PUBLIC SERVICE COMMUNICATIONS SATELLITE USER REQUIREMENTS WORKSHOP

FINAL REPORT

JANUARY 14, 1977

Communications and Navigation Division
Goddard Space Flight Center
Greenbelt, Maryland 20771

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January 1977

Edited by
Edward A. Wolff

Communications & Navigation Division
Applications Directorate

GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland 20771

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PUBLIC SERVICE COMMUNICATIONS SATELLITE
USER REQUIREMENTS WORKSHOP

1. INTRODUCTION

A workshop was held to obtain information on user requirements for public service communications. This information will provide the basis of a study to determine the optimum satellite system to satisfy user requirements The concept for such a system is described in Appendix 1. The workshop examined requirements for data and message services, elementary and secondary education, extension and continuing education, environmental communications, library services, medical education, medical services, public broadcasting, public safety, religious applications, state and local communications, and voluntary services. Information was also obtained on procedures to follow to make the transfer to commercial services. The workshop was held at the Tidewater Inn in Easton, Maryland beginning Sunday evening October 17 and ending Tuesday evening October 19, 1976. This workshop was attended by 147 people. Approximately ten additional people attended the presentations on the morning of the second day to hear the results of the workshop.

The workshop approach was to start with a description of the workshop objectives and the approach to be followed by the participants Workshop participants were requested to submit preliminary thoughts on user requirements prior to arriving at the workshop. Following the workshop description the workshop panels convened to consider the advance submissions, make additional recommendations and critique these suggestions. Included in these panel deliberations was an examination of the potential benefits to be obtained from a public service communications satellite (PSCS) system.

Once the panels had reached their conclusions, they presented their results orally to the entire workshop and documented these conclusions for this report.

The Commercial Services Panel considered the relationships that should exist between industry and a government-sponsored public service communications satellite system The panel concluded that such a government-sponsored system should not be done unless new technology is required or a new satellite is required to reduce user terminal costs. A demonstration system would provide the necessary market validation. NASA should provide user assistance for the entire system and involve industry from the beginning. The demonstration system parameters should be as close as possible to the succeeding operational configuration. The users should make some financial committment and be made aware of the eventual total system cost.

The panel on Data and Message Services described requirements for the relay of data from sensors, between data terminals and between computer files They also described needs for data inquiry, response, electronic mail and high resolution image transfer. User commonality was considered where packet switching might be applied for applications such as medical and weather sensors, digitized voice, bulk data transfer, inquiry systems, interactive data processing and electronic mail. Applications involving direct delivery to the user included programmable hand calculators and a digital citizen's band radio. The panel considered user community problems involving human communications, reconfiguration and growth and modularity

The panel on Elementary and Secondary Education described present communications applications such as the Catholic TV network. Needs mentioned include access to industrial diagnostic specialists, access to remotely stored instructional material, supplements to the teaching staff, instruction to home-bound students, promotion of computer-assisted instruction, facilitation of enrichment activities and aid to handicapped students. Also included were in-service courses for teacher education, teleconferencing for educational professionals and organizations and communications for a variety of other teacher needs The need for communications between school and parents was also described.

The panel on Continuing and Extension Education described the needs for occupational training, continuing professional education, military training, in-service institutional training, education in sparsely populated areas, education for immobilized people and the news distribution of the content of professional society meetings. Opportunities for satellites to make a contribution included market aggregation and equality of access.

The Environmental Communications Panel considered the dissemination of information on space, atmospheric, edaphic and oceanic conditions. They described the need for small messages from many sensors and the transfer of large amounts of information between major collection points and between collection and data processing centers

The Library Services Panel described the need for data base building, information retrieval, information broadcast, access to emergency information, library teleconferencing and facsimile transmission.

The Medical Education Panel described the needs for telediagnosis, mass information transfer to medical schools, computer data band information transfer, health education for the public and physician-patient communications.

The Medical Services Panel described health care needs including improvements in emergency medical services, teleconsultation, remote patient care (telediagnosis), basic and continuing medical education, supervision of allied health care workers, and administration and management of health care resources.

The Public Broadcasting Panel described its present system and its need for additional communications services, for flexibility, and for new services for public radio and television Included were needs for specialized audiences such as instruction for special groups, sequential origination of materials, interactive capabilities for educational services, data transfer for broadcast management, and resource storage and sharing.

The Public Safety Panel described the needs for disaster alerting, two-way radio, national emergency coordination, record traffic, television for education and disaster monitoring, facsimile for arrest fingerprints and identification photographs, data transfer for data base generation and retrieval, and vehicle tracking and location.

The Religions Applications Panel described the need for in-service training for professionals and teachers, data transfer in and out of data banks, software distribution, teleconferencing, interconnection of libraries and educational facilities, off-air broadcast distributing, news dissemination to press and broadcasters, disaster relief coordination, missionary communications, direct broadcast to homes, and health care information.

The State and Local Government Panel discussed the need for communications planning at the national, state and local levels, increasing demand for services, and funding limitations.

The Voluntary and Social Services Panel described the needs for the non-profit sector including communications with members and social service recipients, and between organizational units.

The requirements documented in this workshop will be used as the basis of more detailed user study, a market study and a satellite system study. The results of these studies are expected to be available for presentation to the users by the middle of next year.

Descriptions of the workshop and the process used to arrive at the recommendations are given in this report.

2. WORKSHOP DESCRIPTION

The workshop was held at the Tidewater Inn in Easton, Maryland from October 17 through October 19, 1976.

The workshop was attended by 147 participants as listed in Table 1. The participants were each invited by telephone. Those accepting invitations were then mailed detailed instructions. A copy of this advance mailing is given in Appendix 2. Each participant was asked to make some preliminary suggestions regarding the possible user requirements for communications on the form provided in the advance mailing

The workshop participants were organized into thirteen panels to concentrate on the various disciplines as shown in Table 2.

Table 1

Workshop Participants

Dr. Norman Abramson, Director
The ALOHA System
University of Hawaii
Honolulu, Hawaii 96822
(808) 948-7589

James E. Alexander
Assistant General Secretary
United Methodist Board
Discipleship
P.O. Box 840
Nashville, Tennessee 37202
(615) 327-2700

Dr. George E. Allen, Director
Regional Educational Services
Agency
110 Washington Street
Cumberland, Maryland 21502
(301) 724-6190

Dr. Paul Andereck
5102 Pommetroy Drive
Fairfax, Virginia 22030
(202) 245-2514

Kevin Arundel
National Institute of Education
Technological Applications
Division
Room 616-B
1200 - 19th Street, N.W.
Washington, D.C. 20208
(202) 254-6050

S. S. Ashton
Law Enforcement Assistance
Administration, Room 503
521 - 12th Street, N.W.
Washington, D.C.
(202) 376-2570

M. Barbara Backer, M.D.
1533 Michigan Avenue
LaPorte, Indiana 46350
(219) 362-3681

Gertrude Barnstone
Member of the Board
KPFT
1401 Harold Street
Houston, Texas 77006
(713) 528-0397

Alice Beckman, Coordinator
Appalachia Educational Satellite
Project
Chautaugua County BOCES
9520 Fredonia-Stockton Road
Fredonia, New York 14063
(716) 672-4371

Richard Berglund, M.D.
Chief of Neurosurgery
Hershey Medical Center
Hershey, Pennsylvania
(717) 534-8808

Robert Bernier
COMSAT General Corporation
950 L'Enfant Plaza
Washington, D.C. 20024

Robert Bird, M.D.
Lister Hill National Center for
Communications
National Library of Medicine
8600 Rockville Pike
Bethesda, Maryland 20014
(301) 496-4441

Dr. Edward Blackhurst,
Co-Director
Appalachian Educational Satellite
Project
210 Porter Building
University of Kentucky
Lexington, Kentucky 40506
(606) 258-8911 or 258-8987

John Boning
RCA American
201 Centennial Boulevard
Piscataway, New Jersey 08854
(201) 885-4057

Hal Braham
General Electric
P.O. Box 8555
Philadelphia, Pennsylvania 19101
(215) 962-4364

Warren Braren
Consumers Union
256 Washington Street
Mt. Vernon, New York 10550
(914) 664-6400

Charles Breig
Federal Communications
Commission
8300 - 16th Street, Apt. 102
Silver Spring, Maryland 20910
(301) 632-6495

Brian Brightly
Special Projects Coordinator
Corporation for Public
Broadcasting
1111 - 16th Street, N.W.
Washington, D.C. 20036
(202) 293-6160

James P. Brown
NASA/GSFC
Code 952
Greenbelt, Maryland 20771
(301) 982-6720

Cecil D. Burge, Ph.D.
University of Southern
Mississippi

Fr. George Byrne
U.S. Catholic Conference
Suite 1300
1011 First Avenue
New York, New York 10022
(212) 644-1880

Eugene Cacciamani
Vice President
Technical Department
American Satellite Corporation
Germantown, Maryland 20767

Gerald Carp
Drug Enforcement Administration
1405 Eye Street, N.W.
Washington, D.C.
(202) 382-8063

Dr. Martin Chamberlain, Dean
University Extension
University of California,
San Diego
Q-014
LaJolla, California 92093
(715) 452-3400

Table 1 (continued)

Ralph P. Christenson, M.D. c/o A. Painter 5800 S. S. Vermont Street Portland, Oregon (503) 244-9777	Richard Davies Aeronautic Ford 3939 Fabian Way Palo Alto, California 94303	Sajjad Durrani GSFC/NASA Code 953 Greenbelt, Maryland 20771 (301) 982-4384
Helen Clearwater American Red Cross 6206 Belcrest Road Hyattsville, Maryland 20782 (301) 559-8500	Dr. Dorothy Deringer Education Directorate National Science Foundation 1800 G Street, N.W. Washington, D.C. 20550 (202) 282-7745	Robert B. Egwood NASA/National Space Technology Laboratories Bay St. Louis, Mississippi (601) 688-2125
William Conant GSFC/NASA Code 952 Greenbelt, Maryland 20771 (301) 982-5908	Allen Deschere Division for Blind and Physically Handicapped Library of Congress 1291 Taylor Street, N.W Washington, D.C. 20542 (202) 882-5500	Gianpiero Forcina COMSAT General 950 L'Enfant Plaza Washington, D.C. 20024 (202) 554-6576
Arthur R. Cooke National Oceanic and Atmospheric Administration Telecommunications Management and Planning Div., Rm. 315 6010 Executive Boulevard Rockville, Maryland 20850 (301) 443-8113	Dr. Ted Dixon Superintendent of Schools San Diego County 6401 Linda Vista Road San Diego, California 92111 (714) 292-3513	Eugene Feinberg Operations Research, Inc. 1400 Spring Street Silver Spring, Maryland 20910 (301) 588-6180
Alva S. Cooper Deputy Commissioner Department of California Highway Patrol P.O. Box 898 Sacramento, California 95804 (916) 445-5751	Frank Douglas Operations Research, Inc. 1400 Spring Street Silver Spring, Maryland 20910 (301) 588-6180	Gary Fereno Operations Research, Inc. 1400 Spring Street Silver Spring, Maryland 20910 (301) 588-6180, ext. 361
Joseph P. Corrigan GSFC/NASA Code 720 Greenbelt, Maryland 20771 (301) 982-4094	Dr. Robert Dressler GSFC/NASA Code 903 Greenbelt, Maryland 20771	John Ferretti Miami-Dade Community College 11011 Southwest 104th Street Miami, Florida 33176 (305) 596-1257
Charles E. Cote GSFC/NASA Code 720 Greenbelt, Maryland 20771 (301) 982-4215	Monseigneur Pierre DuMaine Superintendent of Schools Archdiocese of San Francisco 443 Church Street San Francisco, California 94114 (415) 552-3620	Joel B. Fleming Associate Director Virginia Public Telecommunications Council 902 - 9th Street Office Building Richmond, Virginia 23219 (804) 786-7729
Bert Cowlan The Public Interest Satellite Association 55 W. 44th Street New York, New York 10036 (212) 730-5171	Walter Duncan U.S. Army Corp. of Engineers Office of Chief of Engineers (DAEN-CWE-Y) Washington, D.C. 20314 (202) 693-7330	Anthony H. Flores Chief Transmission Branch Telephone Rural Electrification Administration U.S. Department of Agriculture Washington, D.C. 20250 (202) 447-3917

Table 1 (continued)

Samual N. Fordyce
NASA Headquarters
Code ECF
Washington, D.C. 20546

Dr. William F. Fore
National Council of Churches of Christ
475 Riverside Drive
New York, New York 10027
(212) 870-2567

Jerome Freibaum
NASA Headquarters
Code ECE
Washington, D.C. 20546

Joseph Freitag
COMSAT General Corporation
950 L'Enfant Plaza
Washington, D.C. 20024

Elmer Friman
Director
Indiana University Medical Education Resources Program
Indianapolis, Indiana 46202
(317) 264-4083

Virginia Gentle
Instructional Resources
Miami-Dade College
11011 S.W. 104th Street
Miami, Florida 33176
(305) 596-1175

John Gilfeather
Yankolovitch, Skell & White
575 Madison Avenue
New York, New York 10022
(212) 752-7500

Priscilla Gotsick
Route 1
Lakeview Heights
Morehead, Kentucky 40351
(606) 784-9607

Dr. Donald Grace
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332
(404) 894-3400

Donald I. Gray
Fairbanks Education Association
326 Ketchikan Avenue
Fairbanks, Alaska 99701
(907) 452-5737

Joel Greenberg
ECON Incorporated
900 State Road
Princeton, New Jersey 08540
(609) 924-8778

Leon Greenhouse
Operations Research, Inc.
1400 Spring Street
Silver Spring, Maryland 20910
(301) 588-6180

Arthur Griffith
Department of Health, Education and Welfare
Division of Emergency Medical
Room 326
6525 Belcrest Road
Hyattsville, Maryland 20982
(301) 436-6295

Rev. Charles A. Hamilton
Christian Church
P.O. Box 1986
Indianapolis, Indiana 46206
(317) 353-1491

Charles V. Heck, M.D
Executive Director
American Academy of Orthopaedic Surgeons
430 North Michigan Avenue
Chicago, Illinois 60611
(312) 822-0970

Steven Herman
Division for the Blind and Physically Handicapped
Library of Congress
1291 Taylor Street, N.W.
Washington, D.C. 20542
(202) 882-5500

Dr. Gary Hess
Motorola Inc.
1301 East Algonquin Road
Schaumburg, Illinois 60196
(312) 576-5952

Dr. Robert Hillard, Chief
Education Broadcasting
FCC
1919 M Street, N.W.
Washington, D.C. 20554
(202) 632-7531

Patricia Ho
Hawaii State Teachers Association
2117 - B Puna Street
Honolulu, Hawaii 96817
(808) 595-4837

Walter Hogge, Jr.
National Oceanic and Atmospheric Administration
Telecommunications Management & Planning Div., Room 315
6010 Executive Boulevard
Rockville, Maryland 20850

Albert L. Horley
27227 Black Mountain Road
Los Alto Hills, California 94022
(415) 497-4521

Andrew Horowitz
The Public Interest Satellite Association
55 W. 44th Street
New York, New York 10036
(212) 730-5172

Mary Huffer, Director
Department of Interior Library
18 & "C" Streets, N.W.
Washington, D.C. 20240
(202) 343-5821

Rev. Bill Huie
Presbyterian Church of the United States
341 Ponce de Leon Avenue, N.E.
Atlanta, Georgia 30308
(404) 873-1531, ext. 373

Estil Hoversten
COMSAT Corporation
950 L'Enfant Plaza
Washington, D.C. 20024

Joseph Hull
Office of Telecommunications
Institute for Telecommunications Sciences
Department of Commerce
325 Broadway
Boulder, Colorado 80302
(303) 499-1000, ext. 4136

Howard Hupe
Department of Health, Education and Welfare
Room 409E
200 Independence Avenue, S.W
Washington, D.C. 20201
(202) 245-1891

Table 1 (continued)

Dr Richard Jameson
Director of Communications
Council of Christian
Communications
1836 Fairmont Avenue
Cincinnati, Ohio 45214
(513) 251-4666

Donald Jansky
Office Telecommunication
Policy (OTP)
1800 G Street, N.W.
Washington, D.C. 20036
(202) 395-4876

James R. Jenkins
Office of Telecommunications
Policy (OTP)
Room 712
1800 G Street, N.W.
Washington, D.C. 20036
(202) 395-4876

C R. Jones
Hughes Aircraft Company
909 Sepulveda Boulevard
El Segundo, California
(213) 648-2348

James Justice, M.D.
Indian Health Service
Tucson, Arizona 85706
(602) 792-6604

Dr. Ruth Katz
Denver Research Institute
2135 E. Wesley
Denver, Colorado 80210
(303) 753-3373

Donald Kavanagh
Associated Public-Safety
Communications Officers
P.O. Box 669
New Symrna Beach, Florida 32069
(904) 428-8700

Barry Kerne
Operations Research, Inc.
1400 Spring Street
Silver Spring, Maryland 20910
(301) 588-6180

John Kiebler
GSFC/NASA
Code 951
Greenbelt, Maryland 20771
(301) 982-6092

Jeffrey R. Kurland
Western Union
1 Lake Street
Upper Saddle River, New Jersey
(201) 825-5143

Gordon Law
12155 E. Amherst Circle
Denver, Colorado 80232
(303) 458-8000

Howard Lefkowitz
Operations Research, Inc.
1400 Spring Street
Silver Spring, Maryland 20910
(301) 588-6180

Leo L. Leveridge, M.D.
Department of Medical Education
American Medical Association
535 North Deerborne
Chicago, Illinois 60610
(312) 751-6000

Wasyl M. Lew
NASA Headquarters
Code ECS
Washington, D.C. 20546

Lorraine Luckl
ECON Incorporated
900 State Road
Princeton, New Jersey 08540

Dr. Bernard J. Luskin
Coast Line Community College
KOCE-TV
10231 Slater Avenue
Fountain Valley, California 92708
(714) 963-0811

Herbert Majower
Operations Research, Inc.
1400 Spring Street
Silver Spring, Maryland 20910
(301) 588-6180

Ralph Marcotte
U.S. Postal Service Research &
Development Department
11711 Parklawn Drive
Rockville, Maryland 20852
(301) 443-6100

Lois McCoy
National Association for Search
& Rescue, Inc.
P.O. Box 2123
LaJolla, California 92038

Enrico Mercanti
GSFC/NASA
Code 952
Greenbelt, Maryland 20771
(301) 982-4476

James Michalak
Motorola
1301 East Algonquin Road
Schaumburg, Illinois 60196
(312) 576-5952

Douglas Millar
Box 275
Rutland, North Dakota 58067
(701) 724-6282

Bernard P. Miller
ECON Incorporated
900 State Road
Princeton, New Jersey 08540
(609) 924-8778

John E. Miller
GSFC/NASA
Code 950
Greenbelt, Maryland 20771
(301) 982-5885

Keith L. Monroe
Police Management and
Operations Division
International Association of
Chiefs of Police
11 Firstfield Road
Gaithersburg, Maryland 20760

Table 1 (continued)

F. Lee Morris, Director
Mississippi Authority for ETV
P.O. Drawer 1101
Jackson, Mississippi 39205
(601) 982-6376

Dr. Harold E. Morse
Appalachian Regional Commission
1666 Connecticut Avenue, N.W.
Washington, D.C. 20235
(202) 673-7866

William B. Morton
Agricultural Research Service
P.O. Box 345
Greenbelt, Maryland 20770
(301) 344-2013

Dr. Rose Mukerji
Brooklyn College, CCNY
Brooklyn, New York 11210
(212) 780-5941

Jean Marie Neal
Director of Communications
Drawer 6668
Greenville, South Carolina 29606

Edward Nehman
MITRE Corporation
West Gate Research Park
McLean, Virginia 22102
(703) 790-6745

Frank Norwood
Joint Council in Educational Telecommunications
1126 - 16th Street, N.W.
Washington, D.C. 20036
(202) 659-9740

Richard Oldham
KETS
University of Washington
Seattle, Washington 98195
(206) 543-2000, ext. 61

J. Earle Painter
GSFC/NASA
Code 952
Goddard Space Center
Greenbelt, Maryland 20771

Annie King Phillips
National Association of Neighborhood Health Centers
1625 Eye Street, N.W
Washington, D.C. 20006

Neal Pike
FCC 5120
2025 M Street, N.W.
Washington, D.C. 20554
(202) 632-6497

Dr. Kenneth A. Polcyn
Planning Research Corporation, Information Sciences Company
7600 Old Springhouse Road
McLean, Virginia 22101
(703) 893-1800

James G. Potter
Public Service Satellite Consortium
4040 Sorrento Valley Boulevard
San Diego, California 92121
(714) 452-1140

Donald R. Quayle
Senior Vice President
Corporation for Public Broadcasting
1111 - 16th Street, N.W.
Washington, D.C. 20016
(202) 293-6160, ext. 291

Ted Reams
Communications and Warning Officer
7700 Midlothian Turnpike
Richmond, Virginia 23235
(804) 272-1441

Dr. William N. Redisch
Code 950
GSFC/NASA
Greenbelt, Maryland 20771
(301) 982-2265

Mason Reigel
Communications Division
Department of General Services
2020 - 19th Street
Sacramento, California 95818
(916) 445-6937

Dr. Jane G. Richards
Indiana Higher Education Telecommunications System
1100 West Michigan Street
Indianapolis, Indiana 46202
(317) 264-7945

Dr. Marvin H Rimerman
Mayor's Office of Telecommunications
Operations Center
111 N. Calvert Street
Baltimore, Maryland 21202
(301) 396-1100

Martin Rogol
1346 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 833-3934

Stanley E. Rzewnicki
ATT - Long Line Department
110 Belmot Drive
Somerset, New Jersey 08873

Joseph W. Schiesl
National Weather Service
8060 - 13th Street
Silver Spring, Maryland 20910

John Schwartz
National Federation of Community of Broadcasters
3423 Parkview Avenue
Pittsburgh, Pennsylvania 15213

M. Roy Schwarz, M.D.
Associate Dean, Academic Affairs
University of Washington
School of Medicine
Seattle, Washington 98195
(206) 543-7212

Dr. Dean Seibert
Associate Dean
Dartmouth Medical School
Hanover, New Hampshire 03755
(603) 646-3421

Table 1 (continued)

George Selz
Operations Research, Inc.
1400 Spring Street
Silver Spring, Maryland 20910
(301) 588-6180

Robert Shamaskin
Deputy Director
Learning Resources Service (142A)
Veterans Administration
Central Office
Department of Medicine and Surgery
810 Vermont Avenue, N.W.
Washington, D.C. 20420
(202) 393-4120

Nathan Shoehalter
Rutgers University Extension
New Brunswich, New Jersey 08904
(201) 932-4194

Joseph N. Sivo
Code 3400
Lewis Research Center
National Aeronautics and Space Administration
2100 Brookpark Road
Cleveland, Ohio 44135

Dr. Clifford A. Spohn
Deputy Director
National Environment Satellite Service
5809 San Juan Drive
Clinton, Maryland 20735
(301) 763-7190

Paul Stevens, President
Radio and Television Commission
Southern Baptist Convention
P.O. Box 12157
Ft. Worth, Texas 76116
(817) 737-4011

Walter B. Sullivan
GSFC/NASA
Code 951
Greenbelt, Maryland 20771
(301) 982-4059

Emanuel Suter, Director
Division of Educational Resource and Programs
Association of American Medical Colleges
1 Dupont Circle, N.W.
Washington, D.C. 20036
(202) 466-5111

Sidney Tishler, Director
Maryland Center for Public Broadcasting
Owings Mills, Maryland 21117
(301) 356-5600

Jan M. Turkiewicz
GSFC/NASA
Code 951
Greenbelt, Maryland 20771
(301) 982-6092

Dr. Andrew Viterbi
Linkabit
10453 Roselle Street
San Diego, California 92121
(714) 453-7007

Freidrich O. Vonbun
Code 900
GSFC/NASA
Greenbelt, Maryland 20771
(301) 982-5201

Robert M. Walp, Director
Office of Telecommunications
Pouch AC
Juneau, Alaska 99811
(907) 465-3550

Jon D. Wempner, M.D.
Lake View Clinic
Waconia, Minnesota 55337
(617) 442-4461

Dr. Harold E. Wigren
Telecommunication Specialist
National Education Association
1201 - 16th Street, N.W.
Washington, D.C. 20035
(202) 833-4000, ext. 4120

Ronald L. Wilson
WCET TV/48
1223 Central Parkway,
Cincinnati, Ohio 45214
(513) 381-4033, ext. 18

Charmaine Wiscarver
South Dakota Indian Education Association
Kyle, South Dakota 57752
(605) 455-2461

John P. Witherspoon, President
Public Service Satellite Consortium
San Diego, California
(714) 452-1140

Dr. Edward A. Wolff
Code 950
GSFC/NASA
Greenbelt, Maryland 20771
(301) 982-2265

John Woodruff
Code 953
GSFC/NASA
Greenbelt, Maryland 20771
(301) 982-5908

Col. Lawson P. Wynne
International Christian Broadcasters
1504 Arboretum Drive
Chapel Hill, North Carolina 27514
(919) 967-7928

Dr. Elizabeth L. Young
The Ohio State University
Telecommunications Center
2400 Oletangy River Road
Columbus, Ohio 43210
(614) 421-2540

Table 2

Workshop Organization

Arrangements: Hèrbert Majower	
1. Commercial Services Chairman: Donald Jansky Secretary: Joseph Sivo	John Boning, Hal Braham, Charles Breig, Eugene Cacciamani, Richard Davies, Joseph Freitag, Dick Jones, Jeffrey Kurland, Howard Lefkowitz, Neal Pike, Stanley Rzewnicki
2. Data and Message Services Chairman: Norman Abramson Secretary: Charles Cote	Dorothy Deringer, Eugene Feinberg, John Ferretti, Donald Grace, Estil Hoversten, Joseph Hull, Gordon Law, Ralph Marcotte, Andrew Viterbi
3. Elementary and Secondary Education Chairman: Harold Wigren Secretary: John Kiebler	Alice Beckman, Ed Blackhurst, Brian Brightly, Ted Dixon, Pierre DuMaine, Donald Gray, Patricia Ho, Rose Mukerji
4. Extension and Continuing Education Chairman: Martin Chamberlain Secretary: J. Earle Painter	Kevin Arundel, Virginia Gentle, Harold Morse, Frank Norwood, Kenneth Polcyn, Nathan Shoehalter
5. Environmental Communications Chairman: Arthur Cooke Secretary: Enrico Mercanti	Robert Bernier, Walter Duncan, Walter Hogge, James Jenkins, Barry Kerne, Joseph Schiesl, Clifford Spohn
6. Library Services Chairman: Ruth Katz Secretary: Sajjad Durrani	Paul Andereck, Allan Deschere, Pricilla Gotsick, Steven Herman, Mary Huffer
7. Medical Education Chairman: Charles Heck Secretary: William Conant	Mary Backer, Richard Berglund, Robert Bird, Frank Douglas, Elmer Friman, Leo Leveridge, Emanual Suter
8. Medical Services Chairman: Ralph Christenson Secretary: Walter Sullivan	Cecil Burge, Robert Egwood, Leon Greenhouse, Arthur Griffith, Howard Hupe, James Justice, Edward Nehman, M. Roy Schwarz, Robert Shamaskin, Dean Siebert, Jon Wempner
9. Public Broadcasting Chairman: Donald Quayle Secretary: John Miller	Robert Hillard, Bernard Luskin, F. Lee Morris, Richard Oldham, George Selz, Sidney Tishler, Ronald Wilson
10. Public Safety Chairman: S. S Ashton Secretary Jan Turkiewicz	George Allan, Gerald Carp, Helen Clearwater, Alva Cooper, Donald Kavanagh, Lois McCoy, Keith Monroe, William Morton

Table 2 (continued)

11 Religious Applications Chairman: William Fore Secretary: Joseph Corrigan	James Alexander, George Byrne, Charles Hamilton, Bill Huie, Richard Jameson, Douglas Millar, Paul Stevens, Lawson Wynne
12. State & Local Communications Chairman: Robert Walp Secretary: James Brown	Gianpiero Forcina, Gary Fereno, Joe Fleming, Anthony Flores, Jean-Marie Neal, Ted Reams, Jane Richards, Mason Riegel, Marvin Rimerman, Elizabeth Young
13 Voluntary & Social Services Chairman: Bert Cowlan Secretary: John Woodruff	Gertrude Barnstone, Warren Braren, Andrew Horowitz, Annie King Phillips, Martin Rogol, John Schwartz, Chairmaine Wisecarver
Unassigned: Robert Dressler, Samuel Fordyce, Jerome Freibaum, John Gilfeather, Joel Greenberg, Gary Hess, Wasyl Lew, Lorrain Luckl, James Michalak, Bernard Miller, James Potter, William Redisch, Freidrich Vonbun, John Witherspoon, Edward Wolff	

The workshop was sponsored by the National Aeronautics and Space Administration, Goddard Space Flight Center (GSFC) and conducted by Operations Research, Inc. (ORI). A management team was formed consisting of the Workshop Coordinator, GSFC Technical Officer and the Chairmen and Secretaries of each of the panels The panel secretaries were responsible for insuring that each panel session was properly documented and for keeping track of the session timing. The management team met together before, during and after the workshop to coordinate workshop activities. The purpose of each of these management meetings is shown in Table 3.

Table 3

Management Objectives

Workshop:

To provide an opportunity to compile a description of user requirements for public service communications:

Sunday Management Team Meeting:

To acquaint workshop leaders with the workshop plan and with their roles.

Sunday Social Hour:

To assist participants in getting acquainted.

Tuesday Management Team Breakfast:

To review highlights of previous day, to acquaint leaders with the plan for the day, and to discuss any problems that can be anticipated.

The workshop program consisted of three parts:

- A short presentation of workshop objectives and approach
- A formulation of user requirements and
- A final presentation and documentation.

The arrangement of this program is shown in Table 4 and the objective for each of the sessions is shown in Table 5.

An effort was made to have the participants think about the problem prior to the workshop and to give the other participants the benefit of their thought. Accordingly, they were asked to send information on their preliminary thoughts on user requirements These initial requirements descriptions (given in Appendix 3) provided the framework for the panel deliberations. The final recommendations of the panels are given in Appendix 4 and are described in the following section.

Table 4

Workshop Program

Time / Date	Sunday Oct 17	Monday 18	Tuesday 19
8 00-9 00 am		Breakfast	
9 00-12 00 am		Welcome Public Service Communications Satellite Concept Panel Discussions	Panel Presentations
12 30-1 30 pm		Lunch by Panels	
1 30-5 00 pm		Panel Discussions Public Service Communications Needs Potential Benefits of Satellites	Panels Write Reports Workshop Adjourn Committee Critique
6 00-8 00 pm		Banquet	
8 30 pm	Get Acquainted Reception (Cash Bar, Pool-side)	Social (Cash Bar, Pool-side)	

Table 5

Workshop Objectives

To compile a description of user requirements for public service communications.
<u>Monday Morning:</u>
To orient the participants and provide them with an opportunity to brainstorm on user requirements.
<u>Monday Afternoon:</u>
To generate user requirements, critique these suggestions, and develop panel recommendations.
<u>Tuesday Morning:</u>
To allow the workshop to hear and critique the panel recommendations.
<u>Tuesday Afternoon:</u>
To document the recommended experiments.

3. WORKSHOP RESULTS

The workshop began with a short description of workshop objectives and approach. The workshop panels then considered the need for communications without regard for whether or not the communications should be transmitted via satellite. The panels' main consideration was the importance of information transfer to their respective disciplines.

The workshop panels were asked to consider various types of communications such as voice (telephone), record message (telegraph, letter), one-way television (i.e., educational broadcast) to one or many terminals, interactive television (voice or video interactive), facsimile, teleconferencing (audio; audio and video; audio and facsimile; audio, video and facsimile), and data transfer (high and low data rates).

The workshop panels were asked to give attention to substituting electronic communications for other forms as well as augmenting existing electronic communications. The panels were advised that people doing marketing studies wanted information on what users are presently paying for all types of communications (by category) and what users would be willing to pay for new or augmented services.

The rationale used by each panel and a summary of their results are given in the following paragraphs. These paragraphs were prepared by the individual panels.

3.1 COMMERCIAL SERVICES

3.1.1 Overview

This panel consisted of representatives from domestic satellite common carriers, spacecraft manufacturers, communications equipment manufacturers, and government regulatory agencies.

The panel, after considerable discussion, agreed on the primary question it should address in the content of the workshop, as follows:

> Determine the relationship between industry and a Government-sponsored Public Services Communications System.

The approach that was taken is illustrated in Figure 1. The panel completely concurred that NASA should determine the user needs, develop requirements and then aggregate the requirements into a viable system requirement. From these requirements a system (or systems) should be designed and specifications prepared.

The panel felt that the system specifications should be carefully examined and coordinated with the common carriers to determine if they can satisfy the needs. This would include both performance and economic considerations. If there are applications which can be satisfied by existing commercial satellite systems, then they should be so channeled and not be considered for the PSCS.

To be considered for a PSCS an application should meet one of the following criteria:

1. A new spacecraft system is required to meet the user needs which represents an extension of current operational technology.

2. New spacecraft or ground terminal technology is required.

3. The cost of the user equipment is not currently economically feasible thus requiring new system designs.

The panel felt that regardless of what form PSCS takes, the commercial services industry should be brought into the program early enough to insure that a smooth transition to an operational system can be achieved. The users should also participate in the early system design phase to gain an understanding of all of the problems associated with achieving a full or partial commercial system.

Assuming that the above criteria are met and NASA undertakes the development of a PSCS, the panel felt that the program should constitute a market validation effort The market would be established and verified through the use of an actual demonstration approach which could, for some users, take a year or more. The demonstration system provided should be quasi-operational with high reliability and be virtually identical (as far as the user is concerned) with the operational system. The stability of system parameters is of major importance, particularly as regards policies and regulations (for example, frequencies). Users should not be forced to purchase entire new terminal equipments when making the transition to an operational system. NASA should consider the total user system (end-to-end) and provide the required technical assistance in hardware specification, training, operation, test and maintenance needs, program development, etc. NASA should involve industry to establish the optimum crossover points to a full commercial system for each of the user application areas.

In the implementation of a PSCS various alternatives should be examined by NASA in establishing a quasi-operational system as follows:

1. Use existing communications capabilities (space segment, ground terminals, terrestrial links).

2. Provide incentives for industry to develop the services (policies, taxes, subsidies, etc.).

3. Use a Government system in cooperation with commercial services (perhaps renting capability from industry).

The panel felt that the ground terminals could easily be handled by industry with NASA specifying the various configurations and then making an initial buy. Additional terminals could then be provided by industry on a purchase and/or rental basis. Terminals with an add-on modular performance capability could be provided so that a user would only have to pay for his explicit needs.

The panel addressed the question of how the user should participate in a PSCS. The consensus was that the user should make some financial commitment to the system. Users should also be made aware, early in the program, of the ultimate operational costs of their service. For some users a gradual increase in financial commitment should be established to ease the transition to a full commercial system. The participation of the users would significantly help to insure a viable operational capability long after government participation was concluded.

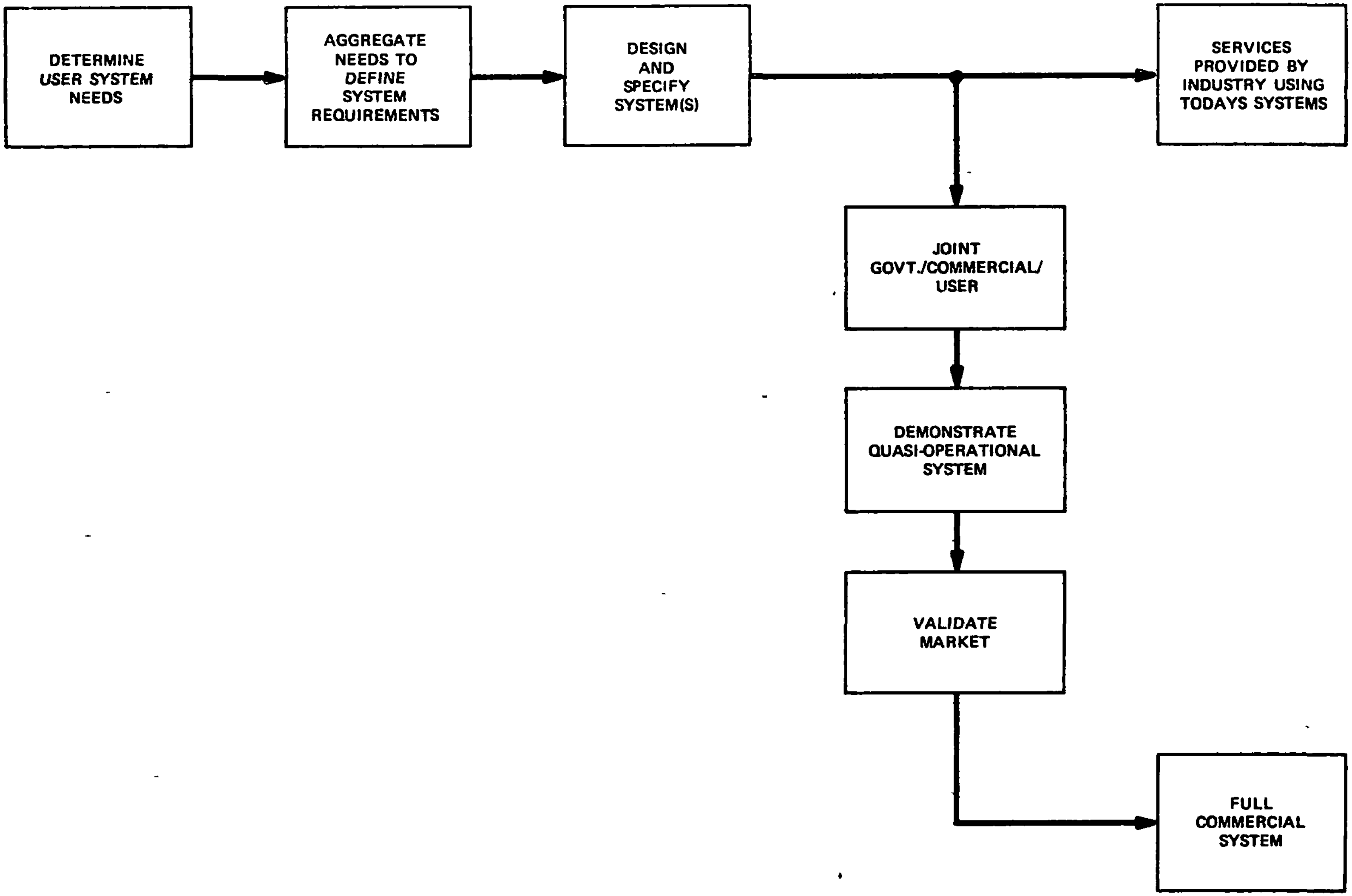


Figure 1. Approach to Determining the Relationship Between Industry and a Government Sponsored PSCS

3 1.2 Policy Questions

Policies of the Federal Government impact in several ways on the utilization of satellites for the provision of public services. It is Federal Government policy to place full reliance on the private sector. This is manifested in OTP Circular 13, and OMB circular A-76. An illustration of the application of this philosophy has been the NASA TDRS Program, in which the requirement of a Federal agency was functionally defined, and the private sector then bid on providing the specified service.

In regard to the question as to what extent NASA should or should not provide such public services, the guiding policy would be that indicated above. Given a particular user need, the first question to be asked is, to what extent the indicated requirement could be provided by the private sector. If it can not be provided, then consideration could be given to determining the extent to which the Federal Government should perform a market definition function. This is a basic policy issue which, while real, is beyond the scope of this conference. However, a determination in this area is fundamental to determining the role of NASA in the area of providing public services via satellite.

1. At what point does the private sector become involved?

2. What cost should be incurred by the user?

These policy issues should be clarified at the earliest opportunity in order to provide appropriate guidance to NASA.

In considering any new kind of service which may be delivered via satellite, an important aspect is spectrum conservation. Both the amount of bandwidth necessary and its location in the spectrum are important. Provided that the role of the satellite system is that of a fixed point-to-point service, existing satellite bands may be used and the only question is the availability of such spectrum. This problem is one that is handled within existing allocations and within existing regulations.

In those cases in which the new services require new spectrum allocations in spectrum space now allocated and used for services other than satellite services, definite and difficult problems arise. For example, it has been proposed that one possible new service might be a satellite-to-vehicle (mobile satellite) service to operate in the 806 to 947 MHz band. This poses a number of problems both domestically and internationally. Domestically this spectrum has been allocated for the growth of terrestrial mobile services. Since terrestrial use of a given frequency will permit thousands of users across the nation while one satellite will preclude reuse of its frequency anywhere else in the country, the efficiency of spectrum use decreases rapidly for satellite use. As a result, there will be serious objection among users to the use of satellites in the mobile bands.

Internationally, there are more serious problems. The 806 to 947 MHz band has been allocated for land mobile usage under an international treaty (the ITU Radio Regulations). In region 2, this spectrum is allocated to broadcast and fixed radio services. Therefore, mobile use of this spectrum within the U.S. is secondary to broadcast and fixed services in neighboring countries. Consequently, we cannot use terrestrial systems in this band closer than 250 miles of the Canadian or Mexican borders. Satellite use of these frequencies has even more consequences to systems in the neighboring countries who will most certainly be opposed to such use.

The procedure for making such allocations changes is to cause the ITU Radio Regulations to be changed to accommodate such uses. This can only be done at a general World Administrative Radio Conference (G-WARC) (or in a special conference) which are scheduled at infrequent intervals (up to 20 years). One such G-WARC is scheduled for 1979 and we have an opportunity to modify the international allocation tables to reflect new uses such as this. However, this is not an easy procedure because the ITU now has a majority of under-developed nations who are not always in sympathy with the needs of more developed nations. Therefore, in order to get changes approved in this forum, these changes must have some appeal to the under-developed members. This leads to the conclusion that those changes most likely to be adopted are those that have rural applications. For example, such uses as rural telephone service, delivery of medical information to remote areas, educational services delivered by satellite, etc., will be those that most appeal to the majority of the ITU members and will give the greatest potential for success in changing the international table of allocations.

3.1.3 Common Carrier Viewpoint

The panel reflected an opinion that today's technology is (in general) adequate to satisfy the presently defined requirements of the public service sector. These requirements generally fall into the categories of voice transmission from fixed or mobile locations, television, data, or facsimile transmission. However, it was noted that some of these requirements are highly specialized, involve limited applications, and are not aggregated. To become cost competitive, needs must be correlated to provide cost attractive offerings.

The Public Service Communications Satellite User Requirements Workshop may identify requirements involving technology not now commercially available. In that event, the carriers noted that they have in the past, and are continuing to assume the responsibility for technology development for supplying communications service when adequate incentives exist.

There is a role for the government to offer incentives that will encourage private industry to continue the technology development and implementation to satisfy new user needs. Should these incentives prove inadequate to stimulate private industry development, there could be a role for NASA to develop the needed technology

The carriers felt that there is a role for NASA in assisting users in defining hardware requirements, preparing operating specifications, and aggregating user needs that have a degree of commonality. The resulting specification should be made available to private industry for competitive bid submission for NASA evaluation. If private industry does not respond acceptably, the service would be a candidate for government development.

3.1.4 Industry Viewpoint

The Public Service Communications Satellite user needs must ultimately be satisfied by commercially viable services. The issue is the process by which this goal is to be achieved.

The panel concluded that NASA, as an agency which is capable of translating user needs into specific system requirements, should perform the total system studies for potential users and specify the system element requirements, i.e., programming, related hardware and/or ground equipment, as well as the satellite system performance and cost goals. The potential users and the commercial suppliers are limited in resources to perform this function and NASA can act as a catalyst in bringing the user and supplier together. Furthermore, NASA can specify the total system requirements of which the satellite link may be a small part in many Public Service Communications Satellite user needs. Upon completion of a detailed definition of the total system requirements, NASA and the potential users can approach the commercial service supplier and determine as discussed below, whether the service is now available or whether a new service must be developed in the private sector or as a last resort in the public sector.

3.1.4.1 Technology Development

The next step is for NASA to determine whether the service can be provided at the desired cost with existing technology. If not, then NASA should sponsor development programs in industry to develop the required technology.

Three types of technology development are anticipated One is the development of user peculiar equipment, such as special displays, necessary to make a particular service cost effective Another is advancing the state-of-the-art of ground terminal technology to reduce cost of improved performance. An example might be the development of a new type of low noise amplifier. The third type is the development of new satellite technology, again to reduce cost or improve performance Examples might be a multiple-beam antenna, power amplifiers in a new frequency band, or a high efficiency solar cell.

3.1.4.2 Demonstration in Orbit

If all parties concerned are convinced that a proposed service is needed, technically feasible and economically viable, then an in-orbit demonstration would not be required, and an operational system can be implemented. In-orbit demonstrations, if required, can be achieved with one or more of the following objectives:

a. To demonstrate technical feasibility, user utility, and cost performance

b. To create a user demand by allowing potential users "hands-on" experience to convince themselves that the proposed service is worth while.

c. In the case where new technology was developed (especially new satellite technology), to verify its performance.

An in-orbit demonstration program in its simplest form would consist of leasing an available transponder from a common carrier, and implementing the ground segment using off-the-shelf equipment. If user peculiar equipment and/or new ground terminal components were developed, these would be added. NASA could take an active role in this stage of the program, procuring the equipment and running the experiment for the user, who would evaluate the data.

There are three methods of procuring a new satellite:

- NASA could procure the satellite from industry and place it in orbit. After the demonstration test phase was completed, NASA could sell or lease the satellite to a common carrier for operation.
- A second method is for NASA to guarantee a minimum lease period of a satellite which is developed by private industry. (The TDRS uses this procurement method.)
- A third method is to allow private industry to develop the satellite and place it in orbit. This method would most likely be a joint venture between the satellite manufacturers and the users.

The method used in procuring a new satellite would depend largely on the amount of risk involved. Obviously, a high risk program with large uncertainty in either technology, used demand, or cost, would not likely be implemented by private industry alone.

3.1.4.3 Operational Phase

A successful demonstration in-orbit would normally lead directly to an operational phase. Regulatory factors (tariff rates, frequency allocations) could present problems and must be considered. The process is shown diagramatically on the following page.

3 2 DATA AND MESSAGE SERVICES

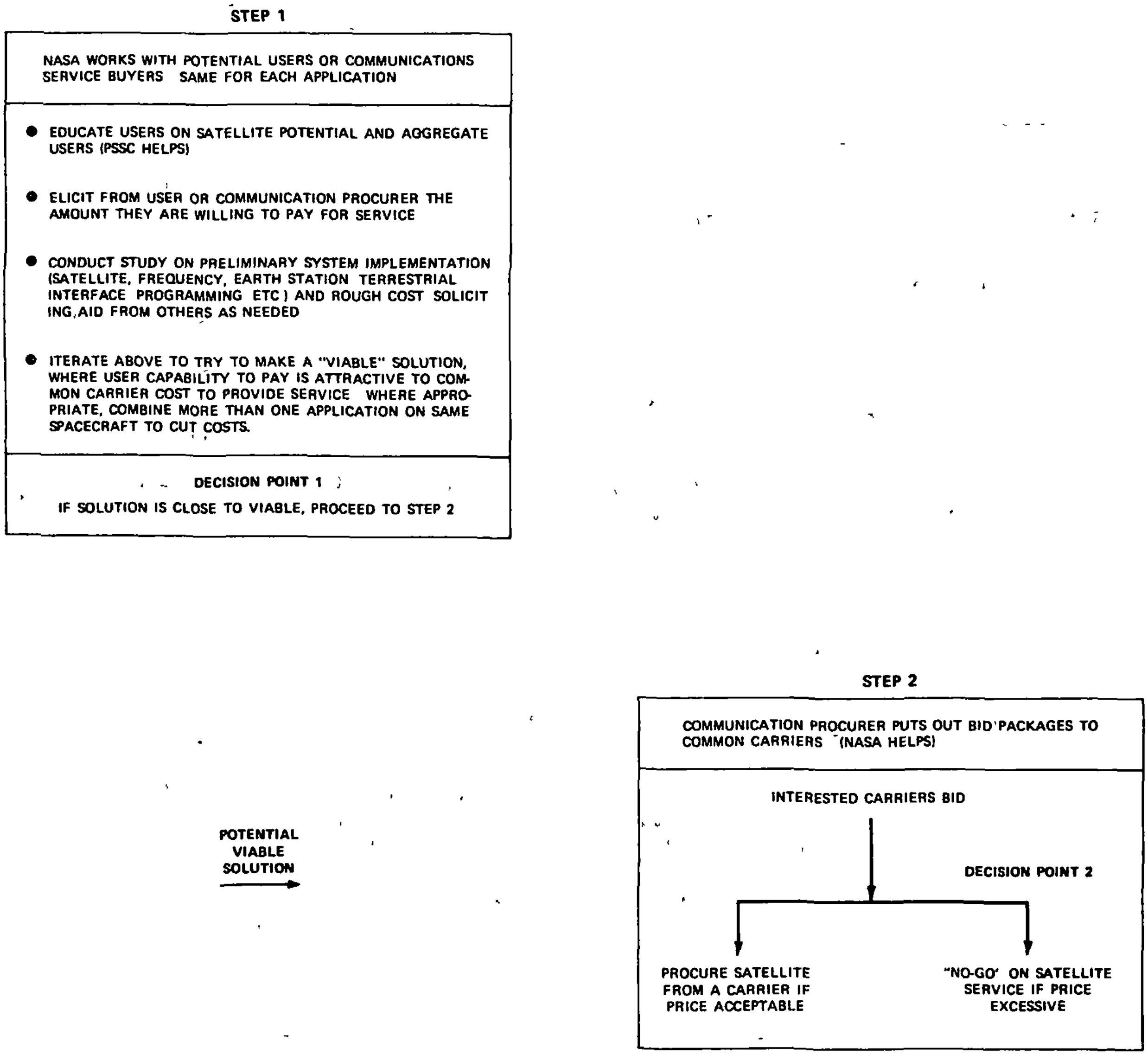
3.2.1 Introduction

There are two overriding socio-technical factors which determine the value of satellite systems for public service user applications. The first of these is the social value of small amounts of data provided at the right place and at the right time. The second factor is the bilateral broadcast nature of the satellite channel which allows communications to take place in broadcast mode to large numbers of users and (less well understood) in broadcast mode from large numbers of users connected in a two-way broadcast network.

Some simple calculations can serve to illustrate both of these points.

3.2.1.1 Data Rates

First consider a single video transponder such as that available on ATS-6 with a total available bandwidth of 30 MHz. The total data rate available from such a transponder could perhaps be as high as



Alternative situations for "No-Go" at Second Decision Point (or First Decision Point). (NASA need conduct study to determine whether situation B or C exists, maybe with carrier help on price for B-1 below.):

A. Satellite common carrier can meet cost/performance requirements of communication procurer, but terrestrial bid is cheaper.

B. Satellite cannot now meet cost/performance requirements of communication procurer, but could do so competitive to terrestrial if either:

1. More users aggregated (share costs such as programming)

2. Advanced technology available to drive cost down (more satellite EIRP makes earth stations cheaper; improved satellite has more channels, less cost per channel; etc.)

C. Satellite cannot now meet cost/performance requirements of communication even with major technology predicted improvements.

Only in situation B does process continue.

Situation B at Decision Point 2:

B-1. <u>More users need to be aggregated</u>

Alternatives:

B-1.1 Further NASA "education" as Step 1

B-1.2 Simple pilot program demonstration, using transponders on existing common carrier satellite

B-1.3 Major demonstration program, using new satellite procured by NASA (operational-like frequency, EIRP, ground station, etc.)

Whenever possible, avoid B-1.3.

B-2. <u>Advanced technology needed to drive cost down</u>

B-2.1 Common carrier develop then provide service. Unlikely because of risk and long time before payoff.

B-2.2 NASA develop technology on R and D flight program. Then repeat step 2, and common carrier profitably provides service on advanced satellite. (Note NASA-developed advanced technology typically usable for several applications.)

B-2.3 NASA develops/launches operational satellite of high new technology, and leases same, then transfers to common carriers.

Emphasis on B-2.2 (or B-2.1 if carriers willing)

100×10^6 bits/second. But if we are interested in large numbers of user earth stations, such stations must be small and available at low cost, operating at a lower data rate of perhaps 5×10^6 bits/second. User requirements for data transmission however could vary from an average data rate of 0.1 bits per second for sensors to average data rates of 1000 bits per second for file transfers among information processors. Peak data rates could be 1000 or more times these values. Thus user requirements in the public sector must consider the satellite resources consumed by each of these uses, and user requirement considerations must weigh the relative social value of satellite communications for small numbers of high resolution images against the social value of 10,000 times as many low data rate devices.

3.2.1.2 Packet Broadcasting

Satellites communications is often viewed as a substitute for ground microwave or cable channels — a big cable in the sky. Satellite channels, however, can provide a different set of user characteristics as well as the conventional form of point-to-point communications now available from land based communication nets. Nowhere are these capabilities, unique to satellite communications, of more value than in the area of digital communications and message services. The key difference from the point of view of data and message services is the broadcast capability of satellites, providing the ability to link directly a large community of users with two-way digital communications. The necessity of using the broadcast mode of digital transmission for a satellite communications community of many users can be seen with a simple example.

Consider a public service system with many small digital earth stations and say 100,000 users. Then, in order to provide complete connectivity of this community by means of conventional channelized (FDMA or TDMA) communications architecture, we require

$$\frac{100{,}000 \times 99{,}999}{2} \approx 5{,}000{,}000{,}000 \text{ channels}$$

The impractical nature of this requirement needs no comment. The point we wish to make is that the user requirement of complete connectivity among a large user community can be met by one of the packet broadcasting digital architecture modes now being investigated. And the importance of this form of bilateral digital communications increases as the square of the size of the user community.

3.2.2 Types of Needs

3.2.2.1 State Communications

Computer to Computer

The State of Florida is currently combining the use of its educational computing centers. Large regional centers are being developed that will share computing and software resources with the smaller end user. There are 9 state universities, 20 community colleges and approximately 70 elementary and secondary school districts that will eventually link together. Some of the institutions are multi-campus.

Eventually, the State of Florida will have all 9 State universities linked together covering the entire geographical region of Florida. The links will be from computer to computer with one large administrative computer center plus one large research center with all other universities becoming nodes in the network. Data rates would range from 100b/s to >19.2kb/s. Of course there could be more than straight point-to-point links, there could be multi-point links and multiple lines associated with each link-up.

Computer links would range from simplex to full duplex and would supply batch and interactive services.

The elementary/secondary schools (K1-12) will eventually share computer resources between themselves and the community colleges. This will be accomplished by dividing the state up in geographical regions.

When the combining of resources is accomplished, there could be as many as 100 computer to computer end-users for batch and time sharing and many (5 ?) thousand interactive terminals for instruction methods such as learning basic programming languages, information retrieval, and computer assisted instruction

Fortunately, this "spreading of the wealth" around the state will bring great economic relief to the taxpayers of the State of Florida as well as making the smaller computer center "equivalent" to the larger computer centers in terms of computing capability

However, this movement toward combined computing capability is not without its drawbacks. To link several educational facilities together to share data there are presently only two choices: telephone land lines and microwave transmission

Because microwave is so costly, the telephone land line system will almost always be used to establish computer links. This presents many problems. Frequently, land lines "fail" just when they are most needed and they are quite costly. Each additional computer link-up usually takes several lines covering distances upward of a hundred miles.

Perhaps by using a public service satellite system as a method for linking computer centers for the State of Florida (or any other State), the cost to the taxpayers could be kept down to a reasonable level while still allowing growth in education computing within tight budget parameters.

The use of satellite communications would have to be economically justifiable as well as reliable to 99.9% as compared to land line and microwave transmission.

The potential is there for educational data links as well as video links; however, more detailed study is required to establish parameters for a public broadcast satellite (network). It seems that satellite transmission has the potential to fulfill the above described network needs in education; however, it would seem that satellites have unlimited potential in other educational applications

Interconnection Within Organizations

State and local government as a user group—The interconnection within Georgia exemplifies the class of user to which a Public Service Communications Satellite could be put The state lists 600 or so "cities" (population of 200 or more); there are 159 counties and 18 Area Planning and Development Commissions (APDC's) composed of groups of counties (some with line responsibilities, others acting more as a service — but each having a hired staff of 10 - 50 people). The State Government has a myriad of bureaus and divisions whose interests often overlap, e.g., energy, environment, taxation, land use, conservation, development These interconnect with each other and through the system downward. Above this superstructure is the Federal Government with data demands, requirements, and funding sources.

There is, then, a real need for data collection, processing, storage, and transmission at a variety of levels within this structure — sometimes vertical and hierarchical, probably more often useful if it could be channeled selectively, laterally and interactively between elements with a mutual interest.

A more specific example—HUD 701 requires a State Development Plan from the State Office of Planning and Budget. Some portions of the data will be obtained with Landsat technology. Some collection from low orbit satellites, some from ground terminals. The number, variety, accessibility location, and reliability of land sensors could be enormously impacted by collection of data unattended through a Public Service Communications Satellite and transmission of data to interested parties from the same satellite

Another state office, Department of Natural Resources, is required by another Federal Government agency (EPA, Sections 208 and 303) to provide information on soil erosion. Some of the above data would be useful, but probably additional sensors are needed.

The State would like spatially oriented land use maps, with varying resolution (urban, farmland, forest, wasteland). More data needs to be collected and combined with some of the above.

State and counties working on computer retrieval of land characteristics use 27 different categories of data. Satellite data services operating in a selective matrix format on pertinent data for storage, retrieval, transmission would aid enormously.

Expansion of the example—Once hardware and software procedures are developed for one State's data services regarding land management for all levels of interest, not only can the model be extrapolated to the needs of other states, but interaction at horizontal interest levels on the data becomes feasible with satellite; e.g., water quality on streams that flow from one state to another, forestry service interaction, migration of birds. The value of such horizontal interaction in exchange of data is perceived to be more than technological, but also psychological in expanding the interrelation of individuals with similar interests and concerns. Additionally, knowledge of other approaches, successes, and problems through interchange can be expected to upgrade quality of services as well as improve efficiency of production.

Hands on utilization of data services without requiring enormous technical knowledge, effort or cost — at the working level in local government — can aid greatly in accelerating public knowledge, acceptance and desire to participate in data services.

Government/public interaction—Much data available from government would be of more public interest if it were easily accessible when needed. Details of building codes, noise regulations, demographics, interpretation of new laws, location of specialized services, land ownership information, etc., would be more useful if they could be elicited on demand, especially in non-urban settings where a personal trip to the source would be a hardship.

Conversely, Government polling of public opinion, of public concerns, of public understanding could serve as a positive feedback while preserving anonymity if desired by the citizens. Low cost, simple digital terminals could transmit to a satellite directly, or perhaps to an intermediate repeater site, permitting remote as well as urban participation.

Linkage of affinity groups—Not only from government to citizens, but among citizen groups, interchange of data service on a timely basis could be revolutionary on progress. Examples include medical diagnostics, marketing information among small to medium sized businesses (e.g., the Georgia poultry industry), determination of availability of components and/or materials for small industries, optimizing distribution of agricultural products to retail outlets. The key difference in this as in many of the previous examples from existing available systems (telephone, radio, etc.) is the many-source to many-user capability on a selective interest basis without the requirement or necessity for intermediaries. Satellite appears to me to be the most feasible approach, especially in view of the generally low data rate which permits large numbers of senders and receivers of the data services in an essentially simultaneous mode.

Miscellaneous comments—Whatever develops as guidelines from this conference should be widely disseminated at least among sample user communities for additions, priorities and comments.

Continuous monitoring of other groups and individuals should take place through some identified focal point in NASA, e.g., there's a Conference on Communications and Rural America, sponsored by the Office of Technology Assessment November 15-17 in Washington. Someone should specifically seek their reactions to this conference's output.

The State of Georgia will release its communication needs study within 1-2 months. It should get to the right people to have an influence as expeditiously as possible.

While NASA views the proposed satellite as quasi-operational, it should be designed with a great deal of user flexibility because users will perceive initial use as experimental for them and they should be able to innovate on the system. It would be tragic to eliminate this.

Whatever the value of the documentation produced, NASA has done a real service just by getting this many people together to explore, brainstorm, and air their views. The contacts will be invaluable to me and provide channels for future interchange and action.

Multi-State Organizations

At a recent meeting, July 5, 1976, the Mountain-Plains governors held at Hershey, Pennsylvania, they determined to do two things specifically related to the proliferation of multi-state and regional organizations:

1. Agreed to form a 10-state "Governors Task Force on the Organization and Management of Multi-State and Regional Activities in the Mountain-Plains Area" and to assign key staff personnel to the Task Force;

2. Requested the Task Force (a) to examine the problems for State government connection with the proliferation of State executive branch associations and interstate compacts, and (b) to develop options for consideration by the Governors for increasing the efficiency and strengthening the effectiveness of regional organizations and interstate compacts in the Mountain-Plains area, including ways and means to streamline procedures for regional cooperation and options for consolidating various multi-state organizations.

This concern, as outlined above, was precipitated by a number of factors, the most important being:

1. Lack of accountability to State government.

2. Programs and strategies which were often counter-productive to an individual State or its executives.

3. The horrendous cost to State governments in both dues structure, manpower and travel costs.

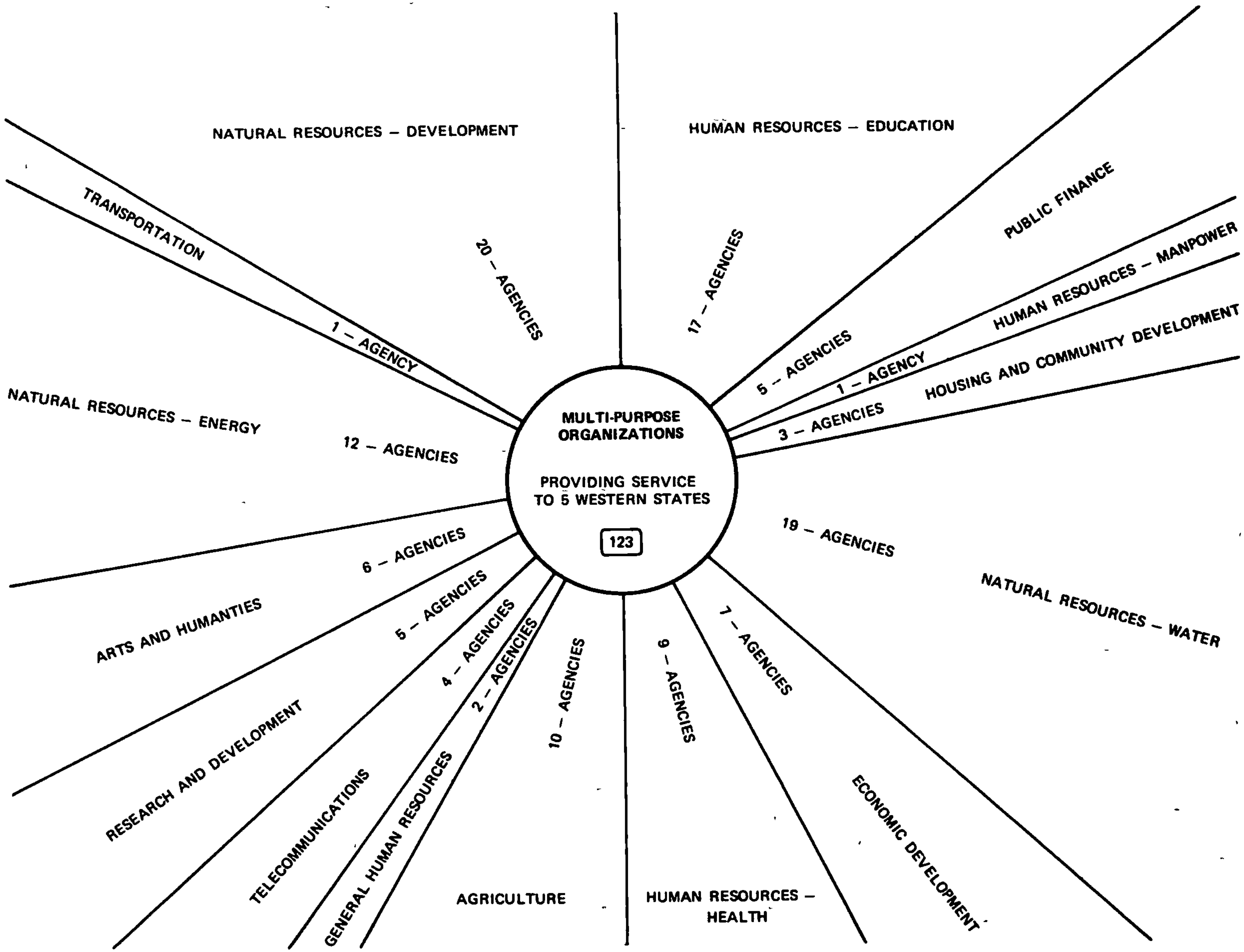
4. The heavy dependence upon Federal funding by many of the multi-State organizations which consequently led to risk of the MSO becoming an extension of Federal policy and not the States' capability.

This determination to amalgamate State resources, specifically into one regional entity to reduce costs and/or increase the benefits of State support for multi-state organizations, will emphasize remedies that involve the joint efforts of the region's States.

While a number of management/administrative formats can solve the current proliferation; the quantity and quality of services rendered to various constituents will have to be addressed. It seems obvious at this time that a viable option to the member States is to consider the use of a communications satellite in any one of all of the tested formats used on all previous ATS missions and also CTS.

Attached are listed a sampling of a number of multi-state organizations in a five state consortia, the Federation of Rocky Mountain States. Preliminary data on the 10-state compact will push the number close to 400. Amalgamation and/or reduction of many of these institutional arrangements will necessitate an alternative system to State government — a quick cross section of the agencies requiring support is also attached, however, no attempt has been made to determine the specific type of service — terminal — or format required. It is however assumed that many agencies can and will use or share a terminal — both fixed and mobile, and further that remote sensing will be a mandated service by others.

There has been no effort to define the type of service needed or guess at the number of terminals required. Initially a terminal at each State House — up and down-link is a must. Hours of usage can be determined upon a survey of consortia needs, but is a massive study in itself and guessing at use and format of use at this time would only further confuse the issue.



MULTI-PURPOSE ORGANIZATIONS
PROVIDING SERVICE TO 5 WESTERN STATES
123
NATURAL RESOURCES – DEVELOPMENT
20 – AGENCIES
HUMAN RESOURCES – EDUCATION
17 – AGENCIES
PUBLIC FINANCE
5 – AGENCIES
HUMAN RESOURCES – MANPOWER
1 – AGENCY
HOUSING AND COMMUNITY DEVELOPMENT
3 – AGENCIES
NATURAL RESOURCES – WATER
19 – AGENCIES
ECONOMIC DEVELOPMENT
7 – AGENCIES
HUMAN RESOURCES – HEALTH
9 – AGENCIES
AGRICULTURE
10 – AGENCIES
GENERAL HUMAN RESOURCES
2 – AGENCIES
TELECOMMUNICATIONS
4 – AGENCIES
RESEARCH AND DEVELOPMENT
5 – AGENCIES
ARTS AND HUMANTIES
6 – AGENCIES
NATURAL RESOURCES – ENERGY
12 – AGENCIES
TRANSPORTATION
1 – AGENCY

Types of Service - Quantity of Terminals

Users Intra-Inter State	Narrow Band	Broad Band	On Line	Off Line
Agriculture				
Farming				
Food				
Forestry				
Marketing				
Research				
Conservation				
Business Commerce				
Fisheries				
Econ Development				
Maritime				
Minority Business				
Productivity				
Regulations				
Community Development				
Open Spaces				
Construction				
Preservation				
Planning				
Research				
Training				
Rural				
Consumer Protection				
Personal				
Safety				
Inspection				
Enforcement				
Disaster Protection and Relief				
Education				
Employment Labor & Manpower				
Energy				
Environment				
Health				
Housing				
Social Service				
Information				
Legal (Lead)				
Natural Resources				
Transportation				

3.2.2.2 Federal Communications

Electronic Mail Service System (EMSS)

Constraints and Problems—The United States Postal Service (USPS) is studying the possible implementation of a new message system called the Electronic Message Service System or EMSS. If implemented, it is planned as a national digital data system offering partial or complete replacement of the present first class letter mail system with new equivalent EMSS services to business, government and household customers of the present first class letter mail system. In general, it would provide the equivalent of all present message services, i e., message, transaction, advertising or a combination of two or more of the above. Messages or data could be inputted in digital (tape disc, magnetic card) format in hand copy (paper, microfilm) form. Cross copy services would be provided so that different input and output forms could be provided to the EMSS user.

It is possible that EMSS, as described above, incorporates many of the needs of the various panel users and that EMSS could possibly use and be a principal subscriber to a Public Service Communications Satellite. However attractive this might be, there are at present USPS policy positions which preclude the present use of the Public Service Communications Satellite for EMSS.

Present USPS policy limits consideration for communication services to common carriers, specialized common carriers and DOMSAT filers. Several other options including (a) the launch and use of a USPS satellite and (b) use of satellites launched and operated by other government agencies were considered but excluded in the final program planning

Despite present restrictions on USPS participation in the Public Service Communications Satellite System, it is apparent that such a satellite system would be enhanced by the participation of the USPS and the possible use of this satellite for the EMS System. In particular, many of the Public Service Communications Satellite users (educational institutions, medical services, state and local governments) have data and message needs which could be provided within EMSS.

In summary, while the USPS is limited to use of common carrier, specialized common carriers, and DOMSAT tariff filers, this meeting has identified other communication opportunities that should be considered in the planning and implementation of the EMSS System.

EMSS Traffic Trends—According to USPS planning objectives, EMSS will consider providing a partial to complete replacement of first class letter mail with equivalent EMSS services. These would provide transaction message, advertising services or combinations of these services to USPS customers. Possible market penetration due to public acceptance can only be estimated. In the light of such uncertainties, the USPS has chosen to specify EMS traffic requirements and the related modal sizing in traffic and size ranges. EMSS with a minimum market penetration would have a minimum estimated traffic requirement of 5 x 10^9 messages per year. On the other hand, a highly accepted EMS System might anticipate annual traffic volumes in the 50 x 10^9 message range. Because of the uncertainty in EMSS traffic requirements, the USPS has chosen to plan EMSS parametrically within the bounds just stated. Additional USPS marketing studies should enable the USPS to zero in more closely on traffic requirements. Also, the identification of feasible communications subsystem implementations for EMSS requires further expansion of message traffic requirements based upon (a) message mix (i.e., digital, facsimile, OCR read), (b) input options offered, and (c) technological implementation.

On the matter of modal sizing, any EMS System would be a national system providing service to CONUS plus Alaska, Hawaii and Puerto Rico, but the total number of modes would be governed by the cost/economic feasibility associated with the market penetration achieved. According to the best estimates, EMS could contain anywhere from 25 modes nationwide up to 5000-10,000 modes for an EMSS offering full replacement for first class letter mail. In this latter case, the modes would most likely be hierarchical and include (a) remote terminals (either privately owned and interfaced with EMSS, or USPS provided public input terminals), (b) EMSS stations which would be the equivalent of a first or second class post office and (c) EMSS centers which would be primarily message (S/F) centers.

The USPS awarded a two-year EMS System Definition and Evaluation Contract to RCA on April 30, 1976. The results of this system planning effort and subsequent USPS management decisions will enable the USPS to more narrowly define the above and other EMSS requirements.

3.2.2.3 Consumer Communications

Aggregated Services

Since the objective of this effort is to move toward an operational public service communications satellite which will prove to be economically self-supporting, at least on the ground segment portion, it is necessary to move away from the anecdotal experiment format. Individual data services considered as individual networks will most likely not be profitable unless many services such as library information, educational services, public safety, etc., can be aggregated in such a way that several institutional resources can be combined to make the satellite system viable.

Such aggregation of services appears both reasonable and desirable in the public interest when one considers the trend of our labor force which is rapidly moving toward the generation and handling of information products — records, billing, inventory, accounting, correspondence, etc. Current assessments indicate that about 46% of the U S labor force is in such activity. Coupled with this change from industrial-service oriented societal activity is the deterioration (disillusionment) of metropolitan-urban communities and a desire to relocate people to rural communities. Last year 1 6 million net people moved into rural communities from metropolitan communities. This has been augmented by the availability of broadband communications services which permit the functions of business to be carried out remotely and accessed from headquarter offices by communications networks. The quality-of-life factors such as health care, education, entertainment and public safety are recognized as necessities by many of the people engaged in this "reverse" migration. Rural communities are often familiar with cooperatives and community programs so that institutional arrangements for multi-user system support is more readily developed. For example, a broadband communication system has been developed by a county in Wisconsin to provide entertainment TV, educational instruction, banking communications, and other minor services. The institutional problems were difficult but appear to be surmountable. The Office of Technology Assessment, an arm of Congress, has recognized this as a specific example of innovative planning and implementation which may become an example to be followed in future rural communication development programs.

This aggregation of community or regional needs requires extensive technological development in terms of protocols, packet message transmission, switching and addressing to accumulate non-real time traffic. Many of the desirable data and message services which appear to be personalized and desirable from a consumer-user point of view are generally of very low data rate when considered in the context of satellite communications and as such can only be supported in the public interest as far as the space segment of such satellite systems are concerned. Equal attention needs to be given to the ground stations, particularly if these serve the needs of a region or community (i.e., county), and the low-cost terminal devices which may require additional message or data processing (storage or editing) at the ground terminal in order to provide the necessary access for transmission. Such SBS-type systems will most likely be required as forerunners to an ultimate digital broadcasting public satellite.

Personal Communications

Personal, Accessible System—This is a discussion of a point-of-view or a design goal in the construction of a Public Service Communications Satellite System. For a technological system to be successfully used, it has to be easily accessible to individuals.

This goal of easy access for individuals is based first in a belief that it is in society's interest for a large number of individuals to use and understand and benefit directly from technological advancements and second, on the observation that it is the use of technology by a large number of individuals which insures widespread impact and continuity of private as well as public support.

Communications and the communications industry have a very strong influence on our day-to-day existence. Two massive communications systems illustrate how communications technology can either advance or restrict us as individuals. The television is in our kitchen, dens, living rooms, and bedrooms. It has literally millions of output terminals and tells us what to think about politics, religion, sex, and unemployment. In fact, it tells us how to think about almost everything but gives us very little if any opportunity to put anything into the system. There are Speak Out programs (for which one must request time) and opportunities to appeal to the FCC but there is really very little that the ordinary citizen who is not exceptionally dedicated can do to influence the broadcasting industry.

The telephone, on the other hand, is an instrument that is easily operable and available to all. We talk to our friends, parents and colleagues easily and frequently. The system is designed and operated for quick, easy and unrestricted access. This same ease of use should apply to satellite use.

The ubiquitousness of the hand calculator and the CB radio—For years we have written and talked about the potential influence of computer aided instruction (CAI) and computing in general on education. However, we have had many abortive and fitfull starts, high expenses and many administrative barriers to effective use of computing in schools. The hand calculator has changed all of this. It is no longer necessary to convince school boards or unions or teachers. The students are appearing in class with calculators and/or checking their homework with them. They, as individuals, are changing the system from within. Soon it will be a personel computer rather than a hand calculator that students will bring to school.

The citizen's band radio has had a similar impact in voice communications. It has changed law enforcement practice, government agencies such as the FCC and has improved the ability and desire of people to communicate among themselves.

One of, if not the major, impact of these devices is that they allow people to solve their problems themselves rather than to go through one or several levels of bureaucracy. It helps to de-bureaucratize our society.

The Goal: A Personal System—The most important thing to keep in mind is that personal does not mean only recreational. One tends to forget that in discussing the sharing of data bases, accessing library resources or using medical services that it is always one person or a small group of people who are attempting to solve some problem. In fact, in the examples of the hand calculator and the CB radio this problem is most frequently work-related.

What are the possible uses for such a service? First, things that have been successful in the past in a restricted geographical area should be experimented with on a wider area. This is particularly important for groups with special needs and requirements. For example, there is an interesting experiment funded by the State of New York and the Bureau of the Education of The Handicapped at Amherst, New York for both physically and mentally handicapped students. It is the provision of, in computing-in-education times, a standard service-drill and practice in mathematics and reading. This could be provided easily as a computing service. However, there is also the experience of the parents and the students of using such a service in the home which is also an extremely valuable experience to be shared with other families of handicapped children. It is this community which could be enlarged and enriched with improved communications facilities. This particular experiment seems likely to be terminated for lack of funds. However, if it were possible to appeal to a larger population over a larger geographic area it may be possible to define a user group that might generate continuing support for such a service. The innovation and creativeness here is in designing ways to use a service. We presently know very little about how to do this.

Other services are law enforcement activities connected with gossip such as that that the CB radio buffs currently support, national computing activities currently supported by national networks, message sending and conferencing and games. The most important criteria for applications are providing an environment in which people and institutions can discover for themselves what is of use and interest to them.

Needed Research—This goal of personal access to communications is one that requires broad research support to go beyond the current practices that we might transfer from activities in computing and communications. The first avenue is one which would be of use specifically to satellite users — the development of an inexpensive hand-held receiving and transmitting station. This is concurrent research that could significantly impact the potential use of such a satellite. Even if NASA itself does not sponsor such an activity, the statement of the desirability of such an activity will facilitate such an activity by other agencies.

The second and final areas of research are valuable with or without the use of a satellite. The two capabilities which must be better developed are better communications protocols for accessing systems and better techniques for browsing in and using large data bases. If these continue to be cumbersome activities it will limit the growth of the more sophisticated applications that individuals may wish to pursue.

It is through this kind of open access to communications technology that the greatest impact will be made. It will serve our short term goals of better emergency service, better library service, and better elementary and secondary education. It will also produce a more technologically literate society and one more capable and willing to communicate with its members.

3.2.3 Problems and Opportunities

Throughout most of the public service data and message services areas, implementation policy when considering alternatives to common carrier and DOMSAT filers presents a policy problem. For example, present USPS (United States Postal Service) policy limits consideration for communications services to common carriers. Options which consider other means have been excluded to date. Thus electronic mail implementation which is technically well suited to a PSCS concept, while also being compatible with mission objectives and goals, could not be implemented by a PSCS system without considerable policy deliberation. Since an EMSS System could easily be extended to offer additional services, in the public service area, this issue is of foremost importance.

Additionally, data services are by nature multi-organization or multi-discipline activities which cross all known boundaries in Federal, State and local sectors. Therefore, it is anticipated that commonality of service, agreements between organizations and a multitude of institutional barriers will present formidable problems.

In addition to those problems the use of a public service satellite for electronic mail service could offer certain opportunities if provided to a limited community. The opportunities we see here involve the investigation of the social factors and user characteristic and user statistics factors which must be understood if the general system envisaged by the U.S. Postal System is to be successfully implemented. The reason for this concern is that a conservative approach to the implementation of a large, general purpose electronic mail system will require the accumulation of knowledge on those sociological factors which determine the use of such a system. The human factors seem to us much less clear than the technological factors, and a pilot system included in a public service satellite could clarify these factors.

3.2.4 Digital Distribution Network Concept

There is a very large spectrum of basic data and message communication services which can be characterized in terms of connectivity and data rate. For example, basic services include digital access lines, digital trunks, switched data service, data collection, data broadcast and data networks.

A Public Service Satellite Communications System would probably have to provide many of these basic services to satisfy the various user applications which are envisioned. On the other hand, if such an undertaking is to adequately serve as a precursor to a continuing commercially viable service, it seems important to especially emphasize those services which represent the largest risks from the technology, cost, utility, and user acceptance point of view.

A prime example of such a service is a satellite-based distributed data network Such a data network might provide terminal-to-computer, computer-to-computer, or terminal-to-terminal communications in support of educational, health service, informal message system and other specific applications. Satellite-based data networks offer unique possibilities for providing flexibility by removing topology constraints, serving geographically distributed and potentially mobile users, accommodating modular growth, and integrating a number of specific applications. The terrestrially based ARPANET and planned and operational networks such as Autodin II and Telenet, which are based on ARPANET technology, provide evidence of the utility of such computer and message networks for some applications. There are, however, significant questions about the economics of such networks and about the level of user sophistication required to effectively utilize them. Specifically, there are currently no satellite based networks. Further, while it is likely that satellites will be used to provide trunking for some commercial networks, it is not likely that satellite terminals will be used to provide access to individual or small groups of users in the near future because of cost and market uncertainties. A fully distributed system which provides user access directly to the satellite without the requirement for the use of terrestrial facilities would be particularly well matched to many of the public service applications, particularly those involving service to sparsely populated areas

Thus a service which should receive careful attention as an important building block for a Public Service Communications Satellite System is satellite-based distributed data networking. Prime goals should be to establish and demonstrate the economic viability of such a service and to develop and convincingly demonstrate the utility and human engineering of applications based on such a service. Packet broadcast satellite ideas provide the fundamental technology. In addition, ground based packet broadcasting, currently being demonstrated by ARPA, may be a useful adjunct to provide economical and flexible access to earth terminals, i.e., some concentration.

3.2.5 Preliminary Technology and Considerations

The realization of a Public Service Communications Satellite System depends on merging the needs of a wide variety of potentially fragmented users with a wide range of needs for data rate, urgency, connectivity and frequency of use. Satellites have the unique capability to service such a widely varied and widespread community of users because of the multiple accessibility and broadcast nature of the satellite channel. Yet in order to meet the needs of the majority of prospective users, two guidelines emerge for economic consideration. First, the few extremely large users should be excluded from common use of the satellite with the many smaller users This, in fact, excludes only the continuous video user with data rate in the megabits or tens of megabits per second, for his needs drive the requirements of the system and hence change its basic character. The second more general requirement is for inexpensive terminals with a high degree of commonality Thus, for example, interactive graphics terminals, medical sensor terminals, bulk data transfer terminals and even a limited number of digitized voice circuits should be able to coexist over the same satellite without the need for dedicated transponder channels or even necessarily the separation of different classes of users onto separate transponders.

The technique for achieving the commonality requirement is at hand. It is known as demand-assignment multiple access communications, or simply as packet transmission, and provides a common format for all users to share a common frequency allocation with efficient use of the channel capacity (i.e., bandwidth and power) in a very cost effective manner. Users with urgent needs or time-continuous needs (such as voice) can be allowed to preempt the channel for short periods, with normal traffic or bulk background low priority and low urgency traffic allowed to fill the gaps.

The challenge is the utilization of existing and developing digital technology (low cost processors and memories) to furnish inexpensive terminals capable of implementing the multiple access and demand assignment tasks required by such a system. Even here a wide variety exists in the complexity of such tasks, very simple techniques permit common operation of many users with low efficiency, while somewhat more sophisticated methods provide considerable improvement in efficiency during peak usage.

The rapid evolution of digital technology, greatly accelerated in the past half decade, gives promise of very inexpensive implementation of even sophisticated assignment and multiple access algorithms. The cost of the earth terminal segment can be further reduced by greater investment in the space segment The economic advantage of such a tradeoff is continuously increased as more and more users enter the satellite network.

An essential step in the evolution of a Public Service Communications Satellite prior to the formulation of a definitive program is the conceptual design of such a satellite network serving a large community of diverse users with small to medium requirements. This would provide the economic yardstick with which to measure the degree of user acceptance and the extent to which the system can achieve the identified needs

3.3 ELEMENTARY AND SECONDARY EDUCATION

3.3.1 Objectives

3.3.1.1 Discipline Objectives

To recognize and support the principle of cultural pluralism which is rooted in our common concerns as humans as well as the differences that enhance the strength and diversity of peoples.

To provide programs, resources and services to children, to youth and to their educators for the purpose of fostering their comprehensive development as individuals and productive members of a changing society.

To plan, diagnose, develop, implement, evaluate, and reassess instructional programs for elementary and secondary students based upon individual needs.

3.3.1.2 Statutory Requirements

Federal, State and local mandatory education laws and corresponding regulations, i.e., Public Law 94-142, Education of All Handicapped Act.

3.3.1.3 Objectives to which Satellites Can Make a Contribution

a. Making resources available to remote isolated areas which otherwise would not have access to them (i.e., making available a physics teacher to an area which has none)

b. Enabling schools and teacher associations to exchange ideas and teaching practices nationwide and worldwide (i e , New Zealand and Lexington, Kentucky).

c. Lessening the sense of isolation many teachers feel when teaching in remote places (harsh physical environment makes teachers eager for outside contacts).

d. Providing opportunities for teachers to participate in projects of significance both nationally and internationally

e. Developing relationships with teachers in other lands

f. Providing in-service educational opportunities for teachers and other educators.

g. Providing a mechanism whereby students can exchange ideas with other students from widely separated places

h. Reaching isolated, mobile, and disperse populations as easily as we reach dense population centers.

i. Providing the opportunity to build closer relationships between individual teachers and their national and state associations, especially where distances present an almost insurmountable problem to effective intra-organizational communications

j. Making possible the development of a new kind of organization for problem solving — one based on a community of interests rather than on geography (i.e., language similarity; urban problems, rural problems, mobility).

k. Making resources available to overcome insularity of impacted urban areas.

l. Linking established delivery systems for increased flexibility in storage, distribution and utilization of materials and resources.

m. Providing access to individualized instruction programs and resources for students with various types of handicapping conditions.

3.3.2 Communications Needs

3.3.2.1 Types of Communications Needs

a. Instructional services for student use.

b Professional development of teachers and administrators.

c. Storage, distribution and utilization of resource data.

d. Parent/community understanding of educational needs and programs.

e. Educational program development and evaluation

Charts on each of the above categories of needs are shown on the following pages.

3.3.2.2 Communications Networks

Present	-	Public Broadcasting Instructional Television Fixed Service Cable Telephone Eric Clearinghouse CBRU (Computer Based Resource Unit) PEACESAT Satellite Network Appalachian Regional Satellite Regional and State networks (microwave leased lines) Commercial broadcast networks PLATO System
Short Term	-	NIMIS (National Instructional Materials Information System) Special Education Learning Resource System Commercial Satellite networks
Long Term	-	Public Service Satellite networks Fiber Optics Lasers

3.3.3 Problem Areas/Constraints

a. Copyright and Residual Rights Problems on materials distributed by satellite.

b. Invasion of privacy.

c. Spillover of satellite signals into unwanted areas.

d. Free-loading of satellite signals.

e. Reluctance of educational institutions to grant academic credit beyond the walls of the institution.

f. Fear of the unknown, especially technology that doesn't work!

g. High start-up costs.

h. Educational authority rests at the local level, raising concern that control of the delivery system will lead to control of the curriculum and a reduction of local autonomy.

Table 6

Elementary and Secondary Education Instructional Needs

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Elementary and Secondary Education Instructional needs of elementary	Written Messages Slow-Scan Video Audio	Audio Transiever Computer Terminal 2-way Video (Color) Telecopier Teletype Video Tape	65,000 Fixed, 1,000 Mobile	NATION-WIDE: Figures are based on the number of schools in the U.S. (65,000). These are minimum amounts and do not	The system should be operational 7 hours per day, 5 days a week: Total of 35 hours per week.	A. A system with this configuration will: 1) Enable the classroom teacher to: a) have independent access to instructional programs and resources when needed.
and secondary students	Simplex Duplex Facsimile Radio Computer	Recorder Multi-Channel Capability		take into consideration the number of students and teachers this system will service.		b) have remote access to specialists to aid in the diagnosis of educational problems of their students. c) obtain immediate access to remotely stored instructional materials, resources, and programs.
	Information and Data Television Television and Two way audio					d) provide computer assisted instruction for their students. e) use multi-channel capability to provide differentiated instruction for various ability groups. f) to obtain expert consultation
	TV Teleconferencing					services related to educational problems. 2) Provide students with opportunities: a) to see/hear/participate in special events that have limited appeal to commercial media.

Table 6 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
						b) for computer assisted instruction (CAI) that will enhance individualized instruction and increase efficiency of teacher/student instructional time. 3. With mobile receiving terminals, a system such as this can also be used to provide temporary instruction for homebound students or long term instruction for students who require an alternative to public/private school instruction.

Table 7

Elementary and Secondary Teacher Education Needs

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Teleconferencing for Teachers & other Educators 4 M	Audio/Video Multiple Simultaneous Terminals	2-Way Voice/Video RO Terminals	1 per 300 teachers	U.S. 50 States and the Territories	2 hour transmissions 5 days/wk	Need: for legislative briefings; Bd. of Dir. Meetings; Public policy reeducation; interviewing public officials Inner-Assoc. Communication, Education & Related Professions.
In-Service Courses for Teachers & Other Educators 4 M	Video RO Audio 2 Way Color, Digital Data	School house terminals - 1 per each school building	NA	U.S. 50 States and the Territories	5 courses/wk (1 hour each course, 3 times per wk)	Need: for Professional growth & Development of teachers re: instructional matters re: cultural interchange (National & global) re: Expert consultation re: home instruction for teachers.
Telex-Mailgrams Telegrams	Data Link	500/day to the field 500 day from the field	Each state and regional office and central office	U.S. 50 States and the Territories	130,000 Telexes Mailgrams, Telegrams	Need: Intra-Association Communications Ex.: NEA AASA etc. (See: NEA Model Attached)

Table 8

Professional Development Needs

(Prototype of requirements of one national professional teachers association)

School districts: 17,000
School buildings: 65,000
Professional orig.: N/A

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Teleconferencing for Teachers	Audio/Video Multiple simultaneous Terminals	2-Way Voice/Video RO terminals in NEA regional offices Present Planned Needed (1 for each 1200 teachers)	 0 0 2,000	U.S. 50 States and the Territories	2 hour transmissions 5 days/wk	Need: for legislative briefings, Board of Directors meetings; UNISERV training sessions
In-Service Courses for Teachers	Video R0; Audio 2 Way Color; Digital Data	School house terminals - 1 per each school building Present Planned Needed	 0 0 65,000	U.S. 50 States and the Territories	3 courses/wk (1 hour each course, 3 times per wk)	Need: for professional growth and development of teachers
Telex Mailgrams, Telegrams	Data Link	25/day to the field 25/day from the field Present Planned Needed	 0 0 2,000	U.S. 50 States and the Territories	15,000 Telexes Mailgrams, Telegrams	Need: Intra-association communications
Data Transmission Computer Uses	Video, R0 Audio 2 Way Digital Data	NEA UNISERV offices nation-wide Present Planned Needed	 0 0 2,000	U.S. 50 States	500 uses daily	Need: Research data, membership surveys

Table 9

Information Storage, Distribution and Utilization of Materials and Resources

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Storage Retrieval Distribution and Utilization of Educational information	2-way digital 1-way audio 1-way video 1-way facsimile	Input/Output terminals with print-out capability; audio, video, and facsimile read out capability	65,000	1 in each school	Available on demand could possibly be processed after school hours.	Information to be stored: 1. Student data 2. Programs of studies 3. Instructional Objectives 4. Learning activities 5. Learning modes ~~6. Media Resources~~ 7. Measurement Instruments 8. Diagnostic/Remedial procedures 9. Management Information

Table 10

Public Information Needs

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No.	Geographical Distribution	Information Volume	Remarks
Inter-school teleconferencing with home-viewing	2-way video 2-way audio video	Audio/video receivers in regional sites Video receiver in each home	65,000	50 U.S. States	60 min. each week or 30 min. 3 x/wk	Method Regional active participation by schools. Home viewer participation via phone to regional site if desired. Purposes 1. To aid parents in dealing with their children 0-18 years. 2. To develop public participation in educational policy.

Table 11

Program Development and Evaluation Needs

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Additional program development and selection of programs Elementary and Secondary Schools	Video/Audio	Point to Point Video School Terminal for U.S.A.	65,000	U.S. 50 States and the Territories	8 a.m. - 3 p.m. Mon. - Fri. 180 days of school 1260 hours	Need: Increased delivery of nonprint curriculum in addition to present PBS system. The volume of program activity prohibits viewing because of the last of delivery systems and access to products. Most stations could provide double their present delivery if there were more space available.
Additional program development and selection of programs for parents of students	Video/Audio	Point to Point	PBS Station 200 Commercial Networks 200 35,000,000 students Approx. 12 million homes	U.S. 50 States	3 hours per week 156 hours per year	Need: For increased understanding by parents of the educational curriculum used by schools
Additional program development and selection for pre-school early childhood grade level 2-4 years old	Video/Audio	Point to Point Video for U.S.A. Day Care Centers or Home Market	10,000 (approx) 4 million homes (approx)	U.S. 50 States and the Territories	Potential capacity 3 hours per day 1000 hours per year	Need: To provide additional pro-social program material for pre-school children

Table 11 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Target Audience programming in Elementary and Secondary Education	Video/Audio					Need: Provide special programming to target groups for equal educational opportunity in school districts, - minority ethnic - special education - vocational education
a) Block and Spanish b) Special Education c) Vocational Education		Point to Point Major urban areas 10,000 school buildings	65,000 school bldgs.	50 States 50 States	2 hours per day Mon - Friday @ 180 days per year 1,800 hours 6 hours per day 2,190 hours per year	
			10,000 school bldgs.		4 hours per day 720 hours per year	
Five Programs Simulation example - Toronto Moon Vigil	2-way Video/audio	Regional groups interconnecting with PBS stations by terrestial lines. Elementary and Secondary Schools	6 up-links 150 receivers	50 States	2 hours per week 50 hours per year	Need: The sharing and collaboration of key educational professionals in a broad geographic area

Table 11 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
USER involvement in program production and public participation in program policy	2-way video/audio	NEA Regional Officers Teachers - PBS Stations or Regional Networks Example: Eastern Educational Networks.	 2,000 150 5	50 States	2 hours per week (realistic potential) 50 hours	Need: Involvement by users of product to participate in program planning of the development of curriculum product
Teleconferencing for variety of Associations and audiences a) teachers b) supt/ administrators c) students	2-way video/audio	Point to Point Confering Maximum 20 Participants for groups terminals	 20 20 20	50 States	Depends upon availability Potential 1,000 hours per year.	Need: Establish better lines for communication; bringing together groups from large distances without necessary travel expenditures.

3.3.4 Potential Benefits of Satellites (economic and social)

a. Substituting communications for travel in the delivery of public services, particularly in rural remote areas.

b. Enabling organizations to train their personnel in far-away places and avoid having to bring them to the headquarters locations.

c. Developing an appreciation of other cultures and life styles and stimulating the use of other languages by Americans.

d. Improving the economic and social conditions in undeveloped or economically deprived areas through improved communications.

e. Helping to alleviate the financial burden of transporting students great distances in rural areas. (Many rural communities have minimum economic resources with which to finance their educational systems, reduced accessibility of schools to both teachers and students, and a need for a wider array of educational services. Satellites can help with these problems.)

f Making more effective the delivery of services to large, thinly populated areas. (Communications satellites are particularly effective in delivering services to a large area whereas terrestrial techniques are more effective in delivering service to points or small areas.)

g. Increasing options for individual learners by providing more choices (e.g., teaching languages not offered at student's school)

h Linking highly specialized diagnostic services and educational procedures with handicapped children in low incidence categories.

3.3.5 Recommendations

a Make an in depth study to translate educational needs into quantifiable data for the purpose of making accurate projections for satellite communication systems

b. Develop a high powered satellite so that inexpensive earth terminals can be made available.

c. Develop low cost mobile and fixed terminals. (This might be done by either public or private means.)

d. Establish a cooperative within the Federal Government that enables a variety of agencies to respond to the necessary hardware needs that educators will have in order to properly implement satellite program activity.

e. Identify and support those resources necessary for program development. It is the panel's opinion that NASA should support Congressional action to increase resources beyond experimentation, as a people's dividend in the space effort.

3.4 EXTENSION AND CONTINUING EDUCATION

This report follows the outline prepared for use by the twelve panels to ensure some relatedness in the findings of these panels. Since the group had no part in construction of the outline, it has imposed some constraints on the way the report has been prepared.

All panel members contributed to the writing contained in the report. This resulted in some duplication which time did not allow to be edited out but which, for the reader, serves to emphasize important points.

3.4.1 Objectives

3.4.1.1 Discipline Objectives (services to be provided)

In developing discipline objectives for a satellite based communications system, two basic assumptions must be made: first, satellite coverage must be area-wide or broadband and two, the development of such a system will require the fullest development of every possible service (entertainment, public and commercial).

The potential for developing truly open-ended and flexible continuing education through the creative use of satellite systems is high. Specific areas that present an immediate demand for broadband satellite technology are:

1. Business and commercial services offer the greatest potential in fast growing rural and small town communities.

2. Medical and health services pose a special problem for most communities not only in terms of continuing education for medical and health personnel, but also in providing for the consumer's need. The medical and health personnel include physicians, nurse practitioners, mental health personnel, dentists and allied health personnel. Consumer needs include both education and services, e.g., emergency medical services, primary care and pre-natal care.

3. Education needs of most communities involve the full range of education personnel and students. Continuing and adult education services have been identified from various studies (Delker Study, ARC Needs). Adult literacy programs have a high priority. Consumer education services in budgeting and family management are clearly identified. Continuing education for parents and educators in parent skills including child development and family relationships is another high priority.

4. Government operates at many levels. The need to inform and include the public in various governmental program formulations is vital. Training and information services to local, state and federal government in data processing, fiscal and administrative operations, and coordination of social services, are some of the services needed.

5. Human resource development is one of the most pressing needs of this country Areas of development using satellite technology include education for employment, vocational rehabilitation for the medically and physically disabled, employment services, nutrition and housing, continuing education for social services personnel, and education for America's recreational development.

By using the catalytic and broadband capability of a satellite, the process of reintegrating the education institutions to the needs of the community it serves can be accelerated. Accessibility of citizens to more information to assist in dealing with immediate career, health and recreational needs can be enhanced.

It is apparent that satellites and gradual community based programs do not provide a panacea for all organizational and program ills. They do, however, constitute an effective alternative for regional community based program development, since they are multi-disciplinary by nature and are therefore capable of responding to a totality of needs that transcend one discipline.

3.4.1.2 Statutory Requirements

Post secondary educational institutions are, obviously, required by law to provide instruction, though the specific curriculum offered may not necessarily be defined by law with regard to specific content. Accreditation agencies stipulate certain requirements, however, individual states may define specific roles for certain types of institutions. For instance, the community college system in many states are charged with providing a university parallel program for those who will ultimately complete a four-year degree but, in addition, are also charged with the responsibility of responding to community needs for occupational, vocational and technical training programs which are usually structured within a one or two year certificate of "terminal" degree program.

A great variety of instruction provided by post-secondary education is made available to meet community needs — preparation for license examinations in a number of fields, in-service training for occupations faced with changing methodologies and technologies, continuing education for a number of professions and occupations that require recertification, and courses that provide information and/or skills necessary for job advancement. Such instruction may not be assigned, by law, to a particular institution, but post-secondary institutions respond to the needs of those individuals in certain professions and occupations who are required by law, by regulatory agency, or by professional standards to meet specified requirements.

Other instructional responsibilities such as providing for the needs of ethnic minorities (e.g., blacks, or spanish speaking populations) or groups such as the physically handicapped or those confined to institutions (e.g., prisons or rehabilitation centers) are defined or implied by equal access/equal opportunity legislation

Institutions, then, find themselves faced with the challenge of meeting a wide variety of needs for a very heterogeneous population. Meeting these needs is greatly facilitated by the use of one or more forms of educational telecommunications that allows instruction to move off the campus, into the community, the industry, the institution and often even the homes of individuals with special problems and requirements. A wide variety of technologies are in current use meet these needs: video (both open and closed circuit); radio; two-way interactive audio, and to a lesser extent, two-way interactive video; computer assisted instruction; computer managed instruction; telephone interaction; audio with telephone interaction; video with telephone interaction; plus the usual array of audio-visual equipment such as film, video cassette and audio cassette.

3.4.2 Communication Needs

A number of the needs of post-secondary institutions are described in other sections of this report: Data and Message Services; Environmental Communications; Library Services; Medical Education; Medical Services; and Public Safety. In addition, specific groups such as Business and Industry and Professional Societies are discussed from the perspective of their on-going services, particular needs and willingness to participate in financing arrangements.

3.4.2.1 Types of Communications Needs

The Health Professions

The health professions have a membership of about 4.5 million persons. Approximately 2.6 million of these are full-time employees of about 34,000 in-patient health care facilities.

In recent years the health professions have been subject to considerable criticism, much of which stems from the concern about professional obsolescence and the resultant impact on quality of patient care. As a result, peer review, audit of charts and records, self-assessment by test or computer, and mandatory continuing education are becoming common practice in the search for a method to assay clinical competence.

In 1967, the National Advisory Commission on Health Manpower broached the subject of relicensure, and since then sentiment in support of some means of updating qualifications has grown within the professions. At the national level the American Academy of Family Practice, the American Dental Assistants Association, the National Board for Certification in Dental Laboratory Technology, the American Dietetic Association, and the American Registry of Clinical Radiology Technicians require their members to obtain a number of continuing education credit hours each year to receive continued certification. The American College of Physicians has established a program of self-administered, self-assessment examinations, while the American Medical Association provides a special award for physicians completing 150 hours of continuing education within a three-year period.

At the state level, currently five state medical associations require completion of a number of continuing education credit hours each year to be eligible for membership. In a number of states, regulations have been established or statutes enacted requiring evidence of continuing "qualification" for optometrists, osteopathic physicians, dentists, dental hygenists, and nurses. Thus, a considerable amount of money is being spent on continuing health education; however, no figures are available.

The health professions recognize that if they do not establish and enforce educational standards, the public may demand sweeping legislation that will bring about such standards. However, the professions do understand the shortcomings of both the legally required and voluntary continuing health education.

Because of the nature of the professions and the distribution of the members, continuing education can bring hardship to health professionals and the public. Members of the medical professions are as widely dispersed as the population of the United States, but are few in number relative to the demands of the population. For example, for every 100,000 people there are approximately 152 physicians,* 48 dentists, and 370 registered nurses. Moreover, the distribution of health personnel does not necessarily coincide with the availability of continuing education programs. The availability of time to attend such programs is a major consideration. In light of the caseloads for doctors, densists, and nurses, and in view of the understaffing of many health care facilities, attendance at continuing education classes (particularly for members of the professions who must travel a considerable distance to attend such classes) can further contribute to the shortage of health care professionals and undoubtedly increase the cost of health services. Consequently, means for meeting the continuing education requirements of the health professions have been and are being explored.

Although not the only distribution systems being explored by the health professions, combined terrestrial and broadcast satellite systems have undergone experimentation and are still being explored as a feasible and desirable means of providing equal continuing health education opportunities to all practicing health professionals. Starting in 1971, Hawaii and Alaska used the first Applications Technology Satellite (ATS-1) on a limited scale to explore the possible value of the technology to continuing health education. During 1974 and 1975, the ATS-6 was used by some experimenters in Alaska, the Rocky Mountain States, and the Appalachian States for the same purposes. This experimentation is continuing during 1976 and 1977 on the CTS, during which the Association for Western Hospitals, Lister Hill, HEW and the States of Washington, Alaska, Montana, and Idaho (WAMI) are involved

Thus, the health professions are establishing a foundation for the use of communications satellites and other telecommunications systems to meet their needs for continuing education. If such use of the satellites is proven practical and economical,** the health professions may be a major user of satellites for continuing education.

Correctional Institutions

The correctional institutions, because of their purpose and characteristics, could possibly benefit from the use of communications satellites for education and training. While the correctional institution population is small, the population's cost to society is extremely high.

The number of individuals incarcerated in the United States is roughly 417,000. There are approximately 23,000 in 47 Federal institutions, 252,000*** in over 400 state institutions, and close to 142,000 in 4,037 county and local institutions. These figures do not include individuals in institutions for the criminally insane.

The individuals who make up the prison community are as diverse in age, experience, aptitude, interests, and learning styles as the population from which they came. As a consequence, when penal institutions attempt to provide education and training programs for this diverse group, they are faced with the impossible task for providing an almost universal range of programs. Nevertheless, many state and local correctional budgets make no provision for full-time teachers or other resources necessary for meaningful education or training programs. With the dearth of funds available for rehabilitation, programs are quite limited.

*Includes Doctors of Medicine (333,000) and Doctors of Osteopathy (12,000)

**The health professions are also experimenting to determine the value of satellites and other distribution systems as a means of directly improving practical health care

***The 252,000 includes roughly 77,000 in training schools for juvenile delinquents

At the local level, 89.2 percent of the county and municipal jails have no education programs. Where programs do exist, many classrooms are make-shift, poorly lighted, inadequately ventilated, and drably furnished. In addition, the traditional modes and methods of instruction are used by "second career" educators, or "day-end-worn" teachers from local schools. This is not to say there are no exceptions to what is being described, for there are.

On the positive side, Texas, Connecticut, and Illinois have created school districts that include correctional institutions. In these districts correctional institutions are allotted budgets, staffs, materials, and other resources similar to those available to other educational institutions in the districts. In addition, some state and Federal institutions have many exemplary educational and vocational training facilities and spend an average of $23 million a year on educational and vocational programs. Interestingly enough, the Federal prisons plan to drop the requirement that all prisoners choose some educational or vocational program for the duration of their incarceration; those who wish to may do so. This decision is based on the belief that it is a waste of time to attempt rehabilitation of inmates who do not wish to be rehabilitated.

The concern over education and training in penal institutions continues to grow. Inadequate educational and training programs is a grievance listed by prisoners, and the journals associated with correctional education and training are replete with articles addressing the problem. One thing is clear: the current educational and vocational programs of penal institutions have not been very successful at rehabilitation, which is attested to by the high recidivism rate of inmates. The reasons are not known; many individuals may not want to be rehabilitated. However, for those inmates who desire rehabilitation, conditions and programs should be made available to help reduce the cost of crime to society.

One step in improving the rehabilitative effort may be the use of communications satellites. Correctional institutions could pool their resources to obtain services for inmates and employees that are not possible today within current budgets. Excellent courseware, instructors, computer systems, and career counselors could be made available to all who wish to participate. A logical extension of this concept could be the taping of public service and educational institution programs. Availability of educational programs would decrease the use of Study Release programs and minimize the requirement for instructor personnel to come into the institutions.

The two-way interaction possible with communications satellite technology offers potential for opening up correctional institutions by permitting access to persons, places, and things that is not possible now. This potential could be capitalized on to aid in rehabilitation by providing some half-way house or socialization experiences while the inmates are still confined.

Individuals within the correctional field are becoming aware of the potentials of communications satellite technology for starting or improving educational and training programs for inmates and employees of institutions, among other applications. However, little has been done by the correctional community to explore these potentials. Nevertheless, as their awareness and understanding increase, correctional institutions may become major users of satellites for inmate and employee education and training programs.

Legal Profession

The legal profession has many characteristics and problems similar to those of the medical profession. Members of the legal profession are widely dispersed, the content of the profession is constantly changing, and members have limited opportunities for continuing their legal education once they leave law school.

Lawyers, like doctors, are few in number relative to the population. The legal profession of the United States is comprised of approximately 355,000 members of the bar. The majority are in private practice. Slightly over 23,000 serve in a judicial capacity. There are about 161 lawyers per 100,000 population.

With the increasing rate of crime, the jammed court dockets, and recent events in the Federal and certain state governments, the profession has received considerable criticism and is being scrutinized Demands are being made for a better organized, more responsible and responsive legal profession. Recently, state and local courts came under attack from the Law Enforcement Assistance Administration (LEAA) of the U.S. Department of Justice for the courts' fragmented and overlapping jurisdictions, lack of sufficiently trained personnel, inconsistencies in handling various classes of proceedings, and shortage of judges. As a result of this, other attacks, and problems in general, there is growing concern about the continuing education programs of the profession and how to keep members current and responsive.

Over the past 3 years, continuing legal education has become an issue in almost all states. Two states, Iowa and Minnesota, have made continuing legal education mandatory. And, according to a recent survey by the Continuing Education of the Bar Office of the American Bar Association, all states except 16* and the District of Columbia are at some point of deliberation about mandatory continuing legal education. One state, Wisconsin, has the proposed requirement before the state supreme court; six states have drafted plans which are currently under review by the state bar association; and 21 states have the subject under study by bar association boards or committees.

Continuing legal education courses are offered by the American Bar Association, state bar associations, local bar associations, and commercial firms. Generally, attendance is voluntary and the courses are paid for by the attendees. Because of the location and cost of courses ($400 to $4,000), many are prohibited from attending.

Some state legal systems do require attendance at certain intensive training sessions once or twice a year, but normally these meetings address "the hot issue of the day" rather than the total training needs of the attendees. Most of the training comprises lectures, workshops, discussions, seminars, and the use of videotape cassettes; there is considerable variation in the quality of the programs Consequently, the adequacy of current educational offerings may be questioned as continuing education becomes increasingly required in the legal profession.

If continuing legal education becomes mandatory, the legal profession will be faced with the same basic problem as the health profession Institutions or programs are not readily available or convenient to a great number of the profession. However, the criteria for obtaining credit will be of great importance. If videotape courses or local bar association meetings are accepted for credit, problems will be greatly reduced.

Currently, the legal profession is exploring alternative means for making continuing education programs available to its members. Satellites are being considered as one alternative distribution system for providing members of the profession with the required courses

Business and Industry

Business and industry are not newcomers to the use of communications satellites. The domestic satellite business is a reality because of these users, and it will continue to grow as a function of their desire for services. Training is one of these potential services.

Business and industry, excluding the health and legal professions and government employees, employ about 64 million people With the downturn in the economy and increasing competition from foreign business, U.S. business and industry are attempting to attain a more competitive posture by eliminating unnecessary workers from their payrolls, improving production practices, and increasing the capability of personnel they retain.

To aid personnel development, business and industry have placed more emphasis on training and development programs and each year more programs are being instituted, with nearly $1 billion now

*States in which no study or action is currently contemplated are Alabama, Arkansas, Delaware, Florida, Hawaii, Kentucky, Louisiana, Maine, Mississippi, Montana, New Jersey, New York, Ohio, Oklahoma, Tennessee, West Virginia being expended annually on training-education equipment and materials. Today, a large percentage of the work force is provided opportunities to participate in training or career development programs.

Firms prefer to offer inhouse training, under their own direction. They use a variety of methods and media, with TV videotapes increasing in use. For larger firms, training locations are usually centralized, but generally there is a mix of centralized and decentralized training. Centralized is preferred not only for content control, but also because of the limited number of available qualified training personnel. However, large conglomerates having widely dispersed facilities realize the cost inherent in centralized training and are exploring ways to achieve desired results through decentralized training programs. Videotape cassettes are being tried as one possible means; teleconferences in conjunction with previously distributed training materials is another. Communications satellites have strong possibilities for marrying the good points of both centralized and decentralized training.

The use of communications satellites for education and training may not be too far in the future for large firms establishing comprehensive national and international communications networks using microwave, satellite, and cable systems. For example, International Harvester has just implemented a nationwide communications system that meets internal and external communication requirements. System capabilities include data transmission, telephone conversation, radio transmission, closed-circuit and so on. The corporation spends over $15 million a year for communications, and addition of a training and educational capability that uses communications satellite technology is within the realm of possibility.

Consequently, as large firms establish national communication networks using satellites and microwave systems, consideration may be given to incorporating broadcast satellites into these communication systems to meet the firms' training and educational needs.

Military Training

The military is noted for its fine training programs. Satellite technology is not new to the military—the Department of Defense has directed communications satellite programs for over a decade. A number of military satellites are in orbit and additional systems are scheduled for launch in the near future. The military also uses domestic satellite systems.

Recent political events that created an all-volunteer military may provide impetus for use of satellites to aid the military in overcoming some resultant training problems. With the advent of the all-volunteer military, there has been a decrease in the variation of mental ability of those volunteering, with most falling in the average-mental-ability grouping. Consequently, the mental ability of the military appears to be decreasing as military technology becomes more complex. In every service the equipment is becoming increasingly sophisticated, and along with it the required knowledge and skills for equipment operation and maintenance For example, automated data processing is a major tool in intelligence, logistics, and weaponry; aircraft have increasingly complex avionics; electronic surveillance systems are becoming the tool of all services; and antiaircraft, tank, and personnel carrier weapon systems are now common in the infantry.

There are roughly 2.2 million persons in the military today, with 785,000 in the Army, 612,000 in the Air Force, and 732,000 in the Navy and Marine Corps; over 1 million are enlistees. The overall replacement rate of personnel averages 25 percent annually. Approximately $6.5 billion was budgeted for training in FY75 and again for FY76; this $300-million increase over FY74 was required to help restructure the training program to meet the needs of the new, all-volunteer force.

Total training systems now must be adjusted to the new military population. Training personnel are finding it difficult to deal with the new enlisted corps; curricula materials are too complex, requiring a major change; curricula are geared to a faster pace, thus requiring extensive readjustment of objectives, information presentation, and media usage; and, for the caliber of personnel who must be trained, a more personalized and centralized approach may be required.

Another major problem facing the military is continuing training. This training is required to enable field units to receive the latest information on use and maintenance of equipment as improved procedures are devised Particularly where remote installations and ships at sea are concerned, moving personnel to training installations or maintaining training personnel and equipment involves significant expense

Some research has been undertaken by the military in an attempt to address these problems. Use of satellite technology is one solution being considered. Centralized on-line CAI systems, CMI, one-way video systems, and two-way audio systems are being viewed as a means for meeting special training needs of recruits. Also under consideration is the use of satellites for meeting continuing training requirements of widely dispersed operational units. The cost of returning personnel to training units for updates is high and reduces operational strength, which is particularly critical in light of the current posture of U.S. forces vis-a-vis our adversaries. Consequently, the military is very interested in satellites as a means to meet domestic and non-continental United States training requirements

Business and Industry Training Requirements

The trade and technical fields have the major training requirements in business and industry Both business and industry spent roughly the same amount of money for all levels of training, but in terms of hours devoted to training, Table 12 shows a different story

Table 12

Distribution of Training Hours by Topic

Topic	% of Total Hours
Technical Knowledge and Skills	35%
Managerial Knowledge and Skills	14%
Understanding or Administering Specific Programs	11%
Formal Pre-Supervisory	10%
Employee Relations	8%
Labor Relations	7%
Personal Skills	5%
Organization or Policy	3%
Miscellaneous	7%

Thirty-five percent of the training hours goes to technical knowledge and skills and 40% to managerial knowledge and skills

Instructional Delivery in Business and Industry

A variety of instructional delivery methods are used in business and industry but the emphasis continues to be the classroom lecture supplemented with audio/visual aids and self-paced instructional materials. The instructional media most commonly used in business and industry are ranked in Table 13. Sixteen-mm film is first, followed by overhead slides and then 35mm slides. Although not listed in the Table, it should be noted that programmed instruction materials are the most widely used medium. Video-tape usage is on the increase in combination with programmed instruction texts and has proven to be most effective when used in this manner.

Looking at large instructional delivery systems, television per se was not referred to in any of the surveys; however, closed-circuit television (CCTV) was found to be an adjunct to training, although not used frequently it is ranked 5th. While computer based instructional systems have produced good training results, they are not widely used in business and industrial training due to the required large capital investment. Further, there is a reluctance to invest in computer based systems for courses which have a short lifetime.

Table 13

Ranking of Instructional Delivery Equipment
Used by Business and Industry

Delivery System	Rank
16 mm motion picture	1
Overhead slides	2
35 mm slides	3
Audio cassettes	4
Closed-circuit TV	5
Film strips	6
Reel to reel audio tape	7
Video tape	8
8 mm motion picture	9
Opaque	10
Computer assisted instruction	11
Audio/visual cassettes	12
Record player	13
Teaching machines	13
Programmed instruction electronic video disk	13

Adapted from: Frost & Sullivan Inc., The Education and Business Training Market, New York: November 1973, Table 7.7, p. 125.

The growth of business and industrial instruction distribution systems over the next five years can be discerned from Table 14. Although projections show a major investment in videotapes and closed-circuit TV systems, 16 mm projectors still rank fourth and software investment is primarily in the motion picture area. It is highly likely that there is a close relationship between the closed-circuit TV and the 16 mm motion picture investments. It is also interesting to note that there are no projections for training and education computer hardware or software.

The amount of money spent to train employees varies with the type of business and industry. It is difficult to obtain accurate figures because firms tend not to keep track of this information However, one study of 37 firms showed that on the average $161 was spent per employee per year, but the range was considerable. One-third spent less than $50, another third $50 to $150, and the rest from $175 to $1,067 per employee during 1974

Table 14

Estimated Domestic Sales Trends of Selected AV Equipment
and Software in Business and Industry

Industry Equipment	1972 $ mil.	1977 $ mil.	1982 $ mil.
Videotape recorder/player	$ 20.9	$ 30.8	$ 56.7
Closed-circuit TV	20.0	29.6	54.6
Filmstrip/slide projectors	16.8	24.6	36.2
16mm projectors	19.6	26.3	32.3
Tape players	10.0	16.1	25.9
8mm projectors	6.6	10.6	17.1
Record players	5.4	7.3	9.8
Overhead projectors	4.3	5.9	7.8
Opaque projectors	1.2	1.6	2.2
Sub Total	$104.8	$152.8	$242.6

Software	1972 $ mil.	1977 $ mil.	1982 $ mil.
Motion pictures	$256.9	$327.4	$417.9
Prepared materials	41.5	69.8	117.5
Filmstrips	41.1	69.1	116.5
Supplies	35.9	50.2	70.4
Sub Total	$375.4	$516.5	$722.1
Total	$480.2	$669.3	$964.7

Adapted from: Frost & Sullivan Inc., The Education and Business Training Market, New York: November 1973, Table 1-1, p. 10.

Another study looks at cost, among other categories, in terms of dollars spent per student hours. In three types of training, sales and management, airline ground school and utility company technician, it was found that $20.46, $22.08 and $16.09 were spent respectively per student hour for 71,500, 170,000 and 25,000 student hours per year respectively.

Instructional Communications Needs

Throughout this section, needs are defined in terms of instruction rather than education. "Education" has a broad connotation that usually includes general public service or public information materials. The concern here is a description of ways by which telecommunications can facilitate the delivery of instruction that results in some form of credit — the accumulation of college credits, licensing and/or certification, re-certification, skills and/or information for job advancement or meeting professional requirements.

Specific instructional priorities can be identified at any given time. A brief listing of current priorities might include such diverse efforts as upgrading teachers in strategies and methods to more effectively teach basic skills such as reading and arithmetic — skills in which student performance, as measured by standardized tests, has evidenced decline over the past several years; instruction in the use and manipulation of the metric system; adult basic education; occupational training; or the use and handling of pesticides. Because priorities change with time, the purpose here is not to define current priorities Priorities are being continuously defined by a number of responsible agencies and will be readily available if and when institutions have greater access to telecommunications that will help them quickly, and with cost-effectiveness, respond to these priorities.

Needs which can be met, in part, by telecommunication systems are course sharing and monitoring and evaluation of student achievement.

Course Sharing—Many schools are currently producing packaged courses that include a variety of media in different configurations - video, audio and print. Production of such packages is expensive, and becomes cost-effective only when completed materials are utilized by a number of institutions and costs are ammortized over a larger student population than is possible within a single institution. The willingness of one institution to adopt materials produced by another has shown a marked increase, though barriers remain.

Access to convenient and inexpensive methods of reviewing course materials, particularly audio and video components, allows individual institutions the opportunity to evaluate course objectives, materials and content. The same methods would provide for the in-service training of instructors in both the content and the methodologies of mediated instruction. This requires:

a. Downline feed of audio and video materials that can be recorded for evaluation and review purposes, as well as for later instructional uses provided all copyright restrictions are carefully observed, and

b. Teleconferencing with two-way audio for in-service training. Video and facsimile would perhaps be useful here, but required only in specialized situations.

In addition to the economies of cost ammortization with course and materials sharing, such courses often allow smaller institutions to increase the diversity of courses available. In other cases, mediated courses, particularly those associated with widely publicized national broadcasts such as Ascent of Man and Adams Chronicles, generate high enrollments which provides an "individual subsidy" for specialized campus-based courses that are important but do not generate high enrollments. Here, cost advantages through affordable telecommunications networks can have a great impact on both the quality of educational experiences and the diversity of the curriculum.

Monitoring and Evaluation of Student Achievement—As instruction moves from a central location such as a campus to increasingly smaller units within the community, monitoring student performance and providing instructional services becomes increasingly difficult and increasingly expensive if each institution is to bear these costs alone. Telecommunications technology would allow for co-operative efforts in meeting such needs.

a. Regional or area media centers could be established so that pooled resources would increase the variety of media available to students, with provisions for dial access or advance scheduling for the closed circuit broadcast of specific materials at specific times.

b. Shared use of computerized instructional materials. Computer Assisted Instruction (CAI) has been used successfully at a number of institutions and the software for specific courses is currently available. Computer Managed Instruction (CMI) is achieving wider application and several such programs are available. Many schools want to use these instructional systems but cannot because (1) the cost of the program itself is prohibitive, or (2) the hardware and expertise to implement them is not within the economic scope of the institution.

An affordable network that allowed a pooling of resources and a sharing of computer facilities would allow smaller institutions to utilize computerized instructional programs housed at some larger facility or regional center With the advent of low-cost mini-computers, and decreasing costs for terminal hardware, the sharing of a computerized instructional system becomes feasible if the costs for linking the system are not prohibitive.

Many of the academic obstacles related to mediated or independent study courses, as well as the capability to deal with specific needs in academic or occupational skill building, would be better handled when discrete evidence of student participation and learning gains are substantiated through the use of such systems.

Instructional Needs Priorities

1. Teleconferencing

   (a) Audio

   (b) Audio, video (less often required)

2. Data Transfer

   (a) Sharing of computerized instructional programs

   (b) Data and records transfer

   (c) Dial access and scheduling from media centers

3. One-way Color TV (to one or many terminals)

4. Interactive

   (a) Voice -

   (b) Voice and color video (less often required)

3.4.2.2 Volume of Communications

This section covers what may be termed only a best guess as to the volume of communications for the present, the short-term future and the long-term future.

We first discuss these time frames, then attempt to give some idea of the time or volume of traffic required, but specifically aimed at satellite transmission time. Finally, a rough chart addresses in summary form the mixes involved in the estimates given.

Present

Given the objectives as detailed in Section 3.4.1, the volume of use of communications satellites at the present time in the extension and continuing education areas is quite limited Ground based systems are fairly well used as in such instances as the University of California at San Diego, University of Mid America (UMA), the Chicago TV College, some ITFS and cable systems, together with the bicycling of videotapes for both continuing and extension education. Added to these basically video systems are audio systems such as the Wisconsin telephone network together with computer involvement in other applications, mostly in the administrative data area.

Imminent, however, is a greater use of communication satellites in the transmission of instruction and services via ATS-6 to Appalachia through the Appalachian Education Satellite Project (AESP). Too, Alaska is planning on a sophisticated narrow band application of communications satellites, however with little extension or continuing education involvement currently envisioned, except for some teacher-related training as a possibility.

The AESP currently projects approximately 20 hours per week via satellite to remote Appalachian sites, all within the rubric of extension or continuing education. While basically one-way video and two-way radio oriented, it is projected that a mix of computer utilization (data) and materials delivery will be used.

While the AESP is a reality, the current scene, at least through 1977, appears devoid of applications addressing large areas via satellite with extension or continuing education materials. Certainly there is an increasing need in the recertification area for courseware. The most prominent areas are in medicine, dentistry, law and engineering. It would appear that a needs analysis and feasibility study of how a communications satellite might address the recertification problems would reveal a large potential group of users. Until such work is done it will be difficult to assess the volume requirements relative to the use of a communications satellite.

In business and industry there is a heavy involvement of telecommunications technology for training personnel. Here too, an assessment of how much technology transfer can be accomplished via a satellite has to be studied. However, with 64 million people employed in the work force, a large number quite obviously at any given time would benefit from upgrading their skills. However, immediate satellite usage by these groups is remote unless it is stimulated by demonstrated effectiveness and available funding, hardware and courseware.

The continuing education aspect involved in leisure learning, as is evidenced in the local schools, community college and college programs, is another potentially large volume user of satellite time. Here again stimulus may be gained by demonstrated effectiveness, available funds, hardware and courseware.

Short Term (1978-1986)

The short term projection for the use of satellite communications for continuing and extension education appears to depend very much on the same conditions mentioned above, demonstrated effectiveness, available funds, hardware and courseware. But it also appears that successful ATS-6 and CTS experiments will stimulate the required interest as a first step. It may be that a significant factor in the technology transfer will then be how actively dissemination and diffusion strategies are implemented. Also, developing technologies such as new hardware components and/or techniques involving satellites, terminals and methods of video and audio compression will help determine the speed with which users will adopt the satellite as an educational delivery vehicle.

Long Range

Given the probable advances that will almost certainly be made and adequate dissemination and diffusion strategies, it is hard to see why large scale use of satellites in delivering extension and continuing education instruction and materials can miss. The following chart shows the progression of use from the present to the future.

Category	Present (1977)	Short Term (1978-1986)	Long Term (1980 -)
Recertification	25 hours	100 hours	200 hours
Business & Industry	5 hours	80 hours	160 hours
Leisure Learning	5 hours	20 hours	140 hours

3.4.2.3 Communications Networks

Present

Although much of continuing and extension education has been carried out in the traditional classroom environment typical of American education since Colonial days, there have been applications of communications technology significant for their innovation and their possible portent if not for their overall impact on this vast and diverse field.

Not surprising, practitioners of engineering education have been chief among the pioneers who have applied communications networks to the needs of continuing professional education. Utilizing microwave relay and the multi-point Instructional Television Fixed Service which is capable of multi-channel, multi-point distribution of television, such institutions as the University of Florida (the now-defunct Genesys System), Stanford University (the Stanford Instructional Television Network), the mid-Texas TAGER Network, the University of Southern California, Georgia Tech and others have established communications networks which link the campus to a wide variety of in-plant teaching locations and permit working engineers to continue their graduate education by participating in courses without the necessity of commuting to the campus.

In continuing medical education are to be found other examples of the application of communications to meet continuing education needs. Like their colleagues in the School of Engineering, doctors have established landmark ITFS networks to link medical schools and teaching hospitals. For more than two decades the Albany Medical College of New York has used the capacity of its public radio station, WAMC (FM), to transmit medical grand rounds to doctors in hospitals in New York, Massachusetts, and Connecticut via FM subcarrier while regular listeners hear the station's regular programming, totally unaware that professional physician training is also being transmitted.

Similarly, professional courses for nurses have been broadcast by non-commercial public television stations. This application, once extending from Boston to San Francisco and Los Angeles sometimes broadcast such materials in the conventional manner, open to viewing by any interested party. Sometimes privacy was maintained by transmitting such programs late at night or in a scrambled fashion, requiring viewing hospital locations to be equipped with special decoder devices. In all, the practice has virtually disappeared with increased demand for station time for public TV's growing general audience and the emergence of new technological approaches.

The recent growing availability of video cassettes and the recent encouraging experimentation with satellite communications clearly portend a new era in the development of communications networks for continuing education.

In summary, communications networks in continuing education have tended to operate within the narrow geographical constraints imposed by technology and economics. Terrestrial networks can bring educational opportunities to engineers in the San Francisco Bay area and to medical practitioners in Atlanta, but they are not available on any cost-effective basis to extend such valuable opportunities to those furthest from the metropolitan areas where the needs are the greatest.

Short Term Projections

The availability of video recording devices, particularly the video cassette, are providing new opportunities to escape from the limitations of hard wire and over-the-air networks. Here, a leadership role is being assumed by business and industry where several large national and multi-national corporations have already gained success in establishing "video cassette networks," off-line, on-demand systems which provide employee and customer training to widely dispersed users. The Ford Motor Company's "Ford Network" includes more than 5000 video tape players at Ford dealers and service centers in every state. IBM and Pepsico are also among the business and industry users of video cassette and the Hewlett-Packard Corp. serves a worldwide network of plants, sales and service installations and users with its video tape operation at corporate headquarters in Palo Alto.

Within business and industry there is emerging a small but growing sector called "video publishing." Time-Life has produced for sale or rental a video cassette-based course in speed reading, and several less well-known companies have developed extensive catalogs of courses, particularly in the computer science and allied fields. Such academic institutions as Colorado State University, with its SURGE (State University Resources for Graduate Education) have circulated video tapes in engineering education to meet a need similar to that served by the Stanford Instructional Television Network.

Such video networks, free from the constraints of both time and geography, seem certain to grow as professional educators become better acquainted with the technology available and more aware of the record of success of their partners in business and industry. Short term growth of communications networking is also sure to include a still-more exciting technology: communications satellites.

The health and education telecommunications experiments already conducted on NASA's ATS-6 and CTS satellites are described in more detail in other sections of this report. Of particular importance to continuing and extension education is the example established by the Appalachian Regional Commission (ARC) in its use of ATS-6 to provide continuing graduate education in the teaching of reading and in career education to rural elementary school teachers in a multi-state area. The success of the project is evidenced by ARC's greatly expanded plans for continuing education for a variety of professional and sub-professional groups.

Other ATS-6 experiments, including those in Alaska and the Rocky Mountains, and those conducted by the Veterans Administration and the WAMI (Washington-Alaska-Montana-Idaho) Project help to point the way for continuing education and the distance-free communications networks which satellite technology makes possible.

A number of experiments relevant to continuing education are already underway and/or planned for CTS and ATS-6 after its return to US service early in 1977. The next step is necessary to move from the status quo of the present and immediate future to the vastly greater possibilities of the short- and long-term future.

Long Term Projections

The technology already exists for audio, data, television and other forms of transmission from high power satellites into small and relatively inexpensive earth stations. Exciting opportunities are presented by the availability of NASA experimental satellites, and these opportunities are being exploited by health and education interests including continuing education. But like a bridge firmly anchored only at one end, an essential condition for further progress is missing.

At the present, successful experiments in the application of communications satellites to continuing education and other needs point to what might be done, but provide no means of moving toward desirable but unobtainable goals. NASA, by its Congressional mandate, can provide opportunities for experimentation, but is barred from providing the basis for operational service. None of the existing commercial Comsats has the technical capability to provide follow-on service to establish, on an on-going basis, the kinds of daily service which ATS-6 and CTS experiments reveal to be technically feasible and socially desirable.

At the far horizon of our view of the future it is possible to perceive communications satellites capable of transmitting direct to learners in their homes and places of work. Such satellites for individual reception are unlikely in this country to replace conventional news and entertainment television, commercial or noncommercial, but the technology does hold great promise for public service applications.

What such satellites, likely to be technologically available within the next 10-15 years, can and should do for continuing education and other needs within the public interest sector cannot be defined in advance. What will be needed in the short term is the opportunity to explore through first hand experience the public services which community reception satellites along the lines already established by ATS-6 and CTS can do.

To get to the long term, we need to pass from the present to the short term future. To do so, continuing opportunities to experiment and to establish continuing services on an operational basis are indispensible. Without such opportunities, we cannot get there from here.

3.4.3 Constraints and Problems

3.4.3.1 Statutory (legal or constitutional prohibitions)

Privacy and confidentiality must be given careful consideration These principles apply to areas such as the transmission of data relative to student performance and student records, as well as to the content of particular specialized courses. Privacy and confidentiality must be protected where required.

Copyright laws must be carefully observed in the use of all types of media — film, audio, video, and facsimile distribution of print material.

The acceptability for credit of mediated instruction has not been clarified by various states, individual institutions, and for certain groups whose instructional program is subject to evaluation by an external agency (e.g., veterans who must spend a specified proportion of their credit hours in a supervised classroom situation, or for certain professions whose requirements state that instruction or in-service training, to be acceptable, must be provided by a specified type of institution and/or that an instructor be physically present.

Post-secondary institutions, particularly those receiving state funds, are subject to restrictions in the ways funds can be used, the types of cooperative arrangements that can be established with other institutions and/or agencies; and the services or practices that can be implemented within their communities. For instance, state-sponsored institutions are often prohibited from the negotiation of leased-time-arrangements for computer services with businesses in the community, institutions with facilities for the production of audio, video or other media are prohibited from contracting for, or producing at no cost, such materials for businesses or public interest groups where these are not utilized in specific instructional situations.

Some institutions are prohibited from enrolling and awarding credit to students who reside outside defined geographical boundaries — e.g., some schools cannot accept the registration and award credit to a student living in another state even though all materials for a particular course may be packaged in such a way that course requirements can be completed through independent study and evaluation of academic performance can be monitored and evaluated by mail or some other form of telecommunication.

3.4.3.2 Regulatory

All instructional programs are directly or indirectly subject to the requirements of various regulatory bodies.

a Educational regulations within the state.

b Accreditation requirements.

c. Boards or committees defining transfer-of-credit agreements among institutions.

d. Open circuit mediated instruction is subject to FCC regulations and, where satellites are in use, to NASA regulations and specifications.

e. Where institutions are providing in-service or continuing education, such programs must comply with the regulations or standards of the professional organization or licensing agency for whose constituency is being served by the program. In addition to meeting specified requirements, such courses often involve private, confidential or protected information to which the general public must be prohibited access.

3 4.3.3 Institutional Constraints and Problem Areas

Not all institutions will accept for credit courses offered over radio or television. While such obstacles are gradually being overcome, the problem continues to exist where faculty committees and/or groups of administrators are not yet convinced that the academic credibility of such courses has been protected and provided for. Attention must be given here to methods for the monitoring and evaluation of student progress and learning.

Designation of the area within the institution to be assigned responsibility for course implementation and student evaluation sometimes creates conflict between departments or divisions. Differences of opinion are as likely to be based on the insistence of a particular area to assume responsibility as it is on their refusal. Delineation is often not clear because there is wide variation among institutions in the structuring of departments and the division of content material among them.

Faculty are often resistant to mediated instructions. Reasons range from fear of the compromise of academic standards to a feeling that such instruction constitutes a threat to their continued employment. Intermediate on this spectrum is a general sense of discomfort with a system in which the instructor's role shifts from center stage to that of learning manager.

Institutional utilization of telecommunications technology is usually constrained by the budget. Needs and aspirations usually exceed financial capability.

Under-utilization of telecommunications technology may result from any of a number of factors. Information on what's available, its costs and its instructional benefits tend to increase utilization. As in many other areas (e.g., the growth of computer utilization) use accelerates use.

3.4.4 Potential Benefits of Satellites

There are vast areas in the United States which still do not receive messages or electronic signals efficiently. This despite the fact that there are radio and TV networks, TV cable television stations, telephones, and other electronic gadgetry extant. It has been demonstrated, however, that these geographic areas can be reached through a satellite communications system.

The ultimate benefit of a satellite communications system is that it will link land based communications systems and provide coverage for everyone — geography and conditions of servitude notwithstanding.

From a social aspect there is a need not only to connect the nation electronically, but also a need to transmit bits of educational information for particular interest groups. Technology can provide that kind of service through a satellite system. It has the capability to be able to transmit not only digital information but also information in the audio and visual spectra.

It is a wide area dispersal system, which at one time can transmit messages to either large or small audiences, to other electronic devices or to specially directed and programmed information receivers.

The satellite communications system can bring together through its transmission capabilities a market aggregation. By market we mean a special interest group — doctors, mechanics, adult illiterates, for example. Therefore in one transmission, special interest groups can receive information anywhere and at the same time.

The technology can permit the aggregation of dispersed demand for services, in other words, the technology allows large numbers of widely dispersed individuals to simultaneously share services, personnel, equipment, materials, or other scarce resources. In this same vein, the technology also can permit individual or personalized service, perhaps more cheaply, by letting a larger number of dispersed individuals with unique needs come together as an aggregate to use services.

By acting in aggregate, institutions might have an academic curricula developed by a renowned, centrally located university that could be accessed through a communications satellite. Moreover, this approach could help to eliminate the requirement that each institution obtain accreditation for its programs, that responsibility would be placed in the hands of the university. Consequently, students' credentials could be acceptable nationally by business, industry, and educational institutions.

Another benefit is that information can be pooled and shared simultaneously. To cite an example, there is a need to teach the metric system. Many schools and colleges are preparing relevant courses — but the project can (and should be) shared. Through the utilization of the best teachers and the preparation of visual aids the effort of such a massive undertaking could be transmitted by but one institution with special inputs by experts who reach the whole country at one time through satellite and ancillary transmission.

It has been demonstrated by the Appalachian Project that the use of satellite transmission has acted as a catalyst to effect and achieve change. Project programs generated other educational program ideas and the demand for satellite transmission has increased many times simply by being used.

Although there is some question as to the need of two-way visual communications the potential is there and assuming that costs are not excessive it could be beneficial in many educational activities — the critical examination by a teacher of a student's work, the teacher in one area, the student at a *remote* site, *for example*, showing his work by two-way color TV satellite transmission.

An inhibiting factor in current network educational programming is the cost of land lines for transmission.

"The advantage of satellite communications increases with the size of the area to be serviced and amount of information *to be transmitted*. This advantage is due to the satellite's capability to use multiple information transmission and reception routes, as opposed to the single routine capabilities of earth communication systems. Earth communications systems have interconnecting links that follow specific routes along the surface of the earth, and their cost increases with the number of locations they connect The volume of information between any two points justifies the cost of the link, further, the cost per information-circuit diminishes as the number of circuits increases. It is the anticipation of heavy increases in information volume that justifies the investment in additional circuits and links.

In a satellite system, the expense of a communications link between a satellite and an earth station is the cost of the transmitting or reception station, and this cost is generally uniform. Consequently, the basic cost to link two earth stations, using a satellite, does not depend on the distance separating them. In addition, since the same satellite can transmit to or receive from many stations simultaneously, the basic investment per communications route diminishes as the number of such routes increases on a per-station basis. It would be misleading, though, not to point out that variable costs for *satellites and* earth stations increase with the number of routes served. However, the number of routes has less impact on the total cost because the satellite system does not require numerous duplications along the transmission path. Table 15 provides a cost comparison for the lease of private phone lines between the Westar satellite system and the AT&T Terrestrial system. This shows that it can be less expensive to communicate using satellites."*

The potential benefits of satellites is limited by cost and the imagination of the user. It has been demonstrated that satellite transmission is increasing. Western Union has 70 companies contracted to use WESTAR services "The rates for full transponder service range from $1.2 million per year to $2.17 million per year depending on backup and other specific terms of the lease." The satellite carries 12 transponders — each of which is capable of relaying color TV signals with accompanying audio.

*From "Instructional Delivery Systems in Business and Industry The Use of Communication Satellites as a Comprehensive Delivery System, by Kenneth A Polcyn, Ph D , PRC Information Sciences Company "

Table 15

Annual Charges for Private Phone Lines

Between	AT&T	WESTAR
Atlanta and New York	$ 9,060	$ 7,440
Dallas and Washington	13,488	10,440
Chicago and Los Angeles	19,176	10,440
Washington and San Francisco	26,256	13,440
New York and Los Angeles	26,359	13,440
Charges are for full-time, unlimited use, and include all service terminals.		
Adapted from: Communicator: Vol. 4, No. 1, Spring 1975.		

RCA has launched SATCOM and has begun service this year. These two specific instances of satellite use demonstrate that there is potential for education as well as other public service groups to use satellite transmission to achieve mutual goals.

3.4.5 Recommendations (not concurred in by all in panel)

1. NASA should undertake an active study of applications of satellite systems and make recommendations for benefit of government and potential users.

2. There should be a detailed study of the continuing education needs of the professions which could be served by satellites.

3. There is a need for a clearinghouse to provide information exchange about the present availability and potential of satellite systems.

4. There is need for a means to inform potential users about possibilities of satellite systems.

5. Government should convene a meeting of all federal agencies involved with satellites to establish policies for the federal government role in development of satellite systems.

6. NASA should continue its efforts to develop high powered satellites so that necessary earth terminals can be obtained inexpensively and used widely in the many applications appropriate to continuing education.

7. NASA should encourage further research in the higher frequency spectrum so as to increase the frequency spectrum available for public service transmission.

8. So that the learnings from this workshop are not lost, a similar workshop should be convened periodically to update and extend the information and recommendations of an informed group.

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3 5 ENVIRONMENTAL COMMUNICATIONS

3.5.1 Objectives

3.5.1.1 Environmental Communications Objectives

Environmental Communications must provide for the collection of data required to permit the monitoring, analysis, prediction and long term study of those environmental parameters affecting human life, and for the dissemination of the data and of processed information derived therefrom to the various users requiring it. This includes data pertaining to space, atmospheric, edaphic and oceanic conditions. It affects, among others, the disciplines of meteorology, oceanography, hydrology and seismology.

Some of the agencies involved at the federal level are the Corps of Engineers, The Geological Survey, The Forestry Service, EPA, NOAA and NASA. At the state and local level are such agencies as state water resources boards, city air pollution monitoring agencies, state agricultural advisory agencies and many others. The environmental communications systems must provide for a full exchange of data and information among this variety of users.

3.5.2 Environmental Communications Needs

3.5.2 1 Type of Communications Needs (Categories of Environmental Communications)

Collection of Data

Data are collected from more than 100,000 remote and populated locations throughout the United States. Most of these are fixed "in-situ,"* however, some reports are received from mobile platforms such as ships, buoys, and aircraft. These observations vary according to the service requirement, e.g., aviation, agricultural, severe storm, and water resource management Service frequencies vary from once per minute to once per day. The variation in the number and frequency of data is required in order to monitor environmental conditions on a local and/or national scale.

All these data must be collected in real time by a communications system and forwarded to collection points, either locally or nationally, depending on the phenomenon. This characteristic of handling large volumes of data in real time is necessary for the monitoring, analysis, and forecasting of short lived environmental phenomena.

In addition to regular data collection, the communications system must be capable of collecting more frequent data as required by abnormal environmental conditions such as storms, floods, earthquakes, tidal waves, etc.

Large volume periodic bursts of remotely sensed* data are also collected for real time use in both digital and analog form. Typical applications are for weather forecasting, wetland identification, pollution contamination, etc.

Dissemination of Data and Information

The data collected must be processed at central processing facilities and disseminated to prespecified users on a scheduled basis. One piece of data may be shared by many users simultaneously or many pieces of data may be needed by only one user.

When adverse environmental conditions warrant, an increased volume of data may need to be distributed on a selected basis to users in geographical areas of concern.

*In-situ sensing sensors located at a site which measure environmental parameters at that site

After the initial dissemination of data, the data generally has to be relayed to other processing centers for further use. This may be accomplished in real-time or non-real time. This type of traffic flow fluctuates (peaks and valleys) periodically. These data are both alphanumeric and graphic.

Communications are used for briefings at high administrative levels in local emergency situations, where real time decisions are required. International telecommunications must have as high a degree of reliability as within the U.S. These communications must have a priority override feature to handle emergency situations that could involve loss of life and property.

3.5 2.3 Telecommunications Systems

There are many environmental telecommunications systems that support governmental missions and corporate charters To the extent these systems can be identified by the Environmental Communications Panel, they are presented in three temporal categories as follows:

Present

The environmental telecommunications systems that currently exist and which can be identified by this Environmental Communications Panel are divided into those serving the Federal Government, Local and state governments, and the private sector.

Federal Government—The Executive Office of the President, Office of Telecommunications Policy, established by OTP Circular No. 12 dated October 12, 1973 a program for coordination of communications planning among Federal agencies. In accord with this program the Department of Commerce was designated the "Lead Agency" for coordinating environmental communications planning Accordingly, the National Oceanic and Atmospheric Administration, acting on behalf of the Department of Commerce, created the National Environmental Communications Committee (NECOM) on December 14, 1973. Other member agencies are the Department of Agriculture, Department of Defense, Department of Interior, Department of Transportation, and Environmental Protection Agency. NECOM is the focal group within the Federal Government for coordination of communications planning among Federal agencies that provide or use communications in support of agency environmental missions.

The attached document, National Environmental Communications Summary Report (Part 1, Systems Inventory) dated August 1975, is the latest inventory of environmental telecommunications systems reported to NECOM by the member agencies.

Local and State Governments—No panelist was qualified to address the present environmental telecommunications systems serving the needs of local and state governments. Generally, it can be said that such existing systems would not involve great distances since most systems would be limited to state or smaller jurisdictions. California is perhaps the greatest user of environmental telecommunications systems The shortage of fresh water and the need to manage such a resource has led to a rather sophisticated data collection system. Florida is perhaps the second largest user of environmental telecommunications systems for state flood control and water supply requirements. Many states rely on the Federal Government for services of environmental telecommunications systems.

Private Sector—Power generation companies, particularly those utilizing coal, are monitoring their local environment for ecological purposes. The mining and manufacturing industries also are users of in-situ and remotely sensed data for purposes of planning and operation.

Short Term (next ten years)

The short term environmental telecommunications systems that can be identified by the Environmental Communications Panel are divided into those serving the Federal Government, the local and state governments, and the private sector.

Table 16

Short Term Change to NECOM Inventory

A To Be Disestablished	B Planned
1-A-1	1-A-2
1-A-5	1-A-13
1-A-35	1-A-21
1-A-38	1-A-24
1-A-40	1-A-25
1-A-41	1-A-56
1-A-50	1-A-57
1-E04	1-A-58
	1-A-59
	1-B-23
	1-B-24
	1-E-1
	1-F-1
	1-F-2

Federal Government—From the attached NECOM inventory, systems listed in Column A in Table 16 will be disestablished during the short term and systems listed in Column B are planned for implementation during the next ten years.

Existing systems that are expected to continue in existence over the next ten years are not listed here but are contained in the NECOM inventory

Local and State Governments—The Environmental Communications Panel could not address this subject.

Private Sector—The Environmental Communications Panel could not address this subject.

Long Term (over ten years)

The Environmental Communications Panel could not specifically identify any communications systems that might be required in the long term The following forecast of long term needs should provide some indication of the "blue sky" environment communications systems that might be postulated.

Energy—Offshore oil and gas exploration will have increased activity and require additional telecommunications support.

Minerals—Recovery of deep seabed minerals, e.g., manganese, copper, nickel, cobalt will require considerable telecommunications support. Industrial activities (oil and minerals in the oceans) may require new needs for communications support in several disciplines including extensive monitoring of the environment.

Food—Fishery Conservation and Management Act of 1976 — provides jurisdiction over fisheries within a 200 mile zone off our shores, expect increase in telecommunications to effect controls.

Coastal Environment—The growing national concern for a balanced management of our coastal environment including energy facilities, ocean transportation, wetlands, and habitats will lead to communications needed for monitoring and control.

Ocean Pollution—There is increasing recognition that the oceans and great lakes are fragils ecosystems that we are damaging. Monitoring, via communications, must be developed and implemented.

Oceans and Climate—There is a new awareness that the oceans are critical in determining the character of the world's weather and climate. Additional remote and in-situ sensing of oceanographic environmental parameters is required for input to simulation models.

Maritime—Present ship-to-ship and ship-to-shore communications may not meet the communications requirements that expanded oceanic activity can be expected to generate. Present shipboard communications may have to be expanded or other systems, such as satellites, used to monitor position location, direction and identification.

Seismology—There are relatively few sensors today that are connected into a communications network for real time reporting. The thousands of reporting sites - individuals and universities around the nation and in other countries - usually report seismic activity by mail and often many weeks after the event. As scientists develop more information on seismic activity, the expectation is that real-time reporting will be a must and possibly *lead to enhanced* seismic activity prediction

Tsunami—Today the Tsunami warning system alerts coastal areas throughout the Pacific Ocean area to prevent loss of lives due to tidal waves created by ocean floor seismic activity. Such messages must be delivered in less than an hour. The warning system presently uses radio and commercial cable and telephone systems, as well as government owned systems to meet the requirement. Although the system may benefit by improvements in technology, requirements are expected to remain at present volumes and number of users, but speed of delivery requirements may increase.

Data Collection—Within the conterminous United States, Alaska, Hawaii, and Puerto Rico areas environmental data collection is expected to increase at about 5% per year. Additional read points may be included beyond today's level toward increasing the input variables in computer prediction models - all toward more accurate prediction techniques in meteorology, hydrology and seismology.

Dissemination of Data and Information—Present systems of 100 words per minute teletypewriter networks and facsimile (2400 b/s) will be slow to evolve to higher bit rate systems. Near term plans are evolving toward allowing the option for users to request the information reports they need or want rather than take only what is put out today In this long term the selection options will be greater. Users will be able to afford implementation of high bit rate digital systems for narrative and graphic information as greater economies of operation are made possible by new and larger networks. The timely occurrence of this is constrained only by the cost of transition from the near term systems to the more advanced systems. Satellites hold great promise toward meeting these requirements should the expected cost reduction occur.

3.5 2.4 Non-Environmental Communications Capabilities of Interest

The various categories (previously listed) of what is generalized here as communications capabilities needed to support environmental areas but not characteristically environmental communications, are expected to grow at about 5% per year, but the emphasis may change from one mode to another. There is expected to be an up-surge in digital systems which also transmit voice communications With any change in emphasis from centralized computer capabilities to distributed computer systems, relative short duration (interactive) connections may result in an increase in dial-up services and decrease in dedicated circuit capabilities.

Graphic—In the area of graphic communications, remote sensing (e.g , satellite to earth) will evolve to systems of increased resolution (greater detail in the pictures) with a resultant demand on telecommunications systems for increased bit rate and bandwidth.

3.5.3 Constraints and Problem Areas

3.5.3.1 Statutory

It is important to note the difference between Federal statutes which set forth mission requirements such as collection of taxes, enforcement of laws, forecast of weather, or monitoring the environment and statutes which address the provision of communications services. The Communications Act of 1934 is the basis for regulation of commercial common carriers. No agency of the Executive Branch is by Federal statute required to provide communications services. Quite frequently the use of electronic communications means is implicit in the statutory activity, however, the selection of specific communications services is done by the agency in accordance with Federal Procurement Regulations (FPR) and the Federal Property Management Regulations (FPMR).

3.5.3.2 Regulatory

Two policy circulars from the Executive Office of The President are relevant. OMB Circular A-76 establishes the general policy of obtaining goods and services from the private sector. OTP Circular 13 applies the OMB policy specifically to communications.

A regulatory consideration of major impact on any NASA undertaking in the field of communications satellites is the outcome of the Federal Communications Commission's Computer Inquiry. The Computer Inquiry is necessitated by the growing use of computers as communications devices as well as data processing devices. The communications (common carriers) industry is regulated, the data processing industry is not regulated. As the two technologies merge, it becomes more desirable to integrate data processing and communications functions. The FCC inquiry seeks to define the regulatory line between the two.

Since all of the environmental disciplines discussed herein require various amounts of both data processing and communications, it would be logical to postulate future system concepts around an optimum configuration of both disciplines. This could possibly result in certain ADP functions being performed aboard the satellite. Such a result would most likely preclude the transfer of NASA developed technology to the private sector due to inconsistency with the expected outcome of the FCC's inquiry.

3.5.3.3 Problem Areas

Any organization that uses communications is under budgetary constraints. The decision whether to implement any telecommunications capability must be based on cost comparison or cost effectiveness analysis.

In the Federal Government, the option to purchase a system rather than lease a service must be clearly defined under OMB Circular A76 and OTP Circular 13. The objective to obtain services is clear but in cases where industry — more accurately Regulated Commercial Communications Common Carriers — prices its services too high, a government agency may prove its own system to be the most economical. Government agencies do not desire to own their own systems. They prefer leasing them, yet the present high cost of satellite service in general, is driving users to implement their own systems.

3.6 LIBRARY SERVICES

3.6.1 Overview

The Panel believes that a major objective of its deliberations should be to enhance NASA's understanding of the complexities of library operations and services and of the roles that libraries can have in community and institutional environments.

The Panel on Library Services takes the broadest possible view of the library mandate of acquisition, organization and dissemination of materials or the information contained therein, as well as the production and examination of new information. Libraries seek to serve the informational, educational and recreational needs of a broad-based population consisting of individuals and institutions.

In achieving its objectives, a multiplicity of library systems exist which seek to meet the needs of library users. Among these are public libraries (under state or local jurisdictions), university and large research libraries (both public and privately financed), special libraries and information centers (associated with various organizations both public and private), and Federal libraries.

In achieving its mandate, the library must deal not only with the individual as indicated above, but also with related organizations and institutions, including other libraries and social services units. There is a need for librarians to aggressively seek linkage roles — librarians as information brokers.

This need is evidenced in part by the many panels whose topical areas include an information or library element but whose membership did not include a librarian or information specialist

It is essential for libraries to consider four areas in the planning and provision of service: needs of users, categories of users, format of storage of material/information and methods of material/information transmission

3.6.1.1 Needs of Users

The needs are bibliographic, reference, referral, research, analysis and interpretation, recreational, and educational.

3.6.1.2 Categories of Users

The categories of users are individuals (in all their various life roles) and institutions (collections of individuals) including government, schools and political, social, business, scientific, and technical units.

3.6.1.3 Formats for Material/Information Storage

The formats include printed word, phonograph records, cassettes, films, magnetic tapes, videotapes, cartridges, maps, charts, microforms, objects, and photocopies.

3.6.1.4 Methods of Material/Information Transmission

The methods of transmission include telephone, telefacsimile, personal contact, mail, computer terminal, courier service (walk-in), radio (wire/wireless), television, cable television, travel, workshops, conferences, bookmobiles, and satellites.

3.6.2 Possible Applications of Satellite Assistance in Improvement or Expansion of Service

3.6.2.1 Sharing of Resources/Facilities

Sharing of resources includes coordination with other community groups, services and organizations, and sharing facilities and staff.

3.6.2.2 Education/Training

Education and training services include services to undereducated adults, adult and continuing education, in-service training, individualized learning, individualized counseling, and elementary and secondary education.

3.6.2.3 Outreach Services

Outreach services include service to remote areas, homebound and institutionalized services, handicapped services, and extension services.

3.6.2.4 Cooperative Library Functions

Cooperative functions include databank sharing, databank building, standardization and compatibility, and utilization of shared resources and data (networking).

3.6.2.5 Referral Services

3.6.3 Parameters/ Constraints Which Must Be Considered in Planning

1. Shrinking library budgets.
2. Censorship/intellectual freedom - court guidelines permitting communities to establish their own standards. Broadbased transmission must take into account the local differences.
3. Multiple jurisdictions - local constraints on funding and sharing of resources and facilities.
4. Enabling legislation - legal requirements to provide the service including the scope of services.
5. Copyright.
6. Lack of prior satellite experience/experimentation, necessary in developing baseline data for planning.
7. Selectivity
   a. Confidentiality and material/proprietary rights. Transmission of classified or restricted documents/diplomatic information to a specific clientele.
   b. Restricted user groups. An example may be seen in the legal restriction of material recorded or brailled for use of the blind and physically handicapped, to be used only by those certified as eligible
   c. Cultural experiences. Material aimed at one cultural groups might prove inappropriate for others.
   d. Intellectual. Grade level of material and content must be geared to the recipient.

3.6.4 Recommendation

A variety of areas exist in which the library profession envisions great benefits from satellite communications The overlapping with the recommendations of many of the other panels provides further evidence of this fact.

The panel is, however, keenly aware of its constraints both timewise and knowledgewise in its ability to prepare a document truly reflective of the entire universe of possible application to the library community. We therefore recommend strongly that this panel continue to function as a liaison between the library community (which it intends to involve heavily in the provision of input) and NASA (which should keep this panel well informed as to current developments and input requirements from the library community).

Table 17

Library Needs

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Library Services (to public of users)	Color Video 1-way Audio 2-way Audio	Library	?	Urban & Rural need for access & for Local Programming will differ	?	Libraries gaining experience with video but, so far, not with Satellite-delivered video.
Data Trans	two-way	Library (individ.) or State/Regional Library Center	?	Initially - likely to be used by Library of Congress, Regional Bibliographical Centers and large libraries	?	Implications differ if transmission of compressed bibliographic data and/or full text are cost-effective.
Teleconference	two-way Audio/Video	Any accessible location in community on shared basis	?	Likely to be for communication from one urban center to another, at first	?	Library experience to date is lacking.
Extension & Cont. Ed.	1-way video 2-way audio	Shared location possible - would encourage libraries to be Community's Center for cont. ed.	?	Focus on rural areas where access to ED is now limited.	?	Library experience to date derives from Alaska and Appalachia, with Rocky Mt. area a possible, next test site.

Further refinement and answers to "?" will be future, on-going objectives of panel

3.7 MEDICAL EDUCATION

The Medical Education Panel Report is a statement of the future (next decade) needs of health care professionals for health science education which will be most effectively met by information transfer systems via a communications satellite. The Panel recognizes the magnitude of health education needs of both the patient and the general public but did not include that aspect in the discussion upon which this report is based.

3.7 1 Objectives

3.7.1.1 Discipline Objectives

The objectives of medical education are to maintain and improve professional services through the education and training of physicians and other health professionals and through biomedical and health services research. The major educational phases for the health professions are undergraduate, graduate and continuing education with different emphases on these phases in each specific discipline (medicine, dentistry, nursing, allied health professions, pharmacy, etc.).

3.7.1.2 Statutory Requirements

There are no federal statutory requirements for the practice of health professions. Each state regulates the practice of these professions and particularly of medicine through its medical practice act.* Some states have introduced a statutory requirement of continuing medical education as a prerequisite for relicensure of physicians and other health professionals. All other requirements for educational or professional standards in medicine are established by voluntary organizations.**

3.7 1.3 Objectives to which Satellite Telecommunications can make a Contribution

The objective is to provide a wider distribution to regional geographic areas for interconnection to terrestrial systems in order to more efficiently reach a wider specialized audience. It would also enable a national coordinating facility to more efficiently provide the programming input to such a system via a multiple capability uplink.

3.7.2 Discipline Communications Needs

3.7.2.1 Types of Communications

Purposes	Type of Communication
Telediagnosis and selected mass information transfer as in medical school classroom, multiple branches of a school or multiple schools, etc.	Audio-video-color 2 way (option - may be used with teleprocessing)
Computer Data Banks Example - data for purpose of determining prognosis in chronic diseases	High Data Rate (Digital) • audio • combination
Business/Educational*** Requirements for hospitals, clinics, groups. (Eventually may be practical for individuals)	Audio-video color 2-way Practical to meet some of this need - expansion of use probably necessary

*FLEX, NBME, e g . The most common provisions for medicine are (1) that the individual has to have graduated from an accredited U S or Canadian medical school (undergraduate education), (2) that the applicant must have one or two years of house-staff training (graduate medical education) and (3) that the individual must have received a passing score on the examination

**CCME, LCME, LCGME, LCCME, specialty boards, etc

***Appended

3.7.2.1 Types of Communications (continued)

Purposes	Type of Communication
Health Education for the Patients Type I - Health Education For the general public, believed to be a public health function	Audio-video use practical now, program content very critical
Type II - Physician to patient about specific condition, a health system function - completely confidential requiring physician input	Audio - 2-way, video is helpful, if available

3.7.2.2 Volume of Communications

At present, very low volume, experimental in nature and regional. During the next ten years, volume will increase in direct response to development of programs and availability of funds both of which are outside the scope of this report. No assessment of long term volume was made by the panel.

3.7.2.3 Communications Networks

At present needs can be identified through recently conducted experiments. The use needs of a dedicated broadband network for health has not been determined.

3.7.3 Constraints and Problem Areas

3.7.3.1 Constraints

Statutory restraints are state and not Federal at this time and they can be unique to a given state.

3.7.3.2 Regulatory Constraints

None now, but disclosure regulations regarding drugs under auspices of FDA have been recognized.

Institutions are not funded to develop or distribute continuing medical education programs utilizing broadband or any other distribution modality.

A problem area relates to confidentiality of data.

3.7.4 Potential Benefits

Overcomes restraints of geographic separation and thereby facilitates sharing of human and physical resources

3.7.5 Consensus

Federal government should consider providing funds for subsidizing the dissemination of educational programs.

3.8 MEDICAL SERVICES

3.8.1 Introduction

The potential contribution of satellite telecommunications is, perhaps, greatest in the area of medical services. Among the specific areas that would benefit are improvements in emergency medical services, teleconsultation, remote patient care (telediagnosis), basic and continuing medical education, supervision of allied health care workers, and administration and management of health care resources. Specific information on these applications is included in Table 18.

Table 18

Medical Care Services

1.1 Disp. Objectives	1.2 STAT Required	1.3 Objective Satellite can make contribution	2.1 Type Communication Needs	2.2 Volume P	ST	LT	2.3 Communication Network P	ST	LT	Constraints and Problems	Potential Benefits
Improve Access to and Quality of Primary Call	No	1. Provide for detection of diseased patient (Person)	DATA transfer Half Duplex Audio	None	?	?	None	Reg*	Reg*	Patients must assume responsibility	Detect injured Patient Answer question Do I have a problem? How do I obtain care for patient in remote area?
		2. Provide patient with access to medical care system	Half Duplex Audio	?	?	?	None	Reg*	Reg*	Patient responsible Confidentiality of Data	
		3. Assess health status by connecting patient with health care provider	Full Duplex Video/Audio Data Transfer Monitoring	Unknown			IHS**	Small Region	Large Region	Confidentially Cost of Comprehensive Terminals	1. Delivery health service where none exist 2. Improve quality of care 3. Increase breadth of services
		4. Provide primary care physician with consultation or provide support for non-physician	Full Duplex Audio/Video Data Transfer Data Monitoring Slow Scan TV	?	?	?	Ground Networks IHS VA System	Region	Larger Region	1. Cost of Comprehensive Terminals 2. Teaching Professionals how to use 3. Obtaining Data as to outcomes 4. Confidentiality 5. Availability - Need 7 days/wk, 24 hrs/day. 6. Payment per experiment period	1. Decrease isolation of care provider 2. Bring resources to bear on patients problems 3. Assist evaluation of Patient status 4. Direct provision of services by non-physician under supervision of physician 5. Decide on referral 6. Connect clinic to hospital. 7. Arrange for referral indicated for patient 8. Access patient records and store data 9. Arrange follow up on referred patient 10. Follow on referred patient when returned to local physician
		5. Provide Emergency Medical Service where they do not now exist									
		6. Provide non-emergency medical service on expanded, on-going basis									

NOTE P = Present ST = Short term LT = Long term * Regional ** Indian Health Service

Table 18 (continued)

Medical Care Services

1.1 Disp. Objectives	1.2 STAT Required	1.3 Objective Satellite can address	2.1 Type Communication	2.2 Volume			2.3 Communication Network			Constraints and Problems	Benefits and Recommendations
				P	ST	LT	P	ST	LT		
Improve relationship between primary and secondary physicians as well as secondary and tertiary physicians	No	1. Provide consultative backup for primary care physicians in rural areas of USA 2. Bring resources of major medical centers to bear on patients problem in areas where resources don't exist 3. Facilitate referral of patient from primary - secondary care physicians and/or from secondary care - tertiary care physicians 4. Develope new system CME focused around patient management problems 5. Encourage development of regionalized system of Health Service Delivery	Full Duplex Video/Audio Data Transmission Monitoring Telemetry	?	?	?	Micro-regions	Expand to include micro regions	MACRO & MICRO regions with condition between systems	1. Confidentiality 2. Patient records 3. Payment for services 4. Set up relationship between patient and case physician 5. Available when needed (24 hrs/ 7 days/wk)	1. Maximize use of resources 2. Lessen isolation of rural physicians 3. Basis for care (?) 4. Increase quality health care 5. Lessen overall cost of health care 6. Focus of regional planning 7. Facilitate placement of physicians in underserved areas 8. Diminish depletion of health care resources.

NOTE P = Present ST = Short term LT = Long term

3.9 PUBLIC BROADCASTING

3.9 1 Objectives

3.9.1.1 Discipline Objectives

Make available public radio and television programs to 100% of the population of the United States.

Make general programming available for audiences with particular needs such as the hearing impaired and foreign language speaking groups

Provide specialized programming dealing with particular needs and interests of ethnic minority populations.

Provide specialized programming needed by special interest groups available in many different situations including the home, automobile, classroom, office, community center, library, auditorium, etc The list of special interests is extensive and includes all levels of formal education and beyond. Continuing educational needs for information and training of police, firemen, health care professionals, social service workers, etc. can be addressed through public broadcasting.

Tap the rich resources of the entire country and exploit our pluralistic society for the benefit of all who can share in that richness

Establish program resource banks where material can be stored in a manner which will facilitate retrieval by appropriate user groups.

Maximize the choice for the local station in program selection, not only of content but of time The Congressional mandate calls for the distribution of programs for use by a station "at times of their own choosing " A station may carry all programs from the national source, or some or none. Program selection for local broadcast is entirely the province of the local station.

To provide quality services at the lowest possible cost.

3.9.1.2 Statutory Requirements

The Corporation for Public Broadcasting (CPB) is mandated by law (cg. Public Broadcasting, October of 1967) to expend funds received from the federal treasury to facilitate the full development of public broadcasting for the benefit of the American people.

Many states have enacted similar laws to foster the creation and delivery of educational services through non-commercial broadcasting.

All non-commercial broadcast licensees operate with the sanction of the FCC subject to all rules and regulations including the charge to ascertain the requirements of their community and to serve the "interest, convenience and necessity" of the public.

3.9 1.3 Objectives to Which Satellites Can Make a Contribution

A satellite system is the most effective and efficient method yet devised to distribute radio and television programs to broadcast stations for their retransmission to the public. A high power satellite can provide service available in low-population density areas where it is not economically feasible to operate a broadcast transmitter. This includes 10-15% of the U.S. population

High quality video with multiple associated audio channels permits programs to be distributed with two or more audio tracks in different languages which a broadcast station may choose to simulcast on radio in markets where large foreign speaking populations reside.

Since a satellite signal is not distance sensitive, it is an efficient means of distributing programming nationwide for use by those stations having a need for service to significant ethnic minority populations (e.g. Hispanic, Native American, Asian American) without interrupting main channel service for all stations

Multiple channel capacity available via satellite makes possible the scheduling for nationwide distribution a myriad of program services for highly specialized programming interests on a cost effective basis. The interactive capability of two-way audio and video is often essential to a meaningful program learning experience for these groups.

The realization of diversity of program resources is greatly enhanced with a satellite system that eliminates the essentially one-way nature of our present terrestrial radio and television interconnection system. With up-link capability at various locations throughout the country, we can originate programs from their source with no additional cost added for distribution from "remote" locations.

Program materials from a central resource could be transmitted to one or more locations on demand during open access time on any one of a number of transponders or during off-hours of light traffic.

With a multiple channel capability via satellite being used for time zone delays, the same program is available to all stations at least three different times a day, and three different programs are available at the same time for most of the day This dramatically increases the choice of time and type of program available for selection by the station.

Projections show that present satellite technology will enable us to provide significantly increased service, both qualitative and quantitative, at a lower cost than is now being realized for a terrestrial system.

3.9.2 Discipline Communications Needs

3 9.2.1 Types of Communication Needs

a. Four channels of high quality video and associated audio for distribution of public television programs.

b. Four channels of high quality audio, capable of compatible stereo pairing, aggregating for compatible quadrophonic, or separable for four monophonic purposes, for distribution of public radio programs.

c. Two-way audio capability from every radio and TV station.

d. Two-way video capability at, at least, one location in each state with some adjustments for heavier population density.

e. Two-way data transmission utilizing both soft display and hard copy between every radio and television station allowing for transmission to 15 TV locations and 15 radio locations simultaneously.

f. Multiple audio channels (approximately 5) associated with each video channel.

g. Expansion of multiple capacity for distribution of program service at the local level including, but not limited to, subsidiary communications channels for FM, instructional television fixed service, multipoint distribution service, video cassette, video disc, and cable.

3.9.2.2 Volume of Communications

	Present	Short-Term	Long-Term
PTV Programs	4,368 Hrs/yr	8,500 Hrs/yr	20,000 Hrs/yr
P Radio Programs	3,200 Hrs/yr	7,280 Hrs/yr	15,000 Hrs/yr
Data Message*			
TV	12,000 m/yr	24,000 m/yr	36,000 m/yr
Radio	8,000 m/yr	10,000 m/yr	15,000 m/yr

*Average length per message is 1 5 minutes

NOTE:

PTV Programs: All numbers very approximate and includes original feed and all repeats. In long term many programs will be distributed which may never be broadcast but will be distributed to special user groups locally by other means.

Radio Programs: Availability of multiple channels for nationwide distribution will bring about large program segments of time of material for the print handicapped to be broadcast on FM sub-channels.

Numerous college courses are provided by the PTV stations working in cooperation with local institutions.

3.9.2.3 Communications Networks

	Present	Short-Term	Long-Term
TV	155 licenses 265 stations	205 licenses 365 stations	280 licenses 400 stations
Radio	175 licenses 190 stations	275 licenses 350 stations	400 licenses 500 stations

NOTE:

Again these numbers are rough approximations. Many more slave transmitters are operated by television than is the case in radio. Public television stations today cover about 80% of the population while public radio covers only 60%; hence the growth in radio will be more rapid. We also expect to see more multiple station markets, especially in public radio, offering different but complementary program services.

Many ancillary services are provided for the community through local government and other service agencies.

3.9.3 Constraints and Problem Areas

3.9.3.1 Statutory

For the first time since the public broadcasting act was enacted in 1967, the Congress has provided multiple year (3) appropriations for the support of public broadcasting adding a measure of insulation from federal control over program content. Constant vigilance is required to maintain accountability for the expenditure of public monies while protecting against undue pressure from government over programming activities.

The concept of "a public dividend" for the tax dollars invested to develop satellite capability has never been fully realized. Additional research and development of new technology to satisfy public service requirements is badly needed. Following that, Congress should find ways to make that technology developed at the public's expense, available for operational purposes by public service users for the public benefit.

3.9.3.2 Regulatory

Congressman Lionel Van Deerlin, Chairman of the House Sub-Committee on Communications has announced his intent for a total review of the Communications law of 1934 as amended. This is the opportunity to make regulatory changes that are applicable to modern day technology both for the short-term and the long-term.

At the international level we must be certain of our requirements to make the best possible representation at the upcoming WARC meetings to insure appropriate agreements regarding use of the spectrum.

The increased services provided by advanced technology will create many regulatory modifications.

3.9.3.3 Institutional

Public broadcasting is characterized by a complex arrangement of institutional relationships involving national organizations, state and regional groupings and the individual local station. Under existing arrangements the Corporation for Public Broadcasting would have central responsibility for the establishment of a system to provide for the services heretofore mentioned. Operational responsibility would rest with the Public Broadcasting Service for television and with National Public Radio for the radio system. Both organizations are membership corporations whose policies are established and controlled by the member stations.

At present, it is the intent to establish a group similar to the original Carnegie Commission to review all aspects of Public Broadcasting and make whatever recommendations may be determined to be appropriate regarding funding and institutional relationships. As with the review of regulatory laws, this will be the opportunity for changes, refinements and improvements in the system.

3.9.4 Recommendations

The immediate requirements of public broadcasting for satellite services can be provided with existing services at competitive costs. Should regulatory and policy considerations cause a delay in present plans, which is entirely possible, a new generation of satellite technology would be essential if these services are going to be provided at reasonable cost.

Continued research and experimentation with advanced satellite technology should be undertaken by NASA to assure public broadcasting the availability of complementary services as well as for the provision of basic services ten years hence and on a more immediate basis in the event of extraordinary regulatory delays.

Many public broadcasting licenses provide ancillary services to their communities and additional communications requirements will be necessary as the scope of these services increases.

For a copy of the descriptive brochure on public broadcasting plans for satellite interconnection, write to: Donald R. Quayle, Senior Vice President, Corporation for Public Broadcasting, 1111 16th Street, N.W., Washington, D C. 20036.

3.10 PUBLIC SAFETY

3.10.1 General

The role of communications in public safety agencies has unusual priority in the performance of their functions. It is obvious that these agencies must use communications in their routine functions. Not so apparent, perhaps, is the role that communications must play when numerous, diverse agencies must cooperate in wide area or macroscopic operations.

Public safety includes law enforcement, fire, emergency medical service, drug enforcement, civil defense, search and rescue, highway maintenance, conservation, and other groups responsible for the protection and preservation of the public's life and property. They are, by nature, generally tax supported activities. As such, monies spent must be clearly justified by their contribution to the objectives of the agencies. Therefore, the evaluation of need for any additional resources must be based on the degree to which that resource, such as a communications satellite program, contributes to the agency doing its present job in a better, or less expensive way, or the degree to which that resource permits the agency to accomplish some necessary, but heretofore technologically unrealistic, function.

3.10.2 Needs

The predominant requirements for public safety communications systems fall into three categories, each with its own technical, organizational and management needs. These three are interagency systems, wide area systems, and training systems.

3.10.2.1 Intra-agency Systems

Day to day intra-agency systems have relatively high volume from mobile and portable units to fixed or to other mobile and portable units These systems are marked by the need for voice grade and relatively slow speed (less than 4800 baud) data links. Some of these agencies have a stated need for video monitoring of fire or disaster operations, or to assist critical management decisions relating to disaster relief operations. Such video requirements are distinguished by their disaster related requirements, which imply a periodic, high priority need interspersed by periods of relatively low activity during test and drill operations. They are usually constrained within political boundaries within a state or other local jurisdiction. Over 95% of these systems are confined to coverage areas of less than 320 kilometers diameter. The functional operation of these systems demands a high degree of individual system protection from interference, now provided by frequency and geographic separations. There are currently over 200,000 mobile law enforcement units, 5,000 fire units, 10,000 ambulance units and an unknown number of other service units now operating in the public service. These units, functioning from day to day in established patterns, must be prepared to respond to unusual incidents and/or disasters by a combination of a multiplicity of responses. Fire, police, ambulance, Red Cross and search and rescue all must be able to coordinate at times of disaster. The nature of the present frequency allocation process, and the premium placed on the presently available spectrum, have slowed the development of interfunctional cooperative systems.

3.10.2.2 Wide Area Systems

There is a need today for communications systems spanning the entire country. The flow of administrative and crime related traffic between states and to and from the federal government is massive. Some 2×10^6 messages with an average of 377 characters are handled monthly by the National Law Enforcement Telecommunications System (NLETS). 20,000 fingerprint cards are sent daily to the Federal Bureau of Investigation. Driver license and automobile registration checks within states (between local agencies and the state records center) involve hundreds of thousands of messages per day. The rapid introduction of mobile digital units into law enforcement vehicles is expanding this load by a factor of about 2 per year. The real time traffic is currently carried on statewide and national land line systems. Some states (about 10) have their own state-owned microwave systems providing intra-state service.

The growing mobility of the criminal element (particularly in drug related cases) is greatly expanding its area of activities. Crime is no longer confined to political boundaries. Drug related cases now require centralized, continuous monitoring or tracking of individuals operating across the United States. Instantaneous voice communications between land, air and marine vehicles, distributed throughout the United States, and their central control point is necessary to assure coordinated apprehension of organized groups of criminals.

State law enforcement, in order to be productive and effectively utilize all of its expensive resources, should have immediate and expeditious access to data and all other resources to pursue its mission.

The problems being experienced by most statewide law enforcement agencies using their present systems are loss of signals, both transmission and reception, high maintenance costs, and most important of all, poor reliability when needed under stress conditions of weather, location and other natural disasters.

It is recognized that satellite communications in the volume needed to support national law enforcement has not been developed, but believed possible. At the present time, the greatest need and largest return springs from the need to consider the upgrading of Federal, nationwide and statewide systems rather than the systems of local entities.

It was discussed and recognized that costs may increase, but the gain of better reliability and the obvious increase in effectiveness of personnel due to their increased availability would offset the higher costs.

Effective concentration of resources, needed to assure their availability in times of disaster, demands stand-by, wide area communications systems be available to allocate their resources to the point of disaster, wherever it may occur. Mobile communications systems, capable of coordinating with all public agencies involved in disaster aid, regardless of their frequency or modulation type, and capable of maintaining communications with the resource control center are essential.

3.10.2.3 Education/Training Systems

The life and property of those citizens residing in remote areas depend on the skills they can bring to bear on their problems from within their own resources. Teaching these people how to protect themselves has, to date, been neglected. This deficiency may be ameliorated by broadband telecommunications The need to teach all Americans the rudimentary elements of First Aid is continuously demonstrated by the Red Cross program that results in the award of 4-1/2 million certificates a year. These needs can be effectively supplemented using highly skilled instructors through a program of instruction that brings the teaching environment into the individual's home.

The non-metropolitan areas of America (less than 150,000 people) have the greatest need and can make the most effective use of satellite communications for education and/or training. These areas are generally isolated from teaching resources, expertise, new technology, and practice that are vital to the delivery of services in the public safety sector. These populations are usually dispersed, sometimes isolated by terrain, and beyond effective range terrestrial facilities.

These areas can be most effectively served by four-way communications (interactive audio-video) The primary need is for classroom training and training demonstrations. The secondary needs can be served by one-way video and audio and simple transmission or accessing of data needed in training.

High priority should be given to the training of teachers of public safety (both paid and volunteer) at the local level essentially limited to subject matter for which national resources or expertise are in short supply. For example, a new technique is search and rescue.

Consideration should be given to live televising of disasters that could serve as training demonstrations or immediate recording and retransmission with a short time (24 hrs). This interjects absolute realism and timeliness to the demonstration. Client response, especially for volunteers, will be magnified by this technique. Every fire station could become an immediate training site, for example.

Therefore there is a need both for scheduled and command use of satellite communications in the educational training of public safety personnel. The satellite can most effectively bring expertise in short supply to widely and thinly dispersed personnel.

3.10.3 Constraints

The satisfaction of these public safety needs can only be accomplished within the framework of existing laws and regulations. For instance, existing Federal security and privacy laws prohibit the establishment of communications links that will further "FEDNET" type of computer linkages. The transfer of criminal history or other criminal justice records requires specialized handling techniques. The privacy of individuals prohibits the linkage of names to statistical analyses.

The sensitive nature of some criminal justice information requires its encryption during radio transmission to preclude its unauthorized dissemination. The sophistication of elements of the criminal community and the proliferation of public owned scanners have jeopardized the security of much of the clear test law enforcement radio transmissions.

3.10.4 Summary of Public Safety Requirements

In view of the above stated needs, and in light of the existing legal and regulatory constraints, the following summary of communications systems requirements has been prepared. This summary makes the assumption that these channels would be provided in lieu of the existing systems, wherever they now exist. For instance, the present two way radio system is controlled by its owners, and as such has addressable characteristics within the area of its responsibility The nature of the 2500 two way radio channels described must include the capability for discrete address ability and inter-channel trunking with sufficient system gain to overcome building and foliage losses at equal or less than system noise levels now enjoyed.

3.10.4.1 One Way Radio (Nation-Wide Coverage)

Wide area disasters, both natural and man-made, require the ability to notify the many diverse, responsible agencies of the impending events. It is assumed that an adequate number of area disaster and search and rescue control centers will be established. Other public safety agencies have the need to disseminate alerts regarding specialized events.

3.10.4.2 Two Way Radio

The present system of police, fire, ambulance, state highway patrol, state police, Federal Drug Enforcement, Federal Bureau of Investigation (when coordinating with local agencies) and other Public Safety agencies, use approximately 250,000 mobile, portable and fixed stations. These now occupy some 200 (approximate) channels in VHF low band/high band and UHF frequencies. They are separated geographically and by political boundaries. Their responsibilities are such that 100% reliability is desirable (They now operate within the 90% coverage, 95% of the time, power density curve of the FCC).

3.10.4.3 National Emergency Channel

In addition to the responsibilities for public safety borne by the established tax supported agencies, three stand-by channels used 3% of the time, would be needed to coordinate these elements during disasters, major search and rescue and other large major, multi-agency response operation.

3.10.4.4 Data Transfer System

Present interstate and state-to-national traffic includes over 2×10^6 messages per year of an average of 377 characters per message. This traffic is now carried over leased circuits.

In addition to this electronic traffic some 29,000 8" x 8" fingerprint cards are sent by mail to the FBI per day The magnitude of this task currently precludes the timely handling by electronic means

It is calculated that the transmission of these fingerprint records, plus the dissemination of mug shots for criminal identification and lost individuals and the interstate transfer of maps, footprints, shoe images and search and rescue data will require 204 voice grade channels.

3.10.4.5 Video

As described above, the surveillance of criminal activities in progress and the control of large scale law enforcement actions requires 4 nationwide video links. Education, requiring video for teaching during only certain hours of each day, requires not only a video channel for teaching, but also one with an interactive voice channel, and a third with an interactive video channel.

Video requirements to monitor disaster activities on a national basis, suggests the need for the availability of 4 non-shared video channels.

3.10.4.6 Data Transfer

The growing use of data transfer via mobile digital terminals by police agencies is developing an important new need for communications channels. The preponderance of this work is between car and a central state computer file. 250 channels are estimated as the nationwide requirement for the next decade.

An additional element is the developing use of automatic vehicle location systems that maintain running plots of police and other vehicle location In transit monitoring of nuclear shipments is but one such use. These systems all have some form of automatic digital position reporting to the dispatch center. 100 voice grade channels are estimated as needed for this purpose.

Five analog channels would provide needed low speed telemetry systems to support police operated emergency medical systems.

3.10.4.7 Search and Rescue, Disaster Rescue, and Emergency Response

A total national emergency response coordination system can now become a reality with the advent of satellite communications

A centralization of data for computer assisted search planning, the use and employment of "overhead" Search and Rescue and Disaster Management teams, the stocking of radios and other SAR equipment in regional emergency caches, plus the coordination of communications on federal, state and local levels can now meld emergency response into an efficient, cost effective, whole system.

Existing communications restraints have prevented such a "whole" coordination system from developing.

The days of fragmented search and rescue response, or "Head 'em off at the pass" SAR tactics can now be replaced with portable earth terminals and satellite communications for coordinating an integrated, whole emergency response effort in major SAR missions, and disaster situations.

3.10.4.8 Environmental Services

One problem which most of the two-way mobile public safety services share is a need for additional area coverage in its mobile-to-mobile and mobile-to-base communications. As the area becomes more rural and more remote, as in most areas of environmental services, this problem increases.

The dream of every forester, naturalist, hydrologist, geologist, and everyone who works in remote areas is to have the same reliability of communications in remote areas as he enjoys while near to his headquarters station, with its attendant benefits of increased safety and efficiency. The systems now being used are using techniques such as battery and solar or thermoelectric powered repeaters, and remote controlled base stations to accomplish as wide coverage as possible. And, always beyond the budget limits, exist areas where there is no regular coverage but which must be covered in case of disaster or emergency such as flood or wildfire fighting.

If a satellite system could provide this additional required coverage, it would fill this need. It could be in a system which would either entirely replace existing mobile systems with the added area coverage, or as a supplemental and emergency system which covers all rural and remote areas.

Second in priority is an increasing requirement for data transmission, either low speed data or high speed for computer services. And third in priority is video, facsimile, and teleconferencing.

This panel does not have knowledge of state, local, and private expenditures for environmental communications services such as forests, parks, water and mineral resources, public land management. This area should receive further exploration.

3.10.5 Costs

It is estimated that the present costs for operating public safety communications systems are as follows:

Criminal Justice	
State and local	$100,000,000
Federal	20,000,000
Search and Rescue	1,000,000
Environmental Protection	25,000,000
	$146,000,000

These costs include spares and manpower. They do not include capital investment.

It should be remarked that a typical mobile installation costs the community about $1300 per unit now and that a single dispatcher base station is about $15,000 though this figure can vary widely depending on complexity.

It is estimated that the proposed additional/new services suggested in the above report would cost, not including launch or other satellite related costs, about:

Criminal Justice	
State and local	$ 60,000,000
Federal	20,000,000
Search and Rescue	600,000
Environmental	25,000,000
	$105,600,000

3.10.6 Exclusions

This report has not addressed the needs of emergency medical services (with the exception of police operated ambulances) as they are represented on another panel. It has not tried to describe the requirements of the many public safety agencies, now operating under the jurisdictions of municipal, county, and state governments.

Nor has this report attempted to address the communications related management requirements established by the laws of our states and communities that preclude sharing of facilities due to local budget or established political responsibility requirements.

The report has made no attempt to relate channel requirements to spectrum realities as established by the FCC or international treaty. It has further treated as an engineering detail the problems of discrete addressability between agency boundaries and between agencies within simular boundaries. It has also considered the problems of relating requirements to funding sources as beyond its scope.

3.10.7 References

1. Requirements Analysis for Interstate Criminal Justice Telecommunications System (NALECOM) JPL, 1974.

2. Final Report, Project SEARCH, Demonstration of Transmission of Fingerprint Images by Communications Satellite, CCTRF, June 1972.

3. Final Report of Option or Configurations for Nationwide Criminal Justice Telecommunications System, JPL, May 1975.

3 11 RELIGIOUS APPLICATIONS

In approaching the religious applications of a public service communications satellite we immediately recognize that there are at least three understandings possible for the work of religion:

1. Institutional churches

2. Church related institutions: hospitals, schools, colleges, social services, etc.

3. Expressions of what is of value in the society

While we have chosen to deal primarily with the institutional church, we have felt it necessary to indicate where church related institutions have specific applications that are similar to, but not identical with, other health, educational, informational and social services, and how the disciplines ought to work in concert.

Our religious concern, in the broadest sense, also finds expression in our belief that there ought to be a genuine public service component to the national space program, for four reasons: first, because the development of satellites was financed by public monies; second, because our nation depends on an informed citizenry and the free exchange of ideas to which the public service satellite could contribute greatly; third, because a public service satellite can, if properly designed, provide significant services to the nation's poor and powerless who desperately need better information, education and health services; and fourth, because religion has a recognized and legitimate role in American life and culture, a public service satellite can provide for a broadening of perspective within religious bodies as well as for a deepening of peoples understanding of themselves.

For these reasons we are not only concerned about the use which the church makes of the project, but also what the project will mean to all of society. We believe that such a satellite should be developed only partly on the basis of economic viability, and that a substantial portion of the enterprise should be developed strictly as a service to the general public.

Finally, in developing our recommendations we were aware of the constraints and protections placed upon religion by the First Amendment. We believe the fundamental principles that must be applied to all of the following applications are the protection of freedom of worship on one hand, and the prohibition of the establishment of any religion on the other. For example, while we would continue to expect the broadcast of sectarian religion on government facilities to be forbidden, on the other hand, we see no similar prohibition to apply to point-to-point transmission of sectarian religious matter.

The religious applications described in Table 19 can be grouped into ten categories:

1. In-service training for pastors, chaplains (military and institutional) and other church professionals, and teachers - sectarian and non-sectarian.

2. Data transfer: computer, video and audio software.

3. Teleconferencing, internal communication; national and international, regional - including programming.

4. Interconnection of denominational seminaries, universities and parochial schools, including library services.

5. TV and radio program distribution (off air).

6. Newsfeed to denominational and secular press, radio and TV.

7. International disaster relief coordination and information.

8. Missionary communications.

9. Direct broadcast - domestic (audio/video) and international.

10. Health.

In religious applications statistical church data could be made more accessible such as baptismal records, clergy assignments, genealogies, etc. This information would be kept in a central national computer bank which would be accessed via satellite by regional and/or state church offices. Within these regions, parish offices would have data terminals which would be connected to the regional centers via terrestrial microwave and/or cable The terminal units would translate the digital data into a slow-scan pictorial or alpha/numeric readout presented on a cathode ray tube, a photographic print, or a typewritten print. This would eliminate time-consuming record-keeping and reproduction locally.

Films, video programs, etc. kept in a national center could be retrieved and transmitted electronically upon signal from a local terminal. Physical limitations could inhibit storage of a vast amount of videotapes, films, etc in a national center, therefore regional storage of these materials would be recommended

Table 19

Religious Applications

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Continuing Education, Clergy, Directors of Religious Education, Clinical Pastoral Education, etc.	1-way Video 2-way Voice & data transfer	Terminals in rerional centers in cities, towns, & isolated areas	2000	As widely dispersed as possible - National and International	3 hr. morning 3 hr. night hrs. Weekdays	May be for credit - user paid. Every major denomination now carries on continuing education by other means.
In-service training for Military Chaplains	1-way Video 2-way Voice & data transfer	Use above regional centers or on military bases	200	On or near military bases	2 - 3 hrs. daily Weekdays	Under jurisdiction of U.S. Chaplain's Corps - Chief of Chaplains
In-service training of Institutional, Industrial & other Chaplains	1-way Video 2-way Voice & data transfer	Use above regional centers - or institutional & industrial terminals	2000	In or near institutions	2 - 3 hrs. daily Weekdays	Chaplains are now working in industry, hospitals, prisons, institutions, retirement centers, apartment & real estate developments, Police & Fire Departments, Trucking networks, other non-profit organizations.
In-service training volunteers - lay persons	1-way Video 2-way Audio Data transfer	Interconnection with home delivery systems (ETV networks, cable systems, libraries, etc.)	5000	Widest possible - utilizing home nets. - 50 States	30 hours per week	This training currently being done by mail, conferences, and other means. This is a large consituency (e.g. - 2,000,000 Church School Teachers in U.S.)

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS			Information Volume	Remarks
		Description	No	Geographical Distribution		
National Denomination Offices	Multiple point audio and video	Fixed portable terminals	? Potential Heavy Usage 300 Terminals	50 States and international by agreement	Current W.A.T.S. Lines used by all groups - heavy use daily. Proposed usage 5 to 10 hrs. per week per terminal	Few foreign conference calls, yet seriously needed. First Priority on audio
Offices, International	Multiple point audio & video	Fixed, portable terminals	200 Ter.	Approx. 60 foreign countries	Moderate usage 500 weekly 2 1/2 hours per terminal	This is random in nature, generally - yet some service would be required every week of the year.
Inter-Church local level	Multiple point audio & video	Fixed, portable terminals	30000 Potential	50 States	Current L.D. lines and W.A.T.S. Moderate usage Proposed or needed 2 1/2 hr. per Ter. per week	Pastor groups, denominational and interdenominational, statewide and nationally. Summer youth assemblies and festivals. Usage relates to cost.
Conventions and Conferences	Multiple point audio & video	Mobil	50	50 States and international (denominational missions)	occasional usage with one way video to T.V. stations & closed circuit congregational meetings.	Moderate usage is now in place. Predict greater use when practical via satellite. Usage relates to cost.

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Library - Microfilm and Video Resources for Denom. Colleges & Seminaries	2-way Data	Fixed Data Terminals	500 500	50 States International	10,000 pgs. per day 10,000 pgs. per day	Economic Data: Check with American Assoc. of Theological Schools, Indianapolis, Ind.

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No.	Geographical Distribution	Information Volume	Remarks
Public Service Radio Program Distribution	1-way Voice program transfer	Radio Stations	Potentially all existing Radio Stations	International and national	24 hour Video feed	Present distribution on tape, film and disc via postal services is expensive and slow. First priority; Domestic, Second Priority; International Users.
Public Service Video Program Distribution	1-way Video program transfer	TV Stations	all existing TV Stations	National and International	Daily heavy 4-5 hrs. Video Feed	Present distribution on tape and film. Expensive and slow. First priority; Domestic, Second Priority; International Users.

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
News feeds to denomi-national/faith group papers, magazines, etc.	Facsimile w/2-way audio to transmit typed copy and photos	Portable uplink Fixed uplink units Fixed down link units	10 50 400	Portable units moved on demand Fixed uplinks at each denom office Fixed downlinks at each denom paper office Distribution of uplinks primar-ily on east coast Down links through-out the 50 States	6 hr/day, normal 14 hr/day, peak	For example, U.S. Catholic office transmits approx. 25 pages 11 x 14 doublespaced copy per day. Also 6-10 photos daily.
News feeds to secular papers, magazines and wire services	Facsimile w/2 way audio to transmit typed copy and photos	Fixed down links at each major paper w/land lines to smaller papers	250	Distribution at down links through-out the 50 States	3 hr/dy, normal 6 hr/dy, peak	Use same portable and fixed up links as in #1.
News feeds to radio stations and audio wire services	2-way Voice (broadcast quality)	Portable up link units Fixed up link units Fixed down link units	10 50 7000	Portable units on demand. Fixed up link at each denom. office. Fixed down links at each radio station and audio wire services Distribution of up links primarily on east coast Down links throughout the 50 States	1 hr/dy, normal 6 hr/dy, peak	ECU-Media News (Nat'l. Council of Churches) feeds 1200 radio stations per week. Nat'l. Rel. Bdcstrs. feed 250 stations per week.

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
News feeds to TV Stations	1-way Video 2-way Voice	Portable up links Fixed uplinks Fixed down links	10 50 850	Portable up links on demand up links at each denom. office Down links at each TV station	1/2 hr./day, normal 3 hr/day, peak	Various denom. offices mail film clips to TV stations regularly.

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
International Disaster relief coordination	2-way Audio 1-way Video	Portable up link Fixed down link	5 50	Portable up links to be air shipped to disaster site on demand Fixed down links to be installed at each denom/faith group office	24 hrs. per day from set up of portable up link to end of disaster period	Portable uplink small enough for helicopter airlift to disaster site for Video feed.

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Missionary Communi-cations	2-way Voice	Terminals	5000	Terminals with each missionary location and at U.S. Affiliate Headquarters	One 10 min. Call per week per mis-sionary with 5% of satellite time to emergency calls	Initial satellite locations over mid-Atlantic to give primary coverage to South America and Africa. 35,000 missionaries overseas. Current HF communications unreliable and inad-equate in capacity.
Missionary Communi-cations Teaching	1-way TV 2-way Voice	Small TV Terminal	3000	Selected sites at Missionary Loca-tions, World Wide	Full Time broad-cast 5-10 PM local time each location	Special classes of instruction with limited querry capability.

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Christian Instruction Video	4 Voice/TV	Direct TV Broad-cast to small inex-pensive receivers with 4 voice capa-bility	20000	Remote sites at International locations	Full time - at least 3 channels	Primary coverage is projected as the southern hemisphere. Present cover-age is provided by radio.
Christian Instruction Radio	1-Voice	Direct audio Broadcast to small inexpensive receivers.	Thou-sands	World Wide	Full time 3 chan-nel capability	Replaces present land limiting radio transmissions

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Telediagnosis Consultation	2-way Audio Data-soft and hard	Voice/data link hospital - clinic - village health aide	?	International in scope, but regional in application	?	Assist paraprofessionals and health aide, in remote villages to provide diagnosis, treatment, and follow-through. X-ray, charts, EKG, photo, etc.
						Needs to be coordinated with the medical service group.

Table 19 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Health Care Information (Basic)	Voice Data Transfer 2-way	1) Voice/data terminals in mission and church related hospitals and health care centers. 2) Mobile portable terminals	500 to 1500 50	International	Moderately heavy traffic	Can expect increase in traffic when present communication barriers are reduced; current traffic is chiefly via mail and publication. Needs to be coordinated with medical services group.
Medical Information update for MD's and RN's	Voice Data Transfer 2-way Occasional Video	Voice/data terminals in mission and church-related health institutions	200 to 500	International	10 hour/week	Need use of slow-scan for charts, graphs, products, X-rays, pictures, etc. Needs to be coordinated with the medical services group.
Training indigenous para-medics (Instructional materials distribution)	1-way Video 2-way Audio Facsimile Computer Assisted Instruction	1) Voice-Video terminals with VTR 2) High Speed facsimile 3) CAI Terminals	200 500	International	20 hrs/week 20 hrs/week	Instructional; can use low-traffic time on satellite. Needs to be coordinated with medical services group. Need real time access.
Health Education and nutrition for mission schools, churches, and community centers.	1-way Video 2-way Audio	Voice-video terminals with VTR in mission schools, centers, churches & similar institutions operated by churches	2000 to 5000	International and U.S.	20-30 hrs/week	Instructional, Needs to be coordinated with missionary education needs.

3.12 STATE AND LOCAL COMMUNICATIONS

The objective of this workshop is to work toward the implementation of advanced telecommunications systems to support the delivery of services to the citizen by state and local agencies. Reaching this goal will require new technology for earth-bound as well as space use and also the development of a broad base of users.

As the panel on State and Local Communications reviewed its assignment in relation to other panels, it became evident that the needs expressed by its members were also covered by these other panels. After visiting these groups we concluded that we might better serve the purpose of the workshop by examining the roles of state and local governments in the process of upgrading and implementing communications services for the public sector. Effective planning at these levels will help ensure better planning at the National level.

3.12.1 Needs Assessment

To accomplish our specific task, we surveyed the broad general categories of potential users and needs. We then attempted to determine whether and where local and state telecommunications planning and services could interface with these users and needs. The broad categories seem to be: education (all levels), health, medical emergency services, environmental services, safety/law enforcement services, library/information services, religious/social services, and government services. Table 20 is not exhaustive but suggests the levels at which some of the specific needs in the above categories should be addressed.

State and local governments need a large variety of information services. These needs are not immediately perceived with respect to satellite communications and therefore require exposure to related examples (i.e., informational programs, needs aggregation) to bring the potential to the cognizance of both user and supplier groups. There is a need for services which will gain both public awareness and support for local and state programs.

A similar need exists among government agencies (e.g., departments of public instruction, corrections, law enforcement, state police and libraries) both for an educational program regarding the potential of wide-band and narrowband telecommunications applications. Emphasis should be on the increased services that can be provided, the improvement of quality, and the economics of scale that can be effected.

There is a need to coordinate the use of satellite capability among the various governmental departments and agencies in order to make most cost effective use, avoid duplication, and foster the sharing of resources.

3.12.2 Statutory Requirements

Although users of telecommunications services can be grouped along lines of interest such as continuing education, environmental communications, or public safety, as examples, the systems which provide these services function within various spheres of governmental jurisdiction. The process of aggregating users at the receiving end of the system helps lower unit costs just as it does in the case of the satellite itself.

It seems unlikely that agencies at the national level operating alone can ensure that the needs of the citizen-taxpayers are being met in the most efficient and effective manner. The participation and commitment of all levels of government is needed in applying this technology in a rapidly changing world. The increasing demands for local services when financial resources are increasingly restricted requires care and consideration in employing innovative techniques. There is a genuine need for planning input at the grass-roots level; local and state governments must do their part in this process.

The lack of statutory authority for planning the use of new and expanded telecommunications systems seriously limits the participation of local and state governments in this field. In some of the more progressive municipalities, counties, and states, progress has been made toward establishing mandates to deal with communications needs, issues and planning. As examples, the State of Virginia, and the City of Baltimore, have seriously acknowledged the importance of advanced telecommunications within their jurisdiction (see Appendix 8).

Table 20

Categories of Communications Services

	Local	State	Regional	National
Education (all levels)				
- Services to Elem. - Sec. Teachers	X	X	?	X
- Continuing Professional Education	X	X	?	X
- Adult Ed./GED	X	X		?
Health/Medical				
- EMS Coordination	X	X	X	?
- Patient Education	X	X	?	?
- Telediagnosis	X	X	?	X
Emergency Services				
- Warning		X	X	X
- Disaster Operations	X	X		
- Search and Rescue	X	X		
Environmental Services				
- Water Resource Management	?	X	X	X
- Weather Monitoring	?	X	X	X
Safety/Law Enforcement Services				
- Personnel Training	X	X		X
- Search and Apprehension	X	X	X	X
- Routine Dispatch Communication	X	X		
Library/Information Services				
- Data Transfer and Exchange	?	X	X	X
- Computer Access		X	X	X
Religious/Social Services				
- Teleconferencing		X	X	?
Government Services				
- Training of Staff and Officials	X	X	?	?
- Administrative Information Transfer	X	X	X	X
- Citizen Complaint and Service Requests	X	X		?

Local and state governments must routinely budget for capital and operating funds required for on-going communications networks. Such budgeting must be carried out through legislative appropriations at various levels. Further, prior planning by local and state governments must include: the establishment of policy-setting precedents, the creation of specific enabling laws, and the creation of legislative appropriation requests.

Another statutory concern is the need for policy regarding the extent to which those living in remote areas are entitled to receive services characteristic of those living in urban areas. Should the consumer pay according to the cost of service provided or should there be a uniform charge?

3.12.3 Regulatory Requirements

The development of an advanced communications system requires that the FCC and users address the question of tariffs, and not automatically apply interstate and/or commercial rates to public service users.

3.12.4 Recommendations

Renewed investment in the development of communications satellite technology is in the public interest. The objective is to make new services available for public service users; types of services which private companies have not yet demonstrated an interest in serving. The reasons that these services are not yet available are that the needs have not been sufficiently well demonstrated and that the economic feasibility of an advanced system (allowing the use of many low-cost earth stations) is not easy to determine. It takes time for users of these services to develop and to assess their value. It therefore makes sense for the Federal Government to underwrite the risk of developing this market provided that the raw data show the prospect of success is reasonably high.

Success implies continuing operation on a commercial basis. Federal policy and common sense dictate the use of commercial communication services. There is no need for adding the caveat, "unless otherwise unavailable," for that is equivalent to economic infeasibility If subsidies are required, not to imply that they are undesirable, it is probably better that they be directly acknowledged, as opposed to being hidden under the cloak of a government-operated system.

If an advanced satellite system is not operated on a commercial basis, then a large group of users, so far neglected, will be unavailable to help support the system. These users are in the commercial service sector. It does not seem reasonable to construct a system employing advanced technology, initially supported by large amounts of federal funding, and then exclude private tax-paying companies and citizens from using it. The satellite doesn't distinguish between a non-profit user and a commercial user. Thus, it should be possible to construct a system to serve both classes of users, enabling all to take advantage of the economies of scale.

As opposed to creating separate systems for the public and private sectors, we suggest the most effective means is to aggregate their demands so that they can be met in an effective manner; then an organization such as the Public Service Satellite Consortium could act as broker to the public sector.

Relatively few establishments, among them governments and their agencies, welcome innovation. We are recommending the acceleration of a process which would otherwise evolve quite slowly, if at all. Consequently the concept set forth may be met with resistance from many governments, agencies, and institutions which have vested interests in the status quo.

Careful anticipation and exploration of such problems coupled with much grass-roots involvement will help minimize helpful resistance.

Far too many states are prepared to analyze and aggregate their communications needs. In the immediate future, it would be helpful if two or three models (possibly one single state, one group of states in a region, or the like) could be set up to deal with needs assessment, policy issues, and, subsequently, the establishment of communications services. It would be desirable that models be established to meet very different communication needs - going across the communications spectrum.

For example, if Indiana, Ohio, and Pennsylvania (states with experience in networking) were to cooperate on an adult education program, decisions would have to be made to determine which institutions would participate and to what degree the nature of the program and the delivery systems would involve satellite use.

In order to expedite progress in this area it is important to take advantage of prior experience gained by municipalities and state governments in utilizing communications services. Therefore, choosing to start where there is a backlog of experience advances our overall objectives.

3.13 VOLUNTARY, PUBLIC INTEREST AND SOCIAL SERVICES

The panel consisted of representatives of non-profit consumer, citizen action, public interest, social service and voluntary organizations. Some six million such organizations are known to exist in the United States; three million of these are monomorphic (they have only a single chapter or entity); three million have more than one chapter. Participating on the panel were representatives of the Consumers Union and the Consumer Federation of America, feminist organizations; the listener supported National Federation of Community Broadcasters and the Pacfica Foundation, Native Americans and the South Dakota Indian Education Association; Day Care Centers; the National Association of Neighborhood Health Centers, the Public Interest Research Groups and Public Citizens; and the Public Interest Satellite Association (PISA).

The panel's discussions were aided by a recently-completed survey, commissioned by PISA, to assess the communications needs, uses and expenditures of the entire universe of non-profit organizations (897) with more than 10,000 members (see Reference Section 3.13.9). The range of diversity included such organizations as The League of Women Voters, the Sierra Club, the National Organization for Women, the National Police Officers Association of America, the NAACP, and the Boy Scouts of America, to name a few

The study revealed that, on the average, each organization spends in excess of $160,000 for communications services per year. The total for this universe approached an annual expenditure of $145 million; $53 million for national and regional conferences; $18 million for long-distance telephone; $13 million for mail campaigns; $4 million for data transmission; and $3 million for radio and television.

The study was predicated on the belief that satellite telecommunications services may soon become available to this non-profit segment of society at a level of technology it can manage and at costs it can afford. Hence, the survey included an assessment of what the respondents would like to do with a satellite if one were put at their disposal. The overwhelming first choice was for telephone, radio was second and television third.

The study further presumed that organizations in the non-profit world are involved in three basic kinds of communications: inter-organizational (communications to their own chapters and members); intra-organizational (communications to other organizations); and communications to the public-at-large This last form of communications — organizations reaching members of the general public — was acknowledged to be particularly important given the inadequate means available for this purpose today. The study indicated that tens of millions of dollars are being spent by these groups to deliver messages to individuals in the home via such conventional means as direct mail and telephone campaigns. Radio and television spots are employed but to a much lesser degree because of the enormous expense involved and the structure of, and lack of access to, current telecommunications systems.

The desirability of devising lower cost alternatives to serve the significant communications requirements, as great as it is for the groups surveyed, is even greater considering that the sample, although of a complete universe, was of only a fractional percentage of the total number of such organizations known to exist.

The panel discussions confirmed the validity of the survey. The organizations represented desire reliable, low-cost telecommunications services to meet a wide variety of existing and anticipated needs.

Each panel member followed the desired format for the workshop. Beyond the results of the survey, several common threads emerged from the discussions: a major point was that the need for feedback from the public to the organizations was just as critical to carrying out organizational objectives as was the need for inter-, intra-, and organization to the public-at-large communication. All expressed a need to better aggregate data and to disseminate it more efficiently and inexpensively. Using satellites was deemed desirable not only because of their potential cost effectiveness, but because they would allow more channels of communications and would allow reaching remote and isolated areas either not now serviced or serviced inadequately by existing means. The new technology could be seen as increasing the efficiency, effectiveness and outreach of non-profit and social service organizations.

3.13.1 Feminist Services

3.13.1.1 Objectives

Objectives include bringing equality to women in our society through enforcement of existing laws, through enactment of needed legislation, and through education and raised awareness.

Rapid two-way contact between local, state and national level organizations would expedite much of the needed organizational work. It would facilitate organizational activities, from getting out the word on need to contact representatives in government on impending legislation, to speeding up the routine "housekeeping" work of organizations, to coordinating efforts on regional, state and national levels in the matter of filing charges, law suits, pushing legislative programs in order to maximize such efforts Two-way satellite communications would broaden the impact of national meetings by enabling large numbers of interested people who would otherwise not be included at all to hear and perhaps respond to important speakers, and could obviate the need for members' personal attendance by having an exchange via satellite.

3.13.1.2 Communications Needs

Satellite communications would also serve a great purpose in educating the public on existing laws. Too many women are unaware of their legal rights and of existing resources to help them. They need to know where to turn. It is important to give information on education (vocational opportunities, women in history) and present role models to girls and women.

Continuing information is needed on such matters as available day care and location of havens for battered wives in each locality; it is important to get specific advice on opening your own business and to have available para legal advice on many aspects of life.

There is a need to disseminate information on jobs available regionally and nationally, listings of women seeking work, a talent bank of "expert" women in all fields as resources, counselling the displaced homemaker on how to apply for a job, and sources of training and education.

A satellite system would be very useful in gathering and exchanging data on the status of women's employment which should be more readily available and more current than it is now. A data bank can give needed information on all aspects of the status of women in our society.

It would be very helpful to have quick, easy access to information on what is being done around the country for organizations to learn how other groups have tackled similar problems in other places and for individuals to learn from each other's experiences.

New women's organizations largely use the mails, print media, the telephone, including some long distance, limited TV and radio. Plans are to curtail use of the mails, possibly to expand use of free public service TV and radio, which is limited at best. Ideal would be a totally informed public, knowing their rights and possibilities, being put in contact with resources, local and otherwise, who can assist them.

At present communications is through the organization - much of that on a "leaders" basis with newsletters to membership, to other organizations and to the public in a limited way and, to some degree, a response back from the public. Satellites would enhance all of these, especially volume of communications to and from public.

A constraint is confidentiality of requests for help and information in individual discrimination situations. Every type of reception would have application-individual home reception - telephone for two-way and TV for audio as well as conference call connections; reception by schools, meeting rooms. Priority is home reception.

3.13.1.3 Potential Benefits

Benefits include making the organizations more viable, serving the needs of the public by giving information on rights and sources of help, and educational material. Satellite communications also give access to remote areas which lack organizations but have the same problems. It could put those women in touch with groups and with individuals. It would be advisable to have 24 hour availability. The "audience" is potentially 200 million since men as well as women are affected.

In short, we need a source of information for and about women - as well as contact and exchanges - on para legal, educational, employment and personal levels

3.13.2 Consumer Services

3.13.2.1 Objectives

Discipline Objectives

a. Independent testing and rating of consumer products;

b. Evaluation of consumer services;

c. User experience, price and needs surveys on consumer products and services;

d. Consumer information center(s): instructional materials distribution to centers and schools;

e. Information clearinghouse for state and local consumer organizations;

f. Leadership training;

g. Service magazine subscriber in response to new promotion, renewal promotion, billing, change of address, and complaints;

h. Information delivery in an audio/visual form easily understood by consumers of diverse socio-economic and educational levels.

Statutory Requirements

a. Testing, evaluation and rating of consumer products and services requirements independent from private and government sectors to maintain impartiality and credibility;

b. FCC regulations, including station license renewal requirements, do not provide public access to the airways for presentation of independent information on consumer products and services;

c. Testing, evaluating and rating of consumer products and services need to be completely independent and impartial to protect against legal liability problems;

Objectives to which Satellites can make Contributions

a. Dissemination of testing information and ratings on consumer products and evaluation of consumer services available to all segments of the consumer public having access to a television set.

b. A satellite connected to a data retrieval center will make information available to consumers at the time it is needed and in a visual form easily comprehensible.

c. Surveys mentioned under objectives above can provide more in depth information on consumer experiences, needs and prices; information can also be localized to take into account regional variations.

d. Consumer information centers providing consumers with current local and national information affecting the purchasing decisions and/or complaints.

e. Interconnection of state and local consumer groups to improve scope and effectiveness via prompt exchange of information.

f. Interconnection for special fund raising events.

3.13.2.2 Communications Needs

Types of Communications Needs

a. Audio visual reports on products tests and ratings; evaluation of consumer services.

Present—Information available only through Consumer Reports Magazine reaching 1.7 million subscribers, 0.1 million newstand purchases and some additional readers through libraries. Twice weekly 1-1/2 minute consumer reports television news features were aired in some fifty markets by commercial stations for their local news programs. Program was aired June 1974 through June 1976, but was discontinued due to inability to meet costs and advertiser pressure on stations; also limited number of educational films rented and sold to schools, libraries and community groups.

Current Plans—Initiate proposal to Public Broadcasting System to produce weekly half hour program (problem - public broadcasting viewers fall into same upper socio-economic group as Consumers Reports magazine subscribers); some limited plans to produce additional educational films.

Long Term Goals—Need to reach consumers of all socio-economic levels either in home or in convenient shopping center locations to provide information prior to purchase of products and services. Information needs to be stored in data retrieval banks that are continuously updated, and needs to be presented in visual form for easy comprehension. Information needs to be as readily accessible as that provided by advertisers and must be income producing to meet costs.

b. Independent User Experience Surveys, Price Surveys and Consumer Needs Surveys.

Present—Information presently obtained on a limited basis via mail, some occasional telephone polling (when funds exist). Lack of low cost electronic technology prevents the gathering of information and, when it is gathered by mail, the response is low and the information risks becoming outdated before, or soon after, the magazine is published. Surveys of consumer needs by non-profit sector are virtually non-existent.

Current Plans—May cut back on surveys due to cost and problem of timeliness of information obtained through mail.

Long Term Goals—User, price and needs survey information gathered by regions on a routine basis with the currency of present day television program Nielsen ratings (and Nielsen product market share information); information available to individual consumers and consumer information centers on some form of subscription or cost-per-use basis.

c. Consumer Information Centers

Present—Inquiries to Consumer Reports seeking specific information are replied to by form postcard indicating inability to respond to individual consumer problems. Some state and local voluntary and governmental consumer groups service complaints but have insufficient data banks to meet needs. Pilot tests show need for such centers, but funds and means are lacking for initiation and development.

Current Plans—Continuation of present activities.

Long Term Goals—Consumer information centers providing two-way communications and utilizing a data retrieval center.

d. Clearinghouse for State and Local Consumer Organizations and Leadership Training

Present—Information provided to such groups on limited basis through bulletins and newsletters in mail. Cost of WATS lines in most cases prohibitive. Leadership training available at a few schools.

Long Term Goals—Provide state and local consumer organizations on a daily basis with interchange of information, provide monthly educational workshops covering current consumer problems and regular leadership training sessions to deal with these problems.

e. Non-profit Consumer Reports magazine subscription fulfillment operations

Present—Handled at a cost of approximately $1 million per year via mail.

Current Plans—Cost of electronic media makes changes in above system prohibitive.

Long Term Goals—Subscription orders, bills, change of address, and complaints handled electronically, possibly including a two-way system.

f. Audio-visual presentation of major consumer problems/issues providing two-way educational "tests" for consumers.

Present—Not available except occasionally through national commercial television networks, public services documentaries, i.e., CBS Auto Driving Documentary.

Current Plans—Commercial broadcasting rating structure and public broadcasting's need to be more popular renders this form of program unlikely. No known plans.

Long Term Goals—Monthly two-hour programs on national basis, presenting consumer tests on vital issues such as food purchasing, housing, health care, personel finances, delivered in audio-visual form to enhance interest and comprehensibility, and allowing for two-way communications.

Volume of Communications

Present—Consumer Reports magazine presently reaches and services 1 8 million plus consumers (monthly subscriptions and newstand sales). These consumers are well above national average in education and income levels. Approximately ten million consumers were reached monthly with the Consumer Report TV news features. Consumer Reports, Consumer Federation of America, local and state consumer organizations receive thousands of consumer inquiries and complaints monthly.

Current Plans—Without access to new technology Consumer Reports hopes for approximately 5% growth in subscription level. Future volume of consumer inquiries and complaints is not possible to project and in part depends on mechanisms established to handle inquiries/complaints.

Long Term Goals—Consumer Reports product testing and consumer advisory information needs to reach consumers of all income and education levels. It is reasonable to project a ten-fold increase in reaching consumers over present subscription levels to 18 million.

Volume for consumer inquiries and clearinghouse activity would increase at least at the same level since these activities are conducted today on only a limited basis.

3.13.2.3 Potential Benefits of Satellites

a. Access to the television medium to present non-commercial information on products and services.

b. Provide consumers with essential price and quality information necessary to make choices between products and services that best serve their interests.

c. Make this information available to consumers who cannot presently be reached through the written word.

d. Contribute to the growth and strength of voluntary, non-profit consumer organizations to help balance the impact of the governmental and private sectors.

3.13.3 Neighborhood Health Services

3.13.3.1 Objectives

Discipline Objectives

The National Association of Community Health Centers seeks to assure the continued growth and development of community health care programs, including neighborhood health centers, community health centers, family health centers, migrant health programs, rural health programs, and maternal and infant care programs. More specifically, NACHC's mandate is:

- To work for the elimination of the dual system of health care and to develop quality health care delivery systems responsive to the needs of communities being served.
- To provide a vehicle whereby community health centers can unite and meet the challenges to their survival.
- To provide education and training opportunities for community health center community board members, administrators and providers to assure that the highest professional standards are maintained.
- To develop a communications network to gather, compile, and disseminate relevant information to the staffs and community boards of community health centers.
- To develop and assist in the implementation of improved management techniques for community health centers.
- To develop methods of permanent and dependable financing for community health centers.
- To develop and implement quality community health education programs.
- To maintain liaison with other consumer and provider health care groups.

Statutory Requirements

To maintain non-profit status.

To be in compliance with the medical practice regulations of the states.

Objectives To Which Satellites Can Make A Contribution

Satellite technology makes contributions not possible with other forms of communications and education, both for continuing medical education and for non-traditional external degree programs of education for other health professionals or for remote communities geographically distant from universities/medical colleges/hospitals. Other advantages include the potential to communicate more quickly and with less cost to contact administrators, the general membership, and area coordinators for immediate response/action. In addition it is efficacious to interconnect the migrant health centers throughout the country for continuity of care and the transfer of data. Frequent conferences are needed for problem-solving, developing strategies for more efficient operation, and planning/reporting. Travel has become a prohibitive cost which has required disproportionate allocation of funds, and lengthy periods away from the work-site. Therefore, teleconferencing via satellite could reduce the expenditures for travel and the secondary problems which arise from the absence of key actors from the health centers during service hours

3.13 3.2 Communications Needs

Two-way audio/video, slow scan television, data transfer and facsimile transmission are the types of satellite services which are needed to serve the communications needs of rural health centers, migrant health centers and urban health centers.

Such services could greatly help to increase the communication of urgent messages, directives and action memos among area health coordinators. They could help meet the growing need for continuing education, including clinical medical education for physicians located in remote communities; external degree programs for other health professionals, especially those located in isolated communities which are geographically distant from universities, medical colleges and teaching hospitals.

Related to the educational and training needs of those involved in the delivery of health services is the need to provide medical information to patients themselves.

Another important communications need is the transfer of data, and this is especially critical for continuity of care among migrant health centers.

In considering the use of satellite communications to help meet these needs, there are some problem areas that will have to be dealt with. There are bound to be legal entanglements that will emerge, and they should and can be avoided by preliminary examination and compliance with the medical practice regulations of the states. Also, privacy and confidentiality of the medical record will have to be preserved, at the point of input

3.13.3.3 Benefits

The benefits of satellite experiments far outweigh the anticipated problems mentioned above. Teleconferencing can demonstrate an effective mode for sharing information, solving regional problems, and developing strategies for operation and expansion. Large-scale conferencing among the managers and board members with the principal actors of sponsor groups, funding agencies, and university/medical schools is one way that satellite communication could reduce the thousands of dollars spent to assemble thousands of persons to a single-spot conference locale several times per year. The funds used for this travel could be routed to improve health services in medically underserved areas.

Since the cost of terrestrial systems increases with distance and the cost of the satellite systems remains constant regardless of distance, satellite communications may be an economically feasible way to interconnect rural centers, and rural to urban centers for higher quality care to persons in medically underserved areas and remote communities. There is a shortage of all health professionals in the rural areas of this country. A model for rural centers is being developed in which a nurse practitioner or physician assistant can manage health care with physician backup. This is not an over-the-shoulder model, but one with the physician located miles away, but on call for consultation and instruction for special procedures. Physicians can be in communication with these mid-level practitioners and with specialists and hospitals, or with patients who are geographically separated from health centers. Satellite communications can be useful to transmit real-time consultations, to transfer critical data, and to provide complete information in medical histories and medical records. Such an interconnecting system could also be of value to migrant health centers which have been established throughout the country for seasonal farm workers.

Family Health Centers offer a model for pre-paid health care, with heavy emphasis on health maintenance. Intrinsic in health maintenance as opposed to episodic sick care, is prevention of illness and disease. Patient education for prevention, compliance, and self-management is significant for developing utilization patterns which minimize in-patient (hospital) care and high costs for lengthy stay in the hospital. This experiment will design, motivate audiences and target groups and transmit programs via slow-scan by satellite. This new dimension will expand health education in diverse localities and to persons in minority groups with cultural differences and who may have difficulty reading and understanding English. Special programs will be developed for handicapped persons. Satellite technology will be tested for appropriate designs to meet the needs of blind, deaf, and physically handicapped.

3.13.4 Public Interest Services

3.13.4.1 Objectives

The objectives are threefold: (discipline)

a. A clearinghouse for existing organizations like the Public Interest Research Groups (PIRG).

b. The development of greater communications from Public Citizens to its members and between Public Citizen and other citizen organizations throughout the country.

c. The development of communication mechanisms to encourage a more informed citizenry.

At present 30 states claim chapters of Public Interest Research Groups on their campuses. These organizations have almost identical purposes; the education of students, the creation of better citizens and the pursuit of certain social objectives such as consumer and environmental protection.

Since these organizations are similar in nature and linked through a new national organization — the PIRG Clearinghouse and Educational Fund — there is a need to provide efficient methods for communication to avoid duplication of efforts and enhance the educational efforts of such separate groups.

Public Citizen on the other hand is a national organization needing to communicate with its members and other like-minded citizen groups. It provides a multidisciplined approach to consumer, environmental and human rights problems. There is therefore a need to communicate information both to and from the main offices in Washington, D.C. and to mobilize and educate citizens concerned about a specific problem.

Another major institutional objective relates to the apparent apathy and cynicism presently gripping the electorate. Citizens generally feel unable to influence decisions, be they corporate or governmental. They essentially feel impotent. A central citizens communication system could provide information on issues pending before state legislatures and Congress, an explanation of either side of an issue taken by members of Congress from a particular jurisdiction, the positions of various interest groups on the issue (such as the Chamber of Commerce, labor and consumer organizations), issues presently before regulatory agencies, and activities of the administrative agencies like HEW.

There are other important, but subsidiary objectives for the organizations, including the need to encourage citizens to assume more active roles in the decision-making process, to train individuals and groups and to inform citizens of their abilities and the sources available to them to engage in social welfare activities.

Statutory and Regulatory Restraints

The major restraints are financial, although FCC regulatory restraints impede the potential for increasing the wider range of communications between individuals and organizations.

Satellites have the potential, assuming price and availability, of meeting all these aforementioned objectives. Existing links such as the Post Office and the telephone, as well as existing broadcasting restraints, both regulatory and corporate, impede the free flow of information between citizens. That there is a need can little be in doubt, as suggested by the spread of CB communication and the popularity of even this non-private method of communication.

3.13.4.2 Communications Needs

Communications Types

The first need is for audio links between similar organizations, like the PIRGs, followed by audio links for other organizations, like Public Citizen, and its members and those individual activists desirous of pursuing their citizenship responsibilities. The transmission of data, reports and other substantive studies quickly and inexpensively would be of enormous benefit. Present duplication and mailing time and costs make widespread communication of detailed information prohibitive.

Present methods for communications such as WATS line service (where one nationwide WATS is shared by 100 people), mail (although the constant increase in postal rates has made mailing more difficult), newsletters and information/action bulletins.

Another vehicle is radio and TV broadcasting, although the competition for time either locally or national is excessively fierce and the coverage of subject matter is at best superficial.

Volume of Communications

At present the PIRGs rarely contact each other and rely to some extent on Public Citizen to circulate information, either through limited use of the WATS line or a newsletter prepared monthly. Recently, the PIRG Clearinghouse has subscribed to a limited WATS line, ten hours per month. The line has been connected so recently that it is impossible to determine the effect and additional need for communications. If, however, there are 30 PIRGs and the WATS line is available for 10 hours per month, the ability to communicate is obviously limited.

Recently, one of the Public Citizen offices moved location. The service man from the phone company was dispatched to hook up service and found it impossible to test the WATS line as it was used constantly without any break. Two hundred and forty hours per month for 100 people is totally inadequate. The volume of mail into and out of the offices is great. However, the cost is presently unavailable.

Communications Networks

The present networks and links are maintained through use of long distance calls or WATS lines, mailings of the "alert" variety, newsletters or direct person to person letters. There exist in Washington, D.C. and other major population centers clearinghouse organizations which specialize in selected issues, attempting to link individuals and groups working on the same issues. At best, however, these clearinghouses are limited in their efforts. An organization can call and receive somewhat up-to-date information on legislation in Congress or at the state level (very limited), or the names of other groups in their state working on similar issues. Sometimes, "how to" manuals are available, but the ability to follow up the manual reading is also severely limited.

3 13 4.3 Potential Benefits of Satellites

In economic terms, satellites have the potential of eliminating the problem of scarcity. During early times in this country, each local community had up to dozens of newspapers, wide distribution of information, and the ability to hold both political and economic bodies accountable. Today many cities have only one newspaper, sometimes owned by the same corporation controlling the radio and TV station. Long distance calls continue to rise in price and the postal service shows even less promise.

3.13.5 Community Broadcasting

3.13.5.1 Objectives

Objectives of Community Broadcasting

a. Facilitating the exchange of program materials, information, and technical expertise among member educational radio stations.

b. Publicizing itself and its members' activities before agencies and groups which may affect community broadcasters' welfare.

c. Fostering the development of public policy to aid the growth of its members and advance the public interest in communications.

d. Seeking an equitable distribution of federal funds appropriated for noncommercial broadcasting and development.

e. Assisting in the organization and expansion of innovative broadcast stations.

Statutory Requirements

a. No statutes affect the development of satellite experiments.

b. Member stations are regulated in accordance with the Communication Act of 1934, which calls for the establishment of the most efficient possible system of wire and radio communications.

c. By providing a program interconnection capability to the educational radio stations, a public service satellite would further the aims of the Communication Act.

Objectives to Which the Satellite Can Make a Contribution

a. Objective a. above, through providing a decentralized program service to stations, with emphasis on timely program material.

b. Objective a., through conferencing capability among station personnel, NFCB staff, and experts in various fields

c. Objectives b, c, and d, through improved policy communication within the NFCB, thus allowing the organization to more accurately represent its members' interests.

3.13.5.2 Present Communications Needs

Types

a. High quality audio real time interconnection ~15 kHz stereo, 50 dB signal-to-noise ratio

b. Relatively wide-band high quality audio interconnect for high speed tape distribution (15 kHz stereo tapes played at 8 times normal speed, with 50 dB signal-to-noise ratio)

c. Teletype for scheduling interconnect

d. Non-voice data to be used in the "parliamentary procedure" of conferencing (viz. requesting recognition of moderator, etc.)

Volume of Communication

a. None - no interconnect available

b. None - not available

c. None - not available

d. None - not available

e. NFCB presently operates a tape distribution service by mail for distribution of non-timely programming

f. Internal communications consist of an annual conference, a monthly newsletter, special mailings, quarterly steering committee meetings, and occasional telephone contact.

g. The above volume of communication is grossly insufficient to meet objectives. Non-satellite methods of increasing volume appear too expensive to be practical.

Communications Networks

a. Radio programs distributed by a central tape exchange on a point-multipoint basis

b. Point-multipoint through annual conference, newsletter, and mailings

c. Point-to-point through telephone calls

d. Although most NFCB communications involve member stations, the general public is reached directly through the broadcast of exchanged radio programs, and indirectly through benefits which the organization provides to member stations.

3.13.5.3 Planned Communications Needs

Types

a. - d. Same as those listed in Section 3.13.5.2

Volume

a. Interconnect operating at least 18 hours seven days per week

b. Tapes distributed for several hours daily seven days per week

c. Teletype available for hours interconnect is in use

d. Non-voice "parliamentary procedure" data in use daily for 2 - 3 hours when conferences are in progress

Communications Networks

a. Live radio programs to originate on point-multipoint basis, with ability to originate live programming from any station

b. Radio program tape distribution to originate on a point-multipoint basis with only one live origination point, although stations will be able to access system by sending tapes to the original point

c. Daily multipoint origination conferences with capability for immediate feedback

d. Teletype and parliamentary procedure data which can be originated from any station

e. Present networks described above may be retained as needed

3.13.5.4 Blue-Sky Communications Needs

Types

NFCB has not officially compiled its blue-sky needs. However, possibilities might include: point-to-point voice interconnection for both radio program exchange and conferencing; direct satellite-to-home radio broadcasting; a live interconnect of Commonwealth television stations; distribution of video to cable TV headends; and video satellite-to-home communications

3.13.5.5 Potential Benefits of Satellites

a. Improved educational radio programming provided to the public via live interconnect and high speed tape distribution

b. Development of an innovative decentralized approach to radio networking

c. Improved communication and professional information exchange between educational radio stations

d. Improved internal communication and responsiveness at NFCB

e. Opportunity to develop ground hardware suitable for high grade audio and adapted for radio station use

3.13.6 American Indian Services

3.13.6.1 Objectives of United Sioux Tribes

Discipline Objectives

To unite all the tribes of the Sioux Nation in the U.S. and Canada.

Statutory Requirements

The Sioux Nation as a sovereign entity negotiated with the U.S. and Canada in the 1800's and should be allowed to return to that status of being a sovereign entity in order to retain its cultural identity. As the Sioux Nation was fragmentized and placed on reservations and reserves, this cultural retention can only be accomplished at the present time by satellite communications.

Satellite Applications

Satellite communications could be handled through the United Sioux Tribes as a vehicle to allow instant communications among Indians in the three states: North Dakota, South Dakota and Montana; and the Sioux reserves in Canada. This communication system could eventually unite all the tribes in the United States and Canada.

3.13.6.2 Discipline Communications Needs

Present	Near Future	Long-Range Future
a. Communication needs of United Sioux Tribes <u>sometimes</u> being met by mail	a.	a.
b. <u>Need</u>: 2-way audio, and data transfer immediately	b. Ultimately use not only 2-way audio, and data, but also video	b. 2-way audio/video, data transfer 2-way digital
c. <u>Availability</u>: 12-hr. during daylight	c. 18 hrs. day	c. 24 hr. day
d. Reliability: 100%	d. Reliability: 100%	d. Reliability: 100%
<u>Volume</u>: 20 - 2-way audio, and data transfer	200 - 2-way audio/video and data transfer	300 - 2-way audio/video; 2-way digital data
<u>Distribution</u> a. Technological: pt. to pt.	a. Technological: pt. to pt.	a. Technological: pt. to mult. pt.
b. Sociological: tribe to tribe: that is as 1 voice to 1 voice speaking for a whole tribe	b. Again, tribe to tribe, but this would expand to include all the other tribes along with the Sioux	b. Begin expansion to little village on each reservation

3.13.6.3 Potential Benefits of Satellites

Satellite communications could create many jobs on the reservations by providing information on economy and structure of various tribes; creating situations for advanced education (tying up with a university); and helping create more self-reliance among the Indian people.

The future implications would be to allow other undeveloped countries to maintain their cultural identity while simultaneously creating a more sound economic base, or self-reliance.

3.13.7 <u>Day Care Centers</u>

3.13.7.1 Objectives of Day Care Association

To unite all the Day Care providers in South Dakota and eventually in the United States.

The lack of any communications whatsoever prohibits this.

Satellite communications allow for instant information; small-scale conferencing; large scale conferencing, and eventually the introduction of this form of communication to children.

3.13.7.2 Communications Needs

Present	Near Future	Long-Range Future
25 - 2-way audio	50 - 2-way audio and data transfer	250 - 2-way audio and data transfer
Distribution:		
- pt. - pt. in 5 state region: N.D., S.D., Neb., Wyo., Mont.	- pt. to pt. in rest of 48 states with more in large cities	- pt. to mlt. pt.
org. to org.	org. to org.	org. to org. and org. to indiv.

3.13.7.3 Potential Benefits

One of the most overlooked professions — child care — holds the key to the future — children. Child care providers are underpaid and usually under-educated but seldom unloving to children. As our society is advancing, we had better provide for advancement for these "isolated" people.

Also, the future of these children is going to contain satellite communications as an ordinary, everyday thing. "Future shock" doesn't have to happen if we plan for it now.

3.13.8 Recommendations

The recommendations that follow represent a consensus of the panel. Like the panel's interests, they range across a fairly wide variety of issues. Some fall directly under NASA's mandate; some deal with matters where NASA might serve as a catalyst vis-a-vis other government agencies. At the base of all these recommendations lies a concept of public access to such technologies. It is felt proper to request such access because such satellite technologies, unlike others in telecommunications history, were developed at public expense and were tax-payer supported. They are:

1. The non-profit sector, the consumer, public interest and voluntary social services organizations, clearly see the need for a satellite totally devoted to the needs of their sector. Whether the ultimate for the fulfilling of these needs will be a satellite owned and managed by the non-profit sector itself, cannot be foreseen at this point. One alternative possibility would be the provision of special tariffs for non-profit organizations on commercial satellites. This is not viewed as impossible, since there is precedent for preferential treatment in the postal service rates granted non-profit organizations and in wire-service rates. Other precedents, both statutory and regulatory, will need to be sought, but the goal is clear and is a recommendation of the panel.

2. The survey of user-needs appended to this report is only a first-cut examination of what it is the non-profit sector requires and may require. NASA's own user-needs survey, and this report itself, is limited in scope. It is a recommendation of the panel that a massive user-needs study, one cutting across those of the 3,000,000 non-profit organizations who might utilize satellite telecommunications to aid their activities, be undertaken. From this, a traffic model could be developed which would aid in satellite technical configuration and system design.

3. It is recommended that a Task Force be established, which would include in its composition representation from non-profit organizations, to consider, prior to finalization of a system design, such matters as ownership (of a satellite to serve the non-profit sector), control of such a system, management of it, and rules of access to it. Such a Task Force might also properly consider the matter of bulk purchasing of equipment for ground use. Such a Task Force should become involved in establishing the design of any satellite which is intended to serve the needs of the non-profit sector.

4. It is recommended that certain design requirements be considered which will particularly impact upon what can be done by satellite users. Terminals should be low-cost, and use small diameter antennas. They should be durable and easy to manage by non-technical personnel. Experimental ground equipment should be so designed as to be compatible with future operational satellite system terminals so that a switchover can be made at minimum cost and with maximum ease. The design should consider that many social service uses, especially in medical record-keeping and health care, require complete privacy. The term low cost is intended to mean at a level of affordability for the average individual.

5. It is recommended that NASA increase its efforts to educate organizations and individuals as to the advantages of satellite telecommunications technology. We wish to note the need and, in addition to what NASA is already doing in this area, suggest that perhaps a mass media campaign is possible and that the services of the Advertising Council be sought.

6. It is recommended that, in order to improve its outreach to the general public, or to the specifically interested public, that some form of mass notice be considered, perhaps something along the lines of the FCC "Action Alert." Regional meetings, to which the public is invited, also following the FCC model, could help. And, it is further recommended that a Citizens Advisory Committee be established, or, if one such does exist, that its membership be enlarged to include representatives of the non-profit sector. It is recommended that NASA attempt to expand this concept of public representation to all of those inter-agency committees on which NASA sits or which consider telecommunications and satellite policy issues.

3.13.9 References

"A Study of Communications Needs, Uses and Costs of Non-Profit Organizations," Conducted for Public Interest Satellite Association by Melvin A. Goldberg, Inc./Communications, New York, May 1976, 84 pages.

Table 21

Feminist Services

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Info on Women's Rights, Employment Education	Home phone 2-way voice and data transfer video on TV	Cities and rural		All 50 States	24-hour, 7 days a week	Need 24 hour service for crisis info - location or havens for battered wives as well as other info for swing shift workers.

Table 22

Consumer Services

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Consumer Product Tests and Ratings; Evaluation of Consumer Services	Audio/Color TV; Digital Data	All Homes or Multiple Central Locations, e.g., Shopping Centers	?	Nationwide - U.S.	24 hours	Need: Provide consumers with information on products and services necessary to make informed choices; available to consumers of all income/ educational levels; income producing.
User Experience, Needs & Price Surveys on Consumer Products & Services	Digital Data; 2-way Audio	Statistically Reliable Sampling of Homes	?	Nationwide - U.S.	Several hours per week	Need: Collect data and integrate with above.
Consumer Information Centers	2-way; Digital Data	Regional and Local Centers	?	Scattered Nationwide - U.S.	8 hours daily	Need: Many consumers require basic money management guidance, access to easily understood information and aid in handling complaints; instructional materials.
Clearing House for Consumer Organizations, leadership training, teleconferencing	2-way audio/ video; Data trasnmission	State and local consumer offices; Designated Meeting Halls Regionally and Locally	?	All States and Selected Local Areas	1-2 hours daily plus 1 day per month	Need: Interchange of information Educational workshops.

Table 22 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Consumer Education and Information	Audio/Color TV; 2-way	Meeting Centers in School Auditoriums and Theaters; Homes	?	Nationwide - U.S.	Monthly 2-3 hours prime time evening	Need: Use popular entertainment format for consumers to "test" themselves on vital consumer concerns, e.g., food purchasing, personal financing, housing, health care.
Magazine Subscription Fulfillment	2-way; Digital Data	Homes to Single Center	2+ Mill.	Nationwide - U.S.	8 hours daily	Need: Handle at low cost subscription orders, payments, change of address, complaints.
Fund Raising Events	Audio/Color TV; 2-way	Meeting Centers in School Auditoriums and Theaters	Top 100 Markets	Nationwide - U.S. or Regionally	1 day or half day; 2 to 4 times yearly	Need: Non-profit groups have limited means to raise funds. Special events using name personalities new films/plays offer unique means of raising funds.
Public Service Messages (30" to 120")	Audio/Color TV	All Homes, School Libraries	?	Nationwide - U.S.	5 messages per week	Need: Service not now available to balance commercial advertising messages.

Table 23

Neighborhood Health Services

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Teleconferencing	2-way audio/video	Inter-area communication between the national office and (5) area, regional coordinators	6	N.E. Area (2) Southern Area (1) (12 States) Midwest (1) Western (1) (Hawaii, Alaska) National Office (1)	Needed: Monthly: (1 Hour) - 6 conferences Quarterly: (1 Hour) - 6 conferences	Presently groups must travel to central location for conferences, no access. Projected volume will increase to cover each state in the area for monthly and quarterly conferences to plan, deliver management training, technical assistance; for problem solving.
Membership Mailings & Action Memos	Facsimile Transmission	Data terminals Point-to-Point Point-to-Multipoint	6 areas & 300 - 500 Centers	(6) areas (as above) and the member health centers in the (50) States	15 minute messages National office communications to key area coordinators, and 300 - 500 health centers for membership information & alert/response	This is proposed as an alternative to rising costs of telephone (long distance) calls, & postage rates to contact membership on critical issues; and to lag and inconvenience in the time factor to receive message and for return responses.
Clinical Medical Education & Continuing Education For Health Professionals	Slow-Scan TV 2-way audio/video Data Transfer	Universities/Medical Colleges & Teaching Hospitals & Health Centers Interactive Mode	50	One per State, rural locus where a rural or migrant health center is operating	Needed: Twice Monthly 60 minute Transmissions during Service hours Twice Monthly 60 minute transmissions during P.M. Hours	This will provide an option not now possible for worker & physician participation for these isolated, rural areas, while remaining full-time to deliver services at the health centers. Volume will increase to all rural/migrant centers.
Data Transfer	2-way audio 2-way data transmission (facsimile & digital)	Interconnect migrant health centers for higher quality & continuity of care; and rural to urban health centers for specialties/hospital follow-up	48 states only 120+	National scope for interconnecting services for migrant/rural centers in remote, isolated communities	12 day hours 9 AM - 9 PM consistent with time zones	At present centers are not related in approach to care. Transient workers receive medical care in a fragmented fashion in whatever state they happen to be working. Continuous care of higher quality is the purpose of this experiment.

Table 23 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Patient Education	2-way audio 1-way video Multiple Terminals	Point-to-Point, Point-to-Multipoint TV Terminals w/microphone	150+	2 Health Centers per State and experimental group of patients to participate in the experiment	DAILY (a) PM - 30 min. (b) 24-Hour (c) AM - 30 min. PM - 30 min.	For general public health education/ prevention For emergency and follow-up care by health professionals For handicapped & for patient self-management of stable-State chronic
				Remote Rural Communities		disease

Table 24

Community Broadcasting

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Interconnection of Educational Radio Stations	2-way High Quality Audio	Transmit-Receive Stations for High Quality Audio, Teletype, and Other Data	30	Continental U.S. Alaska, Hawaii?	At least 18 hr. per day/7 days a Week	For Timely Programming and Interactive Programs with Origination from many Points. 15 KHC Stereo with 50 lb. signal to Noise Ratio.
Large Scale Teleconferencing	Same as above	Same as above	30	Same as above	Subsumes within above	
Small Scale Teleconferencing	Same as above	Same as above	30	Same as above	Subsumes within above	
High Speed Tape Distribution	One-Way "Broadband" High Quality Audio	Transmit Terminal, Receive/Only Terminals	1 60	Same as above	Subsumes within above	30 Transmit/Receive Terminals would also be used to receive High Speed Tape Distribution.

Table 24 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No.	Geographical Distribution	Information Volume	Remarks
Radio Programming for the Blind	High Quality Audio	Transmit only Receive only	1 200	Continental U.S. Alaska? Hawaii?	18 hrs. per day 7 days a week	Timely information distribution via subcarrier on FM Radio Stations.

Table 25

Public Interest Services

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Teleconferencing	Audio/Visual Multiple simulation Terminals 2-way	Regional Present Planned Needed		Existing citizen organizations working on similar issues	Quarterly at Minimum, Hopefully, Weekly	Providing information, consultation and decision making forums for organizations unable to travel with any frequency to a central location.
Information Exchange	Video - Data Banks Slow-Scan TV			U.S.		Information on actions in Congress and local state legislatures. Governmental information and access to decision-making processes will help minimize public apathy.
Education and Training Programs	2-way voice radio Slow-Scan TV			Regional U.S.	Quarterly at Minimum	Providing organizational and managerial skills to citizens based organizations just under way or in existence.
Information Exchange	audio/ telecopy	Student financed Public Interests Research Groups	30	30 States	30 hours weekly	Facilitate organization of development and efficiency of project activity.

Table 25 (continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Orgainiza-tion to Multiple Organiza-tion and Back	Audio/Video Data Slow-Scan TV	Information on Congressional and administrative agency activiti..s		Geographic U.S.	daily	
Organiza-tion to Chapters Intraorgan-ization and Back	Audio/Video Data Slow-Scan TV	Internal Informa-tion to be used to further organiza-tion		50 States	monthly	
Organiza-tion to mem-bers and Back	Audio/Video Data Slow-Scan TV	Polling, info, fund raising	Up to 250,000	50 States	quarterly	

Table 26

American Indian Services

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Present: Basic Communication in Social-ogical Application	2-way audio & data transfer	Communication Centers	Need: 20	Canada-U.S.: N.D.; S.D.; Mont.	Present: 0 Need: 4 hr. transmission 5 days/week	Increase in communications with increasing awareness & uses of the system. Will lead to eventual longer length of transmission.
Near Future: Sociological Educational Economical	2-way audio/video & data transfer	Communication Centers, Schools	Need: 200	All Indian Tribes on N. American Continent	Need: 4 hr. transmission 5 days/wk.	
Long-Range Future: Socialogical Education Economical Data Compil	2-way audio/video, 2-way digital	Communication Centers, Schools, Info. Centers	Need: 300	Begin expansion to isolated areas on reservation.	Need: 8 hr. transmission 5 days/wk.	

Table 27

Day Care Services

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Present: Small Scale conferring	2-way audio	Communication Centers in 25 service areas Base Stations Planned: Present:	 0 25 0	Area distrib. in 5 Midwestern States	Present: 0 Needed: 2 hr. transmission 5 days/wk.	The need for access of communication will increase with awareness of the system.
Near Future: Lge-scale conferencing & info. distr.	2-way audio & data transfer	Communication Centers located in all 50 States with more than 1 in large cities.	50	All 50 States with at least 2 in L.S.; N.Y.; Chicago; Denver; Miami	Need: 4 hr. transmission 5 days/ wk.	
Blue Sky:	2-way audio & data transfer	Communication Centers in major centers; & expand to small cities & rural areas.	250	Expansion to smaller cities, & isolated rural areas.	Need: 4 hr. transmission 5 days/ wk.	

APPENDICES

PUBLIC SERVICE COMMUNICATIONS SATELLITE USER REQUIREMENTS WORKSHOP

FINAL REPORT

JANUARY 1977

Communications and Navigation Division
Goddard Space Flight Center
Greenbelt, Maryland 20771

APPENDICES

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APPENDIX 1

PUBLIC SERVICE COMMUNICATIONS SATELLITE SYSTEM

This appendix contains a description of the objectives, approach and some expected benefits of a public service communications satellite system. This document was distributed to participants when they arrived at the workshop.

A1-2

PUBLIC SERVICES COMMUNICATIONS SATELLITE SYSTEM

COMMUNICATIONS AND NAVIGATION DIVISION
GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

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A1-3

1 INTRODUCTION AND BACKGROUND

There is a need in this country for Public Service Communications Present day space technology can make such services affordable via low-cost ground terminal equipment A Public Services Communications Satellite System will provide evaluations of communications with both small stationary and moving terminals The stationary terminal services include health, education and other public services of federal, state and local government organizations The moving terminal services include emergency medicine, safety, and law enforcement communications The specific experiments to be performed will be defined after the user requirements study during the first phase of the program

The Public Services Communications Satellite System is designed to alleviate some of the problems of inadequate service suffered by citizens who reside in remote regions There are people in the U S without access to the normal communications services (telephone and television) There are people in rural areas that lack the services of medical professionals enjoyed by urban residents There are people in remote areas that receive inferior educational services The ATS-6 Health and Education Telecommunications experiment demonstrated the value of interactive television for applications such as Alaskan health services and education in Appalachia This public services system will build on that experience and improve the quality of life in remote regions The system will demonstrate improvements in the quality and efficiency of public services The system will provide a demonstration of a cost-effective means for mobile communications over large geographic areas

This is a program for satellite communications to provide a prototype low-cost dedicated-service system leading to a commercially operated system The delivery of public services requires a geostationary satellite system for continuity of service and would use large solar arrays, high power transmitters, large multibeam antennas and multiple access techniques to accommodate large numbers of users The users will have economical small fixed and mobile terminals with low radiated power (EIRP) and small receiver antenna gain to noise temperature (G/T) ratios

This program will include the identification of technical and economic requirements and the design, development and fabrication of low cost fixed and mobile ground terminals, both to provide for the development of low cost terminal

technology and to provide a production buy to reduce terminal unit costs The program will assure a reasonable probability of a continuing space capability through the transition to a commercially supplied service A seven-year program is planned The program is designed to lead to a transition from NASA experimentation to commercial operations profitably serving the market

This program is in harmony with recommendations that will be made by the Committee on Satellite Communications of the Space Applications Board Assembly of Engineering, National Research Council This committee considered NASA's future role in satellite communications

This program is also in harmony with the public services aspects of the domestic communications objective (#051) of the NASA Outlook for Space Study and the recommendations of the American Institute of Aeronautics and Astronautics, Electronic Industries Association, and Institute of Electrical and Electronics Engineers

The objectives of this program are described in Section 2 The needs and problems that will be addressed and the expected benefits are described in Section 3 The criteria for including individual elements of the program include the potential benefits to be obtained (both economic and social) and the lack of commercial or viable non-space alternatives for meeting these needs and solving the problems in the near future Although these needs have been recognized for years, satellites have not yet been utilized.

The major obstacle to date to the increased use of satellites for communications services other than long distance telephone is not the lack of available technology, but the absence of well-developed institutional arrangements and the lack of appreciation of the services that can be provided by satellites and their potential for both cost effectiveness and increasing the quality of life This program will aggregate a market to make commercial services economically viable Providing a space capability to aggregate this market has proven to be too costly for the private sector The technical plans to achieve this program, including the technology development needed to reduce the risk of flying new technology on future operational systems are described in Section 4 The economical implementation of some services is presently hindered by the lack of available low-cost ground terminal technology This technology and other continuing long-range research and development required to support the program are also described

The tasks necessary to accomplish this program are listed in Section 5

2. OBJECTIVES

The goal is the realization of operational commercial satellite public services The program objectives are to transfer communications satellite system technology to the public and private sectors for the delivery of public services and in the process to maintain the U S technological lead in space communications. The program is intended to expedite the involvement of the private sector, increase domestic productivity and the balance of payments, improve the quality of life, improve the protection of life, property and privacy, improve the quality of public services and conserve spectrum and energy

2 1 LONG RANGE OBJECTIVES

1 Develop a Public Services Communications Satellite System to be operated by the private sector for the delivery of public services This development includes the transfer of technology and operations to the public and private sectors

2 Maintain the technological lead of the United States in space communications The R&D necessary includes both hardware and software for public service applications that are expected to be implemented more than five years from now

3 Develop low-cost terminal technology including fabrication and manufacturing techniques In order to pursue this objective, NASA will make a production buy of terminals (100-200) to provide reduced unit cost terminals to users and to verify the low-cost technology development

2.2 SHORT RANGE OBJECTIVES

The short range program objective is to make use of the momentum developed by ATS-6/CTS experiments and demonstrations and provide continuity of both space and ground elements to continue to give potential users first-hand experience in the use of satellites for their communications needs

3 EXPECTED BENEFITS

A Public Services Communications Satellite System will enable residents in rural areas to have communications services comparable to urban residents It can improve the quality of health and education by providing information links between large centers of excellence and small rural communities Emergency communications can be provided in disaster areas where conventional systems are disrupted Law enforcement officials in different jurisdictions will be able to communicate easily, thus increasing their effectiveness Several government agencies (Federal, state and local) have communications needs which would benefit from a public services communications satellite system. The various applications needs to be satisfied by this system are described below The criteria for selecting the various applications include the potential benefits to be realized (both economic and social) and the probable lack of commercial or viable non-space alternatives for meeting those needs

Detailed cost benefit studies have not been made yet because of the difficulty of making meaningful studies with the present state of the art and the artificiality in quantifying the social costs and benefits

3 1 HEALTH SERVICES

Spiraling costs, lack of public confidence, archaic practices, and increasing demands for greater service from an overburdened health care delivery system have set the stage for a potential future crisis in health care Application of modern telecommunications technology could eliminate some and ameliorate many of these problems by facilitating improvements in education, training, supervision, direct patient care, administration and the application of current medical research

The potential socioeconomic or practical benefits for health care delivery could be very large in both scope and value They include better emergency medical care in rural areas and better manpower utilization, especially professional, in large urban medical centers Furthermore, they include the possibility of wide broadcast of the preclinical sciences (Anatomy, physiology, biochemistry, etc) to student audiences on a regional basis, implementation of a continuing medical education system, the availability of expert consultation in medical specialties for the rural primary care physician, and the rapid daily transmission of epidemiological data

The cost to the general public, the government and those in the medical arts and sciences for the failure to improve current practices through use of modern telecommunications will be great It would mean the persistence of inefficiency throughout a health care system already burdened to its limits, practitioners lacking current medical and pharmaceutical information, inaccessibility to good health care for the one-third of the people who live in rural areas, and, perhaps worst of all, the unattainability of the goal of shifting medicine from the curative mode to the preventive mode, which many think should be one of the main objectives of a modern health care delivery system

The Emergency Medical Service (EMS) Systems Act of 1973 provides assistance and encouragement for the development of comprehensive area emergency medical services systems (See Public Law 93-154)

Studies by the Committee on the Interplay of Engineering with Biology and Medicine have focused on many problems which plague the provision of emergency medical care in this country These and other studies, have emphasized the key role of communications in linking the multiple elements involved in emergency medical services systems There is a need for an integrated coordinated communications network that brings together all of the components of the emergency medical system to provide optimum care using well-established but often poorly implemented principles of modern emergency medicine

The physicians that treat emergencies believe that the outcome of sudden illness or medical emergencies is predicated not so much on the obvious symptoms or trauma found, as it is on a whole gamut of information on which very early decisions are made

The communications capability offers the potential for the input of advice from a remote specialist to the emergency medical technician (EMT) at the scene for a real-time decision making capability between EMT and physician specialist as to the most appropriate medical facility for treatment and the method of transport based on telemetered data

Many states, such as Maryland, are in the process of developing EMS radio communication systems which serve major cities and surrounding counties These facilities interconnect emergency vehicles with medical and resource coordination centers and will undoubtedly prove highly beneficial as they are brought to fruition and used on a continuing basis

If we are able to realize the full potential of the EMS Systems Act, a great step will have been taken toward the elimination of needless loss of life and limb due to catastrophic sudden illness and other medical emergencies associated with accident trauma occurring in the home, factory or on the highway

Modern satellite communications technology can aid in realizing the full interest of the EMS Systems Act Through the use of satellite facilities, uniform coverage of the U S is available for experimentation and demonstration of a national interconnected system This is particularly significant for rural areas outside the limits of ground radio systems Through this technology, rapid high quality communications for voice, video, and medical telemetry could be achieved operationally in the 1980s

3 2 EDUCATION SERVICES

Productivity losses exist at all levels of education with fewer students, more teachers, increased pay for school personnel and no comparable increase in student test scores In many areas of the country the budget and number of teachers has increased while the number of students has decreased without significant improvement in results Telecommunications has the potential of permitting large gains in educational productivity, increasing teaching effectiveness, and broadening the spectrum of educational opportunities

Despite the institutional problems, the use of telecommunications to relay educational programs at all levels (primary, secondary, university, continuing and cultural) is increasing One report forecasts a need for 80 educational television stations by 1985 for instructional television, video tape distribution and the Public Broadcast System

The role of the Federal government in education is to evaluate the status of education, aid people of the U S in the establishment and maintenance of efficient school systems and to otherwise promote the cause of education NASA has been assisting educators in exploring the use of satellite communications using the ATS-6 and CTS satellites There is a need to continue to work with these users until the technology is effectively transferred

Education includes health education and the training of professional and paraprofessional health care personnel as well as the training of the public in good health practices

3 3 DATA TRANSFER

There are networks in existence for the transfer of data between government installations located all over the globe and some of these networks involve satellites There is a need for a demonstration mission to develop satellite capabilities uniquely suited to this application This will improve the cost effectiveness of transmissions that may be done conventionally or would make possible transmissions that would otherwise be impossible

The need for NASA is to work with the users to assist them in learning of the potential of satellite communications to improve the services they need NASA would assist in the transfer of the technology to operational commercial services

The research of government scientific teams such a Antarctic exploration teams, archaeological teams and geological teams could be greatly enhanced if the teams could be connected to their home base data banks and powerful computers via satellite through small portable terminals

The volume of data transmission by government agencies involves nearly 2×10^{15} bits per year generated by nearly 150,000 nodes These nodes cover military, law enforcement, education, environmental surveillance, navigation, space operations, state government and federal government Commercial goals include the automation and digitization of commercial services New services will become possible through the advent of automatic digital data transmission for health care (medical data retrieval, medical computer aided instruction for ongoing education, medical information systems, centralized medical processing), banking and finance (interbank transfers, credit checks), utilities (monitoring and control systems for power networks, communications networks, railroads, oil, gas, water), publishing (remote publishings), and other applications such as reservations

Three typical applications where significant contributions can be made by satellite telecommunications are health care data, library retrieval and census data

Health Care Data

The cost of medical care has risen greatly in the last few years and all signs point to a continuation of this trend One of the forgotten items in the cost of health care delivery is the assembly, maintenance and retrieval of medical records Thus, this service is different from the delivery of health care previously described It has been estimated that medical data records costs amount to about $5 per capita per annum or well over a billion dollars a year in the United States In many cases the patient and the records are separated so far in time or space that these records are useless in the diagnosis and treatment of the current complaint This not only is a disadvantage medically but also causes the formation of a new file, thereby further burdening the record system with a file that also may be inaccessible the next time it is needed

Satellite telecommunications could help change this situation by making possible the formation of regional medical record centers which could be accessed from anywhere in the country In this way the patient would know that any practitioner would have all the pertinent information available for consideration when the need arises

Apart from patient medical records, epidemiological statistics, disease registries, blood bank inventories and similar types of information could be updated on a daily basis using satellite telecommunications This would be especially useful in spotting and treating outbreaks before an epidemic develops

NASA is presently working with users to explore the capabilities of satellites using the ATS-6 and CTS satellites

Library Retrieval

Library science deals with the organization and flow of information During the last two decades there has been an enormous growth in inter-library information transfer Present library science technology is not capable of meeting these information transfer requirements

Present distribution techniques consist of teletype, facsimile, WATS, magnetic tape distribution and the mail service The key factors limiting growth in the productivity of information transfer are the performance and speed of facsimile devices (transmission is slow and expensive), the limitations of optical scanners, and the high cost of long-distance communications

The Library of Congress has standardized much information transfer and distributes information in a machine-readable format on magnetic tape via the postal service

It is estimated that about 2500 of the 12,000 public libraries in the United States would use the advanced technology of electronic data transfer if productivity gains were commensurate with costs The 2500 college and university libraries and a similar number of technical and specialty libraries would provide a large market for new library science technology

NASA is working with libraries to experiment with satellite communications using the CTS satellite

Census Data

The demographic data derived from the decennial census lags by several years due to difficulty in acquiring, processing and using data obtained in the archaic manner of the census taker The state of the art could support a demonstration where the census taker, using a hand-held telecommunication terminal could input his data directly into a central computer for storing and processing census data This would obviate the necessity of working with hard copy paper sheets and would permit the keeping of running totals and prediction of trends early in the arduous census process Additionally the recording of natality, mortality and other vital demographic statistics could be done on a continual up-to-minute basis

3 4 TELECONFERENCING

There is a need to provide a broad-based, flexible and cost-effective range of teleconferencing services for government and professional organizations engaged in public services The full range of teleconferencing capabilities that must be considered to best fill a service should include computer-based conferencing, interactive graphics, audio conferencing, one- and two-way television, and various combinations of these

Remote video broadcasting of professional society symposia, for example, could enhance the distribution of information A flexible teleconferencing service to interconnect groups of researchers for discussion of their work could alert them to significant findings, and accelerate scientific and technological progress Also, the information retrieval aspect of teleconferencing could allow the professional to intensively search the information base of his field

Information and problem solving are the main tools of the 15-20 million professional workers in the U S today It has been estimated that missed information is responsible for wasting 30% of a professional's time through poor solution to problems or needless duplication of work and half of the information presented at professional meetings is lost due to lack of publication. Also "national" meetings currently tend to be regional in the composition of attendees

The market for teleconferencing of meetings of professional organizations includes 600,000 academic, scientific, and technical organizations, 500,000 health and medical organizations, as well as labor, political and fraternal groups

On the social psychology aspects of teleconferencing; there is a need to understand and to quantify the level of teleconferencing capability required for various types of meetings How much and what types of face-to-face meetings can be replaced by teleconferencing is not well understood More controlled experimentation is needed to better define the parameters, extent of potential use, and capabilities needed

The present NASA program includes work in teleconferencing NASA could expand the use of the day-to-day program and project activities of the agency in an experimental teleconferencing network This network would not only serve the NASA needs of detailed coordination of highly complex technological endeavors, it could also provide the framework within which many of the unknowns about teleconferencing could be evaluated and problems solved An additional benefit to the agency would be conservation of limited travel funds At the same time NASA would be providing commerce and industry an example of energy conservation by the substitution of teleconferencing for transportation

3 5 PUBLIC SAFETY

The major impact of satellite communications in the area of public safety is threefold—to save lives, to provide cost savings and to provide flexibility Satellite communication are capable of contributing in the following areas disaster communications, where other modes have been destroyed or capacity reduced by the disaster, intrastate, for relay of video, high speed facsimile, and in remote areas extending the range of mobile communications The public safety community consists of law enforcement (including the courts), fire control as well as prevention, and civil defense The functions to which this service can be applied include communications to the general public, and their own resources of the public safety organization as well as investigatory, training, education and administrative uses of the public safety organizations

Many of these functions are handled adequately now, but satellite communications will be amenable to longer distances, higher data rates and more flexibility. As requirements grow, satellite communications become more meaningful and cost-effective

4 APPROACH

The technical plan for the Public Services Communications Satellite System effort is divided into four phases. Figure 1 shows the phases and their expected times. This program will require the joint efforts of NASA and other agencies as well as the private and public sectors. The joint efforts among the agencies and public sectors will be defined by a Memorandum of Understanding (MOU) between the parties. The private sector participation will be defined by contractual arrangements. The MOU arrangement is not new to NASA and has been successful in the past. For example, the ATS-6 experiments were often arranged with MOU's between the experimenter (including the Government of India) and NASA. The areas of responsibility and commitment of each party and the objectives and purpose of the MOU are specified. Critical decision points are identified and specific outputs are listed

4.1 PHASE I - OCTOBER 1976 - DECEMBER 1977

The first phase lasts 14 months and includes two concurrent efforts. The first part is a continuation of the ATS-6 and CTS experimental applications and evaluations. Included in this part is the modification and upgrading of the Denver Uplink Terminal (DUT) to provide a more convenient, cost-effective terminal access for the ATS-6/CTS users. NASA will take responsibility for the facility and provide for the modification and upgrading of the facility. This facility will be part of NASA's transfer of technology to the users in the later phases

The second part of this first phase is the study effort to develop the system concept and definition for the public services communication satellite system. This will be an extensive effort during which studies and analyses will be performed to determine the best technical concept and the optimum system configuration. The studies and analyses will be concerned with users' requirements, cost of service, system definition and low cost terminal technology

4 2 PHASE II - JANUARY 1978 - SEPTEMBER 1979

This phase is 21 months long and has two parts. In Part 1 the training and transition of the DUT facility from full NASA operation and maintenance to

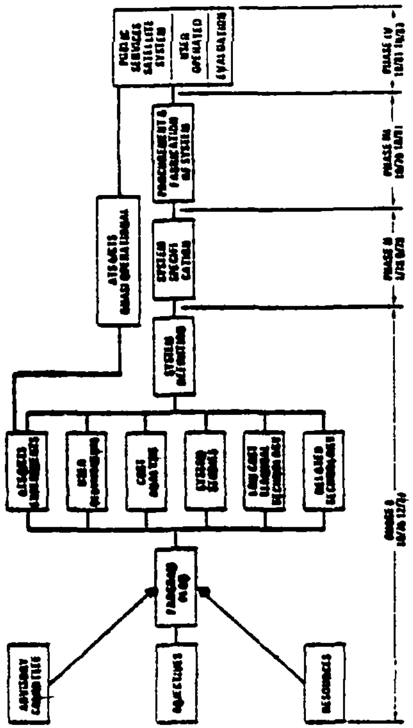


FIGURE 1 MILESTONE SCHEDULE

shared operation and maintenance with the users, The Public Service Satellite Consortium (PSSC), takes place This phase begins a quasi-operational period for the users with the ATS-6 and CTS During this time a backup for the ATS-6/CTS space segment may be required. The space backup could be leases of either or both Anik-4 or the SBS satellites to provide the users with limited operation and program continuity until the new satellite is launched and operational

The second concurrent part of Phase II is the system specification and procurement preparation NASA will have the responsibility for preparing the specification, designing and developing the spacecraft and developing the necessary hardware and software for command control of the system. It will also have the responsibility for developing low-cost terminal technology which includes manufacturing techniques and maintenance techniques which affect the total cost the user must pay to be in the system. Finally, NASA will have the responsibility for developing the overall management and training techniques to be employed in the system implementation.

The users will be responsible for reviewing the plans and designs to be sure they are in consonance with their goals.

NASA and the users will jointly be responsible for the presentation of the system to OMB, IRAC and the FCC,and providing the funds in their respective budgets for the implementation of the system. Procurement packages for the subsystems will be sent to prospective contractors in industry, and the proposals will be evaluated.

One final result of this second phase will be the partial transition of the experiments and demonstrations in Phase I to a quasi-operational system. The other result will be the contracts awarded to industry for the procurement of the space, ground and control subsystems and the interface specifications for user equipment

4.3 PHASE III - OCTOBER 1979 - SEPTEMBER 1981

This two-year period commences with the award of the contracts for the subsystems, and is the system production period The satellite will be ready for launch in October 1981 There will be an engineering backup model in the event of loss of the first spacecraft The system studies in Phase II will determine the need for successive launches to provide a high probability of maintaining the space segment (Perhaps an in-orbit spare and leases at reduced capacities.) The ground terminals will be ready for testing in February 1982 and full production will start in May 1982 with the major portion of the terminals ready by October 1982

The end of this third phase will be the launching of the new satellite and the complete transfer of the DUT complex for NASA to PSSC

4.4 PHASE IV - OCTOBER 1981 - OCTOBER 1983

This period is the validation phase during which NASA and the co-sponsors will test the system to verify that it has met the system specifications During this period NASA and the co-sponsors will transfer the system operation and maintenance to the users (PSSC operations)

4.5 TECHNOLOGY PLAN

The system definition study in the first phase of the program will determine if a major technology breakthrough is required for the satellite for the Public Services Communications Satellite system. Hopefully, the satellite can be designed and built within the technology state-of-the-art However, a major effort will be needed for the terminals if the system is to be cost effective and within the communications budgets of the potential users Because of the large numbers of potential users, this new technology extends not just to the design and the development of components and subsystems, but to the fabrication and manufacturing techniques, maintenance and repair techniques, and packaging techniques The terminals will be developed by several contractors selected through open competition

5. TASKS

The Public Services Communication Satellite System Work Breakdown Structure is as follows

NASA

- Perform the necessary system studies (requirements, costs, tradeoffs) to prepare the System Design and Specifications
- Design, develop and procure the satellite
- Launch the satellite
- Develop the necessary hardware and software for system control
- Develop low cost terminal technology for both fixed and mobile terminals
- Design, develop and procure the initial production run of the fixed and mobile terminals
- Test and validate the system
- Transfer the system technology

Co-Sponsors

- Assist NASA in the specification of the Public Services Communication Satellite System and participate in the preliminary and final design reviews
- Develop the user markets
- Deploy and install the terminals.

Users

- Assist NASA in the specification of the Public Service Communications Satellite System
- Make the needs and services known to NASA
- Develop software as a function of the service such as programmatic material, operational procedures, etc
- Operate and maintain the terminals.

APPENDIX 2

ADVANCE MAILING

This appendix contains a copy of the material forwarded to workshop participants prior to the workshop.

Operations Research, Inc

1400 Spring Street Silver Spring Maryland 20910
Telephone 588 6180 Area Code 301

We are pleased you have agreed to participate in a Workshop on the definition of Public Service Communications requirements sponsored by the National Aeronautics and Space Administration, Goddard Space Flight Center. Workshop participants have been invited from among those active in the field in both the public and private sectors. The invitees will assemble on Sunday evening, October 17, for a two-day discussion-meeting at the Tidewater Inn in Easton, Maryland. The results of the Workshop, a focusing on public service needs and applications, is intended for use by NASA as a guide for formulation of a possible public service communications satellite program A preliminary list of participants, the panels on which they will serve, and the Workshop program are attached.

The location of the Workshop will provide a detached atmosphere for concentrated discussion and creative reflection. A room has been reserved for you for two nights at the Tidewater Inn in Easton,Maryland. You can receive important messages while there at (301) 822-1300. A map showing the location is enclosed. The Workshop has funds to reimburse participants for their travel expenses (governmental regulations prevent reimbursement of Federal employees). A travel voucher is enclosed

A successful and productive Workshop requires that participants give some thought to communications requirements prior to the meeting Accordingly, we are enclosing a form to use to describe potential requirements. Please return these forms in the enclosed postage paid self-addressed envelope to Dr Wolff of NASA by October 1st. This will allow time to convey your preliminary thoughts to the other participants and vice versa Because the number of participants from each organization is limited, you may wish to solicit ideas from your colleagues

Please advise your preference for the way you wish to be identified on your name tag

Operations Research, Inc

Because of the absence of public transportation between the Washington/Baltimore area and Easton, we are arranging automobile transportation Please make your travel arrangements to arrive in the Washington/Baltimore area between 4 and 6 00 p.m , Sunday An early response is desired to assure adequate transportation to the Inn. The intensive nature of the Workshop precludes attendance of families and outside social activities.

We look forward to seeing you at the Workshop. Please call me at (301) 588-6180 if you have any questions.

Sincerely,

Herbert Majower

Herbert Majower
Workshop Coordinator

HM/mam

Enclosures.
- Preliminary List of Participants and Panels
- Road Map
- Program
- Public Service Communications Requirements forms
- Self-addressed envelope
- Travel Plan form
- Travel Voucher (non-government only)

PUBLIC SERVICE COMMUNICATIONS SATELLITES

USER REQUIREMENTS WORKSHOP

OBJECTIVE

To compile and document public sector requirements for communications services that can be most effectively provided by communications satellites Requirements identified by panels of users will form the basis for this overall requirements set that will then be used to develop space communications systems concepts

APPROACH

The workshop will be briefed on space communications capabilities generally with emphasis given to small terminal (mobile and fixed) capability It will then be divided into panels structured along discipline lines that will develop and document their individual requirements which will form the basis for the workshop report. The workshop will review the various panel reports to develop an integrated requirements set having in-so-far as is possible, characteristics encompassing all users needs.

REPORT OUTLINES

1. Objectives
   - 1 1 Discipline objectives
   - 1 2 Statutory requirements
   - 1.3 Objectives to which satellites can make a contribution (including responsible organization)
2 Discipline Communications Needs
   - 2.1 Types of communications needs
   - 2 2 Volume of communications
   - 2.3 Communications networks
3 Present Communications Systems
4. Potential benefits of satellites (economic and social)
5 Recommendations (if any)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	No	Geographical Distribution	Information Volume	Remarks
Emergency Medicine	2 way-voice, video and data transfer	Ambulance Present Planned Needed Base Stations	 200 500 1,000 5	5 county region around Elm City, USA	Present 500 17 messages per day Planned 750/day Needed 2000/day	Need can expect great increase in traffic for specific periods i e , + 50%
Teleconferencing	Audio/Video Multiple Simultaneous Terminals	Voice/Video terminals in 50 regional sales offices Present Planned Needed	 0 0 50	U S 50 states	30 minute transmission 5 days/wk	Present audio techniques preclude use of video material such as charts, products, displays, etc

PUBLIC SERVICE COMMUNICATIONS SATELLITE USER REQUIREMENTS

EXPLANATORY NOTES FOR TABLE WITH EXAMPLES

APPLICATION State the discipline to which this requirement applies, i e , emergency medicine, education, public safety, teleconferencing

SERVICE TYPE State type of communication, i e , audio, video, color video, audio/video, digital data, one-way or two-way

DESCRIPTION Description of type of terminal, i e , ambulance, school house, hospital, clinic Also, describe firm future plans and ultimate desires or needs for terminals

NO List the present, firmly planned for the future, and ideally desired or required number of terminals

GEOGRAPHICAL DISTRIBUTION Describe the present, firmly planned, and ideally desired or required geographical distribution of user terminals, i e , so many per city or county or other geographical region, or so many per other geographically distributed units such as hospitals, police stations, or medical centers

INFORMATION VOLUME List the present and expected volume and duration of transmissions that are or would be required, 200 emergencies per week, 1000 daily (1 min each) transmissions per day, variable scheduling ranging from routine to emergency conditions

REMARKS Use this column for additional explanation of items entered in other columns, if necessary, or for additional explanatory material

PUBLIC SERVICE COMMUNICATIONS SATELLITE USER REQUIREMENTS WORKSHOP ORGANIZATION

Arrangements Herbert Majover

PANELS

1 COMMERCIAL SERVICES
Chairman Donald M Jansky
Secretary Joseph N Sivo
David A Irvin, Hal Braham, Eugene Carciamani, Richard Davies, John E Fox, Joseph Freitag, Stanley R Zawnicki

2 DATA AND MESSAGE SERVICES
Chairman Norman Abramson
Secretary Charles E Cote
Dorothy Deringer, Donald Grace, Ervin Jacobs, Peter McManaman, William Miller

3 ELEMENTARY AND SECONDARY EDUCATIONS
Chairman Harold E Wigren
Secretary John Kiebler
Alice Beckman, Pierre DuMaine, Charles C Fiore, Don I Gray, Andrew Harovitz, Elam Hertzler, Pat Ho, Rose Mukerji

4 EXTENSION AND CONTINUING EDUCATION
Chairman Martin Chamberlain
Secretary Enrico P Mercanti
Franklin G Bouwsma, George Christianson, Larry Grayson, Harold E Morse, Frank Norwood, Kenneth Polcyn

5 ENVIRONMENTAL COMMUNICATIONS
Chariman Arthur R Cooke
Secretary J Earle Painter

6 LIBRARY SERVICES
Chairman Ruth Katz
Secretary Indalecio Y Galicinao
Edward Blackhurst, Allan Deschere, Priscilla Godsick, Steven Herman, Sara Kadec Ronald Miller

7 MEDICAL EDUCATION
Chairman Charles V Heck
Secretary William Conant
Mary B Backer, Richard Bergland, Robert Bird, Elmer Friman Leo L Leveridge, Emanuel Suter

8 MEDICAL SERVICES
Chairman Ralph P Christenson
Secretary Walter B Sullivan
David R Boyd, Arthur Griffith, Howard Hupe, Ray Schwartz, Dean Seibert, Robert Shamaskin, Jon D Wempner

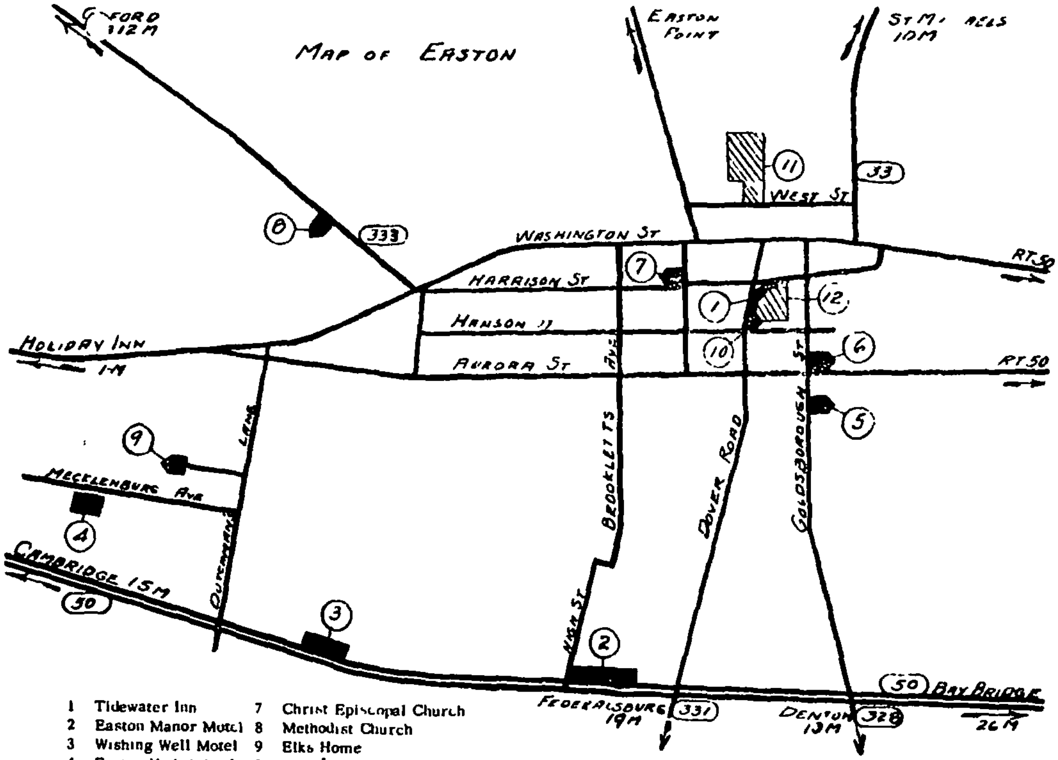
9 PUBLIC BROADCASTING
Chairman Donald R Quayle
Secretary John E Miller
Bert Cowlan, William G Harley, Bernard J Luskin, F Lee Morris, Richard Oldham, Howard Spergel, Sidney Tishler, Ronald Wilson

10 PUBLIC SAFETY
Chairman S S Ashton
Secretary Jan M Turkiewicz
Jerry Carp, Donald D Kavanaugh Lois McCoy, William B Morton , George Allen, Helen Clearwater

11 RELIGIOUS APPLICATONS
Chairman William Fore
Secretary Joseph P Corrigan
James E Alexander, Charles Hamilton William Huie , Richard Jameson

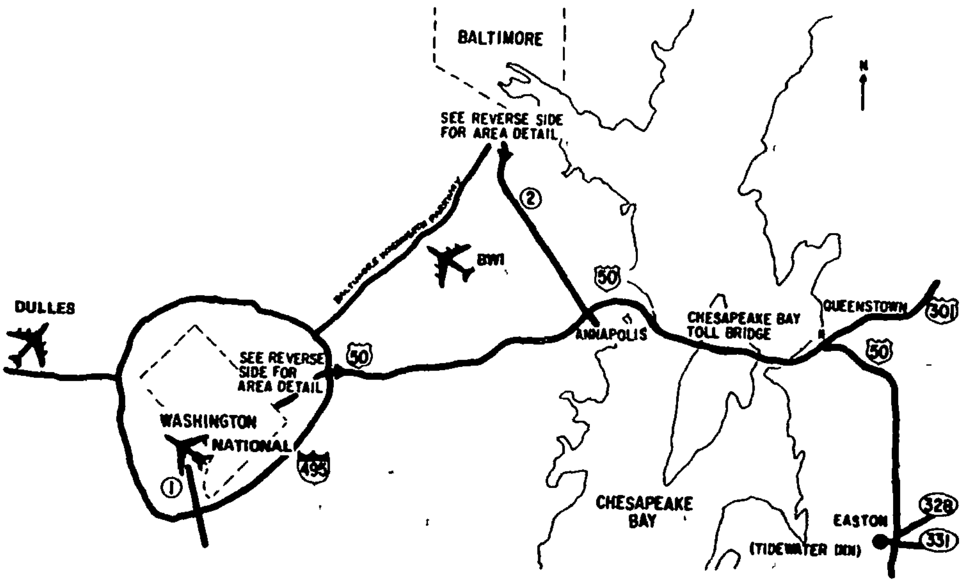
12 STATE & LOCAL COMMUNICATIONS
Chairman Robert M Walp
Secretary James P Brown
Claude Buster, George M Hall, Donald Hinson, Ted Reams, Jane G Richards, Mason Riegel, Elizabeth L Young , Marvin H Rimerman

UNASSIGNED
Robert Dressler, Joel Greenberg, Leon Greenhouse, Eugene Feinberg, Gary Foreno, Samuel N Fordyce, Jerome Freibaum, Samuel Hubbard, Rodger Kaul, George Knouse, Howard Lefkowitz, Wasyl Lew, Bernard T Miller, James Potter, William N Redisch, Lance Riley, George Selz, Friedrich Vonbun, John P Witherspoon, Edward A Wolff Lorrain Lucki



1 Tidewater Inn
2 Easton Manor Motel
3 Wishing Well Motel
4 Easton High School
5 Episcopal Cathedral
6 Catholic Church
7 Christ Episcopal Church
8 Methodist Church
9 Elks Home
10 American Legion
11 Free Parking Area
12 24 Hour Parking Area

1" = 1000 JFC



PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	USER TERMINALS: No	USER TERMINALS: Geographical Distribution	Information Volume	Remarks

Public Service Communications Satellite User Requirements Workshop

Program

Time / Date	Sunday Oct 17	Monday 18	Tuesday 19
8 00-9 00 am		Breakfast	
9 00-12 00 am		Welcome Public Service Communications Satellite Concept Panel Discussions	Panel Presentations
12 30-1 30 pm		Lunch by Panels	
1 30-5 00 pm		Panel Discussions Public Service Communications Needs Potential Benefits of Satellites	Panels Write Reports Workshop Adjourn Committee Critique
6 00-8 00 pm		Banquet	
8 30 pm	Get Acquainted Reception (Cash Bar, Pool-side)	Social (Cash Bar, Pool-side)	

PUBLIC SERVICE COMMUNICATIONS SATELLITE USER REQUIREMENTS WORKSHOP

Travel Plan

Name ____

Address ____

____

____

Office Phone. ____________________

Home Phone ____________________

- -

I plan to attend __________ days of the Workshop (check which days)

Sunday __________ Monday __________ Tuesday __________

I would like to have hotel reservations for the following nights (check which days)

Sunday __________ Monday __________ Tuesday __________

My travel plans to Washington are as follows

☐ Airplane — Airline ______________, Flight No ______________,
Arrival Date ______________, Time ______________,
Arrival Airport ______________________________,

☐ Rail — Train No ______________, Arrival Station ______________,
Arrival Date ______________, Time ______________

☐ Automobile — ☐ I can provide transportation to Easton for ________ people.
☐ I need transportation to Easton

NOTE Please call Mr. Herb Majower at (301) 588-6180 if you have any questions

Please return this form to Dr Wolff in the enclosed postage-paid self-addressed envelope

Please advise your preference for the way you wish to be identified on your name tag.

____

APPENDIX 3

ADVANCE SUBMISSIONS

This appendix contains material submitted by participants prior to the opening of the workshop.

For part of a total emergency response system.

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	No	Geographical Distribution	Information Volume	Remarks
Search Rescue Disaster (NASAR)	2 way-voice and data transfer	Voice/data terminals in 6 region service centers Base stations planned present	 6 1 0	6 Nat'l region centers USA	Present 0 Planned 1 Needed	
Search Rescue Disaster (NASAR)	2 way-voice and data transfer	mobile portable satellite accesses present	? 50 0	U S lower 48 Alaska?	present 0 planned needed:	Need can expect great increase in traffic for specific periods - i e , disaster + by a factor of +10

ANDERECK

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	No	Geographical Distribution	Information Volume	Remarks
Emergency Medicine	2 way-voice, video and data transfer	Ambulance Present Planned Needed Base Stations	 200 500 1,000 5	5 county region around Elm City, USA	Present 500 17 messages per day Planned 750/day Needed 2000/day	Need can expect great increase in traffic for specific periods i e , + 50%
Teleconferencing	Audio/Video Multiple Simultaneous Terminals	Voice/Video terminals in 50 regional sales offices Present Planned Needed	 0 0 50	U S 50 states	30 minute transmission 5 days/wk	Present audio techniques preclude use of video material such as charts, products, displays, etc
Instruction for home-bound handicapped	2 way audio & data 1 way video	TV terminals with keyboard & mike	Thousands	U S & territories	Needed full-time (24 hrs, 7 days) at least 10 channels	Instructional, special classes and home instruction with CAI and feedback to small audiences widely scattered
Instructional materials distribution	1 way audio video 2 way data	Data terminals and video/audio recorders	Thousands	U S & territories	Needed: 24 hr transmission of a volume far exceeding current TV modes capacity	This is conceived as an alternate to mail or UPS materials distribution- one way, with ordering data- two way

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Criminal Justice	2 way data transfer	Interstate communication network (existing)	55	1 point of entry per state plus Federal agencies	Present 3 million messages (300 characters) per month	1983 projected volume is average of 63 kilobits per second nationwide peak = 2 times average
Criminal justice	2 way voice	Intrastate (state police) communications network	10K	average of 200 per state	Present 3000 messages (15 seconds) per day	
Criminal Justice	2 way graphical information	Inter and Intrastate communications networks	200	Average of 4 per state	Present. Very limited Future extensive	Some traffic now being exchanged via facsimile, Intrastate exchange of fingerprint image via high speed electronic means would be highly desirable

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	present No	Geographical Distribution	Information Volume	Remarks
education libraries government	digital broadcasting	minicomputers microcomputers remote sensors	5 20 3	U S 50 states	present. 10,000 bits/sec needed 1,000,000 bits/sec	satellite packet broadcasting

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Tele-conferencing	2 way Audio/ Video	Inst. of Higher Educ representing state agencies throughout the State Needed	31	Scattered "Locality Clusters serving State Agencies	First Six Catagories Total: 6 hrs Daily Broadband Service	Serving almost all state agencies from 31 specified locations Ground connections with agencies and dish
Instructional Programming	2 way Audio/ Video	Higher Educ Public Educ State Personnel Training	31	"	BROADBAND REQUIREMENTS - First 6 Catagories Combin -2 hrs between 8am and 5pm each workday -2 hrs between 5 pm and 11 pm each weeknight -2 hrs between 11pm and 8am each day "	
High Speed Data	Digital Data 2 way	Higher Educ ADP Highway Dept Environment Agencies Medical Inst	31	"	"	
High Speed Faximile	2 way Digital Data	Higher Educ ETV Entities Selected State Agencies	31	"	"	

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Public TV Networking	1 Way Audio/ Video	5 ETV Stations	6	Scattered Locality Clusters Serving State Agencies		
Video Site Monitoring	1 way Video	Environmental Agencies Highway Dept Forestry Engineering & Buildings	31	"		Only Where Feasibly extendabl
Slow Speed Data	2 way Digital Data	ADP and almost All State Agencies	52	Narrowband Service conducted thru 52 "locality clusters serving the state	NARROWBAND REQUIREMENTS for all the following Categories - 24 hr instant access to emergency channel - 10 min/hr on a data conditioned channel - 2 continuous hours in 8am-5pm and 11pm-8am period - 1 min in every 5 for relay of telemetered data on a conditioned channel	
Alert and Alarm Signal	1 way digital data	State Police Off Emergency Svc Highway Dept	52	"	"	

Pg 3 VIRGINIA

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Emergency Voice Networking	1 way Audio	State Police Off Emergency Svc Highway Dept	52	Scattered "Locality Clusters"	See Preceding Page	
Telemetry Signaling	1 way Digital Data	Highway Environment Agencies Medical Inst	52	"	"	
Servo Control Signaling	1 way Digital Data	Hwy Traffic Control	52	"	"	
Slow Speed Facimile	2 way Audio	Virtually all agencies and institutions	52	"	"	

Pg 4 VIRGINIA

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Public Radio Networking	1 way audio (voice grade)	All Public Radio Stations	10	See preceding page		
Instructional Programming	2 Way Audio and/or slow scan TV	Higher Educ Public Educ State Personnel Training	52	"	"	
Audio Conference	2 way Audio	Virtually all Agencies and Institutions	52	"	"	
Aural Monitoring	1 way Audio	Environmental Agencies	52	"	"	

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	No	Geographical Distribution	Information Volume	Remarks
Video site Monitoring (Slow Scan)	1 way Audio quality	Environmental Agencies Hwy 'Dept Forestry	52	See Preceding Page		

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	No	Geographical Distribution	Information Volume	Remarks
EDUCATION	2 way VOICE	LOW COST SIMPLE (similar to those for ATS-1&3) Present-. portable Fixed	 1 1	Follows geographical spread of Am Lutheran Ch -Upper Midwest West Coast and several Mission fields.	Present: 1hr/wk Needed: 500 messages/ day	Primarily interested in the direct interchange of information between widely seperated areas, as a continuing education medium, and to expedite, non redundantly, business. (call interviews group discussions, etc)
		Planned- . Portable Fixed	 10 50			Interested in maintaining current downlink equipment We are using amateur fm, and commercial fm units for terminal that are cheap, uncomplicated and use simple antennas A shift to microwaves would be unwelcome, as I assume terminal costs would skyrocket.

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Education	Audio Video Color TV Two-way digital	Schools/college industry library dormitories apt houses/ condo hospitals		Campuses cities	4 pm - midnight in 20 min → 1 hr blocks of time on a routine 7 day/ week schedule	Current cost of land line precludes this kind of networking of instructional and "educational" programming Traffic cor instructional programming can be expected to continually escalate as technology advances

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
MEDICAL EDUCATION	FULL DUPLEX COLOR VIDEO AUDIO AND DATA TRANSFER	UNIVERSITY TV STUDIOS & CLASSROOM	5	U OF WASHINGTON, U OF ALASKA MONTANA STATE U U OF IDAHO WASHINGTON STATE UNIVERSITY	75 MINUTE TRANSMISSION BI-WEEKLY	NEED HIGH QUALITY COLOR CAMERA WITH LENS EXTENDERS FOR MAGNIFICATION
CLINICAL MEDICAL EDUCATION & CONTINUING MEDICAL EDUCATION	FULL DUPLEX COLOR VIDEO AUDIO AND DATA TRANSFER	HOSPITALS PRESENT NEED PLANNED NEED	 14 20	COMMUNITY CLINICAL TRAINING UNITS ob/gyn BOISE, IDAHO pediatrics GREAT FALLS, MT SPOKANE WA POCATELLO ID internal medicine	30 MINUTES TIME PER DAY 5 DAYS PER WEEK	NEED HIGH QUALITY COLOR CAMERA WITH LENS EXTENDERS FOR MAGNIFICATION
				WENATCHEE WA MISSOULA MT BILLINGS MT psychiatry ANCHORAGE AK family medicine ANACORTES WA WHIDBEY ISLAND WA OMAK WA		
				WHITEFISH/KALISPELL MT SPOKANE WA POCATELLO ID		

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
EDUCATION	FULL DUPLEX	STATE CAPITALS	4	JUNEAU AK BOISE IDAHO HELENA MT OLYMPIA WA	AS NEEDED	
MEDICAL EDUCATION	FULL DUPLEX	VA HOSPITALS		BOISE IDAHO AMERICAN LAKE WA WALLA WALLA WA	75 MINUTES WEEKLY	

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Education	Audio/Color video two-way	1 colleges & universities 2 hospitals 3 conferences centers	sev. thou. needed	possibly throughout the U.S Definately throughout California	Assuming sufficient user terminals - several hours per day	The thinking which is in its earliest stages needs to be correlated with available technology and potential dollars for user terminals The Workshop should enable us to do this

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	No	Geographical Distribution	Information Volume	Remarks
Augmented Verbal Communica-tions	2-way audio & visual (confiden-tiality secure)	Hospital ÷Clinic experience needed	4 Hosp 350 Clin ~1000	Waconia, Minn* 5 state footprint	23/1000 physician day 100-2000/day	local traffic only primarily supplemental not economically sound by itself
DATA	Wide band soft and/or hard copy secure	Hosp ÷Clinic experience needed	4 Hosp 350 Clin ~1000	Waconia, Minn 5 state footprint	35/1000 physician day 150-3000 /day	valuable May encompass centralized computer medical record local primarily bit also general X-ray, Charts-EKG-Photo-ordio
Telediag-nosis (new pat-ient & followup)	2-way audio & visual Data-Soft & Hard Special ter-minals stethoscope ultra sound	Hosp ÷ Clinic Clinic÷ Clinic experience needed	4 hosp 350 Clin	Waconia, Minn 5 state footprint	73/1000 physician day 300-1000/day	local traffic primarily valuable for clinics with satellite office Initial emergency core or followup core
	tactile Secure		~1000			
Consultation	2-way audio & visual Data-same as Telediagnostic	Hosp ÷ Hosp Hosp ÷ Clinic Clinic ÷ Clinic	4 Hosp 350 Clin ~1000	Waconia, Minn 5 state footprint	47/1000 physician day 400-4000/day	local and wide general traffic need previous "familiar" association

*based or approximately 1000 physician-day experiment

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	No	Geographical Distribution	Information Volume	Remarks
Monitoring	1-way visual EKG, Fetal Swangan's Secure	Hosp Clinic experience needed	4 Hosp 350 Clinic ~1000	Waconia, Minn	16/1000 Physican days 80-1000/day	Used "in-house" as well as remote Primarily CCU & OB & ICU
Education	2-way Audio Visual Special effects Slide Stethoscope Microscope Ultrasound	Hosp Hosp Hosp Clinic experience needed	4 Hosp 350 Clinic ~2100	Waconia, Minn	2/1000 physican days 2-10 hr/week	Primarily between tracking institution and students in field
	Sound Secure					

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Heart Research	1-way digital data transfer, terminals to S/C	Human Body Present Planned	200 or more ?	GW University Unknown	Present Planned Unkn Needed ?	Need Unknown, but envision, a demonstration of this application using NIMBUS 6 RAMS and GWU Heart-Exercise Project participants

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Public Service Message System	Digital tape and hardcopy input Outputs Same as input or as cross copy	Present Planned major cities	0 75-100	Top 75 to 100 ODIS areas, over continental US plus Hawaii and Alaska	1×10^9 to 2×10^9 messages per month	Primarily a service for lage volume mailers in business and government
Public Service Message System	Inputs Digital tape Hard copy Graphics Outputs As above with option for cross-copy service	Present Planned ODIS centers Stations Terminals	0 600 10000 5000	National coverage, i e Conus, Alaska, Hawaii, Puerto Rico	4×10^9 messages per month	Would provide for color, grey scale in graphics, and would accommodate advertising, message and transaction services

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Public Safety Training	Audio, Video and data 4-Way	Classroom ITV from State to Regional to Substations Present Planned Needed	 3 4 75	5000 Sqm 3 States 9 Counties	Classroom 5 hrs/wk Other On Command	The future need revolves around a proposed multi-purpose training center which will include interconnects with state instructional centers and local fire stations, police stations, etc
Public Safety Identification	Same with mobile units	Live transmissions from and to disaster scenes	?	Same	On command	To identify methods of control, toxic effects of chemicals, explosives, etc and handling of materials, etc
Public Safety: Tactical-control	Same with mobile units	Same	?	Same	Same	Provide centralized control of major disaster scenes for suppression of fire, explosion, security, rescue, etc Dispatch of equipment

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Continuing Medical Education Tele-conferencing	Audio/ Video Multiple Simultaneous terminals 2-way voice	Voice/video terminals in hospitals, clinics, homes and medical schools Present Planned Needed	 90 135 135	State of Indiana National (50 states)	8 hrs/day 5 day/week 30-60 min transmissions	Presently programming transmissions on terrestrial systems such as ITFS, CATV, common carrier long lines, private cable, and video cassette Serving state of Indiana health science community Interested in forming consortium for national programming distribution via satellite. Future programming will include transmission of hard copy medical data See attached TV guide for current programming

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PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Tele-conferencing	AUDIO/VIDEO Multiple Simultaneous Terminals	VOICE/VIDEO Terminals in 4 Regions Present Planned Desired	 0 0 5	4 Points in Cont U S	Executive Use Sporadic, Staff Use 0 - 5 Hours/Day 7 Days/Week	High Cost For Terrestrial Capability Precludes Obtaining Capability, Is Also Inflexible Compared to Satellite Media
Sensor Readout	Digital	Digital Readout Throughout U S	125K	U S Wide	2-5 second bursts 1-30 Interrogation per Hour	OUTPUT OF SENSOR is Input to Satellite Terminal, May be Manual Interface, One-way Traffic Transmission (from sensor), One-way Interrogation
Graphics Broadcast	Digital Fax	FAX Terminal or CRT With Storage Existing in Three Terrestrial Systems	1500	U S Wide (Some International)	5-10 Minute Transmissions 24 hours/day 7 days/week	Two Systems 90% Utilized One System Cannot Meet All the Requirements that Exist, 100% Utilized Also, 99% of Traffic is Broadcast from 1 node, 1% Originate at 3 Other Nodes
Environmental Data Products	Digital Data 2 Point Service	2400 b/s and 4800 b/s Data Rates Products for Distribution	40	U S Wide	24 hours/day 7 days/week	

2

(Continued)

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Environmental Data Products	Digital Data Random Access Broadcast and (TDM)	2400 b/s Equivalency at Terminals Products for Dissemination Broadcast Products for Distribution TDM	5,000 400	U S Wide	24 hours/day 7 days/week	To Approach Equivalent Bit Rate The TDM Rate Must Approach 50-60kb/s Both Presently Met in Terrestrial Facilities Via Conventional Modes

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Criminal Justice	Two way data	State crime related info computer to computer	50	Contramineous U S	100,000 MSG per mo	
Law Enforcement	One way video	Area wide broadcast of visual ID info	EST 500	U S	UNK	All terminal should initiate broadcast to limited addressable areas Present tech use slow Land line CKTS

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Post-secondary Education	audio/video plus interactive involving 3 groups of approx. 7 each	college or university (both public and private)	69 present	1 per institution situated throughout the state	4 hrs. per day 5 days per wk.	Because of heavy continuing education needs, a minimum of 2 hours in the evening would be most important
Post-secondary Education	computer network	linking 32 private colleges & universities to computers-- ½ to Notre Dame ½ to U. of Evansville	34	located statewide	at outset 1 hr per day would undoubtedly grow to a min. of 3 to 4 hrs. in approx 5 yrs.	Both Evansville & Notre Dame can handle the traffic the problem is in networking
Indiana Dept. of Corrections	Teleconferencing	Involves state dept. & 7 prisons	8	Michigan City plus 7 locations in Central Ind.	30 min. transmission 5 days/wk.	Video most input in addition to audio which is now available
Indiana Dept. of Corrections	audio/video	7 state prisons	7	..	2 hrs. per day 5 days per wk.	employee basic training program and portion of AA degree pgm prisoner career educ. pgms to provide continuity to indiv. h.e. courses currently being taught inside the prisons.

VETERANS ADMINISTRATION

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Telecon-sultation	Dual channel color video; two-way audio	VA Hospitals Present Planned (Experiments) Needed	0 30 *	--- One per hospital in Rocky Mountain and West Coast Regions ---	--- 30 hours during 15 months ---	Any and/or all plans for future use of communications satellites by the VA will await conclusion of VA experiments via CTS The information and data obtained from the VA's CTS and ATS-6 experiences will be used as the basis for determining what use will be made of satellites by the VA for biomedical purposes in the future
National Medical Satellite Journal	Same as above	Same as above	Same as above	Same as above	20 minutes per month for 15 months	Same as above
Hospital Management Teleconference	Same as above	Same as above	Same as above	Same as above	10 to 30 hours during 15 months	Same as above
Continuing Education for Professional Certification	Same as above	Same as above	Same as above	Same as above	100 hours during 15 months	Same as above

* Current experiments will determine

VETERANS ADMINISTRATION

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Allied Health Programming	Dual channel color video, two-way audio	Same as above	Same as above	Same as above	20 hours during 15 months	Same as above
Patient Education	Same as above	Same as above	Same as above	Same as above	10 hours during 15 months	Same as above

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	USER TERMINALS: No	USER TERMINALS: Geographical Distribution	Information Volume	Remarks
Earth Resources Data Dissemination Network (ERDDN)	Digital Data Reception	High data rate (6 to 120 Mbps) receive-only terminals at ERDDN Area and User Facilities Present Planned Needed	 0 0 ~ 100	U.S 50 States	Dedicated 6 Mbps Data Channel - could require a 120 Mbps channel later on.	broadcast of preprocessed 30m/7-band digital earth resources data covering the entire 50 states to all users/area centers simultaneously. Users receive all data within 24 hours of sensing. (The 120 Mbps broadcast channel needed if 10m/12-band data is collected.
Water Resource Management	One-way digital data, low rate	Small, unattended data collection platforms Present Planned Needed Central Terminals	 ~ 100 ~1000 ~10,000 ~ 50	State or regional watershed areas throughout U S One central terminal per state.	4-100 bit messages per day per DCP, fixed schedule.	Polled system using forward interrogation link provides added flexibility with considerable added cost.
U S Postal Service	Electronic Mail System One way data system simplex channels	Terminal at each post office or group of post-offices Present Planned Needed	 0 0 100,000	Major cities in USA.	1 Mbps/Post Office continuously 24 hour service	Point-to-point service
Library Reference System	Fast Printout teletype or facsimile. One way data plus one way command	Terminal at each library plus one computer center terminal. Present Planned Needed Computer Terminal	 0 0 20,000 1	Major cities in USA.	.1 to 1 Mbps/library daytime Growth to 24-hr service	Large memory with computer controlled access. Interactive with user possible.

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS: Description	USER TERMINALS: No	USER TERMINALS: Geographical Distribution	Information Volume	Remarks
Continuing Education Medical	One-way audio/video w return audio capability to national center	Terminals in all teaching hospitals Present Planned Needed	 ? ? ?	50 States	120 minutes of transmission, weekly, 52 weeks	Information volume may increase
Continuing Professional Education Veterinary Medicine	One-way audio/video w return audio capability to national center	Terminals in average of 10 regional centers in each of 50 states Present Needed	 0 500	50 States	120 minutes of transmission weekly, 52 wks	Information volume may increase
Continuing Professional Education Elementary-Secondary Ed Personnel	One-way audio/video w return audio capability to national center	Terminals needed in every elementary and secondary public school Present Needed	 0 ?	50 states	120 minutes of transmission weekly, 52 weeks	To provide updated information on laws affecting education and general professional information on regular immediate basis, information volume may increase
Services to Handicapped thru regional and state centers	One-way audio, video and data transfer	At least one terminal for each major organization in each state Present Needed	 0 ?	50 states	? Likely to be at least 10 hours per week, 52 wks of information transfer	Information, modules, data, and special programs (e g , captioned films and tapes) need to be disseminated regularly to schools and centers used by the handicapped

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Public TV National Program Distribution	one way video, multiple voice track transmission	PTV program receive terminals at all stations	300	National	start 16 hrs per day, up to 24hrs	exchange of program materials for local open circuit broadcasts
Point to point Distribution inter-city	2 way video and audio plus 2 way cue circuits	Voice/video receive term.	25	Top 25 market cities.	thirty minutes per day/week	exchange of common concerns and solutions. Commonality of market size, or geographic location.
Regional or topical programs	2 way video/voice 2 way cue	Regional up & down links ground term.	6 up 250 down	Northeast, southeast, midwest, southwest, mountain, pacific, regions	one hour per day	intra-regional interconnection
Live time international program exchanges	2 way video/voice	TV station up and down links	8	U.S.A. Gr. Britain France Italy W. Germany Sweden Russia Japan	one hour per day	global interconnects for program exchange of live time performance or news programs

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
PUBLIC LAND MANAGE-MENT	TWO-WAY VOICE, DATA, ONE-WAY VIDEO	UP TO 20,000 MOBILE-TO-MOBILE IF COST-EFFECTIVE		NATIONWIDE	BETWEEN 10% AND 100% DUTY CYCLE, MOSTLY DAYLIGHT HOURS	UP TO 100% DUTY CYCLE EXPECTED IN SPECIFIC GEOGRAPHIC AREAS
FIRE FIGHTING (EMERGENCY)	SAME	SPECIAL MOBILE TERMINALS	10	WEST OF 100° WEST	PEAK FULL TIME TWO VOICE CHANNEL EQUIVALENTS, BUT SPORADIC	

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Library information retrieval	2 way data 2 way facsimile or slow scan TV	Receive/transmit terminals in major libraries Receive only in smaller libraries	200 - 2000	U S		Volume depends upon growth of library facilities for automated text access
Library bibliographic search	2 way data	Receive/transmit terminals in all libraries	2200	U S		Possibly better handled by switched telephone network during forseeable future
PBS program distribution	1 way color video/audio	Receive terminals at all PBS stations Delay center transmit terminals	170 3	U S	20 hours per day	
PBS program assembly	2 way color video/audio	Regional transmit terminals either portable or connected to major stations by terrestrial microwave	20	U S	6 hours per day	

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Television remote pickup	1 way color video/audio 2 way voice	Receive terminals in major cities transportable transmit terminals	50 150	U S	25 transmissions per day varying length	For live coverage of events outside single hop microwave range from PBS stations
PBS program preview	1 way color video/audio	Receive terminals at all PBS stations Delay center-transmit terminals	170 3	U S	10 hours per day	Additional transponder to PBS program distribution system
Educational consortia program development and teleconferencing	2 way color video/audio	transmit/receive terminals for discussion, and program sharing	400	U S	12 hours per day on one channel at outset	Interconnection of universities, PBS stations and curriculum development organizations for cooperative planning and production
translator service	1 way color video/audio	PBS station transmit terminals Receive terminals at remote translator sites	50 400	Transmit Receive Regional clusters around PBS stations	Continuous programming	Cover remote localities not now covered by PBS stations

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Public Safety	2-way audio slow speed data	Headquarters Law Enforcement vehicles	1	Statewide	Several hundred 30 second Messages per day 7 days/wk	Volume will change with prevailing conditions
Emergency Communications	2-way audio	Telephone office	1	Each city and town	1 min trans as required	Same as above
Weather and crop reporting	1-way audio and video	Voice/video terminal in each county		Statewide	5 min trans 7 days/wk	Freq and length of messages will increase with prevailing conditions
Teleconferencing	2-way video and audio	Terminals in state government offices needed	50	U S 50 States	60 min trans 5 days/wk	Size of remote earth stations may not permit 2-way video

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS						
		USER TERMINALS				
Application	Service Type	Description	No	Geographical Distribution	Information Volume	Remarks
Emergency Medicine	2 Way Voice and Data Transfer	Ambulance Hospital Present Needed	 0 ?	Extreme Rural and Wilderness areas 50 States	Unknown	Need 2 way voice and data transfe for basic and advanced life support
Emergency Medicine & System Control	2 way Voice and Data transfer Video	Hospitals and Remote Clinics Present Needed	 0 ?	Extreme Rural and Wilderness areas 50 States	Unknown	Need 2 way voice and data transfe for system control Video for advanced life support
Emergency Medical Training and skill update	2 way voice, data and video	Hospitals and Remote Clinics Present Needed	 0 ?	Extreme Rural and Wilderness areas 50 States	Unknown	Need 2 way interactive voice, data transfer, and video for training and skill update.

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Emergency Medicine	2 Way Voice and Data Transfer	Ambulance Hospital Present Needed	0 ?	Extreme Rural and Wilderness areas 50 States	Unknown	Need 2 way voice and data transfer for basic and advanced life support
Emergency Medicine & System Control	2 way Voice and Data transfer Video	Hospitals and Remote Clinics Present Needed	0 ?	Extreme Rural and Wilderness areas 50 States	Unknown	Need 2 way voice and data transfer for system control Video for advanced life support
Emergency Medical Training and skill update	2 way voice, data and video	Hospitals and Remote Clinics Present Needed	0 ?	Extreme Rural and Wilderness areas 50 States	Unknown	Need 2 way interactive voice, data transfer, and video for training and skill update

DEAN J SEIBERT, M D
DARTMOUTH MEDICAL SCHOOL
HANOVER, NH 03755

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS

Application	Service Type	USER TERMINALS Description	No	Geographical Distribution	Information Volume	Remarks
Telecontinuing Medical Education	2 way audio and video multiple simultaneous terminals Remote switching capability	Multiple terminals in each institution Remote control capability		Community hospitals or other central community educational location	6 hours a day 5 days/wk	Confidentiality required
Teleconsultations	" + telemetry capability including high fidelity audio	Remote control capability		Community Hospitals	2 hours/day 5 days/wk	Confidentiality required
Telemedicine	"	"		Medical clinic	As required including emergencies	" "
Teleteaching teaching for students	2 way Audio/video Simultaneous terminals	Conf Rm Capability TV Screen & satisfactory audio		Educational institutions		" "

APPENDIX 4

MATERIAL DISTRIBUTED AT WORKSHOP

This appendix contains material distributed to participants when they arrived at the workshop.

PUBLIC SERVICE COMMUNICATIONS USER REQUIREMENTS WORKSHOP

Please review thoroughly the contents of your briefcase prior to breakfast *Monday morning*, particularly the *Arrangements* sheet

All meals will be served at the Tidewater Inn

All participants staying at the Econo Lodge will be furnished transportation each morning at 7 40 - 8 00 and at the end of each day

When leaving the Workshop, checkout at the Tidewater Inn -- *if you have* accommodations at the Econo Lodge, leave room key with registration desk at the Econo Lodge and return to the Tidewater Inn for Workshop checkout

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PUBLIC SERVICE COMMUNICATIONS SATELLITE USER REQUIREMENTS WORKSHOP

ARRANGEMENTS

October 17, 1976 Sunday - 8 30 p m	Dinner--Hotel dining room (including in American Plan) Social at pool-side, cash bar
Sessions	All sessions (group and individual panels) will be held in the Gold Room in accordance with the Program Schedule mailed to you.
Meals	All meals will be served in the Crystal Room (except Tuesday, lunch in the Blue Room). Breakfast will start promptly at 9·00 a.m.
Menu	You will be requested to fill in the Menu Schedule for each meal, and give it to a staff member either during breakfast Monday morning or prior to the first session in the Gold Room Retain one copy for yourself so you know what you ordered. When entering the dining room for lunch and dinner, you will pick up either a white chip or red chip depending upon whether you selected an item in the Suggestion or Alternative column. You will give this chip to the waiter when he brings you the main course.
Administrative Services	All administrative services (typing, reproduction, message center, travel arrangements, etc) are available from 8 30 a.m. to 5 30 p m. in the Reception Room adjacent to the Gold Room.
Hotel Accommodations	Your room has been reserved per your travel form which you submitted to Dr E Wolff. Accommodations have been made under an American Plan
Expenses	(3 meals) Each attendee (government as well as non-government) requiring a room will receive a bill when checking out, of $30 a day plus telephone calls. All mileage will be reimbursed at the rate of $0.12/mile. In order that all expenses may be reimbursed, receipts must accompany expense voucher

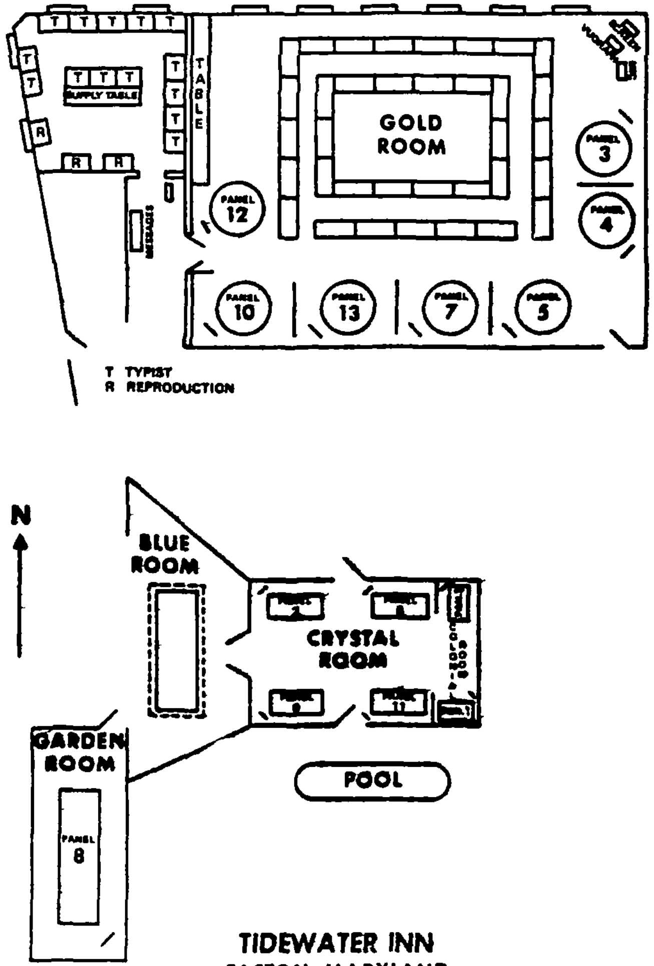
ARRANGEMENTS (Cont'd)

Dress
Informaal attire is encouraged The hotel only requires that you are not barefoot

Hotel Checkout Procedures
All participants are expected to check out by 1 00 p m on the day of departure Please make other departure arrangements at the hotel desk

Payment can be by check, cash, or billed to home addresses

NO CREDIT CARDS ACCEPTED DUE TO SPECIAL RATES



TIDEWATER INN
EASTON, MARYLAND

PUBLIC SERVICE COMMUNICATIONS SATELLITE USER REQUIREMENTS WORKSHOP ORGANIZATION

Arrangements Herbert Majower

PANELS

1 COMMERCIAL SERVICES Chairman Donald Jansky Secretary Joseph Sivo	John Boning, Charles Breig, Hal Braham, Eugene Cacciamani, Richard Davies, Joseph Freitag, Roger Herbstreit, Dick Jones, Jeffrey Kurland, Howard Lefkowitz, Ronald McCabe, Neal Pike, Stanley Rzewnicki, Harry Vantrees
2. DATA AND MESSAGE SERVICES Chairman Norman Abramson Secretary Charles Cote	Dorothy Deringer, Eugene Feinberg, John Ferretti, Donald Grace, Joseph Hull, Gordon Law, Ralph Marcotta, Andrew Vitarbi
3 ELEMENTARY AND SECONDARY EDUCATION Chairman Harold Wigren Secretary John Kiebler	Alice Beckman, Brian Brightly, Pierre DuMaine, Donald Gray, Patricia Ho, Rose Mukerji
4 EXTENSION AND CONTINUING EDUCATION Chairman Martin Chamberlain Secretary J Earle Painter	Kevin Arundel, George Christensen, Marlowe Froke, Virginia Gentle, Harold Morse, Frank Norwood, Kenneth Polycn, Nathan Shoehalter
5. ENVIRONMENTAL COMMUNICATIONS Chairman Arthur Cooke Secretary Enrico Mercanti	Robert Bernier, Walter Duncan, Walter Hogge, James Jenkins, Barry Kerne, Joseph Schiesl, Clifford Spohn
6 LIBRARY SERVICES Chairman Ruth Katz Secretary Sajjad Durrani	Paul Andereck, Edward Blackhurst, Allan Deshcere, Priscilla Gotsick, Steven Herman, Albert Horley, Mary Huffer
7. MEDICAL EDUCATION Chairman Charles Heck Secretary William Conant	Mary Becker, Richard Berglund, Robert Bird, Frank Douglas, Elmer Friman, Leo Leveridge, Emanuel Suter
8. MEDICAL SERVICES Chairman Ralph Christenson Secretary Walter Sullivan	David Boyd, Leon Greenhouse, Arthur Griffith, Howard Hupe, James Justice, Edward Nehman, M Roy Schwarz, Robert Shamaskin, Dean Siebert, Jon Wempner
9 PUBLIC BROADCASTING Chairman Donald Quayle Secretary John Miller	William Harley, Robert Hillard, Bernard Luskin, F Lee Morris, Richard Oldham, George Selz, Sidney Tishler, Ronald Wilson
10 PUBLIC SAFETY Chairman S S Ashton Secretary Jan Turkiewicz	George Allen, Gerald Carp, Helen Clearwater, Alva Cooper, Donald Kavanagh, Lois McCoy, Keith Monroe, William Morton
11 RELIGIOUS APPLICATIONS Chairman William Fore Secretary Joseph Corrigan	James Alexander, George Byrne, Charles Hamilton, Bill Huie, Richard Jameson, Douglas Millar, Paul Stevens, Lawson Wynne
12. STATE & LOCAL COMMUNICATIONS Chairman Robert Walp Secretary James Brown	Claude Buster, Gianpiero Farchina, Gary Fereno, Joel Fleming, Donald Hinson, Ted Reams, Mason Riegel, Jane Richards, Marvin Rimerman, Elizabeth Young
13 VOLUNTARY & SOCIAL SERVICES Chairman Burt Cowlan Secretary John Woodruff	Gertrude Barnstone, Warren Braren, Andrew Horowitz, Annie King Phillips, Martin Rogol, John Schwartz, Charmaine Wisecarver

UNASSIGNED

Jona Cohn, Robert Dressler, Samuel Fordyce, Jerome Freibaum, Joel Greenberg, Gary Hess, Wasyl Lew, Lorrain Lucki, James Michalak, Bernard Miller, James Potter, William Radisch, Freidrich Vonbun, John Witherspoon, Edward Wolff

Name	Affiliations
Abramson, Norman (Dr)	ALOHA Institute
Alexander, James E	United Methodist Board Discipleship
Allen, George (Dr)	Regional Educational Services Agency
Andereck, Paul (Dr)	U S Office of Education
Arundel, Kevin	National Institute of Education
Ashton, S S	LEAA
Barnstone, Gertrude	Member of the Board, KPFT
Becker, Mary B (MD)	Self
Beckman, Alice	Appalachian Educational Satellite Project
Berglund, Richard (MD)	Hershey Medical Center
Bernier, Robert	COMSAT General Corporation
Bird, Robert M (MD)	National Library of Medicine
Blackhurst, Edward (Dr)	Appalachian Educational Satellite Project
Boning, John	RCA American
Boyd, David R (MD)	Division of Emergency Medical, HEW
Braham, Hal	General Electric
Braren, Warren	Consumers Union
Breig, Charles	Federal Communication Commission
Brightly, Brian	Corporation for Public Broadcasting
Brown, James P	GSFC/NASA
Buster, Claude	Rural Electrification Administration
Byrne, George (Fr)	U S Catholic Conference
Cacciamani, Eugene	American Satellite Corporation
Carp, Gerald	DEA
Chamberlain, Martin (Dr)	University of California, San Diego
Christensen, George (Dr)	Iowa State University
Christenson, Ralph P (MD)	Self
Clearwater, Helen	American Red Cross
Cohn, Jona	Motorola Inc
Cooke, Arthur R.	NOAA
Conant, William W	GSFC/NASA
Cooper, Alva S	Department of California Highway Patrol
Corrigan, Joseph P	GSFC/NASA
Cote, Charles E	GSFC/NASA
Cowlan, Burt	AID - Consultant
Davies, Richard S	Aeronautic Ford
Deringer, Dorothy (Dr)	National Science Foundation
Deschere, Allan (Dr)	Library of Congress
Douglas, Frank	Operations Research, Inc.
Dressler, Robert (Dr)	GSFC/NASA
DuMaine, Pierre (Msgr)	Archdiocese of San Francisco
Duncan Walter W	Office of Chief of Engineers
Durrani, Sajjad	GSFC/NASA
Farchina, Gianpiero	COMSAT General Corporation
Feinberg, Eugene J	Operations Research, Inc.
Fereno, Gary	Operations Research, Inc
Ferretti, John	Miami - Dade Community College
Fleming, Joel B	Virginia Public Telecommunications Council
Fordyce, Samuel N	NASA Headquarters
Fore, William (Dr)	National Council of Churches of Christ
Freibaum, Jerome	NASA Headquarters

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Freitag, Joseph	COMSAT-General Corporation
Friman, Elmer	Indiana University Medical Educational Resources Program
Froke, Marlowe	Pennsylvania State University
Gentle, Virginia	Miami - Dade College
Gotsick, Priscilla	Self
Grace, Donald J (Dr)	Georgia Institute of Technology
Gray, Donald I	Fairbanks Teachers Education Association
Greenberg, Joel S	ECON Incorporated
Greenhouse, Leon	Operations Research, Inc
Griffith, Arthur	HEW
Hamilton, Charles	Christain Church Disciplines of Christ
Harley, William G	NAEB
Heck, Charles V (MD)	American Academy of Orthopeadic Surgeons
Herbstreit, Roger	Office of the Chief Engineers, FCC
Herman, Steven	Library of Congress
Hess, Gary (Dr)	Motorola, Inc
Hillard, Robert (Dr)	Education Broadcasting, FCC
Hinson, Donald	South Carolina Appalachian Council of Governments
Ho, Patricia	Hawaii State Teachers Association
Hogge, Walter	NOAA
Horley, Albert L	Self
Horowitz, Andrew	The Public Interest Satellite Association
Huffer, Mary (Dr)	Department of Interior Library
Huie, Bill	Presbyterian Church of the United States
Hull, Joseph A	ITS - Department of Commerce
Hupe, Howard	Director of Telecommunications Policy, HEW
Jameson, Richard	Council-of Christian Communications
Jansky, Donald M	Office of Telecommunications Policy
Jenkins, James R	Office of Telecommunications Policy
Jones, Dick	Hughes Aircraft Company
Justice, James V (MD)	Indian Health Service
Katz, Ruth (Dr)	University of Denver
Kavanagh, Donald D	APCO
Kerne, Barry	Operations Research, Inc
Kiebler, John W	GSFC/NASA
Kurland, Jeffrey R	Western Union
Law, Gordon	Self
Lefkowitz, Howard	Operations Research, Inc
Leveridge, Leo L (MD)	American Medical Association
Lew, Wasyl M	NASA Headquarters
Lucki, Lorrain	ECON Incorporated
Luskin, Bernard J (Dr)	Coast Line Community College
Majower, Herbert	Operations Research, Inc
Marcotte, Ralph P	U S. Postal Service
McCabe, Ronald W	Satellite Business Systems
McCoy, Lois	National Association for Search and Rescue, Inc
Mercanti, Enrico	NASA/GSFC
Michalak, James	Motorola, Inc
Millar, Douglas (Rev)	Self

Miller, Bernard P	ECON Incorporated
Miller, John E	GSFC/NASA
Monroe, Keith L	International Association of Chiefs of Police
Morris, F Lee	Mississippi Authority for ETV
Morse, Harold E (Dr)	Appalachian Regional Commission
Morton, William B	Agricultural Research Service
Mukerji, Rose (Dr)	Self
Nehman, Edward	MITRE Corporation
Norwood, Frank W	JCET
Oldham, Richard C	KCTS - TV - University of Washington
Painter, J Earle	GSFC/NASA
Phillips, Annie King	National Association of Neighborhood Health Centers
Pike, Neal	FCC
Polycn, Kenneth A (Dr)	PRC, Information Sciences Company
Potter, James G	PSFC
Quayle, Donald R	Corporation for Public Broadcasting
Reams, Elwood H	Office of Emergency Service
Redisch, William N (Dr)	GSFC/NASA
Richards, Jane G (Dr)	Indianna Higher Education Telecommunications System
Riegel, Mason D	Department of General Services
Rimerman, Marvin H (Dr)	Mayor's Office of Telecommunications - Operations Center
Rogol, Martin	National PIRG
Rzewnicki, Stanley E	ATT - Long Line Department
Schiesl, Joseph W	National Weather Service
Schwartz, John	National Federation of Community of Broadcasters
Schwarz, M Roy (MD)	University of Washington School of Medicine
Seibert, Dean (MD)	Dartmouth Medical School
Selz, George	Operations Research, Inc.
Shamaskin, Robert	Veterans Administration - Department of Medicine and Surgery
Shoehalter, Nathan	Rutgers University
Sivo, Joseph N	Lewis Research Center/NASA
Spohn, Clifford A (Dr)	National Environment Satellite Service
Stevens, Paul M (Dr)	Southern Baptist Radio - TV Commission
Sullivan, Walter B	GSFC/NASA
Suter, Emanuel (MD)	Association of American Medical Colleges
Tishler, Sidney	Maryland Center for Public Broadcasting
Turkiewicz, Jan M	GSFC/NASA
Vantrees, Harry (Dr)	COMSAT Corporation
Viterbi, Andrew (Dr)	Linkibit
Vonbun, Freidrich (Dr)	GSFC/NASA
Walp, Robert M.	Office of Telecommunications - State of Alaska
Wempner, Jon D (MD)	Lake View Clinic
Wigren, Harold E (Dr)	National Education Association
Wilson, Ronald L	EOET
Wisecarver, Charmaine	South Dakota Indian Education Association

Witherspoon, John P	Public Service Satellite Consortium
Wolff, Edward A (Dr)	GSFC/NASA
Woodruff, John	GSFC/NASA
Wynne, Lawson P (Col)	International Christian Broadcasters Association
Young, Elizabeth L (Dr)	The Ohio State University

Assistant Workshop Coordinator

Meadows, Marsha	Operations Research, Inc

Secretary

Soppa, Linda	Operations Research, Inc

Typist

Bogan, Bill
Camber, Pearl
Eldridge, Luella
Griffin, Edith
Lohr, Alice
McInereney, Loretta
Maher, Lois
Morris, Barbara
Reezes, Maryln
Searle, Susan
Weinberg, Minna
Wyatt, Diane

ALASKA ATS-6

HEALTH/EDUCATION TELECOMMUNICATIONS

EXPERIMENT

ALASKA EDUCATION EXPERIMENT

FINAL REPORT

EXECUTIVE SUMMARY

September 30 1975

I INTRODUCTION

Alaska is a state of extremes Fewer than 350,000 people live in 265 communities scattered throughout Alaska's 586 400 square miles Most of these communities are small and rural, forty percent have populations of less than 1 000 Most of the smaller villages in Alaska are also remote, two-thirds are not on any connecting highway system In these isolated areas transportation is limited to air or water travel In the 45 villages without airstrips transportation is even more limited when fall freezeup and spring breakup prevent either float or ski-planes from landing on rivers

Alaska has the most extreme climate of any state in the United States, ranging from southeastern rain forest to desolate Arctic tundra One-third of the state is north of the Arctic Circle, and winter temperatures can be quite extreme

Adding to the isolation of the state's rural areas is Alaska's poor communications system HF radio provides the only communications link in many villages but changing atmospheric conditions make this network unreliable Telephone service is provided to some rural communities, with much variation in both type cost and quality of service Circuits are typically overcrowded, especially in smaller villages having only one telephone for all to share

AM and FM radio exist primarily in Alaska's larger cities The six public broadcasting facilities in the state serve 16% of the population The commercial public military and cable television distribution systems provide service to Alaska's urban areas Virtually all programming on all systems is video-taped or filmed and played back on a one-week or more delayed basis

A4-7

The cultural diversity in Alaska is also extreme Eskimos Aleuts and Indians (Athabaskan Thlinget Haida and Tsimshian) together comprise 17% of the total state population Three-fourths of these Native Alaskans live in approximately 175 small rural villages with 25 or more residents Numerous traditional languages are still spoken in many villages and those who speak one language or dialect cannot always readily understand those who speak another

Life in Alaska's villages can be hard Year-round jobs are scarce, incomes are very low and the cost of living is high Many still rely on food-gathering for subsistence It is in these small isolated communities that the most serious problems of education and health persist

Health care is a major problem in Alaska's rural areas Medical service in most villages is limited to local health aides, working under the direction of a physician from a regional hospital often quite distant from the individual village

Educational problems in remote areas of Alaska are also severe Primarily non-Native, English-speaking teachers provide schooling through the sixth grade in most villages To continue their education village students are required to attend regional boarding schools or move to a larger, more urban community Many students have almost no frame of reference outside of village life, and find it difficult at best to adjust to more complex urban living

A wide variety of recent studies have agreed in concluding that a satellite communications system could ideally apply to the comples problems of rural Alaska's isolation The State of Alaska has seen the ATS-6 satellite experiment as a prime opportunity to explore increased health and educational communications This experiment provided the state with its first opportunity for utilizing a prototype operational satellite communications system for the transmission of television and multiple voice channels to low-cost earth stations in rural Alaska

The sites selected as earth terminals provided the HET experiment with a cross-section of characteristically rural Alaskan problems Only five are on any existing highway system Travel to the remaining thirteen is primarily by air or water, weather permitting

Five of the 10 Athabaskan languages were represented in the satellite footprint as well as Central Yupik Eskimo Five communities in the footprint have substantial Thlinget-speaking populations Some English is spoken with varying degrees of proficiency in all the villages included Fourteen of the 18 experiment communities could be classed as rural villages with an average population of less than 250

Clearly the challenge of the ATS-6 HET experiment was a unique one This demonstration served as a model for services which might be made available on an economically feasible basis in the future and explored the use of advanced communications systems to lessen the negative aspects of living in isolated rural villages of Alaska

II OBJECTIVES

The ATS-6 HET experiment provided a unique opportunity for the State of Alaska to achieve its objective of gaining from experience the knowledge necessary to make precedent-setting planning decisions on the development operation and programming of a future statewide operational satellite system

The State of Alaska's specific objectives for the ATS-6 HET Alaska Education (ALED) experiment were

1 To install and operate an experimental satellite system to give the state technical experience from which to plan future statewide satellite communications system

2 To provide educators in the state with experience in the development and production of program materials designed to meet the educational needs of rural Alaska

3 To involve users in all phases of relevant program content selection and development

The state's objective was not to determine if a satellite could be useful, but how to most effectively use it Although it was technically possible prior to this experiment to design satellite-based systems to improve communications in Alaska a better understanding of likely utilization acceptance and operation requirements was needed before making any statewide investment of the magnitude required

This experiment allowed the state to gain specific technical experience with the operation and maintenance of earth terminals as well as technical satellite interface The satellite footprint in Alaska provided an identifiable rural target population for innovative programming experimentation based on identifiable educational needs

The selection scheduling and production of programming provided experience in the process of specified educational program development and the data necessary for determining program requirements and costs

Alaska's primary interest was not in precisely measuring the instructional efficiency of various programming and dissemination techniques Rather the state was exploring effective ways of utilizing the technological resource at hand

An effective telecommunications system must allow users to generate service requirements and users must have experience with a system before they can accurately define how it can best meet their needs A consistent objective of this experiment was to provide users with experience in use of a satellite system as well as with the means to express their own priorities among the variety of applications to be made of a telecommunications satellite system for rural Alaska

By directly involving users as active participants in this experiment development interactive real-time communications led to exploration of techniques valuable in reducing the isolation of remote Alaskan communities The ALED experiment provided Alaska with an opportunity to test these user-suggested techniques on an experimental basis This allowed modification of programming for improved effectiveness which in turn stimulated acceptance by involved users and helped determine the suitability of various operational techniques potential user demand and operating costs

XI RECOMMENDATIONS

SYSTEM DESIGN

Based on the state's experience with the ATS-6 satellite system, it is recommended that the Alaska Governor's Office of Telecommunications be represented during the system specification phase of any future satellite operational system design

- The GOT based on its experimental use of ATS-6 recommends that increased usefulness would be provided if future satellite systems included at least the following technical capabilities

1 Two video channels with four high quality phase-related audio channels, each with uplink frequencies useable in Alaska

2 As many single channel per carrier voice channels as possible, to work between low-cost earth terminals At least one of the audio channels should be designated solely for system control and coordination

3 Ability to work with low-cost (10-foot) earth terminals capable of receiving either or both of two television channels and of transmitting and receiving voice on either/any of two or more channels

4 A footprint giving full coverage of the state

5 Full-time satellite availability for service including eclipse protection

SYSTEM OPERATION

For future satellite communications systems the satellite technical control center, particularly if located outside Alaska should have a direct means of communication with a network control center located in Alaska In addition the Alaska network control center should be provided with equipment and personnel necessary to carry out technical and operational monitoring of the system

SITE SELECTION

Future site selection should include Native regional corporation recommendations and should directly allow all potential sites to make their own decision of whether they wish to participate or not Since the potential impact of such a system on village life could be quite substantial all state planning should incorporate a means of villages to consciously and clearly choose to participate

INSTALLATION

1 Site surveys should be conducted at all terminal locations well ahead of actual installation and final site selection to assess the best possible antenna and receive equipment locations

2 Equipment procurement for future systems should be performed with maximum lead time possible to allow efficient on-schedule installation accomplishment

3 Close coordination with both local school authorities and village councils is vital to insure the most practical and useful placement of viewing monitors It is recommended that a minimum of two monitors be placed in each village one in the community hall and one in an appropriate school classroom Maximum use of educational programming could be made with placement of monitors in every classroom

4 Installation planning must flexibly accommodate to the variable weather conditions in Alaska as well as the accessibility of each individual location

5 Future communications networks in the state should plan to provide a minimum of 10% additional complete electronics components as replacement spares

6 In future state networks the satellite should be available for system testing as each terminal is installed with satellite ground support fully operational as well

UTILIZATION AND USER INVOLVEMENT

1 For future state satellite programming efforts the GOT strongly recommends continued utilization of the consumer committee concept to directly involve village users in program design and planning The committees should remain active throughout the production phase of any future project

2 Paid trained and supervised utilization aides at each terminal location should be a continuing component of all future communication networks in the state

3 Two-way audio interaction should remain an option of future systems

4 Village participant selection should be coordinated through village councils or Native regional corporations

5 In coordinating with Native regional corporations it is recommended that requests be made for counselors or trainers people that work at the "grass roots level " to act as corporation representatives

6 Maximum use of all fixed-time educational broadcasts could be made by rural teachers if VTR equipment was available at all sites for recording programs

7 Program scheduling should allow repeat program broadcasts if more than one hour difference in time zones exists among receiving sites

8 With well-trained and informed utilization aides and teachers in each receiving site the utilization of a future satellite network could provide a cost-effective means for providing a wide variety of state agency training programs directly to Alaskan rural residents

PROGRAMMING

1 To acquire needed expertise in instructional media presentation, it is recommended that educational program design for future broadcast systems be performed by an experienced educational planning agency under contract to project management

2 Design of educational programming should also involve close and consistent coordination with the rural educators who will be receiving the programs

3 Prior to program broadcast start a clearly outlined plan of field testing viewer reactions to all programs should be implemented

4 Programming that offers simultaneous Native translations during broadcast should be utilized in future systems, providing translations of all program material not only segments

5 Future program planning should be approached imaginatively and not be limited to the standard concepts of television program presentation

PROJECT MANAGEMENT

1 GOT strongly recommends that future satellite program funding be finalized for all programs a minimum of six months prior to broadcast start and that all commitments with funding agencies be made in writing at all times

2 Management of future program development should include frequent coordination meetings between program designers scriptwriters and producers particularly during development and initial production phases

3 To facilitate program development producers should be funded for coordination input with designers at the start of program design For adequate preparation time prior to production, the production contract should be finalized a minimum of

nine months (preferably 12) prior to scheduled broadcast start

4 Production of programs for future systems should include technical training for Alaska Natives

5 Coordination of the utilization of educational programming should be established between future project management and a central state education agency (such as the Alaska DOE or ASOSS)

6 An active and consistent public information effort is essential to encourage user participation in any future satellite communications network

7 Management for future satellite programming systems throughout Alaska should include a communications advisory board consisting of Native leaders educators from DOE ASOSS and BIA

8 Evaluation efforts for subsequent projects should approach with care the selection of personnel involved in village visits and evaluation of village reactions

XII SUMMARY

The ATS-6 ALED project was a unique experiment--a first opportunity for the State of Alaska to gain the experience of operating a satellite programming network The experiment provided a first-hand demonstration of the practicality of media technology in meeting the communications needs imposed by Alaska's rugged terrain harsh climate and sparse population

The experiment was a model for gauging the appropriateness of using satellite communications for instructional purposes and for developing programming content specifically designed to be relevant to the needs of rural Alaskan residents both student and adult It further demonstrated the potential importance of satellite television programming in supplementing and supporting the instructional resources of Alaska's rural classroom teachers

As a result of this experiment GOT gained experience in a wide variety of areas directly relevant to the planning of a future statewide operational satellite network

Earth terminal equipment was installed by GOT in 19 widely scattered communities throughout the state Over 1 000 miles separates the northernmost experiment site Allakaket with Craig the southernmost community in the ALED footprint The problems encountered in installation due to the isolation of site communities, limited transportation and variable weather conditions provided valuable input for future communication systems installation planning None of the 25 S-band antennas in use failed during the project despite weather conditions and none were damaged Temperatures to -60 degrees F did not impair receive terminal operation and only one equipment failure was directly attributable to colder weather Antenna installation in several communities

required special preparation due to ground conditions and winter snow accumulation

Fourteen terminal sites were rural Alaskan villages with an average population of less than 250 Alaska's ATS-6 ALED footprint included villages with substantial populations speaking in addition to English Central Yupik Eskimo Thlinget and five Athabaskan dialects The experiment presented GOT with the challenge of coordinating input from the culturally diverse footprint population in designing and producing culturally relevant programming All community participants were selected by their own communities or one of the four Native regional corporations represented within the footprint Utilization of ALED programming was further coordinated with local schools and village councils as well as through the 15 aides hired and trained in the operation of all site terminal equipment

This experiment also involved GOT in coordinated working relationships with other state agencies in developing programs for distribution over ATS-6 Instructional programming subject areas were based on the Alaska Department of Education's priority of needs for Alaska rural children and the Department of Education provided continuing input throughout the project Experiments of Opportunity program development directly involved the Alaska Department of Community and Regional Affairs the Alaska State Library and the Alaska Department of Fish and Game

Instructional Programming design was accomplished for GOT by a contracted professional educational design agency with continuing guidance from two 10-member committees of Alaskan program consumers All programs were produced for GOT by an Alaskan professional television production facility

In less than one full year of planning 100 hours of original television programmi were designed and production and broadcast began Instructional programs were available to 1200 rural school children (K-5th grade) and 150 rural Alaskan educators Viewer-Defined Programming was accessible to 9 000 Alaskan village residents young and old as well as to the 50 000 urban residents of Fairbanks

The ALED project gave GOT a first-time experience in the operation of an interactive satellite communication system providing an innovative and direct means of viewer feedback Another unique feature of the project was the experimentation with simultaneous broadcasts in English and two Alaskan Native languages

The technical interface required with NASA and NCC provided GOT with useful experience in the day-to-day coordination and scheduling of real-time satellite broadcasting The operation of the system resulted in specific technical recommendations for future system equipment design and capabilities

The ATS-6 ALED experiment was a model learning experience for the state Both the successes and the mistakes of this experiment were valuable to the continued sophistication of Alaska's development of the most practical useful and effective future operational satellite system for the state

A full external evaluation of this project is being prepared for NIE by Practical Concepts Inc with assistance from the Center for Northern Educational Research In GOT's view one of the most important aspects of this experiment has been the consumer input and reaction during all phases of development In spite of difficulties encountered and the short time span of this project site participants have expressed the hope that the project could continue and expand

In behalf of the school board we would like another ATS-6 project

to continue next year The school children really enjoy the program and they also like to communicate on the satellite

--School Board Chairman Nikolai

I'm going out to get some signatures on a petition that we keep ATS-6 in McGrath next year

--Utilization Aide McGrath

The satellite TV reaches many in a way that radio and regular TV could not and we of Valdez are glad that we are part of the whole program

--Utilization Aide Valdez

We sure would like to have another ATS-6 project next year The school children have more interest in school now They look forward to watching TV They really enjoy it and it's very educational

--Village council President Nikolai

It has been very rewarding to see the very positive and beneficial results (of the Health Education series) If extended and expanded (the ATS-6 project could) change the educational face of Alaska and broaden the educational concepts of the entire nation I feel confident this concern is shared by the teachers and students of rural Alaska as well

--Chairman Health Education consumer committee

The potentials for satellite communications in Alaska are beginning to be discovered by planners and users alike

TELEMEDICINE IN ALASKA
THE ATS-6 SATELLITE BIOMEDICAL DEMONSTRATION

Final Report of the Evaluation of
the ATS-6 Biomedical Demonstration in Alaska

by

Dennis Foote, Edwin Parker, and Heather Hudson

Sponsored by the Lister Hill National Center for Biomedical
Communication, National Library of Medicine

Contract NO1-LM-3-4734

A4-14

Edwin B Parker and William C Fowkes
Principal Investigators

Institute for Communication Research
Stanford University
February 1976

EXECUTIVE SUMMARY

This document summarizes the final report of the evaluation of the Applications Technology Satellite-Six (ATS-6) Biomedical Demonstration in Alaska, one of several Health-Education-Telecommunications (HET) demonstrations on that satellite sponsored by the U S Department of Health, Education and Welfare. The biomedical demonstration in Alaska was jointly sponsored by the Indian Health Service and the Lister Hill National Center for Biomedical Communication The evaluation was conducted by the Institute for Communication Research at Stanford University, under contract to the Lister Hill Center

The primary purpose of the demonstration project was to explore the potential of satellite video consultation to improve the quality of rural health care in Alaska. As part of the project, a centralized, computer-based, problem-oriented medical record system was introduced The demonstration was conducted in the Tanana Service Unit of the Alaska Area Native Health Service.

Satellite ground stations permitting both transmission and reception of black and white television were installed at four locations in the Tanana Service Unit -- Fairbanks, Fort Yukon, Galena, and Tanana. Receive-only television capability was installed at the Alaska Native Medical Center in Anchorage All five sites had two-way audio capability The Fairbanks Native Clinic did not participate in the demonstration because of staff shortages at the clinic and because specialist consultants were available in Fairbanks, making teleconsultation capability less relevant to the needs of Fairbank patients

Two of the locations were in communities without a resident physician — Fort Yukon and Galena In most of the consultations, patients at these two remote sites were seen by physicians at the Service Unit Hospital at Tanana or by medical specialists in

Anchorage In some consultations, patients at the Tanana Hospital were seen by specialists in Anchorage Simultaneous two-way video capability was not available, although the one-way video could be switched to permit transmission from any site except Anchorage Transmission from the hospital to the remote clinics was used primarily for educational programs.

The results of this evaluation should be interpreted in context The demonstration was an exploratory field trial, not a rigorous experiment A relatively small patient population was served and the communities involved are not completely typical of other settings, even in Alaska. The availability of the satellite limited the demonstration to a fixed schedule of three hours per week for a period of nine months There were concurrent changes in the health care system and the social environment that might distort or obscure the effects of the video consultation service. These constraints complicated the conduct of the demonstration and its evaluation, they should also guide interpretation of the results Despite the limitations, much valuable information about the difficulties and advantages of video teleconsultation and its possible implementation in Alaska was gained. Introduction of the telemedicine service into the realistic setting of an on-going health care delivery system in Alaska permitted valuable experience to be gained that would not have been possible in a more tightly controlled experiment in a different setting

CONCLUSIONS

1. Satellite communication using small ground stations for audio and black and white television transmission can reliably provide signals of sufficient quality to be useful in the health care delivery system in rural Alaska

The quality of signal obtained in this demonstration was suitable for the great majority of medical cases encountered The basic satellite equipment, while complex, is not too sensitive for

operational use by non-technicians even under demanding environmental conditions, provided that adequate arrangements are made for technical maintenance and repair Equipment down-time in this demonstration was primarily due to the length of time taken to diagnose and repair equipment problems rather than to persistent malfunctions In an operational setting the larger scale, greater experience, and unambiguous locus of responsibility for maintenance would avoid some of the equipment problems that occurred in this limited-duration small-scale first-time demonstration

2 Useful consultations for practically any medical problem can be conducted using satellite video channels

During 104 scheduled transmission days, approximately 325 video consultations were conducted The range of diagnoses was very wide and included "sensitive" health problems such as genital-urinary problems that one might expect to be omitted from video consultations The patients came from every age bracket and practically every community in the Tanana Service Unit More than 75% of the cases occurred in five categories follow-up visits, accidents, musculoskeletal problems, skin problems, and infective or parasitic diseases The system was also used for transmission of X-rays and EKGs from remote sites and for transmission of educational material from the Tanana Hospital. Most of the consultations were for evaluation of minor problems, but 13% were judged "moderately severe" by the physicians. Relatively few critical or emergency cases were involved, probably because emergencies cannot wait for scheduled transmission times A system with 24-hour-a-day, seven-day-a-week capability would be likely to have a different pattern of use.

3 Satellite video consultation can be successfully carried out by health care providers at all levels of training

Village health aides from Galena, Huslia, Nulato, and Venetie were able to present their patients without difficulty over ATS-6 from Fort Yukon and Galena. A medex and nurses also used the system for successful consultations with primary care physicians in Tanana and medical specialists in Anchorage Physicians in Tanana made use of the system to present patients to Anchorage for specialist consultation

> 4 The unique capabilities of the video transmission may play a critical role in five to ten percent of the cases selected for video presentation Otherwise, there was little measurable difference between the effect of video and audio consultation

Cases selected for television were slightly more complex or severe than those discussed over audio channels The kinds of cases that are difficult to handle over video are also difficult to handle with audio-only consults. Video consultations took longer (12 to 15 minutes) than audio consultations (3 to 6 minutes) The initial diagnosis is changed by the consulting physician after the video consult more often than following audio consults, but this difference appears to result solely from fewer "routine" cases being presented for video consultation. The level of change in management plan is the same for video as for audio consultations

The consultant physicians recorded their best judgment of the probable effect that each consultation would have on the medical outcome for the patient These ratings indicate that about half of all the consultations via any medium should have a more than symptomatic effect on the medical outcome for the patient However, these ratings show no difference between telephone, satellite audio, and satellite video consultations on the patient's expected eventual health status A physician observer judged that the visual information may play a critical role in about five percent to ten percent of the cases selected for video consultation

> 5 The health care providers involved in the demonstration generally felt that the video consultations improved the capabilities of the health care system, but questioned whether the improvement was worth the additional cost or inconvenience They placed much stronger emphasis on implementation of reliable operational audio channels which they consider absolutely essential to delivery of health care in rural Alaska

The health care providers felt that the benefits of reliable voice communication compared to the previous absence of any reliable communication were so great that the additional benefits of video appeared small by comparison Most communities in the Tanana Service Unit have neither roads nor telephones, their only reliable means of communication is the experimental ATS-1 satellite, which is long past its life expectancy and is without a back-up in the event of failure Termination of that capability through technical failure or administrative decision would be a major set-back for health care delivery in the Tanana region. (At the outset of the demonstration, some of the native leaders were reluctant to have their communities involved in a nine-month demonstration that provided little possibility of continued service They agreed to support the ATS-6 demonstration in part because it would continue to focus attention on the need for reliable voice communication)

> 6 The Health Information System (HIS) was judged by all participants in the demonstration to be a valuable addition to the health care delivery system that should be continued in the Tanana Service Unit and extended to other parts of the State

The computerized problem-oriented medical record system with revised medical forms and paper and microfiche output was universally judged to be a significant improvement in the quality of health care delivery in the Tanana Service Unit

The providers saw the format and structure provided by the input forms, the organization of the patient summaries, and the availability of records from other locations as major advantages of the new system. They felt that bi-weekly updates of their copies of patient summaries were sufficiently frequent for most outpatient care.

RECOMMENDATIONS

The full report concludes with a chapter titled, "Implications for Operational Service and Future Research." It reports technical possibilities and cost estimates for possible future operational systems, so that policy makers can review for themselves both the potential benefits and the probable costs of possible next steps. The most promising areas for further research are also discussed. In the light of these technical, cost, and research considerations, nine major and fourteen minor recommendations are made in that chapter.

The nine major recommendations are:

Recommendation 1. The Indian Health Service should continue to assign top priority to implementing reliable operational voice communication reaching all communities in Alaska.

Recommendation 2. The Health Information System (HIS) should be maintained on a permanent basis in the Tanana Service Unit and should be expanded as rapidly as possible to the rest of Alaska.

Recommendation 3: The Indian Health Service should begin field tests of slow-scan video, medical telemetry, facsimile, and data transmission techniques using voice grade (narrow-band) channels.

Recommendation 4. Because operational two-way motion video services throughout Alaska are currently neither technically nor economically feasible, such service should not be considered by the Indian Health Service at this time. Information useful for planning possible future services could be obtained from an experimental video linkage permitting medical specialists at Anchorage to view patients at Bethel.

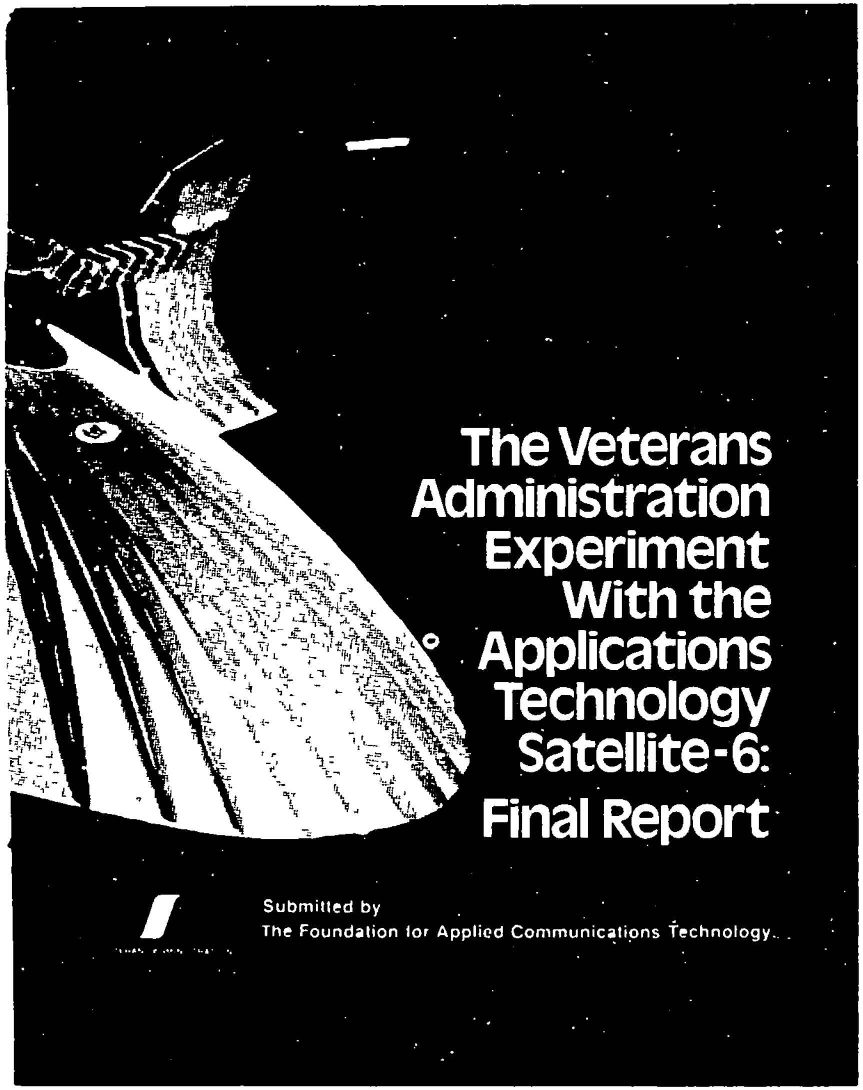
Recommendation 5. The Indian Health Service should work closely with other agencies and organizations sharing common interests and objectives in planning satellite communication systems for health service delivery, including the Public Service Satellite Consortium. This activity should include the preparation of technical plans and cost projections associated with different possible uses of video ranging from limited experimentation to full-scale statewide implementation of one-way video transmission (for education programs) and two-way video linking most Alaska locations for operational video telemedicine services.

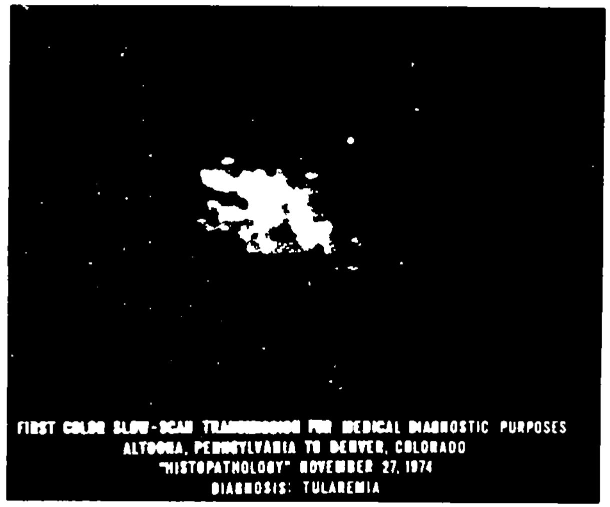
Recommendation 6. Health care planners outside Alaska should seriously consider health care delivery systems in which the primary provider is both geographically and culturally close to the client population, using communication technology to obtain consultation from physicians. The favorable results in Alaska deserve to be copied elsewhere.

Recommendation 7. The Lister Hill National Center for Biomedical Communication and the Indian Health Service should encourage or support research and development activities leading to improved-capability and reduced-cost terminals for multi-function and time-shared use of audio channels.

Recommendation 8. The Lister Hill National Center for Biomedical Communication and the Indian Health Service should encourage or support research and development leading toward time-sharing and bandwidth-sharing techniques for more efficient use of audio and video channel capacity.

Recommendation 9. Technical research and development activities intended to improve the quality of health care should, like this ATS-6 project, have close contact with the physical, social, and human environments in which any resulting innovations are intended to be located.


The Veterans Administration Experiment With the Applications Technology Satellite-6:
Final Report
Submitted by
The Foundation for Applied Communications Technology


FIRST COLOR SLOW-SCAN FOR MEDICAL DIAGNOSTIC PURPOSES
ALTOONA, PENNSYLVANIA TO DENVER, COLORADO
"HISTOPATHOLOGY" NOVEMBER 27, 1974
DIAGNOSIS: TULAREMIA

The Veterans Administration Experiments in Health Communications on the Applications Technology Satellite (ATS-6)

Final Report

by

Kathryn S Caldwell, Ph D
Director, Experimental Design
Foundation for Applied Communications Technology

Section V Data and Evaluation

by

Applied Communications Research
Stanford, California

Project Director	Robert B Shamaskin Deputy Director Learning Resources Service Office of Academic Affairs Dept of Medicine & Surgery Veterans Administration Central Office
Project Coordinator	David E Caldwell *President* Foundation for Applied Communications Technology

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Abstract

The Veterans Administrations Experiments in Health Communications with the Applications Technology Satellite-6

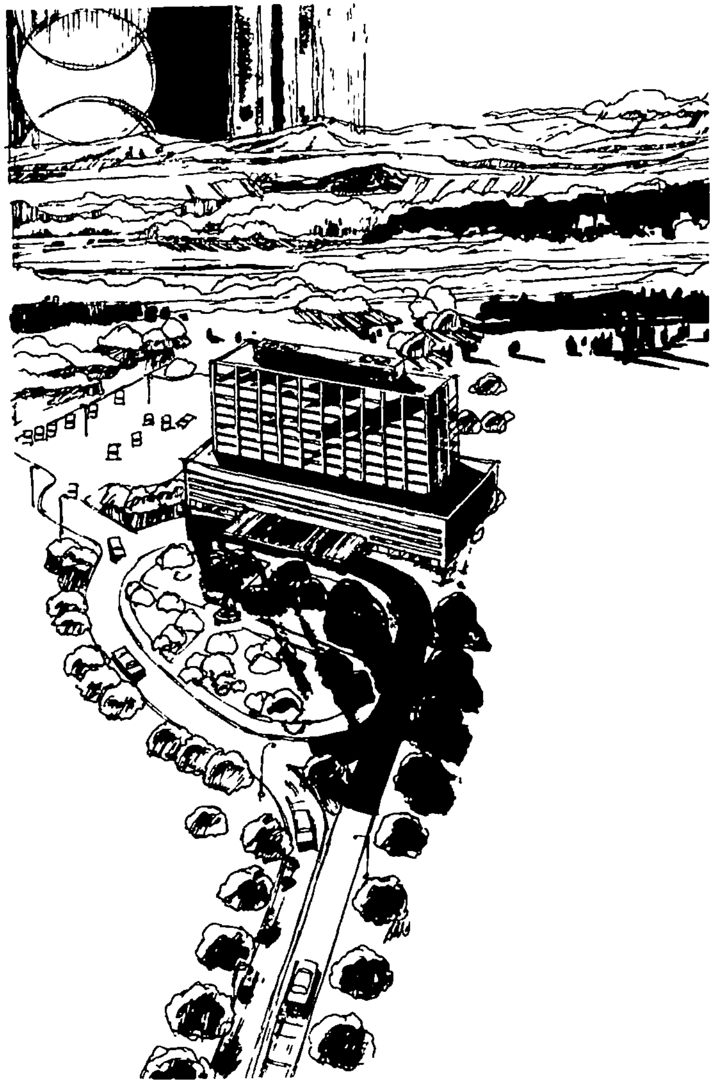
Many of the hospitals in the Veterans Administration system are located great distances from medical teaching facilities To reach these hospitals with participatory educational programs and consultation access by traditional communications methodology such as terrestrial facilities or by traveling specialists is costly and difficult High powered communications satellites can potentially overcome these problems transmitting wide and narrow bandwidth signals to low cost receivers

The Veterans Administration elected to become an experimenter on NASA's noncommercial Applications Technology 6 to field test five types of communications events directed to diagnostic therapeutic and educational purposes The hospitals selected to participate in the experiment were located in the Appalachian Region one of three regions selected for experimentation on ATS 6 due to geographic isolation The audience participants were comprised of physicians nurses and other health professionals

The five events tested were video seminars teleconsultations grand rounds out patient clinics (programs directed to patients) and computer mediated events

Video seminars which included preproduced software were the most well received of the events in terms of audience size and usability according to questionnaires returned by participants However all five events met to some extent the objectives of providing technically clear and audible two way communications by satellite providing useful information in an interesting format which might result in better patient care in the receiving hospitals The Stanford based evaluation conducted for the experiment indicated that the satellite broadcasts had altered the climate of the ten hospitals so that the professionals practicing there were more receptive to new information

Communications by satellite are likely to be of great usefulness to the Veterans Administration in overcoming the educational and clinical inequities and isolation of many hospitals within the vast 383 facility system To be of lasting value however the satellite would have to be high powered (to be received on low-cost antennaes) with longer life expectancy (seven years or more) and available continuously at a relatively low hourly cost



Section I: The Problem

The Veterans Administration comprises the largest health care delivery system in the western world. It includes some 171 hospitals and 212 out patient clinics many of which are located in geographically isolated areas of the United States. Size and geography have created complexity and isolation the two greatest challenges confronting the VA in the continuing effort to provide its patients with high quality medical care.

Theoretically the free flow of communications could solve both of these problems. Administrative complexity could be simplified in one way by standardizing and computerizing patient information and data flow among hospitals. Another kind of complexity created by the constant influx of new information into many fields of medicine could be dealt with more easily. The information would be more useful and digestible if it were accessible to practitioners at the time they needed it or when they were otherwise ready to receive and assimilate it.

The problem of isolation might be overcome with freer access to clear reliable channels of communications. The vital ingredient here would be a two way channel. A one way pouring of information into the hospital does nothing to give the individual practitioner the feeling that he can be heard and therefore has a connection to the outside world.

The technology exists to provide communications hardware and channels to meet all these needs. And indeed since the telephone was invented each new communications device has found its way into settings of patient care. The Veterans Administration has been among the most innovative experimenters and constant users of these devices for providing information and continuing education in many of its facilities. Still the value that communications technology might have in overcoming the problems of isolation and complexity within the Veterans Administration—as well as in other medical systems and facilities—is mostly potential as yet unrealized.

The reason for this cost primarily. A second reason is that for a health system as large and unwieldy as the VA's some means of standardization and overall coordination is needed.

Until very recently it would have been too costly and very difficult to attempt linkage of all health facilities within the VA system to one another and to outside medical centers in one well coordinated system of information exchange. One prohibitive factor was the terrain that isolates the hospitals the same topography is also inhospitable to the establishment of terrestrial microwave linkages used for television and some other communications media.

Then in 1966 the National Aeronautics and Space Administration introduced a communications device that would ostensibly eliminate many of these problems the communications satellite. A satellite equipped to receive and transmit communications signals can replace thousands of miles of ground lines. It can provide two way television channels as well as narrow band channels for simple audio or data communications. Potentially it can interconnect a great many remote sites over a large geographical area.

NASA's sixth satellite in its Applications Technology Satellite (ATS) series was the first with the capability of doing many of these things particularly for broadcasting two-way television. When launched on May 30 1974 ATS-6 was to be the most complex versatile and powerful communications spacecraft ever developed.[1] One of its purposes was to demonstrate the viability of direct broadcast satellite technology with low-cost community receivers.[2] The Satellite was sufficiently powerful that receivers costing less than $5,000 each could be used.

The use of ATS-6 was made available to experimenters by the National Aeronautics and Space Administration at no cost to the users. The initial investment for experimenters would be for ground receivers and for the cost of producing whatever messages they planned to provide during the course of their experiments. To be an experimenter on ATS-6 would mean an opportunity to test the application of new technology with a NASA satellite prior to making a large monetary investment. For the Veterans Administration this meant using the satellite for approximately one year to broadcast various types of messages between ten hospitals in a geographically isolated area. The goal would be to test the feasibility of using future more permanent satellites for many kinds of communications throughout the entire VA system.

BACKGROUND AND HISTORY

The special interest of the Veterans Administration in new types of communications technology is a result of Public Law 89-785 which includes the Exchange of Medical Information (EMI) Act. The 1966 legislation makes provisions for innovative projects that link remote VA hospitals to VA installations located in urban centers and to major medical centers. The intent was to provide VA health professionals no matter how remote their location with access to the most current medical information. The EMI section also states that members of the medical community surrounding these remotely located VA hospitals should be invited to participate in the exchange of information.

The VA Interest in Electronic Media

The EMI enabling legislation specifically mentions electronic linkages as a means by which remote VA centers might receive medical information. Broadcast television could provide such an electronic linkage and so could resultant videotaped programs made for television broadcast. In one example of a project supported with EMI funding the VA contracted with the Medical Television Network (MTN) of the University of California Los Angeles (UCLA) Extension to provide videotapes of broadcast programs to 30 remotely located hospitals. It was found that physicians nurses and other professionals gained more from using videotapes at their own convenience than when they had to adhere to a rigid broadcast schedule.[4] Therefore MTN began to distribute programs on videotapes and films abandoned its closed circuit television broadcast method of distribution and changed its name to the Medical Media Network (MMN). By 1971 the VA had expanded its contract with the UCLA based MMN to provide 90 of its remotely located hospitals with MMN programming.

The VA Interest in Becoming an Experimenter on ATS-6

Although programs on videotape and film accompanied by study guides appeared to be an effective way to provide continuing education in the VA remotely located hospitals this method of distribution did not allow for an immediate interchange between program faculty and learner which has been suggested as an important ingredient for successful adult education. A VA/MMN Guest Speaker program was initiated to provide for this immediate person to-person exchange if only for a limited number of programs. Participant hospitals were invited to select two programs during the year to be supplemented by a specialist (on the program subject) who would travel to the hospital. The success of the Guest Speaker program serves as additional evidence of the value of direct exchange with faculty for participants in programs for continuing medical education.[5]

The VA health professionals also had another major need shared by physicians and nurses in all hospitals in order to provide patients with medical care based upon the most current information they require immediate access to specialists in certain fields as well as to current journals and other media. Many educators believe that finding the solutions to problems as they present themselves from day to day is the best method of adult learning. However to provide one physician or one nurse with an access to all the information sources needed to solve the specialized medical problems they face would require complex communications linkages with major universities medical libraries and other repositories as well as with individuals as consultants. NASA's ATS 6 promised a prototype of the technology that will meet these complex communications requirements in the future should satellites become a permanent fixture. It would also provide immediate two way access to faculty coordinators of programs that videotapes and films cannot provide.

With these capabilities which could potentially satisfy so many of the needs of VA health professionals in isolated hospitals the ATS-6 appeared to provide the technology legislators had in mind when they wrote the EMI Act. The decision was made that the VA would become an experimenter on the satellite. Some of the principals of the Medical Media Network who had formed a nonprofit corporation known as the Foundation for Applied Communications Technology (FACT) were asked to coordinate the experiments and to produce the programs that would be broadcast over ATS-6 during the experimental year (1974 5).

The Decision to Use VA Hospitals in Appalachia for the ATS-6 Experiment

By the time the VA had decided to become an ATS-6 experimenter three geographical regions had been designated as footprints for the satellite. A footprint was the area roughly the shape of a footprint that could receive usable signals from the satellite when it was beamed at a particular point. The three footprints selected for experimentation with ATS-6 because of their geographical remoteness were Alaska the Rocky Mountain area and Appalachia. The Veterans Administration selected ten remotely located hospitals in Appalachia for its experiments.

STATEMENT OF THE PROBLEM

Health professionals practicing in VA hospitals many of which are located in geographically isolated areas require means for communicating on an individual consultant basis as well as in large groups for diagnostic therapeutic educational purposes in order to provide medical care based on current information and research findings.

PURPOSE OF THIS STUDY

The purpose of the VA/ATS-6 experiments was to determine whether satellites can provide the technology to meet some of the communications requirements of the VA from telephone conversations to two way television consultations on a cost effective basis.

LIMITATIONS

When the VA experiments on ATS-6 were conceived they included the following aspects which had to be redesigned owing to unforeseen problems.

1 Two-way Communications

The satellite had the capability of transmitting television signals and was said to be accessible to receive signals from any point within any one footprint at any one time. The original design was based on the expectation that transmission would be on a frequency bandwidth of 2250 mhz and satellite transponders for all HEW and the VA experimenters were built with that band in mind. For the VA experiments a mobile unit outfitted with an inexpensive transmitter was planned for reaching the satellite. The mobile unit would travel from hospital to hospital originating programming that other participating hospitals could receive on television sets linked to inexpensive receivers.

The 2250 mhz band was however under the jurisdiction of the Department of Defense. It was expected that the DOD would relinquish the frequency for the period of the satellite experiments. In April 1973 in meetings between the Department of Health Education and Welfare and the Department of Defense the DOD refused to relinquish the frequencies in the

Appalachian region on the basis that it was needed for national security

Experimenters had the choice of building new transponders to receive signals in the 6 ghz bandwidth (at a cost of several million dollars) which could send signals from Atlanta that would be received somewhere in Canada but not in the southern portion of Appalachia or they could use permanent large earth stations that have their own frequencies which the satellite was equipped to receive. The experimenters in Appalachia chose the latter alternative

A. Selection of an earth station

The permanent earth stations were located in Rosman North Carolina Denver Colorado and the Mojave Desert. The most proximate earth station to the Appalachian Region was the one in Rosman N C. The use of this earth station was especially appealing because the National Medical Audio-visual Center (NMAC) in Atlanta had offered the use of its television production facilities at no cost for the duration of the VA/ATS-6 project. Land lines and microwave equipment would have to be installed to link Atlanta with the Rosman earth station. At first this appeared to be an inconsequential step in reaching the satellite. When costs of installing this equipment were quoted however they were so high that by comparison it was less expensive to originate programming in Denver. The Federation of Rocky Mountain States had already installed facilities for broadcasting its own programs to the Rocky Mountain States including a major earth station nearby at Morrison Colorado. It was thought that the VA experiments might also originate from the Federation studios but the fee quoted for use of the studios was high so that a less expensive alternative was to use the facilities of commercial CBS-TV station KMGH in Denver and lease microwave equipment to send signals to the Federation's facilities where they could then be transmitted to the earth station and then to the satellite

B. Simulation of two-way interaction

The important aspect of two way interaction which the satellite was originally to have provided now had to be simulated with traditional land lines. Testing the two way aspect was considered important even though it wasn't actually carried by the satellite because it was thought that future satellites will have the capability of transmitting two-way television and other signals a capability that would appear to be of particular importance to the Veterans Administration

Traditional telephone lines could carry audio signals on a conference call basis. Because of the cost of these lines the decision was made to have only five lines open to the studio. The ten hospitals were divided geographically into two networks identified as green and red

The plan was to ask the five hospitals in each network to call in at different times to ask questions or make comments during the broadcast period

The video portion of the television signal was thought to be of great importance during two way consultations between physician or nurse and specialists. X rays cardiograms scans and other visual aspects of case presentations would be vital to these consultations. Some method had to be devised for sending visual signals from the hospitals to the studio where consultant specialists would be located. It was decided to use slow scan technology capable of sending visual information scanning it line by line via telephone to a television receiver

C. Simulation of hospital broadcasts

Another important potential use of satellites would be for hospital originated communications as opposed to studio broadcasts. Potentially satellites will enable hospitals to send in house programming, as well as individual messages to other hospitals and medical teaching centers. To simulate this aspect of satellite technology the decision was made to incorporate the mobile unit originally planned for field production. Instead of sending signals via the satellite the mobile unit would be equipped to make videotapes which could be sent to the Denver studio in time for broadcast and with a slow scan transmitter for sending visual information the day of broadcast

2. Experimental Control

As is the case with most adult educational projects it was difficult to isolate learners and the variables that would affect knowledge gain so that one could say definitively that changes in patient medical care occurred because of one program or several programs broadcast over the satellite. During the broadcast period there were other forms of on going postgraduate education and in service training in each hospital. Staff members in participating hospitals were transferred to other VA's or elsewhere and new members came in during the experimental period. To further complicate matters videotapes of the programs were distributed widely (in a few instances even to VA hospitals selected as controls for the experiment)

Furthermore the hospitals selected to be experimental for the project were not selected on a random basis. For practical and technical reasons they were selected on the following bases

A. They were within the geographical footprint that could receive transmissions from the satellite

B. They were relatively remote from a major medical center in most instances

C. They had a large case load of general and medical surgical patients (with one exception Salisbury N C was the only neuro-psychiatric center selected to participate) in order to narrow the scope of appropriate subject matter for programs

D. They had indicated an interest in participating

The VA hospitals selected were those located in Salem Virginia Mountain Home Tennessee Beckley West Virginia Clarksburg West Virginia Altoona Pennsylvania Wilkes-Barre Pennsylvania Dublin Georgia Asheville North Carolina Salisbury North Carolina and Fayetteville North Carolina

ORGANIZATION OF THE REPORT

The remainder of this report will discuss the experiments designed for the VA/ATS-6 project how they were accomplished and their outcomes in the following sections

Section II The Experiments

Section III The Procedure

Section IV Observations

Section V Data (The evaluation report submitted by Applied Communications Research)

Section VI Summary Conclusions and Recommendations

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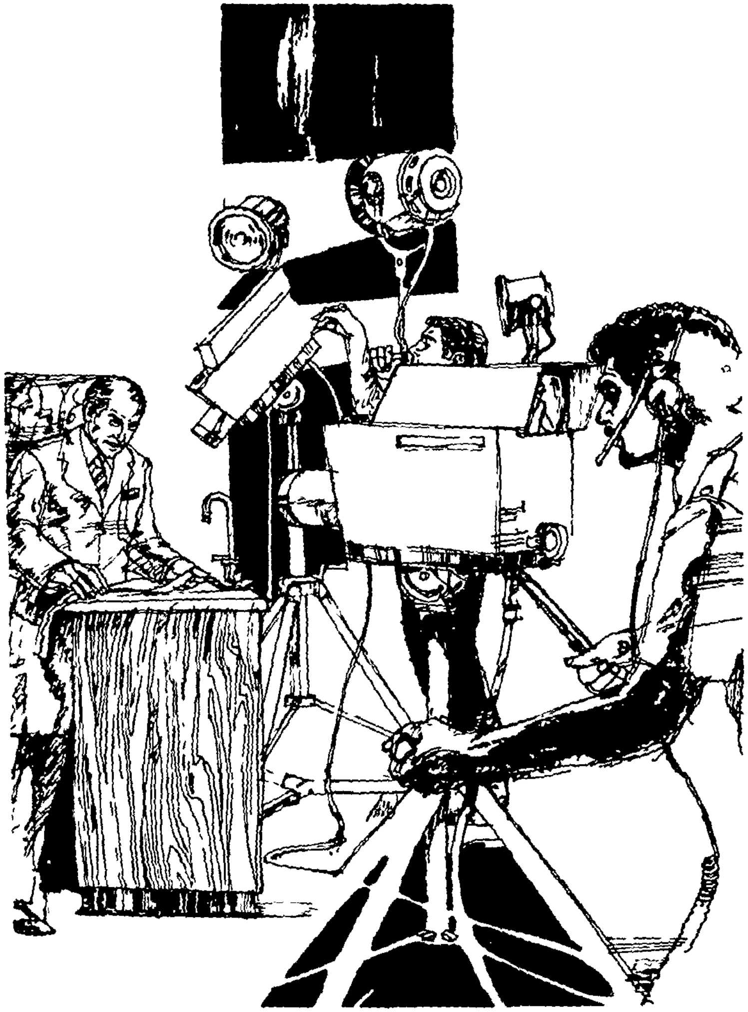


Section II:
The Experiment

The communications satellites created during NASA's Applications Technology Satellite program were much like the telephone or television in that the technology appeared before most people realized they had a need for it

In the case of the Veterans Administration however once the capabilities of the ATS-6 became known a number of uses for the satellite became obvious It seemed advantageous to test the satellite for these uses in a limited number of hospitals for potential use throughout the VA health system

The experimental events subsequently designed for the VA's validation of the satellite had been tried in other forms and in traditional contexts with varying success Although there would be subtle changes from the VA/ATS-6 experiment such as an emphasis on high quality production of programs the most significant variable to be tested was the satellite itself

Designers and manufacturers of the ATS-6 claimed that it would deliver television pictures more clearly than could be received on home sets and a signal that would be unaffected by weather or terrain The claims were potential however until someone attempted to broadcast television signals via satellite

Testing and validating the ATS-6 was an important conclusion to NASA's Applications Technology Satellite program The program had resulted in technology that eventually could provide many kinds of communications including television directly to schools hospitals and other institutions—even to individual homes—through inexpensive ground receivers Almost anyone could become a broadcaster by satellite and anyone able to afford a ground terminal could become a receiver The technology had *far reaching potential* applications and NASA was offering experimenters an opportunity free of charge to find those applications Then if the satellite was all it was purported to be successfully transmitting many types of communications signals its commercial value would result in future manufacture of geosynchronous communications satellites, but they would be *underwritten by private enterprise rather than by the Federal* Government [5]

COMMUNICATIONS BY SATELLITE*

Important to the VA in its decision to become an experimenter with the ATS-6 were the results of past experience of others with previously launched satellites in NASA's ATS series

Background of ATS Program

The first Applications Technology Satellite launched was ATS-6 in December 1966 A number of special television events were relayed by ATS-6 including ten hours of Canada's Expo 67 to Australia Most relevant to the VA however were the medical communications to Alaska ATS-1 provided a two way radio contact between native health aides in remote Alaskan communities and a Public Health Service doctor in the Alaska Native Medical Center in Anchorage Traditional communications by high frequency radio had been unreliable and the system by satellite soon provided a service heavily relied upon by the Alaskan natives [7]

ATS-2 was launched in 1967 A failure in the fuel supply system of the Agena rocket used to launch the satellite caused it to assume an elliptical orbit The ATS-2 tumbled and rotated The spacecraft re entered the earth's atmosphere on September 2 1969 and was destroyed [15]

ATS 3 launched in 1967 was significant for its ground-to-spacecraft-to-aircraft communications over the Atlantic a demonstration of which took place on November 21 1967 It also transmitted the first color photograph of the earth from space and was used for ship-to-shore communications for the management of shipping fleets

ATS 4 launched in 1968 by a Centaur missile was left in a 100 by 400 nautical mile orbit because the Centaur's second ignition was not accomplished ATS-4 re-entered the earth's atmosphere and was destroyed

ATS 5 launched in 1969 is being used for ranging tests specifically for the Maritime Administration to determine line of position of ships ATS 5 has also been used for teletype transmission ionosphere propagation tests weather experiments and other tests some involving aircraft in measurements of multipath effects and tone ranging

ATS-6 Potential

ATS 6 was to be the most complex and powerful communications satellite ever launched The more high powered the satellite the less expensive the ground receivers need be and the goal was to provide high powered signals to a large number of small inexpensive stations located over a large area on the earth

Such satellites could be highly useful to a system as widespread and complex as the Veterans Administration Once the satellite had been designed developed and launched communications (from two-way television to transmission of photocopied letters) might be cost effective as compared to traditional communications To be an experimenter on ATS-6 to test the feasibility of such a satellite communications system for the VA was a significant opportunity

THE VA/ATS-6 EXPERIMENTAL EVENTS

The Veterans Administration experiments on ATS-6 were to be based upon two general communications requirements

A The need for access to specialists for consultations and

B The need for continuing education that incorporates learner participation

*A two way linkage was implied in both of these re*quirements

Practical experience with the Medical Media Network supplying videotaped programs to VA hospitals [4] and research evidence supports the existence of these two basic needs In a study undertaken to identify informational needs of the Appalachian medical community needs that might be met *using the ATS-6 Singh and Morgan* state that

> One of the major problems with physicians para professionals and medical students working in the rural areas is difficulty in maintaining contact with professional developments There are also problems related to on the job training of para professionals because hospitals and health departments generally cannot afford to send a recruit away for institutional training [16]

The report goes on to suggest tele lectures computer assisted instruction and tele conferencing as methodologies for resolving these problems

Active participation during the presentation of continuing educational programs is considered a vital ingredient by most specialists in the field of medical education [21] Experience has *shown that even a week's delay in answering questions* resulting from a videotaped program leads to a decreased interest in the answers to the questions and therefore less learning Immediate interchange between learner participant and the instructor is far more satisfying [18]

Based upon the VA's communication requirements their own experience and the research evidence the principals of *the Foundation for Applied Communications Technology* (FACT) designed five experiments or events for trial on ATS 6 all of them incorporating the two-way linkage as a primary *ingredient These were categorized as video seminars grand* rounds out patient clinics teleconsultations computer-assisted instruction and computer managed patient history taking VIDAC a technological experiment that will be described in a later subsection was added after the experimental period began but was not part of the basic research design for the overall VA experiment

In the remainder of this section on the experiments each of these events will be described A subsection will be devoted to each one explaining the experimental design as well as the historical background that lead to the event's selection for the VA/ATS-6 experiment

1 VIDEO SEMINARS

Background

Television in its various forms from live broadcast to videotaped programs has been thought of as a potential substitute for the in-person lecturer In some cases it was thought television would be even better than live demonstration because it could show close ups and edit out visual noise that would distract from the instructional message Furthermore a well produced television tape using charts diagrams perhaps even animated sequences could present the information in the most clear and concise manner, and an instructor would have to prepare his presentation only once for an unlimited number of learners Based upon these premises television has been tried in numerous modes from closed and open circuit broadcast to the cycling *of videotapes among* institutions with the intent of providing continuing education for physicians and nurses as well as in-service training for para professionals with varying results in terms of changed learner behavior and the ultimate test of medical learning improved patient care

In instances where television had been used unsuccessfully as a *medium for continuing medical education some said that* the primary reason for failure was poor production Amateurish low budget programs featuring primarily the talking face to deliver didactic information could not hold the attention of sophisticated learners accustomed to commercial television [8] Well produced programs on the other hand and programs featuring familiar modes of education such as grand *rounds had resulted in some evidence of changed* behavior on the part of medical professionals [20]

The video seminars for ATS-6 were intended to do more than present a canned lecture The goal was to go as far as possible toward providing in person communications for the medical professionals in the ten Appalachian VA hospitals substituting a visit via satellite for actually sending consultants to each of the *remote locations Viewers of commercial television will tell you* that they feel they know certain TV personalities just from seeing them on a regular basis If Carol Burnett and Johnny Carson can establish such a familiar relationship with viewers why couldn't medical educational instructors with dynamic personalities?

McLuhan[11] and others have suggested such an interaction *with television instructors is possible Actual experience with* two way interaction with radio and television instructors had not borne this out however When two-way radio programs were broadcast for physicians in the Intermountain region most physicians only listened rather than asking questions themselves [6] In two instances two way audio with television also failed to generate much physician participation in the form *of questions and discussion Two-way open circuit broadcasts* were tried in the Intermountain region and closed-circuit

*The following discussion of satellite technology and of telecommunications in medicine is not meant to be an inclusive overview of all experimentation and demonstrations of communications technology applied to medical care For more thorough discussions of satellites and their application to social services please see Filep R and Wedemeyer D *An Analysis and Annotated Bibliography in Communication Satellites for Social Services Focus on Users and Evaluation* Learning Systems Center University of Southern California 1975 scrambled programs were broadcast in Los Angeles In both cases physicians did not participate significantly in the two-way portions of the programs [4,4] In both instances production quality was suggested as a reason for failing to motivate viewer response Experiences of two other groups [10,17] suggested that the use of short preproduced programs followed by live question and answer periods were a successful means of providing continuing medical education

Video Seminar Design

The producer-coordinator of the VA/ATS-6 experiments believed that a primary facilitator for overcoming the barrier created by the television screen between instructor and audience would be a continuing moderator of proven on camera abilities to host the weekly programs The moderator would have to possess special qualities he would have to be a physician in order to handle the subject matter he would have to be acquainted with numerous medical specialties relate well with other medical specialists who would appear on the programs as consultants be an excellent instructor generally and generate charisma on the television screen an ability not common among classroom instructors

The moderator would provide continuity within each program and from week to week between programs He would begin the video seminars by introducing the subject the faculty and the panel members for the program and then lead into the preproduced film or videotape on the program topic These preproduced materials would be didactic and short Their goal would be to generate a common ground for questions and discussion among audience participants Once the film or videotape had been shown the moderator s next task would be to urge two way discussion by asking members of the red or green network to call on the telephone lines available to them While waiting for calls the moderator would have to be prepared with his own questions for the consultants and to stimulate questions on the part of the remote participants The moderator would have to be able to adroitly interrupt panel members when telephone calls came in and cut off discussions when time ran out at the middle and end of the broadcast period

The goal of the video seminars was to present didactic material on an identified informational need within the participating hospitals in well produced short films or videotapes a format that had been somewhat successful in the past and then add elements that were thought to be needed to motivate interest on the : t of health professionals live participation and immediat. feedback In addition printed study guides which had also proven to be an asset to instruction [4] were to be sent out in advance of the video seminars to be used as a supplement to the programs The study guides would begin with program objectives in terms of behavioral and attitude change as well as in terms of improved patient care The content of study guides for individual programs would vary but each would include instructional material relevant to the program (sometimes the script of the preproduced portion of the video seminar) and a bibliography Many would include illustrations and diagrams plus complicated charts that would not reproduce well on television

Evaluation of Video Seminars

Success of the video seminars would be evaluated in terms of knowledge gain attitude and behavioral change on the part of viewer participants and patient care outcomes Also important would be the subjective response of participants to the programs specifically and generally particularly in terms of potential use as a permanent means of continuing education

2. GRAND ROUNDS

Background

Previous experience of which the already-cited report of a two-year experience in Ontario is just one example indicates that grand rounds can be a particularly popular mode among physicians for continuing medical education a mode that works well when televised The fact that grand rounds involves two-way interaction between presenter and his audience made this mode appealing as an experiment event for ATS-6

Grand Rounds Design

Once again the continuing moderator would host the program As in video seminars he would introduce the faculty coordinator to present case histories their diagnosis and treatment Each grand rounds event would cover a subject identified as an informational need by participants in the hospitals Participants would then be able to ask questions concerning the case presentations and the subject matter generally

The goal of the grand rounds events was to simulate institutional rounds on television and still maintain the production quality of the video seminars Loss of satellite frequencies (described earlier) meant that grand rounds programs could not be originated live from hospitals (except for two programs that were originated from remote locations during the experimental year by leasing microwave circuits) although it is clear that such hospital-based transmissions are preferred by viewing physicians and nurses

Grand rounds were not supplemented with study guides because the information covered was to be spontaneous at the time of the broadcast This meant that faculty coordinators of the grand rounds could not list objectives for knowledge gain behavioral or attitude change or necessarily for patient care outcomes

Evaluation of Grand Rounds

Grand rounds events would be evaluated for success technically in the ability to simulate grand rounds and broadcast them over the satellite and at the same time maintain high production quality that would interest viewers in participating in the program

3 OUT PATIENT CLINICS

Background

Television is accepted as an effective means for providing adult education as witnessed by the existence of a large number of educational television stations supported by public funds and by universities and other educational institutions It was postulated that patients might be able to learn about the treatment and rehabilitation for their own diseases by receiving televised instruction using the same components and concepts that would be used for the video seminars i.e. a preproduced film or videotape discussion by faculty coordinators and panelists and opportunity to ask questions

Although the EMI enabling legislation does not specifically provide for patient education it was felt that the inclusion of a small number of patient education programs was appropriate for the VA/ATS-6 experiment because the methodology could relieve professional staff from the responsibility of patient education At the same time these professionals might learn new methods of instruction and perhaps some new concepts in treatment and rehabilitation concurrent with their patients

Out-Patient Clinic Design

The subject matter for out patient clinics would be based upon the most common needs for patient instruction among the ten participating hospitals as indicated by the nurses and others involved in patient instruction The selection of topics for these events also would be according to material that would be adaptable for television

Programs would begin with an introduction of the subject and faculty by the moderator followed by a preproduced program on the subject a discussion and time for questions and answers open to the patients and their families in the participating hospitals

Evaluation of Out-Patient Clinics

Out patient clinic events would be evaluated for their success in changing behavior and attitudes on the part of the patient as well as for knowledge gain

4. TELECONSULTATIONS

Background

Those individuals who have taken a special interest in the education of the postgraduate physician have found that learning is most effective in terms of changed behavior when it is self generated problem oriented and related to routine day to-day practice [21]

Another ingredient said to motivate physician attention to programs is presentation of somewhat controversial material [7] while a negative influence is when the subject matter is too nontechnical [18] These and other factors were taken into consideration when the teleconsultations were designed as an experimental event for ATS-6

Television had been used successfully in diagnosing emergency medical problems at the Logan International Airport Medical Station of the Massachusetts General Hospital In this situation nurse-clinicians at the airport clinic made an initial evaluation of patients then presented cases requiring physician attention via television to physicians at Massachusetts General Hospital

> Inspection auscultation and interpretation of roentgenograms and microscopic images were readily performed despite the intervening distance Percussion and palpation were done by the nurse clinician Rapport between the physician and his patient was readily established.2

As described in the previous section on **The Problem**, the original concept was to televise case presentations from the participating hospitals to the Denver studio where specialists would be available for consultation All of the elements described in the Logan Airport study could have been incorporated for the teleconsultations When the Department of Defense denied use of the frequencies needed to transmit signals to the satellite from points within the footprint area however the concept of generating wide-band television signals from any of the participating hospitals had to be abandoned

Another method was needed to send visual signals to the consultants in the Denver studio Slow scan technology was suggested for this purpose The original proposal to perform the experiments on ATS-6 on behalf of the VA submitted by FACT early in 1972 [1] suggested that slow scan technology should be tested on the satellite strictly as an engineering experiment to see whether the technology coupled with the satellite might be of use to the VA When the frequencies needed to send television signals were made unavailable slow scan was incorporated into the teleconsultations for sending visuals from the remote locations to Denver

Slow Scan Defined

Slow scan television is a technology that makes it possible to send visual information over a telephone line by breaking an image down into electronic signals that are reassembled at the receiving end by scanning the image line by line on a television monitor

Previous Use of Slow Scan to Provide Medical Information

A prototype slow scan system was constructed by a national electronics firm for the University of Wisconsin Department of Postgraduate Medical Education for use in continuing medical education programs. The intent was to use slow scan to make available on a broad geographic basis the more than 50 medical educational events weekly occurring at the medical center Before investing in slow scan on a large permanent basis however the prototype system was to be tested on a small scale From the period of May through June 1970 the prototype system was tested in lecture situations in three community hospitals and one Veterans Administration Hospital The prototype was considered unusable and the experiments generally unsuccessful primarily due to technical difficulties The principals involved in the experiment recognized slow scan as having great potential value as an inexpensive means of providing education and they stated that experimentation with the medium would continue at the University of Wisconsin [4]

In 1973 members of the University of Wisconsin Extension reported that the slow scan equipment was being modified for a satellite communications experiment but that general use of slow scan for medical education was not being pursued.[17]

Two major problems encountered by the Wisconsin experimenters were inherent in the prototype system First due to the time required to scan visuals (1 minute 8.5 seconds for fast scan with a horizontal resolution of 160 lines 2 minutes 17 seconds for a high resolution of 320 lines needed for most visuals used for medical purposes) the slow scan could not keep pace with several of the lecturers The lecturer would have to pause in his presentation to wait for the next visual to appear even though the prototype system had capability of storing four visuals in advance of the program The second problem was that 46.61 percent of the visuals displayed at the remote hospitals using slow scan were judged unacceptable for technical reasons

Another group in Los Angeles used a different system produced by another electronics company for transmitting radionuclide images [21] In this study 90 scintillation scan examinations were transmitted by slow scan to physicians who viewed the scanned images and made interpretations These interpretations were later compared with interpretations made directly from the same films In 68 of the 90 examinations the two interpretations were the same The experimenters listed the limitations of the system resolution was grossly inadequate for routine radiograph transmission the system was unable to detect and transmit small changes in image density at the white end of the gray scale and so some film of low contrast could be interpreted directly but could not be transmitted successfully accurate interpretation of printed material was limited to block lettering one inch or larger The Los Angeles experimenters like the Wisconsin group saw great potential for the system once it had been refined and the technical limitations overcome

Even if the technical problems of slow scan could be overcome the designers of the VA/ATS-6 experimenters wondered whether some visual information[11] such as X rays and EKGs could be used for diagnostic purposes when displayed on television under the best circumstances Prior to the experiments with closed circuit telediagnostics at Logan International Airport a study was made of microwave transmission of roentgenograms (X rays) One hundred were transmitted to a panel of three physicians at Massachusetts General Hospital for interpretation Their interpretations were compared to those made directly from the films by a hospital radiologist The panelists agreed on classification in 92 of the 100 cases The panelists findings were compared with those of the hospital radiologist and there was no disagreement in 77 percent of the cases A tendency to classify disease one category greater in severity accounted for the major difference between the panelists interpretations and those of the hospital radiologist The zoom lens of the television system added some capabilities not available by conventional radiographic methods as did control of the intensity of illumination of the view box and control of contrast and brightness on the television monitor Apparently televised roentgenograms could be used for some diagnostic purposes

Colorado Video Inc the electronics firm that had manufactured the equipment used in the Los Angeles radionuclide image experiment displayed their slow scan equipment which they had refined since the Los Angeles experiments for the FACT staff Higher resolution had been achieved and the system was now capable of storing 27 black and white visuals and one color visual prior to broadcast It was unlikely that it would be necessary to let air time on the satellite go by while everyone waited for a visual to be scanned except when color was required for more than one illustration

Design of the Teleconsultations

As for all of the programs the moderator would introduce the subject of the teleconsultation and the consultants who were in the studio to discuss the topic Case presentations would follow They would be videotaped in the VA hospital responsible for the telecomsultation during the week prior to broadcast The videotape would be sent air express to Denver in time for the Wednesday broadcast

Once the cases had been presented physicians and or nurses and studio specialists would begin Slow scan images would be used during this live portion of the program The visual sent via slow scan might be roentgenograms (X rays) pathology slides or any other still picture including those taken from a live dynamic situation and frozen by a special device

The goal of the teleconsultation events was to answer the specific technical questions of Appalachian physicians and other specialists This meant that general interest of a large audience would probably have to be sacrificed Viewers in the other nine hospitals could look on while the physicians and other specialists consulted with the panelists in Denver but whether or not they found the programs interesting or useful would not be important The teleconsultations would provide information on as close to a one-to-one basis as possible

Evaluation of the Teleconsultations

The objectives to be evaluated in the teleconsultation events would include engineering objectives (is consultation via television satellite and slow scan technically feasible?) and attitude change objectives on the part of physicians and nurses in the participating hospitals the consultants in the Denver studios and possibly patients whose cases were to be considered in the teleconsultations These attitudes would have to be measured subjectively by asking the individuals how they felt about the teleconsultation experiences as opposed to the way consultations are usually conducted (in person or by telephone)

5 COMPUTERIZED EVENTS

Computer assisted instruction was one of the methodologies suggested in the Washington study[12] for experimentation in medical communications for Appalachia on ATS-6 Once the decision had been made to comply with this suggestion the next step was to select computer programs that could most benefit the physicians nurses or other personnel in the ten VA hospitals After a brief search that primarily revealed the number and scope of available programs an approach was made to the Lister Hill Center Computer Assisted Instruction (CAI) Network The LHC had a vested interest in the health experiments on ATS-6 and several members of the network including Massachusetts General Hospital and the University of Illinois had programs that appeared useful to VA professional staff members especially to technicians and nurses

The chief of the research and development branch of the CAI Network was contacted concerning the availability of the programs for experimentation on ATS-6 in the ten VA hospitals His reply was not promising both in terms of expense and interest on the part of the Network and its members in participating in the satellite experiments Directors of the CAI programs at Massachusetts General and at Illinois were contacted individually The director of the Masssachusetts General Hospital was not interested in investing his time to make the adaptations to his system necessary to link the hospitals to the computer via satellite rather than telephone line The Illinois program had been discontinued temporarily Then about a month before the broadcasts were to begin on ATS-6 a representative of the Illinois CAI program wrote a letter inviting VA participation with linkages to the computer via satellite to be arranged by the Lister Hill Center By that time arrangements had been made to use two other programs

The programs selected appeared to meet the needs of specific groups of professionals practicing in the VA hospitals One program designed to teach clinical decision making seemed well suited for nurses who would be trained to assume new roles as heads of wards and admitting rooms The second computerized program was to enable patients to take their own psychiatric and social history by responding to a battery of self report instruments This computer managed program seemed to meet a need in VA psychiatric hospitals for early patient evaluation prior to case disposition for more effective management and treatment

The computers for both events were located in Salt Lake City Utah a location well suited geographically for the experiments, because linkage to the satellite uplink required telephone lines only between Denver and Salt Lake City Connections with the University of Illinois or Massachusetts General Hospital would have required far more extensive land lines and more complex connections

Another fortunate happenstance was that ATS-3 a previously launched satellite became available to ATS-6 experimenters This meant that computer signals could be sent to the experimenting hospitals by ATS-6 and the return signal would be carried by ATS-3 rather than by telephone line as originally planned This arrangement would only simulate what it would be like to communicate full circuit with a computer via high powered sateline such as ATS-6 but the simulation would be much more approximate than using land lines for the return link

Design of Computerized Events

Computer Training in Clinical Decision Making

The computer for the CAI program in clinical decision making was located in the University of Utah Biophysics Department in the Latter Day Saints Hospital Salt Lake City Designer of the CAI program and head of the Department Dr Homer Warner asked that a pre-test be made of the program s acceptance by VA nurses prior to offering the program via satellite The reason for this was that satellite time was severely limited especially by the requirements of the computerized experiments that both ATS-6 and ATS-3 be available simultaneously This meant that the computer would be accessed for a maximum of two and a half hours weekly during the broadcast period allotted to the VA on ATS-6 This limited access time would not allow a fair test of the CAI program itself and so it was to be validated in a two-week pretest during which it would be offered to a VA hospital via telephone 24 hours a day

As originally conceived the hospital receiving the program by telephone would limit its access to the computer voluntarily to the two and a half hours during which the same program would be provided to a second hospital via ATS-6 For reasons that will be described in the Section on Procedures this did not work out and the two tests comparing telephone linkage with satellite connections to the computer were made consecutively rather than simultaneously

Evaluation

The CAI program designed by Dr Warner s group was intended to train medical students in history taking and diagnosing using a probabilities game It was to be evaluated for knowledge gain particularly among the nurses who used it in the telephone-connected hospital and technically for potential use of a high powered satellite to make such a computer program available to VA hospitals generally

Psychiatric Social Self Report by Computer

The objective of this experiment was to determine whether a successful computer patient interchange could be achieved by satellite an interchange in which a patient would respond to psychiatric social instruments presented on a cathode ray tube The responses would then be analyzed for a computer generated report to be used as the basis for case disposition If such a computer satellite connection could be managed it would mean that the same battery of psychiatric social instruments could be used at the entrance to all satellite-linked VA psychiatric services A patient would participate in self-analysis tests at the entry point rather than taking tests during his treatment at a time convenient to staff members. The self-assessment would not only save time of professional staff

Evaluation

The computerized patient self assessment events would be evaluated for the engineering objective of making the computer-satellite connection A comparison would be made between the patient interacting with the computer via satellite, and a patient interacting with the computer locally in the same building housing the computer Subjective responses of patients and psychiatrists in charge of the experiment in the receiving VA hospital as well as those individuals operating the computer would be added to the evaluation of this computerized event

6. VIDAC

VIDAC (Video-Audio Compressed) is a system developed by Westinghouse Electric Company for transmitting and storing audio-visual still frame programs in a greatly compressed form Generally the ratio in real time to compressed time for programs containing both audio and visual material is 240 1 so that in two minutes of transmitting a maximum of 24 twenty-minute audio visual programs can be sent to and stored in, a distant facility

In compliance with a request made by Westinghouse and approved in the VA Central Office an agreement was made to test the VIDAC system on ATS-6 by transmitting the compressed programs to one hospital at the end of the VA s two-hour broadcast for ten weeks The VA hospital in Dublin Georgia was selected to receive the transmissions and participate in the VIDAC experiment The physicians and nurses at the hospital would select the programs they wished to view and these programs would be stored for the week following transmission They would then be viewed on the in-house television system at Dublin

Evaluation

Evaluation of the VIDAC experiment via ATS-6 would be undertaken by the Center for Educational Technology at Florida State University Evaluation would determine the proportion of the potential audience who used the programs how frequently individuals used it and the patterns of utilization according to time and clusters of viewers. The system would be evaluated technically and the signal would be evaluated for clarity of video and audio channels Audiences would be asked whether the lack of motion and interaction were shortcomings of the system No attempt would be made to evaluate the programs themselves for their contributions to knowledge gain behavioral change or other such objectives.

SUMMARY

In planning these five experimental events the designers realized that the human factor would be an important variable influencing the outcome of the experiment as important as the technology. *The ways in which different individuals influenced* the experiment from installation of equipment through production and then response to these five events could not have been predicted.

What actually took place from the design stage of the experimental events through 44 two-hour broadcasts of programs will be described in the next Section The Procedure.

Section III: The Procedure

The principal goal of the VA project on ATS-6 was to conduct an experiment not to establish a service The Project Director and Coordinator were well aware of similar projects demonstration and experimental that had come to be relied upon as a service so that individuals involved could no longer be objective about the successes and failures of what they were doing The very human tendency on the part of the program *producers to want the project to be successful was a factor that* had to be recognized and set aside as were the biases in the other direction on the part of the program recipients and others against all such electronic intrusions into their professional lives

Other positive and negative biases were apparent when the project was inchoate in fact from the time it was first discussed by members of the Veterans Administration Central Office and its advisory groups At that time views against expensive satellite technology were aired and considered along with those in favor of taking advantage of an opportunity to test satellite communications with an eye toward possible future general applications within the VA system In the end the Administrator s Special Medical Advisory Group approved the VA becoming an investor as an experimenting agency and the VA/ATS-6 experiment was undertaken by the Office of Academic Affairs of the VA s Department of Medicine and Surgery The Deputy Director of the Learning Resources Service Robert B Shamaskin was designated Project Director The Foundation for Applied Communications Technology was contracted June 1 1973 to coordinate the experiment

The experiment was conducted in three stages

Stage I Organization and Needs Assessment (June 1 1973—February 15 1974)

Stage II Preproduction (February 15—June 30 1974)

Stage III: Implementation (July 1 1974—May 20 1975)

Formative evaluation was undertaken during each of these three stages and a summative evaluation followed after the Implementation stage was completed The results of the *evaluations will be reported in Sections IV and V of this report*

In this Section the three procedural stages of the experiment will be described

STAGE I ORGANIZATION AND NEEDS ASSESSMENT(June 1, 1973—February 15, 1974)

The first steps in organizing the experiment were to (1) bring together the resources required for the experiment both within and outside the ten participating VA hospitals and (2) conduct a needs assessment that would be the basis for program subjects during the satellite broadcasts.

Organization of Resources

A great variety of human and technical resources were needed for the VA/ATS-6 Experiment Organization of the *human element came first as liaisons were formed with several* organizations and agencies that would perform some function during the course of the experiment These included

1 The National Aeronautics and Space Administration (NASA)

The providers of the communications satellite required that experimenters communicate with them about their plans and progress by sending a representative to meetings of a Users Task Force In return the NASA advisors would provide technical assistance when needed through its engineering group at the Goddard Space Flight Center (GSFC) in Maryland

2. National Medical Audiovisual Center (NMAC)

A division of the National Library of Medicine the Atlanta based facility is comprised of television facilities and personnel videotape editing equipment and other resources which were *offered at no charge for the VA/ATS-6 Experiment They were* used heavily during the production of preproduced materials for the satellite broadcasts

3. Appalachian Regional Commission (ARC)

The agency that had originally intended to conduct medical experiments on ATS-6 along with educational and career programming When the VA offered to conduct medical experiments in Appalachia ARC offered to fund the evaluation for the project The agency was forced withdraw this offer and was then invited to send a representative to the VA Experimental Coordination Committee (described below) to continue the dialogue between the VA and ARC

4 Board of Directors Foundation for Applied Communications Technology (FACT)

Members of the FACT Board of Directors who had been involved in the management of the UCLA Medical Media Network and the California Regional Medical Programs would act in an advisory capacity to the Board President who would coordinate the experiment

In addition to these existing groups one additional committee was formed to advise in program development and topic selection This was the

5 Experiment Coordination Committee (ECC)

Representatives were selected from the Veterans Administration Central Office the ten participating VA hospitals medical school faculty ARC and from the health community of Appalachia The VACO Project Director would serve as *Chairman of the ECC*

6. Hospital Coordinators

Five individuals from each VA hospital participating in the experiments were asked to perform certain coordinating functions within their hospitals during the course of the experiment These were the *Medical Coordinator* who would represent staff physicians a *Nursing Coordinator* who would perform the same function for the nurses and allied health personnel and *Evaluation Coordinator* who would collect data and file reports an *Engineering Coordinator* who would assist in the installation of the receive-only terminal (ROT) and learn to operate and adjust it as well as make reports regarding the technical function of the satellite and a *Communications Coordinator* who would be in charge of public information including advertisement of the broadcasts by satellite both in house and for the community

Subcontracts

In addition to liaisons with these committees and agencies subcontracts were made with four other groups to perform functions during the experiments These were

1 The Federation of Rocky Mountain States (FRMS)

Also an experimenter on ATS-6 FRMS had been contracted to design install and maintain the ground based equipment for the satellite This would include the receive only terminals *(ROTs) microwave links needed to augment the satellite* transmissions and access to the ATS uplink terminal at Morrison Colorado

2. Applied Communications Research (ACR)

A Stanford University based group was subcontracted by FACT to perform the formative and summative evaluations of the experimental events. They would interact with the director of experimental design to evaluate events according to certain objectives and to report formative evaluation results during the experimental period ACR would make a summative report of the experiment after the final broadcast

3 *David Grieve and Associates*

This San Francisco based production group would produce films and videotapes on specific program subjects These preproduced programs would be shown during the live broadcasts via satellite as part of the experimental events David Grieve *et al* would also travel to the ten participating hospitals during the teleconsultation events to preproduce case presentations and other material and to coordinate live slow scan transmissions to Denver during the teleconsultations

4 The Medical Media Network (MMN)

The UCLA based network would distribute selected programs from the ATS-6 experiments for distribution to the 79 *continuing members of the VA/MMN*

Needs Assessment

The physician nursing and evaluation coordinators of the ten participating hospitals were asked to direct the gathering of learning needs that would become the basis for satellite programs

This informal needs assessment was conducted as follows A *list of subjects compiled as learning needs by the VA/MMN* among its participating hospitals was circulated to the ten Appalachian hospitals There the coordinators were asked to have staff members review and update the list to even discard it if necessary They generated hundreds of topics from specific how to do-it surgical techniques to broader areas such as the then new problem-oriented medical record These topics were arranged in order of frequency listed and the 100 most frequently mentioned became tentative subjects for programs

The 100 topics were then submitted to the Experiment Coordinating Committee for refinement into subjects and for recommendations of faculty coordinators for the programs that would be produced on each topic. The list of program subjects was then returned to the coordinators in the ten hospitals. They were asked to survey the physicians nurses and other appropriate practitioners to ascertain specific information they wanted to have covered during programs on the 89 topics The list generated for each topic was designated the User Objectives for the program and forwarded to the faculty coordinator for inclusion in his plans for the program

STAGE II PREPRODUCTION (February 15—June 30, 1974)

A series of activities was undertaken concurrently during this stage of the experiment Programming decisions were made transforming the list of subjects into scheduled broadcasts *divided among four experimental events The design of several* of these events included preproduced didactic material that would have to be completed prior to the first broadcast scheduled for June 1974 Key professional people were to be hired hospital coordinators informed of their roles during the course of the experiment and an evaluation plan developed with the Stanford group All of these activities were accomplished within the designated period and will be described in the remainder of this section

Video seminars would be used to present how to information that could be summarized in a videotape or film to be followed by question and answer sessions

Grand rounds would be devoted to clinical case presentations within the broad areas of interest to the practitioners in the ten VA hospitals Specialists would present their methods of case diagnosis and management hospital participants could then discuss these cases with the presenters

Out patient clinics would be much like the video seminars but the audience would include patients and their families For these events films and videotapes would be used for presenting didactic material

Teleconsultations would provide an opportunity for physicians and nurses in the hospitals to ask their specific questions of specialists concerning cases they were treating The subject matter would therefore be very general to allow for the specific subject matter that would become pertinent at the time of broadcast

Decisions of how to divide the programming also were based on the formula for the number of times an event was to occur during the broadcast period approximately ten teleconsultations (one for each hospital) forty video seminars twenty grand rounds and four out patient clinics A preponderance of video seminars would be used because this methodology had been most successful in the past for providing continuing education Two-way grand rounds and seminars for patients and their families were unknown quantities No one was certain how well audiences for these types of programs would use the two-way satellite linkage

Production of Software

Once subject matter had been assigned an event category production of preproduced software could begin Deciding how to produce this software under what conditions and using what equipment was based upon another complex activity that was ongoing throughout the project selection utilization maintenance and, in some cases design of technical equipment Many of these decisions were made with the assistance of key staff members The recruitment and hiring of these individuals was a task that began with the conception of the project and was ongoing into the production phases

Recruitment of Key Staff Members

The director of experimental design was the first professional staff member to be recruited She participated in the early planning stages of the experiment coordinating the needs assessment and working with the project coordinator in designing the experimental events and assigning subject matter to the event categories

The next step was to find a producer-director who would have the responsibility of coordinating the elements of each satellite program including the preproduced portions live lectures and two-way exchanges with the hospitals and then directing the live broadcasts Experience in medical television would be important background for this producer-director who was to have an enormously important role in transforming a list of subjects into interesting informative television programs

To find an individual with the necessary talent and resourcefulness to take on this responsibility required nearly a year The project coordinator asked candidates to produce a videotape on one of the subjects assigned to the video seminar event category The individual hired as producer-director for the experiment was selected in January 1974 on the basis of the resulting videotapes

Once the producer-director had been retained a search for program moderators a physician and a nurse could beg n Videotapes of potential moderators in instructional settings were reviewed at the University of Colorado Medical Center and a physician-moderator was discovered who had all of the necessary attributes An Associate Professor of Medicine and a hematologist he was asked to become the continuing host/moderator pending arrangements with the University of Colorado which were eventually agreed upon as satisfactory to all parties. A nurse program moderator also was recruited One nurse who had background working in a VA coronary care unit as well as other specialized training was asked to make a videotape test along with other candidates She was retained as nurse moderator based upon an agreement with the Veterans Hospital in Denver where she was an employee

Another key professional the production assistant was hired prior to the first broadcast but was replaced soon after the broadcast year began

An engineer was hired to travel with the mobile unit that would be used to videotape or film the preproduced didactic material This arrangement did not work well and the engineer left the project A second engineer was contracted to travel with the mobile unit during the teleconsultation events.

Involvement and Training of Hospital Coordinators

The hospital coordinators with their various assignments from engineering and data collection to public information had the vitally important function of seeing to it that there was someone to react to the experimental broadcasts Without them there would have been a communicator with a message but no receiver Their function of gathering an audience then collecting audience reactions was essential to the successful conduct of the experiment So an in-person in house training session seemed not only important but necessary

To accomplish this training within a reasonable period of time (remembering that the ten hospitals were scattered from Wilkes Barre Pennsylvania to Dublin Georgia in some of the most hard-to-reach portions of the mountainous Appalachian United States) utilizing certain professional people who would be asked to take time from their schedules to be instructors and for an acceptable monetary cost it was decided to bring the necessary resource people to each of the ten participating hospitals by chartered aircraft

The week long session began on July 12 1973 at Washington s National Airport Six individuals participated in the informational exchange and training sessions the VACO project director the project coordinator the director of experimental design a representative from the Stanford evaluation group an engineer from the VA Central Office and an engineer from the Federation of Rocky Mountain States At each hospital the traveling group met with the five coordinators and other interested individuals including hospital administrators technicians community representatives and faculty members from local teaching institutions The project director from VACO introduced the group and described the experiment and its legislative basis the project coordinator explained the specific aspects of the experiment, including what each hospital would be asked to do the director of experimental design asked for an updated list of program needs previously requested as well as some ideas for patient programs and methods of presentation the representative of ARC met with the hospital coordinator for evaluation and the engineers from VACO and FRMS met with the hospital engineers to determine sites for the antenna receiver and monitors and to discuss other technical aspects of the experiment

Hospital representatives made some requests for example the chief of psychiatry of Salisbury asked for computer managed programs of psychiatric patients This request was the basis for selection of the computer program at the Salt Lake City VA Psychiatric Service as an experimental event

On July 18 when all of the hospitals had been visited the group went to Atlanta to meet with the experiment coordinating committee at the National Medical Audiovisual Center It was at that time that the first categorization of needs into program topics was undertaken and ECC members offered initial suggestions for faculty coordinators

As the experiment was developed further during the ensuing year and the numerous specific requirements of the hospital coordinators became apparent a second information and motivation session seemed essential Key individuals from each hospital including the hospital director and coordinators of medical and nursing programs were invited to participate in a utilization seminar prior to beginning the nine-month broadcast period The session took place at Cape Kennedy the day before the ATS-6 was launched During the session a videotape was presented explaining the project and how each experimental event would be conducted Evaluation procedures and instruments were circulated for the ten hospitals hospital posters were passed out which would announce upcoming programs and participants were invited to ask questions and comment On May 30 1974 the hospital representatives watched as the Titan III missile successfully launched the ATS-6

Evaluation Objectives Designated

Although the primary responsibility for evaluation of the project belonged to the Stanford based Applied Communications Research group some interaction was required with the FACT experimenters This interaction primarily involved the development of the objectives that were to be evaluated for each experimental event

Objectives for the events varied according to how much pre-planning was possible for each type of program In the case of video seminars for example much pre-planning was accomplished before the program was broadcast Grand rounds and teleconsultations on the other hand could not be rigorously preproduced Objectives for these events were much more general

Objectives for the video seminars included: engineering (clarity of the audio and video portions of the signal) utilization (the make up of the audience expected to participate in the program) knowledge gain (the content of the program as conceived by the faculty coordinator) attitude change expected on the part of the audience behavior change and possible patient care outcomes that might result from professionals participating in the program These objectives were developed for each video seminar by asking the faculty coordinator to submit objectives prior to beginning work on the production of the software for his program He was to develop the knowledge gain and other objectives after reviewing the user objectives submitted by his potential audience The list of objectives for the video seminars were printed in most cases in the from of the study guides which supplemented programs for this experimental event

Objectives for the grand rounds included: engineering utilization and whatever subjective responses the evaluation group would be able to gather following these programs.

Objectives for the out-patient clinics included: utilization knowledge gain attitude and behavioral changes among patients and families who viewed the programs

Objectives for the teleconsultations included utilization and engineering objectives including whether or not the slow scan transmissions were technically clear and whatever subjective responses the evaluators were able to gather

The computer events and VIDAC would be evaluated for technical results whether or not signals were transmitted clearly via satellite and for factors inherent to the material transmitted

STAGE III IMPLEMENTATION (July 1, 1974—May 20, 1975)

The first broadcast to the ten hospitals via ATS-6 was to have taken place on July 3 1974 Before the broadcast year could begin however it was necessary to be certain that all linkages with the satellite had been made and were working so that the hospitals could receive a clear television signal A full facilities test had been scheduled for the Wednesday prior to the first broadcast but the receive-only terminals (ROTs) were delivered and installed too late for this So instead of a full facilities check an engineering test was made and significant problems were discovered All ten of the ROTs had been miswired The Federation of Rocky Mountain States and Westinghouse (manufacturers of the ROTs) agreed to modify the terminals in time for the July 3 scheduled broadcast but the VA Central Office did not want to risk assembling hundreds of people for a broadcast that would set the tone for the entire experiment without ascertaining that they would receive a clear signal A facilities check was scheduled for July 3 1974

During the demonstration television signals were broadcast from the KMGH TV studio in Denver via ATS-6 to the ten receivers at the VA hospitals in Appalachia The participating hospitals were asked to telephone the Denver studio on a five-line conference call according to Network (Red and Green) as soon as they were instructed to do so All ten reported they were receiving both video and audio signals clearly, although Wilkes-Barre s signal was weak probably because the hospital was located on the fringe of the foot print receiving area Beckley reported a snowy picture at times probably due to problems with the cable in their building Beckley s engineer thought the problem could be resolved by the following week All ten of the hospital engineers had one common complaint they had not had enough time to receive full signal strength before going on the air They must have an additional 15 minutes prior to broadcast to align their antennas and attempt to get full signal strength the following week

The push-to-talk telephones presented some initial difficulties These telephones which linked the hospitals with the Denver studio were equipped with a switch that would cut out the audio from the television receivers in the room when a physician or nurse wished to talk to Denver This eliminated the distraction of the person speaking into the telphone and then hearing himself come back over television a half second later The drawback was that unless the individual on the telephone spoke very loudly the rest of the audience in the room with him could not hear his question In some hospitals public address systems were set up near the telephone to carry the speaker's questions and comments while the switch cut out the television audio. In some other hospitals audiences complained throughout the experiment that they could not hear questions from their own audience.

The facilities demonstration was felt to be very successful technically despite these minor problems. The satellite was functioning as expected; the signals were clear (better than on home sets, some participants said) and the VA and FACT coordinators of the experiment felt they were ready to begin the regular broadcasts.

The Implementation stage of the experiment began on July 10, 1974 with the first broadcast to the ten VA hospitals via ATS-6. The five experimental events and how they were accomplished will be described in subsections in the remainder of this section.

1. VIDEO SEMINARS

The video seminars were to be comprised of didactic material presented on film or videotape, followed by, or interspersed with, two-way discussions between faculty in the studio and participants in the ten VA hospitals.

Preproduction of Video Seminars

The first step was to select a faculty coordinator for the program. The requirements for a faculty coordinator included: recognition by colleagues for expertise in the program subject, ability to instruct and interact with an audience using the television medium, and interest in participating in the experiment. Faculty coordinators were suggested by the Experiment Coordinating Committee, by other specialists in the subject area, and by the continuing program moderators, who were familiar with the abilities of colleagues in the Denver area. Because Denver had a concentration of medical specialists, well recognized in their subject fields throughout the United States, it was an excellent source of faculty. The proximity of these individuals proved convenient in developing program materials and methodologies, and so about 50 percent of the program faculty for the experiment were from the Denver medical community. The other 50 percent of the faculty came from medical centers and other facilities throughout the country.

Once a faculty coordinator had been selected and had agreed to work on a program, he was asked to write a three-to-four-page paper or essay on the subject area for his program. This would be the basis both for the television portion of the program, and for the study guide that would be sent to the hospitals prior to the program broadcast. The paper would cover the information requested in the "user's objectives" defined by the hospital participants, who would be the program audience. It would also cover the knowledge gain and other objectives the faculty coordinator believed to be important to bring the audience up-to-date in the subject.

Study guides. All of the video seminars were to be supplemented by study guides, which would include the objectives for the program, a bibliography, relevant articles, and in many instances graphic material that could not be used on the televised program because it was too complicated, or else graphic material that was so germane to the topic that printed copies would be useful permanent materials for the audience participants.

Films and videotapes. The project coordinator set a goal to record as much of the preproduced program material as possible on videotape rather than on 16mm film. The reason for this was his belief that film sets up a "barrier" between screen action and the audience while videotape achieves virtually the same feeling of presence as does a live television broadcast,

The feeling of presence was a particularly important aspect in all of the experimental events. Several physicians in the ten participating hospitals had mentioned their concern that they would not be able to relate to a consultant over television with the same degree of confidence and ease with which they could talk with someone in person. An objective of the experiment was to dissolve the barrier of the television screen as completely as possible, and retaining the live quality of television as opposed to film seemed to be one step toward accomplishing this.

The preproduced didactic inserts for the video seminars therefore were to be recorded on videotape. The mobile production unit, which would travel among various field locations to make these preproduced videotapes, was to be equipped with a portable television camera and other equipment that would make it possible to record programs on one-inch helical scan tape, in color. The one-inch tape could then be transferred to quadraplex tape for editing and broadcast. The equipment required, however, was not available by the time preproduction was scheduled to begin (a year before the satellite was launched), and so for the first part of the production season, film had to be used. Later as electronic equipment did become available, videotape replaced film for the preproduced software.

Not all of the films and videotapes used for the didactic portions of the video seminars were produced exclusively for the ATS-6 experiment. In some instances, pre-existing software was used.

Once the preproduced material was ready, including graphics and slides as well as the films and videotapes, and the study guide had been edited, printed and sent to the hospitals, work on the live portion of the broadcast began. The faculty coordinator and other participants traveled to Denver the day before the broadcast. Additional inserts for the program might be videotaped that afternoon, and any charts or graphics that had not been completed and photographed for slides were prepared by an artist. The program was rehearsed and participants informed of when and where to be the next day.

Video Seminar Broadcasts

On the day of the broadcast the faculty coordinator and other participants were expected to arrive an hour before the program went on the air. During this hour, last minute arrangement of visuals and other materials could be made, and the participants were made-up for television and given microphones. Fifteen minutes prior to air time, the satellite was pointed toward Appalachia and color bars and music were broadcast so that the hospital engineers could check receivers for audio and visual signal strength and clarity. Five minutes before air time a camera was focused on a person on the set so that receivers could be adjusted for skin color. At precisely 1:00 p.m. EDT (EST later in the year) the program began.

Following a standard opening sequence, the physician or nurse moderator would introduce the subject and faculty for the program, and the preproduced portion would be shown. The intent was to provide some commonality and a base for initiating live discussion and questions. The two networks, Red and Green, were invited alternately to telephone in with their contributions.

In most instances the video seminar was an hour long and was followed by another event, either a second video seminar, or grand rounds, or an out-patient clinic. After the two-hour broadcast, representatives of the viewing audiences in the hospitals were telephoned for a quick evaluation of the two events. This "instant survey" was to gather formative information regarding technical clarity of the signal, as well as acceptance of the programs themselves.

Most of the 37 video seminars produced during the broadcast season followed this pattern fairly closely. Some exceptions were: two remote broadcasts, one from a coronary care unit in a hospital, the second from a rehabilitation center; one variation in which the preproduced videotape was copied and sent to each of the ten hospitals prior to broadcast, so that only live programming was presented during the broadcast period on the satellite; and one instance in which a preproduced program was broken into segments and live two-way discussion invited between each segment.

Some occurrences and reactions to the video seminars will be reported in **Section IV: Observations.**

2. GRAND ROUNDS

Grand rounds were to be based upon case presentations within a general subject and would not, therefore, be as prestructured as video seminars. Faculty coordinators were given the program subject, user objectives for the subject and asked to present a current relevant case, or cases, using visual materials, such as laboratory findings.

The faculty coordinator and other program participants arrived the day before the grand rounds event and went through the material they would present. Last minute work was done on any visuals that might be conceived during this rehearsal, and some inserts might be videotaped.

The day of broadcast, the faculty arrived an hour before air time for last minute instruction, make-up and microphone placement. The moderator introduced the faculty participants and the case presentation was made. Live questions and answers followed, and were interspersed with live discussion among the faculty in the studio and more didactic material.

Seventeen grand rounds were presented during the experiment.

3. OUT-PATIENT CLINICS

The out-patient clinics were much like the video seminars in format, but they were not supplemented by study guides. The goal was to provide patients and their families with information needed for home care or rehabilitation of their particular illness. Faculty coordinators for these events were specialists in their subject areas. They were informed that their audience would be patients and families, rather than professionals, and so they should gear their presentations accordingly. Rehearsal for the out-patient clinics followed much the same routine as for video seminars and grand rounds. Three out-patient clinics were presented during the experiment period.

4. TELECONSULTATIONS

The teleconsultation events were to be hospital originated, with the studio specialists on the receiving end rather than being the presenters of material. A great deal of field production, therefore, was required prior to each hospital's program.

Another special feature of the teleconsultations was the slow scan method of sending visual information from the hospitals to the studio on the day of broadcast.

Preproduction of Teleconsultations

The Wednesday prior to the teleconsultation, the mobile unit would begin traveling to the originating hospital and would arrive on Thursday. In many instances production of the case presentations would begin then and continue over the weekend and through Monday, when the finished videotaped case presentations were sent air express from the nearest large airport to Denver. During Tuesday and early Wednesday the still visuals to be sent over the slow scan system would be planned.

Each teleconsultation event was based upon a subject the participating hospitals had listed as an area in which they desired consultation with specialists. The originating hospital for the teleconsultation selected a subject that was considered to be a speciality in that institution, usually owing to the large number of cases treated in the area. The concept was for the hospital participants to present current cases, including related visuals such as roentgenograms, electrocardiograms and various types of scans, and then receive consultations from the specialists in the Denver studio relating to diagnosing or managing the case.

The slow scan process. Throughout the teleconsultation events, the slow scan process selected for the experiment would be tested in many ways.

The particular system used, developed by Colorado Video, Inc., was comprised of a television camera, a slow scan transmitter with a telephone data coupler, a specially ordered telephone line, and a device at the receiving end for reconstructing the "bits" and scanning the information, line by line, to reform the still image on a television screen. Also included in the system was a disc storage device that could store 27 black-and-white images and one color image. This meant that 28 still pictures could be sent prior to broadcast time to be retrieved, instantly, from the storage disc when needed.

In addition to testing whether this system could be used for medical purposes, such as diagnosing X-rays and histograms—evaluations that had been made in previous experiments (described in Section II)—this system would be tested for its ability to transmit usable color visuals, a test that had never been made within a medical context until the VA/ATS-6 experiment.

Broadcast of Teleconsultation Events

On the day of the teleconsultation broadcast, the faculty specialists would arrive about half an hour prior to air time for make-up and microphone placement. They were not briefed in any way, in most instances, for what they would be discussing, except for being informed of the general clinical area that would be the program's topic.

They would view the case presentations, made on videotape at the hospital and sent to the Denver studio, as it was shown over the satellite. The originating hospital then participated in a live discussion, and the other nine hospitals were invited to contribute if they wished to do so.

Ten teleconsultations were presented during the experimental period.

The following table is a listing of all programs broadcast during the VA experiment on ATS-6.

TABLE I
VA/ATS-6 SATELLITE EXPERIMENT
PROGRAMS BROADCAST 7/10/74 through 5/20/75

	Program Title	Participants
7/10	40 000 Country Miles Open Discussion	David E Caldwell Roger Hamstra Peggy Mathis Robert B Shamaskin
7/10	Anemia Video Seminar—M D	Roger Hamstra Stephen Wallner M D
7/17	Problem Oriented Medical Record Video Seminar—All Disciplines Two-Hour Program	Roger Hamstra James Crutcher M D
7/24	Acute Upper G I Bleeding—M D Grand Rounds—M D	Roger Hamstra J Edward Berk M D Burton H Smith M D Fred Kern M D Gilbert Hermann M D Samuel Caruthers M D
7/24	Acute Upper G I Bleeding—R N Grand Rounds—R N	Peggy Mathis RoseMarie Hale R N Janet Velazques R N Judy Goodhart R N
7/31	Changing Role of the Nurse Part I Video Seminar—R N	Peggy Mathis Nancy Hynson R N Robert Bradley M D
7/31	Acute and Chronic Renal Failure Grand Rounds—M D	Roger Hamstra Robert Contiguglia M D Melvin Klein M D John Conger M.D
8/7	The Management of Commonly Occurring Arrhythmias Video Seminar—M D	Roger Hamstra Paul Walter M D William Nelson M D Hywel Davies M D
8/7	Arrhythmias Video Seminar—R N	Peggy Mathis Paul Walter M.D Shirley Hoffman R N Joan Bullas R N
8/14	Changing Role of the Nurse Part II Video Seminar—R N	Peggy Mathis Barbara Eckert R N Ethel Hicks R N
8/14	Maintenance of Venous and Arterial Cannulas Video Seminar—R N	Peggy Mathis Wanda Avery R N Nancy Hutchings R N
8/21	Alcoholism Rehabilitation Grand Rounds—R N LVN NA PSYCH SW	Roger Hamstra Gene Moody Joseph Duetsch M D John Buckman M D
8/21	The Problem Drinker Outpatient Clinic—Patients/Families	Peggy Mathis John Mogen M D Marybelle Fisher MSW
8/28	Changing Role of the Nurse Part III Video Seminar—R N	Peggy Mathis Lois Morgan R N Ann Trageser R N
8/28	Family Therapy Video Seminar—M D R N PSYCH SW	Roger Hamstra Ian Alger M D Kitty LaPerriere Ph D
9/4	Death Dying and Grief Video Seminar—R.N, LVN NA SW PSYCH Two-Hour Program	Roger Hamstra Peggy Mathis Lewis Richer Ph D John DeHaan M S.W Carol Alexander R N , M S.
9/11	Pulmonary Embolism Video Seminar—M D R N	Roger Hamstra Arthur Sasahara M.D Joan Fitzmaurice R.N
9/11	Changing Role of the Nurse Part IV Video Seminar—R N	Peggy Mathis Barbara Eckert R N
9/18	The Diabetic Patient Outpatient Clinic—Patients/Families	Peggy Mathis L Mae McPhetridge R N.
9/18	Surgical Treatment of Peptic Ulcers Grand Rounds—M D R N	Roger Hamstra Robert S. Britain M D Allan B Kortz M D Peter H Baker M D
9/25	Behavior Modification Techniques Grand Rounds—R N PSYCH SW Two-Hour Program	Roger Hamstra Peggy Mathis Ogden R Lindsley Ph D Ray Beck Sandy Dinkins M A. Claudine Paris B.A.
10/2	Changing Role of the Nurse Part V Video Seminar—R N Two-Hour Program	Peggy Mathis Virginia Longest B.S.N M.A. Barbara Eckert R N Ethel Hicks R N Nancy Hynson R N Ann Trageser R N
10/9	Coronary Arteriography Video Seminar—M D R N	Roger Hamstra Timothy Takaro M.D Philip Oliva M.D
10/9	Chronic Obstructive Pulmonary Disease Grand Rounds—M D R N	Roger Hamstra Ann Brookens B.S.N A R I T James H. Ellis Jr M D Richard Matthay M D Shirley Pfister B S.N
10/16	Cardiopulmonary Resuscitation Video Seminar—All Disciplines	Roger Hamstra Archer Gordon M D Ph D A James Lewis M D Kevin M.'McIntyre M.D J D Leonard Scherlis M.D
10/16	Problem Oriented Medical Record Video Seminar—R N	Peggy Mathis Corrine Cherpak R N Sondra Ferguson R N
10/23	Genital Urinary Infection Grand Rounds—M D SURG R N	Roger Hamstra Marc LaForce M D Gale Adair R N B.S.
10/23	Biofeedback Video Seminar—All Disciplines	Roger Hamstra Richard N Filer Ph D
10/30	Coronary Care Unit—Remote Video Seminar—CCU R N LVN NA ADMIN Two-Hour Program	Peggy Mathis—on location with Shirley Hoffman B S N Sharon Palmer R N Roger Hamstra—in studio with Dennis Battock M D Paula Huska B S N Sidney Smith Jr M D

	Program Title	Participants
11/6	Cardiac Rehabilitation Video Seminar—M D R N LVN N A	Roger Hamstra L Loring Brock M D Joe Acker Jr M D Ned H Cassem M D Frann Mount R N B S N
11/6	Cardiac Rehabilitation Outpatient Clinic—Patients/Families	Peggy Mathis L Loring Brock M D Ned H Cassem M D Frann Mount R N B S N Gordon Titus—Patient
11/13	Hypertension Video Seminar—All Disciplines Two Hour Program	Roger Hamstra Edward D Freis M D Thomas B Gottlieb M D Sally Shaughnessy R N
11/20	Wilkes Barre Pa Teleconsultation Silicosis M D Two-Hour Program	Roger Hamstra Charles I Bishop M D Raymond L H Murphy M D Neal Goodman M D Dennis Waite M D
11/27	Altoona Pa Teleconsultation Histopathology M D Two-Hour Program	Roger Hamstra Paul J Kadull M D James J Bergin M D Morgan Berthrong M D Thomas E Starzl M D
12/4	Clarksburg W Va Teleconsultation Cardiovascular Surgery M D Two-Hour Program	Roger Hamstra Reverdy H Jones M D William G Rainer M D Theodore R Sadler Jr M D James N Wolff M D
12/11	Beckley W Va Teleconsultation Radiology M D Two-Hour Program	Roger Hamstra William E Christie M D Donald Fink M D Stanley B Reich M D John F Roberts M D
12/18	Salem Va Teleconsultation Problems in Access to Circulation in Dialysis M D R N Two Hour Program	Roger Hamstra William Reefe M D Jorge Roman M D Anne Bobal B S N Kenneth Cotton Gary Lum M D Melvin M Newman M D
	Christmas and New Year s Holidays	
1/8	Mt Home Tenn Teleconsultation Cardiac Arrhythmias M D R N Two-Hour Program	Roger Hamstra Lyman A Fulton M D Henry L Brammell M D Shirley Hoffman R N David Shander M D
1/15	Asheville N C Teleconsultation Problems of the Geriatric Patient—M D R N—2 hr prog (First hour of program relinquished for President Ford s State of Union address so Gov of Alaska could receive it)	Roger Hamstra Peggy Mathis Curtis Crump M D Jackie Avery R N James C Folsom M D William A Hines M D
1/22	Salisbury N C Teleconsultation Nursing Care in Long Term Illness—M D R N and continuation of the Asheville Teleconsultation Two Hour Program	Roger Hamstra Peggy Mathis Ruby Miller R N Curtis Crump M D Lee Bowles Jean Hayter B S N M A Ed D William A Hines M D Margaret Kersenbrock B S N Jessica Stone R N
1/29	Fayetteville N C Teleconsultation Pancreatitis M D R N Two Hour Program	Roger Hamstra George F Cameron Jr M D John O Hale M D Samuel Caruthers M D Lawrence Norton M D John W Schaefer M D Peggy Mathis Rosemarie Hale R N M S N Marcheta Hecko R N Janet Velazquez R N M S
2/5	Dublin Ga Teleconsultation Pulmonary Diagnostic and Therapeutic Problems—M D and Speech Therapy—R N	Roger Hamstra Robert F Proctor M D Maj Dennis M. Chalus M D Col Roald A Nelson M D Col Tracy E Strevey M D Peggy Mathis Beverly K Hagemann R N Nick McNeil M A Thomas Prescott Ph D
2/12	Solitary Pulmonary Nodule Grand Rounds—M D R N	Roger Hamstra D Boyd Bigelow M D F C C P David E Hutchison M D Neal Goodman M D
2/12	Pre Op and Post Op Thoracotomy Care Grand Rounds—R N LVN NA	Peggy Mathis Sharon A Palmer R N Katherine Williams R N
2/19	Blood Gasses Video Seminar—R N	Peggy Mathis Marilyn Flood R N M S David C Levin M D Chris Tanner R N M S
2/19	Neurological Diagnostics Grand Rounds—M D R N	Roger Hamstra Michael Cherington M D James A Lewis M D John C Stears M D
2/26	Oral Cancer Detection Grand Rounds DDS R N LVN	Roger Hamstra John L Hicks D D S Richard Delo D D S M S
2/26	Antibiotics in Urinary Tract Infection Video Seminar—M D R N	Roger Hamstra R Russell Martin M D Gladys Chelgren R N M S N L Barth Reller M D
3/5	Psychotherapeutic Drugs Grand Rounds—M D R N PSYCH SW	Roger Hamstra Leo E Hollister M D Thomas J Crowley M D Wallace LaBaw M D

	Program Title	Participants
3/5	Fiberoptic Endoscopy Video Seminar—M.D or Team	Roger Hamstra William I Wolff M D Barry W Frank M D Thomas A Witten M D
3/12	Schizophrenia Video Seminar—PSYCH M D	Roger Hamstra Thomas J Crowley M D Anne McLean R N B.S. Paul Polak M D
3/12	Cirrhosis Video Seminar—M.D R N	Roger Hamstra Hyman J Zimmerman M.D Judith Goodhart R N M S.N Thomas A Witten M.D
3/19	Heart Sounds Grand Rounds M.D R.N.	Roger Hamstra Lane Craddock M D Shirley Hoffman R N
3/19	Acute Respiratory Failure Video Seminar—M.D R N	Roger Hamstra Joseph H Bates M D Richard Matthay M D Judith Tietsort R N A R R T
3/26	Cancer of the Colon Grand Rounds—M.D R.N.	Roger Hamstra Robert E Gerner M D F Bing Johnson M.D George E. Moore M.D Richard M Mulligan M.D
3/26	Care of the Colostomy Patient Video Seminar—R N LVN NA	Peggy Mathis Norma N Gill E T Joan Kerr R N E.T Vicki Jensen R N. E.T
4/2	Care of the Chronic Lung Disease Patient Video Seminar—M.D R.N. LVN	Peggy Mathis Marilyn Flood R N Shirley Pfister B S.N Judith Tietsort R N A.R R T
4/2	Tracheostomy Video Seminar—R N LVN	Peggy Mathis Shirley Pfister B S N Marilyn Flood R N Judith Tietsort R N A.R R T
4/9	Cardiac Catheterization Video Seminar—M.D R N	Roger Hamstra Paul D Stein M.D Kathleen Donnellan R N Sidney C Smith Jr M D
	First Hour was relinquished to Radio Astronomers in the Applachian Region at the request of NASA	
4/16	Stroke Rehabilitation—Remote Video Seminar—R N LVN PSYCH SPEECH THERAPIST Two-Hour Program	Roger Hamstra Peggy Mathis James C Warren Barbara Boutell O T R Enid Maxwell R N Michael Shaffer M.S W A S.C W James Svoboda M A Charles Szmczak R P T

	Program Title	Participants
4/23	Quality Assurance in Nursing Video Seminar—R N Two-Hour Program	Peggy Mathis Virginia Longest B.S N M A Joan M Gratz R N Marie J Zimmer R N M S N
4/30	Management of Unstable Angina Video Seminar—M D R N	Roger Hamstra Stewart M Scott M D Robert A Chahine M D F Maxton Mauney Jr M D John H Russell M D
4/30	The Selection and Use of Wrapping Materials for Sterilization Video Seminar—Central Supply R N O R	Roger Hamstra John Cobis Frank Mussoni
5/7	Problem Oriented Medical Record Update Video Seminar—All Disciplines Two-Hour Program	Roger Hamstra James Crutcher M.D Sondra Ferguson R N
5/14	Ultrasonics in Cardiology Video Seminar—M D R N	Roger Hamstra Arthur E Weyman M D Sonia Chang B.A.
5/14	Suicidal Patient Grand Rounds—R N LVN NA	Roger Hamstra Norman L. Farberow M D Fred Loya M.A.
5/20	Attitude Therapy and Treatment of Depression Video Seminar—M D R N PSYCH	Roger Hamstra James C. Folsom M D Suzanne Dozier R N Lewis Picher Ph D
5/20	Retrospective The VA Satellite Experiment Open Discussion—All Disciplines	David E Caldwell Robert B. Shamaskin

5. COMPUTERIZED EVENTS

Once two programs had been selected to be computer events on the satellite the major activity of estabinshing interfaces between computer satellite and hospitals was accomplished by the two coordinators for these events the Biophysics Department of the University of Utah College of Medicine located at the Latter Day Saints Hospital and the Psychiatric Service of the Veterans Administration Hospital Both of these facilities are located in Salt Lake City Utah

Selection of Participants

The two Appalachian VA hospitals selected to participate in the clinical decision making program (of the Biophysics Department University of Utah) had expressed an interest in having their nurses participate in the computer assisted training Fayetteville evidenced the most interest and was selected to test the program using traditional telephone lines 24 hours a day for the program validation period then for two-and a half hours on Wednesdays during the test period on ATS-6 Altoona was selected to participate via satellite linkage

Salisbury was selected to participate in the patient-self assessment program (of the Salt Lake City VA Psychiatric Service) because the request for a computer-managed program had come from that hospital The doctor who requested the program was asked to coordinate the event at the receiving end

Engineering

The computerized events were primarily engineering experiments to compare satellite linkages with traditional telephone connections between computer and CRT The interface with the satellites presented the most difficulties in conducting these events

Implementation of Computerized Events

The implementatioo of both computer events was delayed by a federal regulation then pending and about to become law The legislation was intended to protect individual privacy and the time required to write letters certifying how patient identity would be protected during the exchange between Salt Lake *and Salisbury delayed the beginning of all computer ex* periments for two weeks

On December 10 a test was made at the Goddard Space Flight Center of the computer signal transmitted through ATS-3 and 6 The engineers reported the lines were unclear It appeared unlikely that both Altoona and Salisbury could transmit signals via ATS-3 simultaneously because the satellite was operating on half power only The December 10 test indicated that the signal transmitted through both satellites (3 and 6) was usable by at least one transmitter at a time however and the decision was made to continue with the two experiments as planned until success or failure could be determined

The Fayetteville Tests. The computer terminal scheduled for use at Fayetteville was damaged in transit which resulted in a second delay of the experiment The linkage with the *computer via telephone* line was established in mid January and except for a *two-week period during which the telephone* line was inadvertantly disconnected the nurses at Fayetteville had access to the clinical decision making program 24 hours a day for two months During that time 16 individuals logged time on the computer and ran a total of 94 cases

The Altoona Tests. On January 15 1975 the first ATS-6 and 3 mediated computer events were attempted with Altoona ATS-6 carried the signal well to Altoona but apparently the 90-watt *Altoona transmitter was not sufficiently powerful to return a* clear signal

The satellite connection via ATS-6 and 3 was attempted seven times during the VA s broadcast period on ATS-6 During these attempts the connection was maintained successfully only once for the entire two hours The other six attempts were not successful for various reasons the computer broke down on one occasion and once the telephone company inadvertantly disconnected the line between Salt Lake City and Denver On the four remaining days reception of the signal via ATS 3 from Altoona was marginal to poor and the program was operative only for about ten minutes each day (Table II)

TABLE II COMMUNICATIONS LOG
Salt Lake City to Altoona Via ATS-3 and ATS-6

Date (1975)	Comment
January 15	Communications via ATS-3 *unreliable* Land link via telephone established to replace ATS-3 Communications via ATS-6 very good
January 29	Able to run only for the last 10 minutes due to a bad receiver at NCC in Denver
February 5	Both links (ATS-3 and ATS-6) functioned well for the entire two hours.
February 12	VA Hospital at Salisbury North Carolina also using ATS-3 and ATS-6. Interfered with communication between Altoona and Salt Lake City Able to run for only 10 minutes when Salisbury shut down their transmitter
February 19	Phone lines between NCC in Denver and LDS Hospital in Salt Lake City disconnected by phone company *No run time*
February 26	Video terminal at Altoona inoperative No run time
March 5	Signal from Altoona via ATS-3 modulated by local radio station in Altoona No run time

As predicted the problem was primarily with ATS-3 The one day the program was operative over this satellite the 90-watt transmitter was used to return the signal from Altoona so the problem was not entirely with this part of the system The engineers rated the signal from the ATS-6 as clear and entirely adequate

The Salisbury Satellite-mediated events. The patient self assessment program was initiated at Salisbury on January 22 The test was not successful because the data sets ordered for Salisbury were not compatible with the telephone lines being used

Other problems interfered with a successful transmission of the return signal from Salisbury until March 5 Transmission was successful on March 12 Then on March 19 the telephone line from Salt Lake City to Denver was again inadvertantly disconnected by the telephone company Two more hours of patient self assessment were accomplished on April 2 and on 9 16 and 23 except for one hour when the satellite was not available to the VA/ATS-6 experiment (Table III)

TABLE III
SALT LAKE-SALISBURY SATELLITE COMMUNICATION EXPERIMENT
FINAL REPORT
January 22, 1975 to April 23, 1975

1/22 to 1/28 The first transmission was planned on 1/22 with Terry Ahmstedt in Salisbury to assist We discovered that the data sets in Salt Lake and Salisbury were not compatible with the phone lines being used We *corrected the problem in* Salt Lake anticipating transmission on 1/29

1/29 to 2/4 The telephone company had still not provided the data set in Salisbury To avoid another possible delay we found an appropriate data set in Salt Lake City and shipped it air freight to Salisbury When the phone company s data set had still not arrived Salisbury engineering installed the one we had provided for them

2/5 to 2/11 *Communications were not established* on 2/5 due to either problems with the satellite or lack of adequate amplification to the signal arriving from ATS-3 at Denver The problem was finally isolated at Denver Corrective action consisted of one hour testing with all points involved using ATS-3 only This effort continued *for several days* until NASA suggested that Denver work full time on their own to solve the problem

2/12 to 2/18 During transmission time Denver conducted tests to investigate suspected interference between Altoona and Salisbury They informed us that both stations could not be run simultaneously because of a transmission power difference between the Salisbury transmitter and the Altoona transmitter

2/19 to 2/25 Denver solved the amplification problems We achieved approximately one hour of successful communications with Salisbury

2/26 to 3/4 On 2/26 we were informed that the LDS-Altoona link would receive the entire two hours of satellite time Thus no transmission occurred to Salisbury

3/5 to 3/12 On 3/5 we completed two full hours of patient testing

3/12 to 3/18 The LDS-Altoona experiment was discontinued *We completed two full hours of patient testing*

3/19 to 4/1 When we attempted to transmit on 3/19 we discovered that the phone line from Salt Lake City to Denver had been disconnected There was apparently some confusion on the part of AT&T in Washington between extension and disconnection of the line The order to disconnect was issued by AT&T in Washington In the ensuing debate AT&T accused the Salt Lake City VA of an FCC violation because we had a non AT&T data set on the line AT&T claimed that they disconnected our line because of this alleged violation However AT&T found this data set when disconnecting the phone line

Russ Condy of Mountain Bell had made the suggestion at the beginning of the project that we use our own data set on the line He made the suggestion because AT&T would have difficulty billing for a Mountain Bell data set attached to a phone line ordered by AT&T in Washington We followed his recommendation

4/2 to 4/23 We ran two hours of patient testing each Wednesday except for a one hour period in which the satellite was not available

Ronald A. Giannetti, Ph.D

As the NASA engineers had predicted Altoona and Salisbury could not transmit simultaneously over ATS-3

6. VIDAC

Programs transmitted over ATS-6 for the VIDAC experiments were selected after discussions with the Chief of the Medical Service and directors of continuing education and in service training at the VA Hospital in Dublin The selection was also based upon the lesson materials available at the National Medical Audio Visual Center (NMAC) Three broad categories were designated cardiology transfusions and PH regulation Programming in these categories would be provided weekly for ten weeks (November 20 1974 through February 5 1975) during two minutes of transmission time over the satellite The *target audience was to include physicians nurses nurses* assistants dietitians laboratory technicians and technologists

Previous studies had indicated the effective compression ratio for combined audio and still frame visual material was 240 1 Average program length of the NMAC materials was about 20 minutes The two-minute transmitting time would therefore allow a maximum of 24 programs to be sent in compressed form to the Dublin facility There they would be recorded on videotape the visuals in still pictures the audio in real time so that when played back the programs would resemble slide tape programs

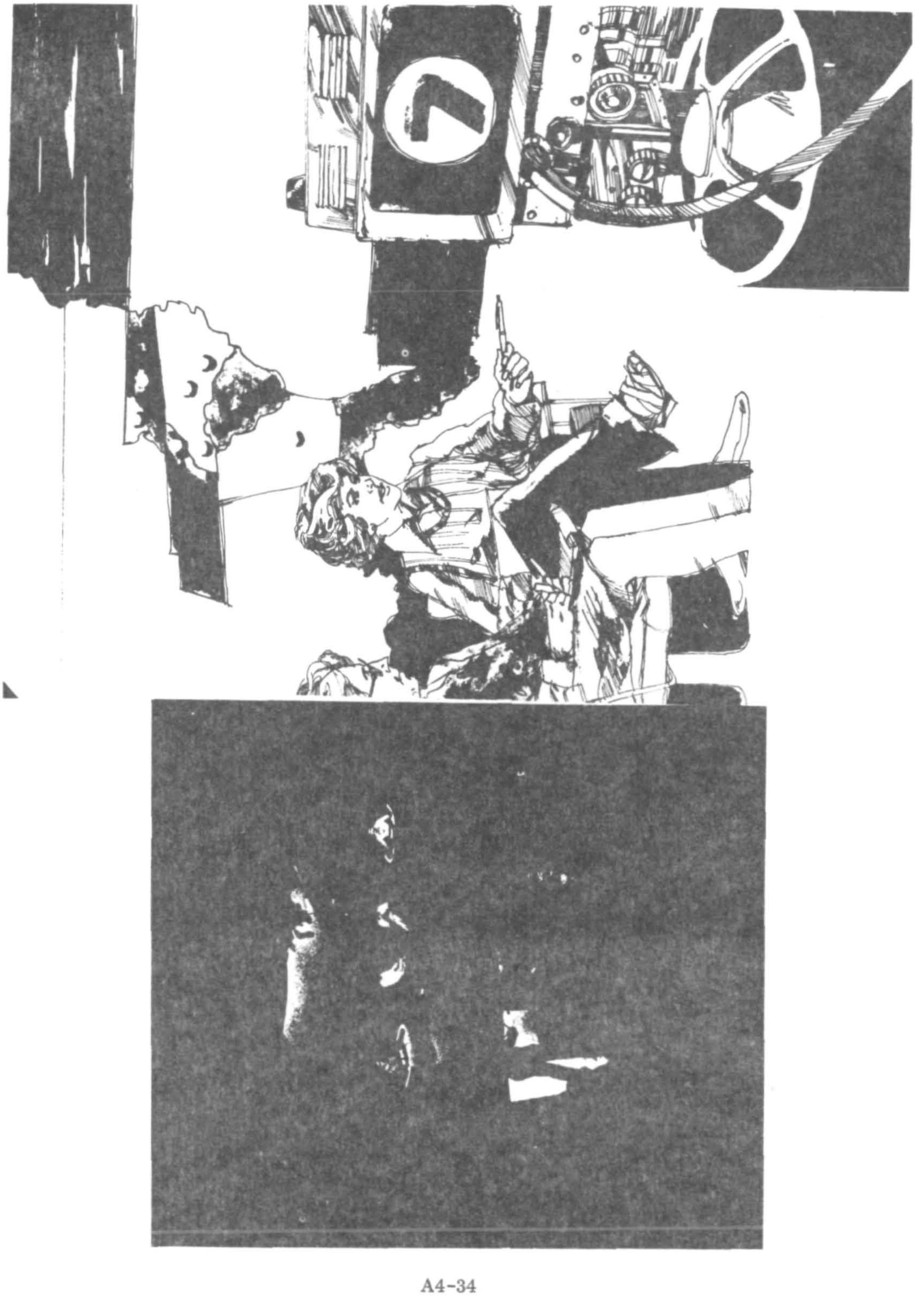
It was found that 33 program titles would be appropriate in the general categories selected by the Dublin VA These were divided into two groups of 17 and 16 programs Only one library could be transmitted during the time allowed each week and the selection of which it was to be was based upon the number of programs requested by participants at Dublin The group containing the greatest number of requested programs was transmitted

In the Dublin facility users could select the programs they wanted to see on conventional color television receivers used to display the programs in real (expanded) time A catalog of available programs was to be provided for potential users A log of program requests would be maintained by the audio visual technician for the hospital and this log would be *supplemented by anecdotal material for the evaluation of the* experiments

Other than transmitting the programs supplied by Westinghouse FACT and the Veterans Administration Central Office had no participation in the VIDAC events

SUMMARY

The response to these experimental events varied from program to program and from hospital to hospital The project s designers and producers viewed programs as successes or failures for several reasons but largely based on the apparent immediate reaction of the audience The total VA/ATS-6 experiment as viewed by the experimenters will be considered in the next section **Observations.**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Section IV: Observations

The observations in this section are made from the point of view of the experimenters, that is, the individuals who designed, produced and directed the programs broadcast during the VA Experiment on ATS-6. Their concern was with how programs were received. Could audiences hear and see clearly? Were faculty coordinators interesting to them? Did people stay for the whole program? Did they ask questions—or at least want to? And perhaps most importantly, what course should be taken in future experimentation on behalf of the Veterans Administration with communications by satellites?

The observations in this section are not based upon the formal evaluation efforts contracted to Applied Communication Research of Stanford, California. The data and formal evaluation by ACR will be reported in Section V. The observations discussed in this section are rather the compilation of the views of the project manager and designers based upon their experiences over the broadcast year, discussions with viewer participants, and comments made throughout the experiment by those individuals associated with its production.

Informal telephone interviews were conducted with representatives of the hospitals immediately after each broadcast to determine audio and video clarity of the signal received, the general response to the programs, and any problems the hospital might have had. These telephone interviews, along with the comments volunteered by hospital participants at various times during the broadcast year, have provided additional input for the following observations.

GENERAL OBSERVATIONS

Hospital Participants

The most frequent and consistent attenders of the VA programs broadcast on ATS-6 were nurses, including registered nurses, licensed practical nurses and nursing assistants. There are, of course, far more nurses than physicians or any other type of health professionals practicing in the VA hospitals, and nurses have also traditionally shown more interest in continuing education programs than have physicians.

In designing the program for ATS-6, the experimenters hoped to reach a large physician audience, too. For this reason, a good many of the broadcasts had physicians as the target audience, and a majority of the teleconsultations were intended for physicians only. The difficulty, however, lies in defining a specific physician audience. As is true of the practice of medicine throughout the United States, there are few general practitioners remaining in the VA. Most physicians now are specialists, and to interest them a program must deal with some aspect of their specialty. This can be done, and very successfully, as is evidenced by the reaction to one video seminar, Fiberoptic Endoscopy, concerning a highly technical diagnostic procedure. The difficulty in presenting this kind of highly specialized program on television, however, is that it is of interest to a limited audience. The result is that premium satellite time, production expense, and support costs will be spent to reach perhaps two or three physicians in each receiving hospital, all of whom will praise and ask for more of this kind of program. In the meantime, the nurses, who attend programs for almost any target audience, as well as the dentists, therapists, psychiatrists and other specialists, protest that the program had nothing for them and ask when will there be a program presented in their specialty.

In experimenting with the satellite, attempts were made to satisfy most specialty demands. The goal of the VA/ATS-6 experiment was to test many kinds of communications with various types of audiences. Therefore, many narrow target programs were included in the broadcast schedule along with programs intended for more general audiences. The range extended from patients and their families to the physician specialist interested in new diagnostic techniques. The producers knew from past experience the kinds of programs that would appeal to these various audiences, and past proven approaches were used in many instances. There were exceptions, however, such as the effort made to attract an *audience on a "team approach" basis, for which* the two-hour broadcast period would be divided into two programs, both dealing with the same disease entity. The first, directed to physicians, would discuss technical aspects of diagnosis and treatment. The second, intended for the entire "team," would discuss treatment and care and attempt to include the roles of all team members. Some physicians protested that both programs were too general.

Physician comments regarding the programs were generally positive, however, and considering the number of them practicing in the ten hospitals, the physician audience for all broadcasts was considerable. Their specific reactions and some changes that occurred because they attended the broadcasts will be discussed in **Section V: Data and Evaluation**.

The audience make up included more than the hospital participating in the ATS-6 programs. There were many individuals who listed their position as "other," among them were psychiatrists, dentists, therapists and allied health professionals. In addition, publicity for the programs attracted professionals from the community surrounding the participating VA hospitals. These non-VA participants included physicians and nurses, therapists, and in some instances clergymen and social workers, all of whom had an impact on the experiment as it progressed through the year.

HOSPITAL MILIEU

An important variable in the acceptance of the ATS-6 broadcasts in each of the ten participating hospitals was the milieu in which it was received. Milieu in this case includes factors such as the attitude of the hospital director, the enthusiasm and efforts of the five coordinators, and the physical setting in which programs were received.

The Attitude of the Coordinator

Each hospital within the VA system is a separate entity, devising much of its own policy and determining what will be supported in its operation. The key to determining such policy is the hospital director. For this reason, the attitude of the director, particularly his enthusiasm, was considered an important aspect in selection of the ten VA hospitals to participate in the ATS-6 experiments. Unless the director accepted and approved of the project, physicians and other professionals practicing in his hospital were unlikely to hear about the broadcasts, much less attend them. Time is a valuable commodity for a health professional in a VA hospital.

At the outset all of the ten participating hospitals, therefore, had directors who were generally quite enthusiastic about the experiments. *A majority continued to approve and support the* project. The exceptions became manifest during the course of the project. They occurred for two reasons:

1. The original director of the hospital was transferred during the project and the new administrator was unaware or otherwise unsupportive of it; and
2. The enthusiasm of the director had been generated due to a misunderstanding of the role his hospital would play during the course of the experiment. When the experiment was announced and described, he thought that his hospital would be a teaching hospital for the other participants. When he learned this was not the case, that his hospital would be on the receiving end for instruction, he was no longer supportive.

The Enthusiasm and Efforts of the Coordinators

Next to the attitude of the director, the attitudes of the five coordinators for the experiment were important variables in determining how many people attended programs, *filled in* questionnaires, and responded to the project generally.

These five included the *medical coordinator*, responsible for deriving subjects of interest to doctors and informing them when upcoming programs would be of interest to them; the *nursing coordinator*, who performed the same function for nurses; the *evaluation coordinator*, who collected data as background prior to the experiment and provided feedback in the form of attendance lists and questionnaires and telephone information during the course of the project; the *engineering coordinator*, who maintained the ground receiving equipment and reported any problems or failures; and the *communications coordinator*, who was in charge of publicity for the experiment.

One or more of these individuals took responsibility for printed material, the posters announcing upcoming programs and study guides, if there were any. In some instances the physician coordinator did not function well in this role, and so the nurse coordinator took over and saw to it that physicians in her hospital were informed of upcoming programs and received study guides. Occasionally the nurse coordinator took on the role of the communications coordinator, seeing to it that outside groups were invited to the broadcasts of interest to them.

In one instance, the evaluation coordinator was invaluable in maintaining interest in the programs, in seeing to it that *information from the hospital was provided to the evaluators* and the director of experimental design. He also redesigned one questionnaire to make it simpler for respondents to fill in and return to the evaluation group.

In some instances the efforts of the coordinators were enough to maintain some enthusiasm for the ATS-6 experiments despite a lack of support on the part of the hospital director. Even though they were able to do this, they reported frustration with the effort and felt that administrative support could have done a great deal to increase audience size and participation, and therefore increase the data on which to determine the relative success or failure of satellite communications in their hospital.

The Physical Setting

Another important variable in determining acceptability of the broadcasts by hospital participants was the environment in which they were received. In one instance the programs were received on television sets located in a large auditorium where participants had difficulty seeing the small picture and where the sound was distorted due to echoing and otherwise poor acoustics The auditorium was not air conditioned and so it was also very uncomfortable on warm days.

In another hospital participants were divided They could view the programs on television receivers in three small rooms located throughout the hospital but only one room was equipped with the two-way telephone for interaction

Other hospitals had smaller audiences, or more television receivers in the same room so that people could see the picture at closer range and there were few complaints about not being able to see or hear except when questions were asked, a problem that will be discussed in the following subsection. With the exception mentioned previously most of the hospitals apparently provided physical settings where audiences could see and hear well and felt comfortable during the broadcasts

TECHNICAL PROBLEMS

During the course of the experiment the ten hospitals *usually reported receiving a clear audio and video signal from* the satellite They frequently compared it with the signal they received on home sets saying that the picture from the satellite was superior Occasionally one of the hospitals on the fringe of the satellite footprint would report poorer reception than usual Once in a while a hospital reported a poor signal caused by a malfunction within their hospital system Normally though, the satellite was reliable in transmitting a clear signal from Denver

The primary difficulty reported during the entire experiment was that audiences could not hear or understand certain questions asked by participating hospitals. One reason was the problems caused by misuse of the push to-talk telephones described in Section III Another was that many of the physicians, the group that asked most of the questions were foreign born and their accents made them difficult to understand A setting that was poor acoustically in the first place exaserbated the problem The suggested solution to the problem was to have the physician moderator repeat the question before answering it which he did This too was occasionally criticized because too much time was taken for repeating the questions asked by people in the hospitals.

RESPONDING TO FEED-BACK FROM PARTICIPANTS

Throughout the experiment attempts were made to respond to suggestions and complaints from participants in the ten hospitals For example when several coordinators complained that the posters announcing the schedule of upcoming programs were too small and difficult to work with and that there were not enough of them for their hospital a new poster was designed This one was three times the size of the first was reprinted in quantity requested by each hospital every three months in a new color Program schedules were printed on gummed labels. To change program announcements the coordinator had only to peel the back of these labels and press them in the place indicated on the poster This flexibility and ease in announcing programs was felt to be important One intent of the experiment was to provide programs as they were needed by the participants or when a subject became especially timely A tight program schedule strictly adhered to throughout the year was a restriction to be avoided

When the broadcast schedule was changed to include such timely or important programs the changes were announced at least three weeks in advance of their broadcast day The changed schedule was announced during the regular program broadcast by satellite, and new gummed labels were sent to the hospital coordinators. Nevertheless many hospital participants especially non VA members of the audience complained that they did not receive the schedule change *information* and therefore wasted their time in coming sometimes many miles to see a program of no interest to them

Other recurrent criticisms were that there was not enough time for questions and answers and other live dialogue from the hospitals and that study guides and other printed material was late in arriving, available in too small a quantity or nonexistent for the program. These two problems of live participation and printed information will be discussed next

TIME ALLOTTED FOR QUESTIONS AND ANSWERS FROM HOSPITALS

A scenario often repeated for video seminars grand rounds and out-patient clinics would be as follows the formal presentation would be made first This would include a film or videotape, or for grand rounds, a graphic lecture-presentation by the consultant originating from the Denver studio The time was then opened for telephone feedback in the form of questions or discussion from the ten hospitals. The hospitals were invited to participate according to network red or green The program moderator would then ask questions he had prepared on the day's subject while waiting for hospitals to call in If a question should come in from a hospital he would cut the discussion of his question short to take the telephone call Sometimes it was necessary to fill" with dialogue among the moderator consultant and panelists in the Denver studio because there were few incoming calls from the hospitals. Then ironically toward the end of the program several calls would come in and each caller might have more than one question which could not be dealt with in the time remaining When the broadcast time ended hospital participants were asked to write in their unanswered questions and the letter would be forwarded to the faculty members for the program Even so frustrations were expressed indicating a desire for more interactive opportunity

The program producers were concerned primarily with using satellite time wisely Dead air space where nothing happened while panelists waited for calls from the hospitals, would not only be a waste of satellite time but would also probably result in a lost audience For this reason they planned to fill the whole two hours in case there was no hospital participation Then as the broadcast year progressed and many people did call in the preproduced materials were shortened Then on two occasions when there were no callers for almost the whole hour there were some awkward moments on the Denver set while the moderator attempted to fill the time and once filled it by lecturing to the hospital audiences about their responsibility in the two-way project

The exact equation for how much time in any one program should be planned and produced and how much of it left open for live discussion was never arrived at during the course of the broadcast year It is one of the most elusive elements in the attempt to meet requirements of participants for an interesting involving informative program

PRINTED SUPPLEMENTARY MATERIAL

Another dilemma that remained unresolved throughout the broadcast period was how to provide printed material in the form of study guides that would include the most usable information and at a time participants were most likely to [illegible] it In the planning stages for the experiment hospit[illegible] coordinators said they did not want to receive study guides until just prior to the broadcast they would supplement They did not want to pass them out before the programs because people were likely to misplace or forget them and there would not be enough to pass new ones out when the programs were aired Previous experience had also taught them that people were unlikely to use the materials until they saw the program.

For this reason study guides were most often sent to the hospitals just a few days before they were to be used On two occasions they were sent much earlier to comply with the request from people who said they wanted the material in time to prepare for the programs. This resulted in several complaints that the guides had come too early and were lost On a few occasions preparation and printing time resulted in late shipment of these materials so they arrived after the program had been broadcast

Another request made frequently by hospital participants was that printed supplementary information be made available for all events not just video seminars. The decision had been made in the experimental design stages however to eliminate printed material for out-patient clinics and grand rounds since the seminars would provide adequate opportunity to test the value of the printed guides

In addition to these general responses to the VA/ATS-6 experiment as a whole the project designers and producers also made some specific observations during each of the individual events These will be described in the following subsections

1. VIDEO SEMINARS

As the broadcast year progressed and attendance lists and reactions came back from the hospital participants it was evident that video seminars were more popular at least in numbers of participants and positive reaction than other events One reason for this may have been that because they were supplemented with a study guide the video seminars were approved by several professional groups (including the American Medical Association) for credit in continuing education The programs for physicians in fact received Category I accreditation

A second reason for the popularity of the video seminars may have been that they were well produced comparative with commercial television During the telephone interviews following programs, the frequent response from evaluators in the hospitals was that the audience praised the broadcast for its high technical and production quality For reasons already stated there was very little air time that was not planned for during the video seminars The combination of software interaction between moderator and panelists and live question and answer segments with the hospitals provided the constantly-changing picture and sound needed to prevent habituation and therefore maintained high audience attention The evidence of this is that according to observers interviewed after the broadcasts audiences tended to stay seated and wandered in and out of the room less throughout the video seminars than during grand rounds teleconsultations and out patient clinics

A future effort might be improved by structuring the seminars somewhat less and providing more opportunity for interaction

2. GRAND ROUNDS

Grand rounds events had two hurdles to cross to achieve the goals intended by the experimental designer and program producer The goal was to provide hospital participants with a similar experience to the participation in grand rounds in a medical teaching center The obstacles were that the setting was not a hospital it was a television studio and that grand *rounds would inevitably be compared with video seminars for* audience appeal and interest yet the programs would have no preproduced materials or study guides

The primary complaint regarding grand rounds was that the programs were not supplemented with study guides The second most apparent problem was in the presentation Rather than taking advantage of the traditional format of grand rounds as they take place in the hospital by presenting one or more patients and using a provocative detective method to arrive at diagnosis and management of disease entities faculty coordinators for grand rounds events often chose a didactic approach to presenting information On the occasions when a patient was presented by videotape the presentation was well received

If grand rounds were to be utilized in future satellite communications they would probably attract and hold a greater audience if they could center around an actual patient and could be presented live from a hospital setting. Television cameras lighting and other equipment have become less obtrusive to the point that they need not be obstructive to grand rounds presentations as they routinely take place in these medical center settings With this approach grand rounds would differ significantly from the video seminars so that they would present a unique experience for physicians and other practitioners in the hospitals.

3. OUT-PATIENT CLINICS

The three out patient clinics were well-attended events but not by patients They received much praise and much criticism The goal in planning these events was to involve patients and families in dialogues with the specialists in the Denver studio but two obstacles made this difficult First the hospital audiences were not comprised solely of patients and their families They also included nurses physicians and other professionals and the presence of these people plus the satellite and television technology prevented a" but a minimal number of questions Questions asked w[illegible] e mostly from nurses or written out by patients and asked by nurses. Second the faculty coordinators for the programs in some cases tended to address their colleagues on their own level rather than provide information for patients in context and language they could understand. Patients sometimes protested that the programs were over their heads To ameliorate this partly a patient was included on the panel in the third OPC on cardiac rehabilitation and this program was the most popular of the three

The latter program s popularity may also have been attributable to the subject it treated cardiac disease as opposed to alcoholism and drug abuse the subjects of the other two OPC s Patients having cardiac ailments seemed less inhibited in discussing their problems than were patients with the other two diseases Feedback immediately following all three of the programs indicated however that the patients who did attend them were most interested in the information presented Nurse coordinators reported that resulting videotapes of the programs were being used for patient education programs as well as in-service training for professional groups

Ideally future programs for patients and families will be planned for patients as a target audience and faculty coordinators will be selected for their ability to address this audience on their level of medical sophistication (but not speak down to them) Printed material should be provided for these programs too Many kinds of informative documents are available from volunteer health agencies The problem here is to locate them assure their appropriateness and distribute them in time for broadcast

The question of whether or not two-way communications are significantly important to the audience of an out patient clinic is a difficult one These audiences tended not to use the opportunity to ask questions but perhaps the situation preventing their participation could be altered For example the audience could be restricted to patients and families only

4. TELECONSULTATIONS

The goal of these events was to provide an opportunity for physicians (and in some instances nurses) to consult with specialists about problems they were having in diagnosing or treating actual patients The intent was to bring hospital physician (or nurse) together with the consultant connecting them by satellite and television rather than by travel Ideally the technology could save much time and expense for such consultations on a routine daily basis

The primary problem in achieving this goal was that the teleconsultations were not private one-to-one events Like the other satellite broadcasts they had an audience both participatory in the originating and observing nine hospitals where all satellite broadcasts were monitored and in other places There was therefore a feeling of a need for showmanship on the part of each hospital presenting a teleconsultation Physicians were reluctant to show lack of current knowledge in the extreme lack of privacy Their goal became to show the expertise of their hospital In most instances the presenters would state how they treated a patient who by then had died or been treated and discharged from the hospital The intent was not to gain information as to how they might have diagnosed or treated the patient but rather to challenge the specialists in Denver to do it better

Fortunately there were enough exceptions to this pattern so that it can be said the media worked to provide information so that patients could be better cared for The teleconsultations concept potentially has great viability and the satellite could be extremely valuable in overcoming problems of time and distance

Two-way television is not a necessary ingredient for accomplishing this The VA/ATS-6 Experiment utilized slow scan TV for sending pictorial information to the consultant Although apprehension was expressed prior to the experiment about this technology especially when it was to be used for transmitting X-rays and histopathology slides there were few if any instances during the actual teleconsultations when the visual transmitted was less than adequate for diagnostic purposes. The main complaint was that the slow scan process took a long time to display a visual despite the fact that most of the black and white visuals had been stored previously so that they could be displayed instantly when needed The only time the actual scanning process had to be used to display a visual was when it was in color and only then if it was the second to be used One color visual could be stored prior to the broadcast

As for visual clarity of the X-rays and other visuals the consultants for several programs stated at the end of the program that the slow scan mediated visuals were adequate During the teleconsultation on radiography the television camera on location was used to focus on a close up of one portion of a chest film The resulting visual sent via slow scan was adequate for a panelist, a specialist in middle lobe syndrome to detect a peculiar shadow alongside the heart in the right hemithorax a shadow not present in a chest X ray taken two years previously He diagnosed the patient as having middle lobe syndrome In a letter written December 12 1974 Roger Hamstra M D moderator of the broadcasts documents this and two other instances in which teleconsultation events incorporating slow scan altered diagnosis or treatment of a patient in the consulting hospital

The teleconsultation events on ATS-6 therefore indicate that satellites and adjunct technology can successfully alter and improve patient care in isolated hospitals If satellites are to be used to transmit future consultations however the settings and circumstances should probably be different from what they were for the VA experiments on ATS-6

First the communication between consulting physician and specialist should be discreet Routineness of this method might eliminate some non participating observers but other methods too should be employed to insure privacy

Second to be truly effective as a mediator of consultations satellite linkage must be available 24 hours a day seven days a week as must the consultant at the other end Consultation services have been developed in major metropolitan areas so that physicians can call a medical center and be connected with a specialist on duty at the time Perhaps a satellite inter-link could provide contact with a nationwide network of specialists each of whom covers a certain time period during which he is available for consultation as physicians in group practice who cover for their colleagues

Third full duplex video is not really necessary for the teleconsultations One way video is useful but it should be from the hospital to the consultant because most of the visual information will originate in the consulting hospital The specialist might have slow scan available for sending information if and when it is needed

If a video-originating capability is not possible slow scan is adequate in most cases for teleconsultations Slow scan plus an audio channel is probably a viable substitute for full duplex television if the cost of originating video becomes prohibitive on a permanent domestic satellite

Fourth in further experimentation with teleconsultations particularly when video capability is employed all showmanship should be discouraged Teleconsultations must not be regarded as television productions reflecting on the creative talents of the originating hospitals.

5. COMPUTER MEDIATED EVENTS

For both computer mediated events of the VA/ATS-6 experiment the software provided seemed to be well accepted in the hospitals The difficulties in providing them by satellite were technical and primarily due to the decreasing transmitting power of ATS-3 the satellite used to return the signal from hospitals to computers If computerized events are used in future satellite communications the two-way linkage should be available continuously Otherwise the advantages of computer-mediation are lost

The computer-assisted event was most successful in terms of how it was received at the VA in Fayetteville and thus during the two weeks when the program was available 24 hours a day The fact that the program was available by satellite for only two hours a day once a week was much to the detriment of the program The satellite in this instance was not as useful as traditional land lines for providing a communications linkage between user and computer This was due primarily to restricted time on ATS-6 and the fact that ATS-3 was failing rather than inherent problems with the satellite acting as a transmitter Potentially the satellite may be a better transmitting device than landlines because landlines used to access computers frequently fail or are overburdened with users

6. VIDAC

During the ten weeks VIDAC programs (still frame pictures transmitted at high speed) were available at the Dublin VA 42 individuals viewed selected programs and completed evaluation forms This was 20 percent of the possible target population and included primarily nurses dietitians and laboratory personnel Usage was restricted to the day shifts because television facilities were unavailable at night for security reasons

In their report of the VIDAC experiment on ATS-6 which included data from the evaluation forms collected by the Dublin evaluation coordinator and analyzed by the Florida State University evaluators the Westinghouse group said that the small numbers of program users could be attributed to the lack of support on the part of the hospital administrators The report states that those who did use the VIDAC programs were impressed enthusiastic and generally felt that a program of this type would greatly benefit them as well as the hospital, and in the opinion of some the entire VA network Present features considered ideal by users were the random access concept and a multiple viewing possibility but motion is almost essential in the limited instances when certain motor skills are being taught

Among other things the report offers the following conclusions regarding the VIDAC system

The time required to broadcast many *hours* of material is measured in *minutes*, which should permit reduction of the operating costs of television facilities and VIDAC central libraries could serve an area approximately one third the size of the earth by utilizing a single dedicated satellite channel

The evaluation coordinator at the VA hospital in Dublin was asked to comment on the VIDAC system He said that he felt the resulting programs were not much different than the slide tape programs they had in their library Operating the system required a full time employee available to punch up programs when they were requested on one of the four channels on the hospital s television viewing system If a program was allowed to run continuously (one of the modalities evaluated in the experiment) that channel could not be used for any of the other videotapes or films the hospital has available on its informational access system

The evaluation coordinator said that the programs received via satellite were frequently unusable because they were unclear The Westinghouse group attributed this on one occasion to the satellite having been "mispointed thus dropping 10db At another time the difficulty in transmitting the VIDAC programs was said to be caused by a technical malfunction at the Denver studio The Dublin evaluation coordinator reported that the primary technical difficulty was in the receiving equipment at the hospital It tended to overheat and distort the image and sound received

The Dublin coordinator said that more people might have been informed of the VIDAC programs and participated in the experiment if it had been better managed As it was he was given the equipment and program catalogs and told to publicize the experiment throughout the hospital operate the system evaluate it and maintain the equipment This was more than a full time job he said and he did not have time to do it

SUMMARY

The designers and producers of the events comprising the VA experiment on ATS-6 formed opinions about what was taking place during the program broadcasts—how they were received how they might have been better—all during the broadcast year The bases for these opinions were the telephone calls that came in during the programs the responses given during the telephone surveys immediately after the broadcasts and unsolicited comments that came in to the FACT office during the experiment The formative evaluation from the Stanford group of course added greatly to this basis of opinion After the experiment was over the Stanford group went on to conduct retrospective analyses. The data from these plus their observations during the year make up the following section **Data and Evaluation.**


Satellite Will Connect 10 VA Hospitals
Satellite Television Used in Experiment
V A Hospital in W-B Part of New System
Space
Satellite Teacher
HEW Involved in Satellite Launch from Kennedy Space Center
'Perfect' Satellite Picture Sent Hospital
VA Hospital to Use Satellite Wednesday


RED NETWORK

A4-39

Section V: Data and Evaluation

(by Applied Communications Research, Palo Alto, California)

INTRODUCTION

The experiment impacted the ten experimental hospitals on several levels. Nearly all individual events provided information which was used by some segment of the hospital staffs. Many such as the presentation on G I infections had a significant impact on hospital procedures in nearly every hospital. The six experimental events had varying success. Video seminars seemed to have the greatest impact and were the most popular. The other end of the scale was represented by the CAI events which were plagued by technical problems. The most profound effect however was that of the experiment as a whole on the hospital staffs.

1 Methodology

The VA/ATS-6 events can be divided into two groups: those designed for delivery to groups (video seminars, grand rounds, outpatient clinic and teleconsultation) and those designed for delivery to individuals (CAI and computer mediated patient management). The teleconsultation events should perhaps be classified as individual delivery events. However the form in which they were used was more that of a hospital-originated grand rounds than a one-to-one consultation.

The evaluation of these events is based on a variety of data collection techniques. The group events were evaluated using a combination of data gathered by direct observation, interview and audience reactions (collected both via an evaluation form completed immediately after each broadcast and via retrospective questionnaires administered two—three months after broadcast). Because of changes in questionnaires and time problems questionnaire data collection was not uniform across the experiment. The following table shows what types of questionnaires (and how many) were completed for each of the four group-oriented events. The program evaluation questionnaires were those completed by the audience immediately after each broadcast. The partial retrospective questionnaire referred to in the table was the initial prototype questionnaire which covered the first 14 events broadcast. This questionnaire was substantially revised into a much more powerful instrument (the full retrospective questionnaire) which is the foundation for much of the evaluation.

	Number of Programs	Program Evaluation	Full Retrospective	Partial Retrospective
Video Sem	38	37	19	9
Grand Rounds	16	16	11	4
Teleconsultation	10	10	10	
Patient Seminar	3	3	2	1

The events directed towards individuals (CAI and computer mediated patient management) were evaluated primarily by observation and interview. Data collection for these events was limited as a result of a number of problems which are discussed in subsection 6.

In summary evaluation data were collected via the following methods:

Pretest—a four page questionnaire distributed just prior to the first broadcast. The pretest was used primarily to collect data on existing information seeking patterns in the experimental hospitals and to measure initial expectations towards the VA/ATS-6 project.

Evaluation forms—one-page questionnaires distributed for every program broadcast which were used to collect immediate audience impressions of the programs. In addition the return volume of these forms was used to provide some measure of attendance.

Retrospective questionnaires—four page questionnaires distributed periodically to measure the impact of previously broadcast programs. Four retrospective questionnaires were distributed each covering 10—18 programs.

Post test—a four page questionnaire distributed at the end of the project to assess the impact of the entire VA/ATS-6 experience.

Site visits—a field representative of ACR traveled throughout Appalachia during the ten months of the project visiting the experimental hospitals and interviewing staff members to obtain their reactions both to the project as a whole and to individual programs. In addition where possible he observed broadcasts in the hospitals. After the experiment ended Dr Roger Hamstra the physician moderator also site visited four of the experimental hospitals to analyze the impact of the experiment on medical care provided by the hospitals.

Consultant evaluation forms—forms distributed to consultants who participated in the ten teleconsultation events to collect their impressions of the teleconsultation experience.

Participant evaluation forms—forms distributed to experimental hospital staff members who made presentations in the teleconsultation events to obtain their reactions to the teleconsultations.

The following table shows how many data were collected by each of these measures and how many of the 69 events (including introduction and debriefing) were covered by each technique.

Instrument	N. Programs Covered	Instruments
Pretest	n.a	547
Evaluation Forms	67	12,533
Retrospective	56	1,076
Post test	n a	302
Site Visits	n.a	44
Consultant Eval	10	26
Participant Eval	10	100

2. VIDEO SEMINAR

The video seminars were the most frequent type of program (N-38). They were also the most popular type of program and were very well attended. Average attendance based on program evaluation sheets for 37 programs was 199.07 with a standard deviation of 61 13. This figure is however a considerable underestimate. By comparing returned program evaluation forms with available attendance logs we predict that the actual attendance averaged about 400 per program or 40 viewers per hospital. The most heavily attended program was the initial video seminar on problem oriented medical records for which 413 program evaluation forms were completed.

In addition to being the most well attended of the experimental programs the video seminars were also the most highly rated. The mean rating for the 28 events covered by the retrospective questionnaires was 1.87 on a scale of 1 (very good) to 5 (very poor). This mean was based on 1,942 individual program responses. In addition the most highly rated of the 42 events covered by the full retrospective questionnaire was a video seminar (Fiberoptic Endoscopy) with a mean rating of 1 36 (based on 61 responses).

In general responses to the video seminars were very positive. There were of course minor complaints about material or presentation techniques with most of the programs. One relatively frequent complaint for example was that the events were over produced and lacked spontaneity.

A second frequent complaint was that the time provided for discussion was far too short. After a number of these comments had been received an alternate delivery technique was employed for one program (Pulmonary Embolism). The preproduced portion of this program was sent to the hospitals in advance so that it could be viewed prior to air time and the entire hour could then be spent on discussion. Response to this variation was mixed. The previewing time created scheduling problems—particularly for non VA physicians who wished to attend. Comments from four hospital evaluation coordinators are summarized below.

Approximately 80 people viewed the film prior to broadcast 15 viewed the broadcast The audience felt the old way was best

Fifty four people viewed the tape prior to broadcast and 27 took part in the live question and-answer session People attending felt this mode of presentation was preferable even though it was more time consuming. Physicians did not get much out of the question and answer period and tended to prefer the prepared program

The tape was shown twice before the broadcast and a total of 39 attended Forty-one attended the broadcast but only one took part in the question and answer session (approximately 15 of those present at the broadcast had not viewed the tape)

Reactions were mixed—the extra discussion time was appreciated but the additional session created scheduling problems

Approximately 30 people viewed the program prior to broadcast but only a small percentage of these were present at the broadcast There was little or no participation in the question-and-answer session

The impact of the video seminars appears to have been quite high Of those who reported seeing video seminars (3078 viewer experiences 1 viewer experience=1 person viewing 1 program) 47 percent reported that they discussed the information presented with their colleagues and 43 percent reported using the information in their work In addition 29 *percent reported that they sought and obtained additional* information on topics presented and 18 percent reported that they made changes in their work because of the programs (These findings are based on responses to the 19 video seminars covered by the full retrospective questionnaires.)

3. GRAND ROUNDS

Grand rounds were not as popular as the video seminars There were fewer of them (17 events as compared to 37 video seminars) and the mean attendance (again based on the evaluation forms) was lower—182 0 with a standard deviation of 58 46 Again as with the video seminars we should point out that this figure is low since it is based only on the returned evaluation forms The actual attendance per program was probably at least double this figure

In addition to low attendance the grand rounds were also rated lower by those responding to the retrospective questionnaires The mean program rating (based on 774 viewer experiences) was 2 2 on the 5 point scale (1= very good) The lowest of the 42 events rated was a grand rounds (Behavior Modification I) with a rating of 3 64 (92 viewers responding)

Responses to the grand rounds were more mixed perhaps because the viewers were able to focus more on individuals

One complaint constantly appeared on the evaluations of the grand rounds events lack of any printed material to go with the event Although these events were not intended to be accompanied by printed material complaints from respondents about the lack of such material were loud and clear

The impact of the grand rounds events (15 covered by the retrospective questionnaires) appears to have been somewhat lower Of those who reported viewing the grand rounds events (1237 viewer experiences) 38 percent reported discussing the events with their colleagues 40 percent reported using the material presented in their work 22 percent reported seeking additional information on topics presented and 12 percent reported changing techniques due to information presented

4 TELECONSULTATION

The teleconsultation events were as noted earlier somewhat different from what was originally intended The purpose of the event was to test the viability of satellite mediated teleconsultation Because of problems with the satellite (discussed in an earlier section) and time limitations (the events had to be scheduled in advance for a particular time and in some cases had to be augmented by advanced videotaping) the teleconsultation events ended up being more hospital originated grand rounds than teleconsultations Cases were selected by the presenting physicians and nurses in advance sometimes perhaps more for demonstrating the competence of the presenter than for obtaining advice Despite these problems however the responses to these events suggest two major points (1) that satellite mediated teleconsultation is viable and (2) a hospital originated grand rounds has more appeal than does a grand rounds program coming from a remote unknown location

Because of the special nature of the teleconsultation event additional data collection instruments were employed In addition to the regular program evaluation forms filled out by viewers special forms were prepared for physicians and consultants participating in the program in order to obtain their reactions to the teleconsultation

*In general both the presenting physicians and the con*sultants were highly enthusiastic about the potential for teleconsultation although some were less than enthusiastic about the specific consultation in which they participated

The following comments are representative of those made about the teleconsultation event They have been selected from the consultant and participant evaluation forms and from the program evaluation forms completed by the teleconsultation audience (non participating hospitals)

Almost all hospitals complained that foreign born personnel were difficult to understand Personnel at several hospitals also complained that the program was designed principally for doctors and that not enough information for nurses was included Several favorable comments indicated that the program was better than the usual canned lectures that the program brought together valuable medical knowledge interesting cases and interesting opinions from different physicians and that the program was a good way to educate doctors who need prodding to bring themselves up to-date
Viewer Comment—Silicosis—November 20 1974

I would suggest either the original X ray film or copies be given to the participants rather than using slow scan Copies should also be made available to participating groups The X rays were poorly visible Much of this was due to the poor placement of the camera at the origin—there was inadequate attention to brightness contrast and sensitivity of the transmitting camera
Consultant Comments—Silicosis

Several individuals felt that the first case presented was a waste of time " Otherwise the program was considered good and the consultants were considered excellent Many people felt that there was a great deal of benefit to be gained from the variety of solutions and criticisms presented for handling cases One individual stated that the program had limited potential for non participants

Some individuals felt that for the material to be of value to pathologists prior opportunity to examine the slides is essential One person stated that the photomicrographs were of poor quality and that the consultants should study the cases beforehand for better discussion Several physicians also commented that they would like to see the histopathology of the liver and kidneys
Viewer Comments—Histopathology—November 27 1974

The physicians presenting the cases were not sufficiently versed in details to answer promptly questions asked from the panel

The hospital videotapes were not in color which is essential to proper evaluation Slow scan was too slow This program has an exciting potential but it needs much more understanding between medical and television experts.
Consultant Comments—Histopathology

This type of consultation has high potential if the case material can be known in advance so appropriate consultants can be brought in Chest X rays were too poor to be of value
Consultant Comments—Cardiovascular Surgery

There was considerable loss of detail when blow-ups were made during the slow scan process There was some difficulty in centering on points of interest in the slow scan There certainly seems to be some potential to this technique but I wonder about the costs. Once we became familiar with the format it all ran fairly well The reproductions were only fair and the slow scan does take long enough to interfere with the consultation somewhat.
Consultant Comments—Radiology

The slow scan would have been better in color I had hoped for more participation from the audience This seems to have extremely high potential—especially for non physician health care workers who do not enjoy the avenues of communication open to most physicians The feedback from the listeners at the various VA hospitals seemed lukewarm I teach better with a blackboard and a few 2x2 slides to illustrate technical points Neither was available for our session
Consultant Comments—Technical Aspects of Dialysis

Many of the cases had little or nothing to do with the management of arrhythmias One case seemed to have been presented solely to generate an opinion from us that could have been predicted quite easily i e the case was used to support a position and not really to teach Many of the cases were not therapeutic problems but seemed to be presented to point out the clinical acumen of the presentor Presentations should be much shorter The slow scans were amazingly clear Some sort of device is needed (e g. electronic calliper) to demonstrate arrhythmias on the screen The interaction needs more colleague to-colleague flavor rather than primary physician to consultant flavor
Consultant Comments—Cardiac Arrhythmias

Personnel at Salem complained that the panelists did not seem to be too well versed in geriatric care Salisbury also complained that the consultants answers were too vague One physician felt that the cases were too typical and that a surprise case should have been used
Viewer Comments—Problems of the Geriatric Patient

Presentations took up so much of the time there were so many cases and so many on the panel it seemed that each question was quickly responded to without much opportunity for thought interchange or feedback I felt many questions were left unresolved and almost glossed over I believe there is considerable potential for learning both by those who present the problems and by non participant learners but I am not sure the same kind of program meets both needs
Consultant Comments—Nursing Care in Long Term Illness

Too much delay for good interchange with hospitals I would like a little more flexibility and informality—the opportunity to move around and use classroom-type tools This mode of presentation seems stressful and stilted to me
Consultant Comments—Pancreatitis

I feel we did not give adequate answers to all of the questions presented It was unfortunate that as a panel we did not agree on potential patients for speech therapy
Consultant Comment—Speech Therapy

The following comments were offered by the ACR field representative after viewing one of the teleconsultation events from the originating hospital

Slow scan was used in the presentation of X-rays patient histories shots of the hospital staff and slides. The doctor presenting the case with X rays said he was extremely pleased with the quality of the slow scan

A large number of the hospital s staff were involved with the teleconsultation but often I had the impression that the effort was directed towards getting the presentation finished and not in obtaining information This could be partly attributed to the confusion on time use and placement of individual presentations

A nurse in the medical service said teleconsultation was a great learning experience for her It helped bring the doctors and nurses a realization that they were parts of a medical team instead of two different groups she said She believed the program was geared too much towards giving out information instead of receiving it She said the hospital could have been saved a lot of time if the procedure for teleconsultation had been better explained to the staff She rehearsed her presentation for a total of about 15 hours over a two-and-a-half week period

The mean attendance for the ten teleconsultation events was 157 9 with a standard deviation of 28 92.

The average rank for the ten events (based on 781 viewer experiences) was 2 08—midway between the video seminars and the grand rounds

The impact of the teleconsultations was very interesting The events seemed to provoke far more discussion (60 percent of the 838 persons attending events reported discussing them with colleagues) than did the video seminars and grand rounds Approximately the same percentage of viewers reported using information gained from the events in their work (40 percent) However viewers expressed less interest in seeking additional information (14 percent) Reported changes in behavior (15 percent) were midway between that reported for video seminars and for grand rounds

5. Outpatient Clinics

Because there were only three out patient clinics presented data available for evaluation was limited All three of the broadcasts were covered by program evaluations two were covered by full retrospective questionnaires and one was covered by the prototype retrospective questionnaire

The out patient clinics had the highest mean attendance of any experiment—226 with a standard deviation of 28 92.

The mean rating of the two events covered by the full retrospective questionnaire was 1 98 (207 viewer experiences)

Some complaints were made that the language in the events was too technical for the patients to understand On the other hand the final out patient seminar Cardiac Rehabilitation was commended several times for having patients participating in the panel

6. CAI Experiments

The CAI events were the most frustrating of all the events to evaluate In fact because of problems encountered both in the conduct of the event and the conduct of the evaluation we are unable to provide any substantive evaluation

For the evaluation arrangements had been made to obtain case data from the developers of the program on each nurse who participated in the experiment In addition "log sheets were developed for the participants to record their experiences and comments Arrangements were then made with the nurse-coordinators of the event at the two participating hospitals (Altoona and Fayetteville) to collect this data and forward it to ACR As a final check the ACR field representative was requested to visit each of the participating hospitals and observe the event in action

During the course of the experiment the nurse-coordinators for both hospitals left As a result we were unable to obtain any log sheets describing the nurses reactions to the programs In addition we did not obtain the computer printout describing the participants progress from the originating CAI center Finally due to technical problems encountered in running the experiment the field representative had only very limited opportunity to observe the event in progress

What information we do have is based primarily on interviews conducted with nurses who did (or planned to) participate in the experiment

The following are excerpts from site visit reports describing interviews conducted with nurses about the CAI experiment

FAYETTEVILLE Reactions at Fayetteville towards the CAI program were quite positive although several of the nurses interviewed indicated they had only limited contact with the CAI event because of schedule problems Most nurses interviewed expressed frustration that the program was available only two hours per week (after the initial period in which the program was available 24 hours a day)

One nurse in hospital admissions said she had only been able to use the equipment once because she had been on leave She said the CAI program was the most effective training tool she had ever used and was a great deal more valuable to her than the rest of the ATS-6 events She found the equipment easy to use and felt it would be very useful to her to have this program available all the time She indicated that the reason the CAI program was more valuable to her than the rest of the ATS-6 events was that most of the other events were geared more towards physicians Therefore although she enjoyed learning from these programs much of the material was over her head The CAI on the other hand seemed tailored especially for her

A ward nurse indicated she felt the CAI program served as a constant refresher of medical knowledge She also felt it had great potential for keeping her abreast of new techniques within her own specialty and for broadening her knowledge in other areas

An RN in the psychiatric ward stated that while she had not been able to use the program herself she felt from her talks with nurses who had used it that it was an extremely valuable learning experience She also stated that the full impact of the program had not been felt

ALTOONA Technical problems with the Altoona programming greatly affected the impact of the CAI program Many of the problems seem to have been caused by equipment malfunctions at Altoona although some program malfunctions were experienced as well (For example the program frequently failed to record completed exercises)

In addition to technical problems there apparently were some initial problems in understanding how the equipment worked This problem was aggravated by the loss of the nurse coordinator part way through the experiment

The following comment was written in response to a question on the post test asking what aspects of the ATS-6 experiment the respondent would like to see repeated should another satellite become available

> We were impressed with the potentials of the computer program that we were unable to use due to technical problems (I) believe this has great potential for training hospital personnel if it would be available on a 24 hour basis (It has) great potential for special areas of coronary care respiratory intensive care etc

It is impossible to make any assessment of the CAI event based on the data available The Fayetteville on line experience appeared to be quite positive however technical problems made it impossible to make any assessment of the satellite mediated links

In addition to the lack of information available to evaluate the CAI experiment technical advances in the computer industry suggest that alternate means for providing CAI may be more viable within a few years The growth of the value added carrier industry (which provides computer communication channels over leased lines) suggests that alternate delivery means for CAI may be possible at relatively low cost Also rapid advances in the computer industry particularly in the area of microcomputers may have a significant impact on CAI within the next two years

7 Computer-Mediated Patient Management

The second computer event performed in the VA/ATS-6 events was to assess the value of a computer managed program for diagnosis of psychiatric patients This program was provided to the Salisbury N C hospital only

The nature of the program made it very unamenable to traditional evaluation measure As a result evaluation of the event consisted of site visits by the field representative

Some initial technical problems were encountered and in the first six weeks of operation (February 19 to April 2) only three full sessions involving two patients were conducted

The potential for this type of program at Salisbury is high as traditional diagnosis involves administration of the MMPI battery which must be sent to Minnesota for diagnosis (this requires five days) The CAI program has the potential for providing more rapid diagnosis although this had not been the case as of April 4

Physicians reported that the two patients seemed to enjoy using the CAI equipment One of the two patients had refused to take the MMPI but did not object to the CAI exercise Neither of the two patients experienced any problems with the keyboard Hospital officials indicated they felt only about 25 percent of their patients would be able to use this equipment upon admission but that after some initial treatment this figure would rise to approximately 75 percent Some patients because of combined physical and mental problems would probably never be able to use the CAI program However this group was considered virtually untestable

This particular program seems to offer high potential although our data is extremely limited The data on technical problems is insufficient to make any judgment concerning its viability for satellite transmission However as in the case of the CAI programs advances in the computer industry may make other forms of transmission or in house computers a more viable means of access

8. Comparing the Group-Oriented Experiments

It is instructive to examine the four group-oriented events to see how successful each was in comparison with the others These comparisons are based on data from the retrospective questionnaires

The first comparison uses the ratings given each program in the final retrospective questionnaires This form was used to evaluate 19 video seminars 11 grand rounds 10 teleconsultations and 2 outpatient clinics

Type of Program	# Programs Rated	Rating (where 1=very good 5=very poor)
Outpatient Clinic	2	1 71
Video Seminar	19	1.87
Teleconsultation	10	2 08
Grand Rounds	11	2.20

The second comparison comes from the post-questionnaire and is based on 302 responses In this questionnaire respondents were asked to indicate which of three formats (video seminar grand rounds teleconsultation) they found most effective

Respondent	N	Video Seminar	Grand Rounds	Teleconsultation
M D s	89	61%	18%	11%
Nurses	147	46%	16%	16%
All	302	53%	16%	14%

The third comparison comes from responses to a battery of questions on the retrospective questionnaires asking

Which of the programs did you see?

Which of these programs have you discussed with your colleagues?

Have you been able to use any of the material presented in these programs in your job? Which programs?

Have you tried to obtain additional information on subjects covered by any of these programs? Which programs?

Have you made any changes in the way you perform your job because of information presented in any of these programs? Which programs?

The following table presents an analysis of the responses to these questions tabulated by role and by program type

All respondents (physicians nurses administrators others) responded

	Saw Program	Discussed Program	Used Info.	Sought Info.	Changed Technique
Video Seminar	3078	47%	43%	29%	18%
Grand Rounds	1237	38%	40%	22%	12%
Teleconsultation	838	60%	42%	14%	15%

M D s responded

	Saw Program	Discussed Program	Used Info.	Sought Info.	Changed Technique
Video Seminar	852	35%	42%	27%	17%
Grand Rounds	491	32%	34%	23%	11%
Teleconsultation	343	51%	34%	14%	6%

Nurses responded

	Saw Program	Discussed Program	Used Info.	Sought Info	Changed Technique
Video Seminar	1931	51%	43%	28%	18%
Grand Rounds	582	42%	40%	21%	12%
Teleconsultation	394	64%	45%	20%	19%

9 General Observations

This subsection covers observations not directed towards any specific experiment but rather towards the VA/ATS-6 project as a whole Much of the data collected—such as the pre and post tests site visits etc —have significant impact on the potential for a satellite mediated biomedical communication system

9 1 Hospitals

There were marked differences in the cooperation and participation of the ten experimental hospitals These differences were caused by a number of factors including size relative remoteness staff load and the personalities' of the hospitals

In some hospitals for example administrative support for the experiment was less than enthusiastic This manifested itself in a number of ways—physical facilities used for showing the programs publicity both inside the hospital and for the surrounding medical community morale of the staff etc In one hospital for example a site visitor encountered a senior nurse who had been on station for more than ten years yet was not aware of the VA/ATS-6 program

The following chart shows the mean attendance by hospital across all programs

Hospital	# Programs Reported	Mean Attendance
Altoona	54	18 22
Beckley	61	15 90
Clarksburg	57	13.07
Dublin	63	11 05
Fayetteville	65	19 63
Mt Home	63	20.16
Oteen	64	27.25
Salem	66	20 27
Salisbury	66	21 38
Wilkes-Barre	65	30.58

(Mean Hospital Attendance=18 99 per program)

As noted earlier in this report these figures are based upon returned program evaluation forms and represent a significant underestimate of the actual attendance Several hospitals for example used a number of small viewing rooms rather than one large one but did not have sufficient personnel to administer the program evaluation forms at each location Also in many cases a portion of the audience left before the program was concluded and thus did not complete the forms

9.2 Roles

In addition to differences between hospitals there were marked differences in the responses of the various role categories used in this evaluation In general nurses seemed both much more positive towards the experiment and much more aggressive in seeking information The nurses were also far more critical of events and offered a proportionately larger share of comments than did any of the other role groups Throughout the experiment large numbers of nurses attended events designed specifically for physicians (and frequently complained because they lacked preparatory material which would enable them to better understand the programs)

The following table shows the mean attendance by role across all events and across all ten hospitals

Role	Maximum Attendance	Minimum Attendance	Mean Attendance
M.D	88	0	39.77
Nurse	249	26	94 82
Administrator	18	0	1 46
Other	223	0	49.60
Total	416	82	188 41

9.3 Program Ratings

As noted earlier the most highly rated program was Fiberoptic Endoscopy and the lowest rated program was Behavior Modification I The table below lists the events with the highest attendance

Program	Attendance
POMR	413
Alcohol Rehabilitation	318
Upper G.I Bleeding (Nurses)	299
POMR Update	297
Changing Role of the Nurse I	273
Death and Dying	273
Problem Drinker	264
POMR (Nurses)	263
Cardiac Rehabilitation (Video Sem)	255

The lowest attended events were

Program	Attendance
Pre-op and Post-op Thoracotomy Care	81
Ultrasonics in Cardiology	107
Histopathology	108
Neurological Diagnosis	109
Cardiac Catheterization	114
Changing Role of the Nurse IV	118
Behavior Modification II	121
Technical Aspects of Dialysis	132

The program most cited in the *post-experimental questionnaires* was Death and Dying. It obviously made a great impression on the nurses who viewed it and it was the program most frequently mentioned by them when they were asked to cite examples of how the experimental events had affected them in the performance of their jobs

9.4 Videotapes

One unexpected result of the VA/ATS-6 events was the high use of videotapes made of the programs Most of the hospitals videotaped the events for later use by staff members who were unable to be present for the original broadcast Some hospitals kept a complete file of programs Others for economic reasons retained only the most popular programs erasing others to free the tapes for reuse

Although it was impossible to obtain accurate figures detailing the use of these videotapes the data we do have indicate that the viewing of events was at least doubled through the use of the videotapes *Often videotapes were used not only* within the experimental hospitals but were also exchanged with other area hospitals

The following table is a partial listing of showings of program videotapes at Altoona one of the hospitals that seemed to make great use of the videotapes This listing is incomplete but it does give some idea of the frequency of use of the tapes and of the number of staff members who were present for showings

Date	Program	Attendance
7/31/74	Changing Role of the Nurse I	22
8/7/74	Arrhythmias	22
8/14/74	Venous and Arterial Cannulas	18
8/14/74	Changing Role of the Nurse II	20
8/21/74	Alcoholism Rehabilitation	20
8/21/74	The Problem Drinker	19
8/28/74	Changing Role of the Nurse III	25
8/28/74	Family Therapy	17
9/4/74	Death and Dying I	44
9/4/74	Death and Dying II	37
9/11/74	Changing Role of the Nurse IV	12
9/18/74	Surgical Treatment of Peptic Ulcers	14
9/18/74	Diabetic Patient	11
9/25/74	Behavior Modification	6
10/2/74	Changing Role of the Nurse V	28
10/9/74	COPD	4
10/9/74	Coronary Arteriography	7
10/16/74	CPR	25
10/16/74	POMR	15
10/23/74	Genital Urinary Infection	28
10/23/74	Biofeedback	30
10/30/74	Coronary Care I	23
10/30/74	Coronary Care II	18
11/6/74	Cardiac Rehabilitation I	14
11/6/74	Cardiac Rehabilitation II	12
11/13/74	Hypertension I	21
11/13/74	Hypertension II	16
11/27/74	Patient Histology Tissue Conference	4
12/4/74	Cardiovascular Surgery I	4
12/4/74	Cardiovascular Surgery II	1
12/11/74	Radiology	0
12/18/74	Technical Aspects of Dialysis I	8
12/18/74	Technical Aspects of Dialysis II	1
1/8/75	Cardiology Conference I	10
1/8/75	Cardiology Conference II	3
1/29/75	Pancreatitis I	14
1/29/75	Pancreatitis II	10
2/19/75	Blood Gases	3

The unforeseen popularity of these videotapes had a major impact on the evaluation in two areas. First because of the informality of videotape use it was impossible to gather accurate data describing this use Second some of the videotapes made their way into other VA hospitals which had been selected to serve as controls for knowledge gain evaluation to the experiment As a result all the control hospitals were contaminated and were unable to serve their control function

9.5 Impact

The post-experimental questionnaire contained a number of questions regarding the impact of the VA/ATS-6 experiment as a whole Although the sample is not too large (302) the responses to these questions provide significant insight into both the viability of a satellite-mediated communication system for the VA and its possible impact

To summarize responses to these questions we have crosstabbed them against the roles of the respondents to show the differences in responses by role Each role is represented by a row in the table and by reading across the row it is possible to see how respondents from a particular role type answered a question Response categories for the questions are listed across the top of the table and are shown as columns.

To interpret the table first read the very last column This gives the number of respondents from each role type and what percent of the total sample this group represents In table 1, for example there are 89 M D s and they represent 29 5 percent of the sample Now read the bottom 2 rows. They give the number of respondents who selected each answer to the question For example in the first table 41 people or 13 6 percent of all respondents answered very much to the question Now look at one of the cells—row 3 column 4 It shows that 33 nurses answered the question with a slightly response These 33 nurses are 22 4 percent of all the nurses who responded they represent 42.3 percent of all people who responded slightly to this question and they are 10 9 percent of the total sample Note that the number in the lower right corner (302) represents the *total number of people responding* to this question and is the sum of the farthest right column and also the sum of the bottom row

The first table deals with the success of the ATS-6 events in providing information to help solve existing problems. Across all roles 67 percent indicated they felt the events had at least somewhat eased their problems Nurses tended to be slightly more positive towards the experiment than were physicians

Q. Considering all the problems in medical care that you are *familiar with to what extent do you feel that the ATS-6* programs solved or eased these problems?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	0	1	2	0	0	3
No Role Stated		0.0	33.3	66 7	0 0	0 0	1 0
		0 0	2 4	1 2	0 0	0 0	
		0 0	0.3	0.7	0 0	0 0	
	1	3	16	37	24	9	89
M D		3 4	18 0	41 6	27 0	10 1	29 5
		50 0	39 0	22.8	30 8	60 0	
		1 0	5 3	12 3	7 9	3 0	
	2	3	18	88	33	5	147
Nurse		2.0	12 2	59 9	22 4	3 4	48.7
		50 0	43 9	54 3	42.3	33.3	
		1 0	6 0	29 1	10 9	1 7	
	4	0	0	2	2	0	4
Admin		0 0	0 0	50 0	50 0	0.0	1 3
		0 0	0 0	1 2	2 6	0 0	
		0.0	0 0	0 7	0 7	0 0	
	5	0	6	33	19	1	59
Other		0 0	10 2	55 9	32 2	1 7	19 5
		0 0	14.6	20 4	24 4	6.7	
		0 0	2.0	10 9	6 3	0 3	
	Column	6	41	162	78	15	302
	Total	2 0	13 6	53 6	25.8	5 0	100 0

The second table describes responses to a question probing the potential for satellite-mediated communications. In general the respondents were quite positive about the potential (83 5 percent indicated they felt there was some potential and only 1.3 percent felt there was no potential) Again nurses tended to be more positive than physicians

Q To what extent do you feel satellite communication (including the actual ATS-6 programs you have seen) has the potential to solve or ease these problems?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	0	0	3	0	0	3
No Role Stated		0.0	0.0	100 0	0 0	0 0	1 0
		0 0	0.0	2.1	0.0	0 0	
		0.0	0.0	1 0	0.0	0 0	
	1	2	30	38	17	2	89
M.D		2.2	33 7	42 7	19 1	2.2	29 5
		14.3	27.8	26 4	53 1	50 0	
		0 7	9 9	12 6	5 6	0 7	
	2	10	49	77	10	1	147
Nurse		6.8	33 3	52.4	6.8	0 7	48 7
		71 4	45 4	53.5	31.3	25 0	
		3 3	16 2	25 5	3.3	0 3	
	4	1	1	2	0	0	4
Admin		25 0	25 0	50 0	0 0	0 0	1 3
		7 1	0 9	1 4	0 0	0 0	
		0.3	0.3	0.7	0.0	0 0	
	5	1	28	24	5	1	59
Other		1 7	47 5	40 7	8 5	1.7	19 5
		7 1	25 9	16.7	15 6	25 0	
		0.3	9 3	7 9	1 7	0 3	
	Column	14	108	144	32	4	302
	Total	4 6	35 8	47.7	10 6	1 3	100 0

A surprising number (15 3 percent) of the respondents indicated they asked one or more questions in the events they attended Physicians tended to ask more questions than did nurses

Q Did you ask any questions during the broadcasts you attended approximately how many questions per broad cast?

	Count Row Pct. Col. Pct. Tot. Pct.	0	1	2	3	4	5	Row Total
	0	3	0	0	0	0	0	3
No Role Stated		100 0	0 0	0.0	0 0	0 0	0 0	1 0
		1 2	0 0	0 0	0 0	0 0	0 0	
		1 0	0.0	0 0	0 0	0 0	0 0	
	1	66	15	7	0	1	0	89
M D		74 2	16 9	7 9	0 0	1 1	0 0	29.7
		26 0	51.7	77.8	0 0	50 0	0 0	
		22 0	5.0	2.3	0.0	0 3	0 0	
	2	127	11	1	4	1	1	145
Nurse		87.6	7.6	0.7	2.8	0 7	0 7	48 3
		50 0	37 9	11 1	80.0	50 0	100 0	
		42 3	3.7	0.3	1 3	0 3	0.3	
	4	2	0	1	1	0	0	4
Admin		50 0	0.0	25 0	25 0	0 0	0 0	1.3
		0.8	0.0	11 1	20.0	0 0	0.0	
		0 7	0 0	0 3	0.3	0 0	0 0	
	5	56	3	0	0	0	0	59
Other		94 9	5 1	0 0	0.0	0 0	0 0	19 7
		22 0	10 3	0 0	0.0	0 0	0 0	
		18 7	1 0	0 0	0 0	0 0	0 0	
	Column	254	29	9	5	2	1	300
	Total	84 7	9.7	3 0	1 7	0 7	0 3	100.0

When questioned concerning the value of the real time interaction offered by satellite communication slightly more than 50 percent felt it had some value approximately 25 percent felt it had little or no value and the remaining 25 percent declined to respond

Q How valuable were the real time interactions?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	1	0	2	0	0	3
No Role Stated		33.3	0 0	66 7	0.0	0 0	1.0
		1.3	0 0	2.0	0 0	0 0	
		0 3	0 0	0 7	0 0	0 0	
	1	22	12	28	19	8	89
M D		24.7	13 5	31 5	21 3	9 0	29.5
		28 9	22 6	28 0	31 1	66 7	
		7 3	4 0	9.3	6 3	2.6	
Nurse	2	31	31	54	28	3	147
		21 1	21 1	36 7	19.0	2.0	48.7
		40.8	58 5	54 0	45 9	25 0	
		10 3	10 3	17 9	9 3	1 0	
	4	1	1	1	1	0	4
Admin		25 0	25 0	25.0	25 0	0 0	1 3
		1 3	1 9	1 0	1.6	0 0	
		0.3	0.3	0 3	0.3	0 0	
	5	21	9	15	13	1	59
Other		35.6	15.3	25 4	22.0	1 7	19 5
		27 6	17.0	15 0	21 3	8 3	
		7 0	3 0	5 0	4 3	0 3	
	Column	76	53	100	61	12	302
	Total	25 2	17 5	33 1	20 2	4 0	100 0

When questioned concerning the degree to which they felt they had access to specialists and consultants in Denver via the satellite the respondents were more negative Only 49 6 percent felt they had some access while almost 36 percent felt they had little or no access This may in part be a reflection of the frustration expressed throughout the experiment over the lack of discussion time

Q To what extent do you feel you have had access to the specialist/consultants in Denver?

	Count Row Pct. Col. Pct. Tot Pct	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
No Role Stated	0	1	0	0	2	0	3
		33.3	0 0	0 0	66 7	0 0	1 0
		2 3	0 0	0 0	2 7	0 0	
		0 3	0 0	0 0	0 7	0 0	
M D	1	13	17	25	21	13	89
		14 6	19 1	28 1	23 6	14 6	29 5
		29.5	22 7	33 3	28 8	37 1	
		4 3	5 6	8 3	7 0	4.3	
Nurse	2	20	47	32	34	14	147
		13.6	32 0	21.8	23 1	9 5	48 7
		45 5	62 7	42 7	46 6	40 0	
		6 6	15 6	10 6	11 3	4 6	
Admin	4	0	2	0	1	1	4
		0 0	50 0	0 0	25 0	25 0	1 3
		0 0	2.7	0 0	1 4	2 9	
		0 0	0.7	0 0	0 3	0 3	
Other	5	10	9	18	15	7	59
		16 9	15 3	30 5	25 4	11 9	19 5
		22 7	12 0	24 0	20 5	20 0	
		3 3	3 0	6 0	5 0	2 3	
	Column	44	75	75	73	35	302
	Total	14 6	24 8	24 8	24 2	11 6	100 0

The next question probed the degree to which the satellite events had been able to create a sense of face to face interaction between the respondents and the Denver consultants. Nearly 53 percent of the respondents indicated they felt there was some success at creating this interaction Nurses again tended to be more positive than physicians

Q We often get information from colleagues in a face to-face situation To what extent have the ATS-6 programs been able to create a sense of face to face interaction between you and the Denver consultants?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
No Role Stated	0	2	1	0	0	0	3
		66 7	33 3	0 0	0 0	0 0	1 0
		4 4	1.5	0 0	0 0	0 0	
		0 7	0 3	0 0	0 0	0 0	
M D	1	11	16	25	28	9	89
		12.4	18 0	28 1	31 5	10 1	29 5
		24 4	23 9	27 2	41 2	30 0	
		3 6	5.3	8.3	9.3	3 0	
Nurse	2	21	37	48	28	13	147
		14.3	25 2	32.7	19 0	8 8	48 7
		46 7	55 2	52 2	41 2	43 3	
		7 0	12 3	15 9	9 3	4 3	
Admin	4	1	1	1	0	1	4
		25 0	25 0	25 0	0.0	25 0	1 3
		2 2	1 5	1 1	0 0	3 3	
		0 3	0.3	0.3	0 0	0 3	
Other	5	10	12	18	12	7	59
		16 9	20.3	30 5	20 3	11 9	19 5
		22.2	17 9	19 6	17 6	23 3	
		3.3	4 0	6 0	4 0	2.3	
	Column	45	67	92	68	30	302
	Total	14 9	22 2	30 5	22 5	9 9	100 0

A significant proportion of the respondents did feel that pertinent information had been transmitted in the satellite events

Q To what extent do you feel that pertinent information was transmitted via ATS-6?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
No Role Stated	0	1	0	2	0	0	3
		33.3	0 0	66.7	0 0	0 0	1 0
		3 6	0 0	1.7	0 0	0 0	
		0.3	0.0	0.7	0 0	0 0	
M D	1	5	37	35	9	3	89
		5 6	41 6	39.3	10 1	3 4	29.5
		17 9	28.2	29 2	50 0	60 0	
		1.7	12.3	11 6	3 0	1 0	
Nurse	2	17	64	63	3	0	147
		11 6	43.5	42 9	2.0	0 0	48 7
		60 7	48.9	52.5	16.7	0.0	
		5.6	21.2	20 9	1.0	0 0	
Admin	4	0	2	1	1	0	4
		0 0	50 0	25 0	25 0	0 0	1 3
		0 0	1 5	0 8	5 6	0 0	
		0 0	0.7	0.3	0.3	0 0	
Other	5	5	28	19	5	2	59
		8 5	47.5	32 2	8.5	3 4	19 5
		17 9	21 4	15.8	27.8	40 0	
		1 7	9.3	6.3	1.7	0 7	
	Column	28	131	120	18	5	302
	Total	9.3	43 4	39.7	6.0	1.7	100.0

In general the respondents felt that viewing the VA/ATS-6 events was a good use of their time Nurses were far more positive than physicians

Q To what extent do you feel that viewing programs (ATS-6 programs) was a good use of your time?

	Count Row Pct. Col. Pct. Tot. Pct.	No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
No Role Stated	0	1	1	1	0	0	3
		33 3	33 3	33 3	0.0	0 0	1 0
		1.7	1 1	0 9	0.0	0.0	
		0 3	0.3	0.3	0 0	0 0	
M D	1	21	18	35	11	4	89
		23 6	20.2	39.3	12.4	4.5	29 5
		35 6	19 4	30 4	44 0	40 0	
		7 0	6.0	11.6	3.6	1.3	
Nurse	2	29	59	50	5	4	147
		19 7	40 1	34 0	3 4	2.7	48.7
		49 2	63 4	43.5	20.0	40 0	
		9 6	19.5	16 6	1 7	1.3	
Admin	4	0	1	2	1	0	4
		0.0	25 0	50 0	25.0	0.0	1.3
		0 0	1 1	1.7	4.0	0 0	
		0 0	0.3	0.7	0.3	0 0	
Other	5	8	14	27	8	2	59
		13.6	23.7	45.8	13.6	3 4	19.5
		13.6	15 1	23.5	32.0	20.0	
		2.6	4.6	8 9	2.6	0 7	
	Column	27	133	100	34	8	302
	Total	8.9	44 0	33.1	11.3	2.6	100 0

In addition to stating that viewing the satellite events was a good use of their own time respondents also indicated that they felt it was a good way for others to employ their time as well!

Q To what extent do you feel that viewing programs (ATS-6 programs) was a good use of others time?

Count / Row Pct / Col. Pct / Tot. Pct.		No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	1	1	1	0	0	3
No Role Stated		33 3	33.3	33.3	0 0	0 0	1 0
		1.7	1 1	0 9	0 0	0 0	
		0.3	0 3	0.3	0 0	0 0	
	1	21	18	35	11	4	89
M D		23 6	20 2	39 3	12.4	4 5	29 5
		35 6	19 4	30 4	44 0	40 0	
		7 0	6 0	11 6	3.6	1 3	
	2	29	59	50	5	4	147
Nurse		19.7	40 1	34 0	3 4	2 7	48 7
		49 2	63 4	43.5	20 0	40 0	
		9 6	19 5	16 6	1 7	1 3	
	4	0	1	2	1	0	4
Admin		0 0	25 0	50 0	25 0	0 0	1 3
		0 0	1 1	1 7	4 0	0 0	
		0 0	0.3	0 7	0.3	0 0	
	5	8	14	27	8	2	59
Other		13 6	23.7	45.8	13 6	3 4	19.5
		13 6	15 1	23.5	32 0	20 0	
		2 6	4 6	8 9	2.6	0 7	
Column Total		59	93	115	25	10	302
		19 5	30 8	38 1	8 3	3 3	100 0

When asked whether or not they felt viewing the experimental events increased their competence nearly 60 percent of the respondents indicated that it had at least somewhat increased their competence Only 7 3 percent felt that viewing had not increased their competence at all Again nurses (69 4 percent) tended to be much more positive than physicians (49 4 percent)

Q To what extent do you feel that viewing increased your competence?

Count / Row Pct. / Col. Pct / Tot. Pct.		No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	1	0	2	0	0	3
No Role Stated		33.3	0 0	66 7	0 0	0 0	1 0
		3 1	0 0	1 6	0 0	0 0	
		0 3	0 0	0.7	0 0	0 0	
	1	7	17	27	25	13	89
M D		7 9	19 1	30 3	28 1	14 6	29 5
		21.9	32 7	20 9	37 3	59 1	
		2 3	5 6	8 9	8 3	4 3	
	2	19	26	76	25	1	147
Nurse		12.9	17 7	51 7	17 0	0 7	48 7
		59 4	50 0	58 9	37 3	4 5	
		6 3	8 6	25 2	8 3	0 3	
	4	0	2	0	2	0	4
Admin		0 0	50 0	0 0	50 0	0 0	1 3
		0 0	3 8	0 0	3 0	0 0	
		0 0	0.7	0 0	0 7	0 0	
	5	5	7	24	15	8	59
Other		8.5	11 9	40 7	25 4	13 6	19.5
		15 6	13.5	18 6	22.4	36 4	
		1 7	2.3	7 9	5 0	2 6	
Column Total		32	52	129	67	22	302
		10 6	17 2	42 7	22 2	7 3	100 0

The last two questions concern the technical quality of the individual events and the quality of the intructional material presented When asked if they felt the events were technically adequate 81 5 percent of the respondents felt they were at least somewhat adequate and only 1 3 percent felt they were not technically adequate

Q To what extent do you feel that the ATS-6 programs were technically adequate?

Count / Row Pct / Col. Pct. / Tot Pct		No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	1	0	2	0	0	3
No Role Stated		33 3	0 0	66 7	0 0	0 0	1 0
		2 9	0 0	1 8	0 0	0 0	
		0 3	0 0	0 7	0 0	0 0	
	1	6	48	27	5	3	89
M D		6.7	53 9	30 3	5 6	3 4	29 5
		17 1	35 8	24 1	29 4	75 0	
		2 0	15 9	8 9	1 7	1 0	
	2	20	62	58	6	1	147
Nurse		13 6	42.2	39 5	4 1	0 7	48.7
		57 1	46 3	51 8	35.3	25 0	
		6 6	20.5	19 2	2 0	0 3	
	4	0	3	1	0	0	4
Admin		0 0	75 0	25 0	0 0	0 0	1.3
		0 0	2 2	0 9	0 0	0 0	
		0 0	1 0	0 3	0 0	0 0	
	5	8	21	24	6	0	59
Other		13 6	35 6	40 7	10 2	0 0	19 5
		22 9	15 7	21 4	35 3	0 0	
		2 6	7 0	7 9	2.0	0 0	
Column Total		35	134	112	17	4	302
		11 6	44 4	37 1	5 6	1.3	100 0

When asked if they felt the topics were covered comprehensively by the events 76 8 percent of the respondents indicated they felt they were covered at least somewhat comprehensively

Q To what extent do you feel that topics (in the ATS-6 programs) were presented comprehensively?

Count / Row Pct / Col Pct / Tot Pct		No Reply 0	Very Much 1	Somewhat 2	Slightly 3	Not At All 4	Row
	0	2	0	1	0	0	3
No Role Stated		66 7	0 0	33.3	0 0	0 0	1 0
		5 6	0 0	0 8	0 0	0 0	
		0 7	0 0	0 3	0 0	0 0	
	1	7	35	35	11	1	89
M D		7 9	39 3	39 3	12 4	1 1	29 5
		19 4	32 7	28 0	33.3	100 0	
		2.3	11 6	11 6	3 6	0 3	
	2	19	55	60	13	0	147
Nurse		12 9	37 4	40 8	8 8	0 0	48 7
		52 8	51 4	48 0	39 4	0 0	
		6 3	18 2	19 9	4.3	0 0	
	4	0	1	2	1	0	4
Admin		0 0	25.0	50 0	25 0	0 0	1 3
		0 0	0 9	1 6	3 0	0 0	
		0 0	0.3	0 7	0 3	0 0	
	5	8	16	27	8	0	59
Admin		13 6	27 1	45 8	13 6	0 0	19.5
		22 2	15 0	21 6	24 2	0 0	
		2.6	5.3	8 9	2.6	0 0	
Column Total		36	107	125	33	1	302
		11 9	35 4	41 4	10 9	0 3	100 0

Another measure of program impact was developed from questions asked in the full retrospective questionnaires These questions are listed below

Which of the programs did you see?

Which of these programs have you discussed with your colleagues?

Have you been able to use any of the material presented in these programs in your job? Which programs?

Have you tried to obtain additional information on subjects covered by any of these programs? Which programs?

Have you made any changes in the way you perform your job because of information presented in any of these programs? Which programs?

These questions were asked in three retrospective questionnaires covering 42 programs generating a total of 5561 viewer experiences (viewer experience=1 person viewing 1 program) By chaining together the responses to these questions in a series we can gain some insight into the potential impact of this form of programming

To begin we look across the questions to see that of those who saw the events (5561 viewer experiences) 44 percent indicated that they discussed the program material with colleagues 41 percent indicated they used material from the events in the performance of their jobs 24 percent indicated that they sought additional information on topics presented and 16 percent indicated that they changed the performance of their job because of information presented in the programs

Next we consider those individuals who both saw events and discussed them with their colleagues (2457 viewer experiences) Of the people who fell into this category 53 percent indicated that they used information presented in the programs 30 percent indicated that they sought additional information on the topics presented and discussed and 24 percent made changes in their job performance based on information learned and discussed

Carrying the chain of behaviors one step further we next examine those people who saw the program discussed it with their colleagues and obtained additional information on the topics Of these 77 percent indicated that they used the information in the performance of their jobs and 47 percent stated that they made changes in their job performance as a result of this information

Since these chained behaviors represent self selection they must be viewed carefully They suggest what might happen under optimal conditions not what can happen as the result of a structured program In general if people view the events and if they then feel moved to discuss the information presented in these events with their colleagues the probability is fairly high that they will use the information (53 percent) If in addition to discussing the program with colleagues they seek out additional information the probability that they will use the information jumps to 77 percent

Again we caution that no causality is implied here The data does not allow us to determine if the adoption of new information was based on some need which existed prior to the program or whether it was indeed a case of some totally new information presented in the program and forming the base for traditional adoption behavior What these data do suggest however is that given the right conditions events of the type presented in these events can have a significant impact and can trigger an information adoption pattern

9 6 Technical Problems

Technical problems were present throughout the project Comments on at least 30 events complained about poor audio and, less frequently about loss of video signal Site visit reports also indicated frequent audio problems However it appears from the pattern of these reports that the problems did not appear in all hospitals at the same time suggesting that the technical problems were at the receiving rather than at the broadcast end Also many of the hospital viewing rooms had very poor acoustics which further complicated the problem both when receiving the events and when asking questions

9.7 Scheduling Problems

There were some scheduling problems caused primarily by time constraints and production problems encountered in some of the programs This meant that the original ten month schedule had to be corrected with monthly updates which were sent out around the middle of the preceding month Although this provided the hospitals with two—three weeks warning of schedule changes it did cause the hospitals some distress—particularly in their community relation programs which encouraged area physicians to attend the broadcasts

While this may seem a minor problem many of the hospitals did have strong community interest in the experimental events and frequently had large numbers of non VA attendees

The actual broadcast schedule created problems as well In several hospitals it conflicted with long established meetings that could not be rescheduled Also many staff members who wished to be present for the broadcast could not because they were on duty and could not leave Obviously no single time would be best for all viewers however it seems obvious that future experiments or events should have some arrangement for multiple scheduling

9.8 Printed Material

One problem which was mentioned briefly in the discussion of grand rounds was the frequent absence of printed material to accompany the programs Rescheduling sometimes caused problems in getting printed material to the hospitals in time for the video seminars Comments from the hospitals indicated that they preferred to get the printed material in advance so staff members could prepare for the programs yet the material often was not available until the day of the program (sometimes even later) Another frequent complaint was that there were not enough copies of the printed material

Although no printed materials were prepared for the teleconsultations or grand rounds there were frequent complaints about the lack of it Perhaps the impact of the events would have been greater had such material been available This problem was particularly acute among nurses watching physician oriented programs They were highly motivated and interested in the material but found much of it very difficult to understand Some sort of preparatory material might have significantly increased the impact of the events on them

9 9 Post-experimental Impressions

A post experimental questionnaire was distributed during the last program of the series to collect impressions towards the project as a whole One question of particular relevance asked the number of ATS-6 events the respondent had seen at time of broadcast and the number seen later via videotape The following table shows by hospital the number of respondents who completed the questionnaire the mean number of programs seen at broadcast time by each respondent the number of respondents who reported viewing videotapes of the broadcasts and the mean number of videotapes each of these respondents viewed

Hospital	Respondents	Mean Programs At Broadcast	# Viewing Videotapes	Mean Tapes Viewed
Altoona	20	20 85	11	21 9
Asheville	40	10 18	13	2.85
Beckley	28	8 18	16	2 69
Clarksburg	20	19 65	9	4 67
Dublin	26	22	16	9 13
Fayetteville				
Mt Home	52	13 64	24	2 92
Salem	33	12 09	8	8.75
Salisbury	34	16 09	12	10
Wilkes Barre	49	16 57	26	7 73

These respondents were obviously self selected (as were all respondents) and were in general very pro-ATS-6 Regardless of the self selection bias however it is apparent that there is at least a hard core of very avid users of the experimental programs To get some feeling for their impressions of the experiment the following comments have been selected from the questionnaires

Q Why did you attend programs?

Interest in subjects and also interest in the project —nurse (all programs)

I was project coordinator —nurse (all programs)

Because in this area most other forms of CT (continuing training) are dull lectures I need CT badly in all fields and because I found most of your programs very interesting — physician (55 programs)

Saw most of the programs in our library from 7 to 8 in mornings because the volume of patients demand all my time in my office —physician (26 programs)

I felt I learned from them —physician (8 programs)

I enjoyed the exchange of information and new ideas and reviewing old methods even though we are not equipped or staffed to handle some of the more sophisticated methods — nurse (many programs)

Q Describe ways in which you perform your job differently because of an ATS-6 broadcast

Unlike before I do not take elaborate tests time and efforts to determine the cause of hypertension in patients now I realize the treatment and prevention of complications is what is really important Also I now use the three classes of hypertension drugs as the particular case needs —physucian (48 programs)

A patient with anemia was being studied at the time of the program on anemia—the points made on the program were directly utilized in managing the patient —physician (45 programs)

No way —physician (15 programs)

Actual job performance was not changed Assimilation of significant and practical aspects of broadcasts into the overall performance was virtually automatic and probably contributed markedly to the efficiency and efficacy of the guidance provided by a Chief of Staff —physician (50 programs)

In process of changing catheter care Presently evaluating various closed drainage systems before initiating a new procedure —nurse (50 programs)

I was able to help at least one patient who was dying and knew for certain that he was dying —nurse (22 programs)

Sengstaken tubes—using Iced saline reassuring the patient etc We are in the process of revising our urinary drainage procedure and have drawn material from that program —nurse (41 programs)

None —physician (20 programs)

The approach to COPD breathing at bedside has been modified slightly —phyucal therapist (11 programs)

I can think of none There were new ideas which I can recall but the nature of illness of most of our patients is such that little if any change in dealing with them is of value The majority of our acutely ill patients are transferred to acute centers for treatment The majority remaining are long term chronically ill and alcoholic Methods used in treatment of the alcoholic have been inadequate —nurse (many programs)

I seriously consider transferring stroke patients to rehabilitation centers rather than nursing homes —physician (8 programs)

Tried to refrain talking any more than necessary in the operating room —nurse (40 programs)

None—except to brag about the program in an attempt to improve the community image regarding the Veterans Administration —physician (26 programs)

I am less depressed because my work which is overwhelming is interrupted by this beautiful program—so I go back refreshed —physician (55 programs)

Q. What do you feel are the major strengths of satellite communication for medical care within hospitals?

Two way communication on selected medical problems Also the study guides reinforce the information —physician (48 programs)

Subject material dealt with is that which is being currently used in the hospital where we work —physician (10 programs)

Immediacy of communication variety of speakers and consultants and ability to transmit technical data —physician (45 programs)

Ready accessibility to recent developments in diagnosis treatment and management of selected essentially common disease Opportunity to discuss with expert consultants questions and clarification of obscure points in presentations Visualization of techniques patients summaries etc that reinforce memory retention Conservation of travel time and costs involved in attending similar programs seminars etc — physician (50 programs)

Entire staff Dr RN s LPN s etc all see the same programs—new trends etc Easier to to apply and use new techniques learned and easier to get doctors to order new things if they have seen it work via satellite —nurse (2 programs)

To communicate new ideas from hospital to hospital to promote more feeling of teamwork with VA hospitals and to give opportunities to meet and know fellow VA personnel — other (10—12 programs)

Visual aid very effective authorities on the subject matter and all programs have major VA backgrounds and are pertinent to care of VA patient —nurse (10 programs)

Q What do you feel are the major weaknesses of satellite communication for medical care within hospitals?

The busy schedules of personnel especially doctors did not allow them to attend the programs as they would have wanted to —physician (48 programs)

Small talk—local showmanship —physician (20 programs)

Expense of program probably far exceeds gains to be realized —other (15 programs)

"All hospitals are different one may not be operated like another hindering duplication of ideas All hospitals do not have staff like Denver or Chicago have e.g colostomy specialty nurses"—Other (10—12 programs)

"The program (2 hours) was too long a time for staff to be off the work area—also 1 o clock is one of the busiest work periods in the day —nurse (7 or 8 programs)

"In some instances the only benefit derived was a personal benefit from hearing specialists in given fields We are unable to implement many of the suggestions and ideas due to limited facilities and staffing"—nurse (3 programs)

"Do not get indepth expert consultations"—physician (8 programs)

"Too much time spent in communication between panel callers and answers were not included in a booklet to supplement program"—nurse (33 programs)

"Material not furnished on all programs Need to specify who the program applies to —nurse (20 programs)

"Pre-planned and no choice in subject topics. Not adequate time for questions and answers Would appreciate written copy forwarded to each station of questions and answers for future and deeper study"—nurse (10 programs)

"The rigidity and lack of continuity so far The one shot' broadcasters seem tense and some viewers seem stimulated too late. Brief follow-up broadcasts might be worthwhile—like continuing series on a topic"—other (12 programs)

"Too much time spent on question and answer session Too much time spent in presenting material from different hospitals—some was very poor material —physician (50 programs)

Q. Please list any specific knowledge you have gained from ATS-6 programming that has been useful to you in performing your job.

"The practical approach to treatment of hypertension management of anemias and a better understanding of cardiac arrhythmias and unstable angina and their management —physician (48 programs)

"Better knowledge of arrhythmias etc. The program on sergstaken tube—that knowledge has probably been used the most by me —nurse (3 programs)

"Much—including about scapular spasticity (care of the stroke patient) how patients are taught to colostomize themselves how patients undergo carotid arteriography and the benefits of diagnosis in this procedure"—other (10—12 programs)

"I now understand more about colon disorders and learned about the use of feteraptics in diagnosing colon lesions I enjoyed the one that discussed O R patient that could hear while under general anesthetic"—nurse (20 programs)

"Management of cirrhosis and the liver coronary disease and many others"—physician (50 programs)

Q. What effect do you think the ATS-6 experiment has had on communication patterns within the hospital staff?

"Fostered an increased participation by staff members in personal interchanges that clarified many of the problems encountered by these members and resulted in ultimate resolution of at least a reasonable percentage of the difficulties"—physician (50 programs)

"Very effective. Staff enthusiastic—well represented by most of hospital services —nurse (10 programs)

"Has definitely enhanced communications via teamwork approach on ATS programs"—other (10 programs)

"Salubrious"—physician (2 programs)

"Interfered with usual communication patterns especially after the novelty paled —physician (24 programs)

"Better between me (physiciatrist) and all other services (except psychiatrists)"—physician (53 programs)

Q. In what ways do you feel there will be any continuing or long-term effects from the ATS-6 experiment

"All the knowledge we have gained is stored and will be recalled as we encounter problems added to the rest of our knowledge and used to better care for our patients —nurse (3 programs)

"Continual total assessment by the patient care team Continued interest in professional performance through analytical thinking and interdisciplinary approach to problem solving Increased motivation for use of sources Recognition of need to develop research skills"—nurse (45 programs)

ATS-6 teaches personnel about different phases of hospital care—knowing this contributes to giving quality care to each patient"—other (10—12 programs)

Q. If another satellite were available for VA use what aspects of the current experiment would you like to see repeated?

Program it back to us—sooner —physician (55 programs)

"All of the various approaches used in transmission had something of value to contribute If a personal priority were desired the seminar format would be given the highest desirability rating this would be followed by the grand rounds and teleconsultation formats in that order of decreasing preference As noted in preceding each broadcast had something to contribute irrespective of format Planning was excellent and one would be somewhat presumptuous to suggest any radical change in the experimental design"—physician (50 programs)

Q. What aspects would you like to see changed?

Content—boring Approach—it should not be a single taped grand rounds Use color"—physician (15 programs)

"I would like to see more on the subject of anesthesia its special problems as related to alcoholism why one type of anesthetics is preferred to another due to patients special problems and most important—a thorough medical and laboratory workshop prior to"—nurse

More discussion about the specilities (selected topics) in hematology rheumatology infectious disease and nephrology —physician (50 programs)

Avoid broad coverage—stick to narrow specific problems"—physician (24 programs)

9 10 Cost and Utility

As is typical with most experiments a large portion of the costs of this project was devoted to experimental equipment and other types of "trail blazing which would not be typical of an operational system

Using the total cost of the experiment it is possible to at least provide some cost/utility figures for different aspects of the experiment Of course these figures could be very misleading since they are based on an experimental rather than an operational system

The cost of the experiment was approximately one million dollars which if spread equally among the 69 events comes to \$14 492.75 per event If we divide this amount by our estimated number of viewers per event (400 at time of broadcast) we arrive at a cost of \$36 23 per viewer experience If we add in an estimated 400 viewers who saw the event via videotape then the cost per viewer experience drops to \$18 12 This of course reflects only the ten experimental hospitals The videotapes were also distributed to other hospitals—both VA and non VA—so the actual impact of each event spread far beyond the ten hospitals The cost per viewer experience is probably far lower than the above estimated costs (although we were unable to calculate it)

In addition to the cost per viewer experience we can also project some measure of the impact on viewers of each event Based on responses to the retrospective questionnaires (discussed in subsection 9 5) we have projected that approximately 43 percent of those who view a program will use some of the information presented in that event in the performance of their job From this we can project that one event could directly impact the job performance of at least 172 viewers (assuming 400 viewed the broadcast) for a cost of \$84.26 per viewer The retrospective questionnaires did not discriminate between viewing the programs at time of broadcast and viewing them via videotape However if the projections hold for videotape as well as for live presentation then this cost estimate could easily be cut in half

Another cost utility measure can be developed from data collected via the post-experimental questionnaire The 302 respondents to that questionnaire had viewed an average of at least 15 events—obviously a hard core' of highly motivated viewers It seems safe to assume that at least half of these respondents will function as gatekeepers or opinion leaders—passing information gained on to colleagues and to others they contact in their work Although we are not aware of any studies of the impact of gatekeepers in a hospital setting the research literature does suggest that social processes are a significant factor in the diffusion of new medical information A small number of opinion leaders from a variety of different roles and specialties could then have a very great impact on the provision of medical care Obviously this has an effect on the cost/ratio While \$36 23 or even \$18 12 may seem a high cost for a single viewer experience if that viewer is an opinion leader the utility of the investment may be increased by a significant amount

Conclusions

After reviewing the mass of data collected to evaluate this experiment particularly the comments offered by respondents both on questionnaires and to on site interviewers it is apparent that the main outcome or product of this experiment was intangible This outcome could best be described as a kind of gestalt that gradually appeared over the course of the experiment

Like any gestalt this one cannot be completely explicated However we can describe some facets of the gestalt that we did observe

1 A feeling on the part of the medical personnel that they were not isolated—that there was somebody there

2 A sense of identity with other VA hospitals—an awareness of common experiences and common problems

3 A sense of team identity that appeared to bring physicians and nurses (and allied health professionals) closer together that made them aware that they were part of a team

4 An awareness of the need for a continuous inflow of information to provide stimulation for the mind

5 A new awareness of the availability of information and an easing of the barriers to information seeking

The impact of this gestalt was considerably greater than the impact of any individual event—perhaps larger than the impact of the total contents of all the events It created the space or provided the climate in which it was possible to effect changes not only in medical care practices and techniques but more importantly in the attitudes and behaviors of individual staff members

The live quality of the video presentations was probably the major contributing factor to this gestalt Viewers were aware that the programs were focused at them and that it was possible for them to ask questions and get a response in real time While few people availed themselves of the opportunity to ask questions on the air the fact that they could if they wished had a great impact on them

The second most important factor contributing to this gestalt was probably group viewing Viewing events together with physicians gave the nurses a sense of equality and greatly increased their self image They began to view themselves as team members rather than as subordinates (This was probably also due in no small part to the five-part series on the Changing Role of the Nurse broadcast early in the experiment)

A third major contributing factor was an awareness on the part of the viewers of the other participating hospitals Through questions and via the teleconsultation events viewers became aware of the other hospitals and could see that they were not alone or unique and actually had much in common with other VA hospitals

How long this gestalt will continue after the conclusion of the experiment is an interesting question which should perhaps be studied at some future time Whether this gestalt can remain without the constant support of the VA/ATS-6 events (and for how long) remains to be seen

Our second conclusion concerns the environment within which the experiment was conducted As we noted earlier there was considerable variance between hospitals in the way the VA/ATS-6 experiment was supported Certainly the experiment could not be all things to all people (or to all hospitals) Some hospitals got more than they expected others were disappointed It was our observation however that as with most things the rewards the hospitals got from the experiment were directly related to the effort and support they put into the experiment The gestalt we discussed earlier affected all hospitals but it was much more apparent in some than in others It would appear that administrative support and enthusiasm were significant factors affecting the overall impact of the experiment on the individual hospitals

Our next area of discussion concerns the impact on viewers of the program material In evaluating the impact of educational material on a population it is traditional to attempt to measure behavior change It is important however to be aware of the problems involved in trying to prove causality i e that exposure to specific information did cause (or did not cause) a change in behavior

First it is important to remember that it is impossible to control or even identify all the variables affecting a field experiment Thus although a subject may be exposed to a message it is almost impossible to prove that a specific exposure caused the specific behavior change How do we know for example that the subject had not received the same information previously? How do we know that subsequent exposures to the same information did not occur? Also how can we prove that there was indeed long term behavior change rather than simply a response to a slightly different set of conditions A new drug prescription for example might be based on observation of a different set of symptoms rather than on new information received

It would be extremely naive to assume that a particular chunk of information presented in one event could create behavior change What actually happens is that this chunk is combined with other chunks of information already stored by the individual At some time in the future a certain set of circumstances activates this chunk of information which together with other chunks (acquired both before and after the acquisition of our particular chunk) generates a specific behavior

Another way of viewing this problem is to divide information into two basic types— nutrient (adding to the general store of information on call but not applicable to any specific situation) and application (bearing on a specific problem or situation) Most of the information provided by events in this experiment is nutrient information—it is stored together with other nutrient information obtained from other sources

Sometimes however enough nutrient information is gathered on a particular topic to create a critical mass (usually in the form of an idea or a question) which then triggers the seeking of application information for that particular topic As a result of application information collected alternative courses of action are formulated and one may be selected thereby resulting in behavior change

Nearly all continuing education material provides primarily nutrient information The closest we can tie such information to specific behavior changes is to show that changes related to the content of a program occurred after exposure to that event

For example many respondents reported changes in techniques associated with catheterization One of the event broadcasts dealt with this topic yet nobody reported changing behavior based only on information from this event A typical comment would be that as a result of the event viewers were aware that present techniques were inadequate and that they were in the process of evaluating alternative techniques to select a new one Obviously the event contributed to the behavior change but additional information was required before the change was made

In evaluating the impact of these events then the most we can say is that in many self reported cases events appear to have contributed to specific behavior changes Many of these instances have been described in subsection 9 9 Overall the impact appears to have been significant A large number of behavior changes were reported both by respondents and via site visit reports in areas that were covered by the event material

Some specific changes were identified by Dr Roger Hamstra physician moderator for the broadcasts in a post experimental visit to four hospitals to assess event impact Several examples from his reports are cited below

> One physician recalled a point that was made in the urinary tract infection and catheter care program—that a patient with chronic bacteriuria and chronic pyurea without symptoms does not necessarily need to be treated with an antibiotic The physician then described one case (which Dr Hamstra verified from the patient s records) where a patient with a positive urine culture with a significant bacteria count was not placed on antibiotics
>
> A medical resident at one hospital reported that while he was not aware of any changes in patient management he did feel the professional enrichment he received from the programs he viewed was significant A vigorous discussion between himself and the chief of cardiology followed the program on cardiac arrhythmias for example In add tion he was motivated to read a certain number of papers dealing with the same subject to compare the results of those papers with the opinions on the broadcast
>
> By reviewing log books with a chief of pathology Dr Hamstra was able to detect a change in the frequency of ordering serum folate serum B-12 and serum renin levels (A program on anemia had encouraged greater use of B-12 and folate determinations while the program on hypertension and discouraged the use of serum renin determinations) During May of 1974 there were three B 12 measurements eight folate measurements and two renin measurements In May 1975 (after the programs) there were twenty eight folate measurements forty five B 12 measurements and one renin determination
>
> Another hospital record check indicated a dramatic increase in the ordering of arterial blood gas tests—up from one in May 1974 to 55 in May 1975 Between those two dates a number of satellite programs dealt with lung disease pulmonary emboli and the value of arterial blood gas tests
>
> A cardiologist reported that he had significantly decreased his requests for serum renin determinations after viewing the program on hypertension He also reported that he had developed a number of ideas and modifications based on material he learned from the programs One example he cited (verified by Dr Hamstra from the records) was increasing the length of time for leaving a transvenous pacemaker from two to four days to seven days or more He also reported using high dosages of procainamide for patients with quinidine resistant ventricular disrhythmia problems again based on information from the VA/ATS-6 programs
>
> One physician reported that since viewing the program on shizophrenia he is using haldol rather than valium to quiet patients with degenerative brain disease
>
> A nurse in an intensive care unit reported that in her unit catheter systems are now used in a closed pattern in that when urine cultures are required they are obtained with a syringe and needle as recommended in the VA/ATS-6 program
>
> An inhalation therapist and laboratory technician for blood gases reported that in developing a procedure book for his area he had used the study guide on arterial puncture very extensively He also reported that he does at least four or five blood gas studies per day

11 Summary

1 The experiment as a whole had a significant impact on the experimental hospitals

2 This impact spread to other hospitals via videotapes of individual events

3 The major impact was the creation of a gestalt which facilitated increased information seeking improved morale and created an environment which facilitated innovation

4 Nurses seemed more receptive to the programming than did physicians

5 Video seminars were the most popular form of event although out patient clinics might have been first had more been presented (Only three OPS were presented which was insufficient for complete evaluation)

6 The grand rounds format also has great potential However it would probably be better if the events originated at hospitals rather than from a central location

7 Satellite mediated teleconsultation appears to have great potential Unfortunately the ten events used to test teleconsultation potential were limited by the available technology (only one way video was available) and the presentations were more in the nature of grand rounds than one to one teleconsultations

8 Reactions to the slow scan technology were mixed Color would have helped but many consultants felt picture transmission was slow enough to interfere with the consultation

9 The two computer events were inconclusive Both events appear to have been well received but technical problems obscurred whatever qualities the software might possess

10 The use of videotaped events was extremely widespread and effectively increased the use of the event material by an order of magnitude

11 Although videotapes of the events were used extensively the live quality of broadcasts together with the interaction was the major contributor to the gestalt the experiment created

12 The mixed viewing of the events (physicians nurses and allied health personnel in a common room) was a significant contributor to the gestalt created by the experiment

Section VI: Summary and Conclusions

SUMMARY

During a 44 week period from July 10 1974 to May 19 1975 69 programs divided among five experimental events were broadcast over ATS-6 to ten Veterans Administration hospitals in the Appalachian Region Each hospital was provided with a telephone linkage to a Denver television studio where programs originated so that two-way interchange was possible during all broadcasts For one experimental event the teleconsultations the hospital from where the consultation originated also was equipped with a slow scan video compressor so that *visual information could* be *transmitted* to the Denver studio

The overall goal of the experiment was to determine whether satellite-mediated communications have a place in the Veterans Administration health system The importance of a free flow of information throughout this enormous system has been recognized The ability to communicate is vital to the management of the system and to the assuagement of feelings of isolation among the professionals working in remote facilities

The question asked in this study was are the capabilities of *communications satellites sufficiently* unique diverse, and cost effective as compared with traditional carriers of electronic messages to warrant participation by the Veterans Administration on future more permanent communications satellites?

Evidence Provided by the Experiment on ATS-6

Perhaps the most significant indication of the potential use of satellite communications throughout the VA system was the way in which the weekly ATS-6 *broadcasts were regarded in the* ten participating hospitals at the end of the experiment Although participants had been asked to regard the broadcasts as experimental rather than as a service by the end of the 44 weeks the regularly scheduled programs had generally come to be thought of as a useful service When the final telephone survey was taken at the end of the last broadcast coordinators asked when the broadcasts would begin again Several wanted to know whether their hospital would receive programs on the next satellite

Over the broadcast period the programs with the exception of the teleconsultations continued *to attract about the same* number of participants in the various hospitals Professionals continued to attend the weekly broadcast long after the novelty factor was no longer in effect possibly an indication that an expectation of a well produced program on a timely subject with an opportunity to ask questions will always attract an audience

More than simple attendance records there were many inputs from the hospitals indicating that programs had met the objectives set for them they had resulted in knowledge gain attitude change and even behavioral changes resulting in better patient care outcomes Patient records given to the physician moderator of the programs during hospital visits after the broadcast period indicated several instances where patient care had been altered following procedures recommended in a VA/ATS 6 broadcast And generally speaking the evaluation data indicated a change of climate or gestalt in the participating hospitals a change that resulted in more willingness to accept new information and to change methods of practice accordingly

The programs broadcast on ATS-6 for the experiment in health communications were apparently successful in achieving *their purpose—and more The question remaining* is Could these same outcomes have been achieved using a less exotic mediator than an expensive satellite?

In a monograph publication by the Rand Corporation 'two types of communications are said to justify the use of live broadcast by satellite (1) late news and special events and (2) those in which two way interaction is an integral part Both of these factors were taken into consideration in designing the broadcast schedule for the VA/ATS-6 experiment All programs selected incorporated timeliness and therefore the need for two way interaction When the evaluation data are examined it appears that these two way factors were significant to the acceptance of the programs and to the general regard of the regular broadcast as a service rather than as an experiment on the part of the ten participating hospitals

The Satellite as Mediator

Although the two justifications given for using a satellite to broadcast programs were integrated successfully into the live experimental events it is questionable that a satellite was essential for accomplishing the broadcast of two way programs on a regular weekly basis to ten hospitals in Appalachia It is true that the ten hospitals are located in geographically isolated areas but had the Veterans Administration been able to underwrite the costs of providing traditional linkages the ten hospitals could have been connected by microwave to receive closed circuit television signals The return linkage for two way discussion would be provided by telephone line as it was for the experiment Most of what was accomplished in the way of *education and provision of information during the VA/ATS-6* experiment could therefore have been achieved without the use of ATS 6

But the intent of the VA/ATS 6 experiment was not to find whether a communications satellite could replace traditional linkages for ten hospitals spread over a small area It was rather to find whether the satellite could transmit signals at least as clearly as traditional mediators to inexpensive receivers located in geographically isolated areas If it could reach these satisfactorily the satellite could also transmit to facilities in all other locations It could then potentially become the means of *interconnecting a geographically wide spread vast group of* facilities for purposes of (1) management (2) education (3) consultation and (4) diagnosis

The ATS-6 was successful in transmitting a clear audio and video signal as well as computer information to the ten participating hospitals reliably for nearly a year with very little maintenance required for receiving equipment For this reason it is possible to arrive at some conclusions about the future use of satellites throughout the Veterans Administration health system

CONCLUSIONS

The unique feature of a communications satellite is its ability to provide an electronic linkage among many facilities located over a large geographic area A high powered satellite such as ATS-6 has the ability to provide clear transmissions to inexpensive receivers in almost any domestic location Based upon this *information many individuals have conceived of* equally as many possible systems designs for using satellites coupled with other media for communications and education The following concept based upon similar knowledge plus the experience derived from the designing and implementing the VA/ATS-6 experiment is one conception of how a satellite might be utilized in providing an informational network for the Veterans Administration s 383 health facilities

The Future A Satellite-Mediated Communications Network for Veterans Administration Health Facilities

Some communications needs of the VA s large system of hospitals clinics and other facilities are (1) an overall system of patient management from systemized high standards of care to efficient utilization of resources (2) a means of providing two way access to continuing education at times and places convenient to the practitioners (3) a linkage to specialists accessible at any time to physicians and nurses and other professionals and (4) a mechanism for providing wider usage for special diagnostic equipment so that one such piece of equipment could serve many facilities

The Communications Linkage

A satellite mediated network linking all 383 VA facilities throughout the United States could serve many uses in meeting these four general needs All or some of the 383 facilities might each be equipped with a transceiver capable of receiving and sending signals via satellite to and from a central location and to and from each other Thus equipped the VA satellite network would have the potential for an infinite variety of communications The intent would be to make available to all facilities the specialized knowledge developed at various VA centers as well as to tap the resources outside the VA when appropriate

To make the most efficient use of scarce resources the VA centers specializing in diagnosis treatment and care of certain diseases could become instructional centers for other hospitals Also the nationwide network could be divided into smaller regional networks when appropriate Any facility within the region could potentially become an instructor for its neighbors and any facility could also serve as a center for its community for receiving two-way instruction from other facilities

Communications Center

The informational core of a future National VA Satellite System *might be a building or complex* housing a variety of special facilities and equipment among them a computer television production and broadcasting facilities and special diagnostic devices capable of measuring physiological manifestations electronically without regard to distance

Along with these mechanical devices the complex would also include people specialists in fields ranging from cardiac disease to library sciences The specialists aided by machines would form systems for providing information when needed for the VA facilities to meet the four general communications needs of management education consultation and diagnosis Some possible specific ways these systems might meet these needs will be described in the following discussion

Patient Management The Problem Oriented Medical Record (POMR) has already been introduced to the Veterans Administration health care facilities Potentially it will become a means of ascertaining that patients receive consistent high quality medical care in all VA hospitals When generally accepted the POMR will facilitate treatment of patients by the various services because team members will be able to refer to it know what has been done for the patient and what remains to be done It will also facilitate the transfer of patients from one facility to another potentially it will mean a more efficient use of available resources throughout the VA health system

The POMR method of patient management will probably achieve its greatest potential for setting and maintaining high standards of patient care throughout the VA when it is incorporated into a computerized system that also includes patient care standards that are continuously updated a review mechanism and a means for providing continuing education and in service training when needed

The central computerized maintenance of POMR s plus their review and provision for continuing education could be a major operation of the Communications Center The computer linked ... tellite to all facilities would continuously update standards of practice or procedures for the disease categories seen in VA facilities It would be up to the individuals practicing in the facilities to acquaint themselves with updated standards and to participate in continuing education programs about new techniques and methods of care when needed A computerized review mechanism overseen and coordinated by a peer group assigned the task of standards review for one facility—or several facilities—would ascertain that established standards of practice are adhered to in each hospital When some aspect of care is substandard in a hospital intensive educational courses might be provided to bring practitioners up to date on the current standard of practice they are expected to follow If one individual is repeatedly found to be practicing below the level expected of him or her that individual might be asked to appear before the review group to discuss an acceptable means of changing his behavior

This course of action from the establishment of standards of practice through medical audit and remedial action and re-audit follows the procedure recommended by national legislation amending the Social Security Act to require Professional Standards Review Organizations (PSRO) or some other method of Utilization Review for audit of hospital records Hospitals must comply with the review requirement in order to receive funding provided through Titles V XVIII and XIX The purpose of the legislation is to ascertain that Medicare and Medicaid fund are not utilized inappropriately but it is also to see that certain performance levels are observed by physicians nurses and other practitioners

The hospitals and other medical care facilities of the Veterans Administration are not funded through these sources nevertheless the same philosophy of setting and adhering to high standards of practice through peer review has been adopted by the VA for its health delivery system The Health Standards Review Organization (HSRO) responsible for the maintenance of standards in the various centers operate much the same way as do PSRO s for hospitals outside the VA

The greatest difficulty encountered by hospitals in adhering to the legislation requiring medical review is that the recommended procedure is to have local groups of physicians establish the standards of practice that are to be followed This is based on the belief that unless physicians establish their own standards for practice they will not adhere to them The result is that in some cases where a hospital is very small a specialist might serve as a committee of one to set his own standards and review his own procedures in the care of his patients There are disadvantages for large hospitals too for example the time required for committees of specialists to sit down and write out standards for each disease entity they may treat—standards which will surely change with the ever expanding growth of medical knowledge Physicians faced with such a challenge—which has no end—may consider adopting standards set by their peers and updated continuously through a computerized database

Education Once the Problem Oriented Medical Record peer review mechanism audit and re audit have been computerized for the VA satellite network the next step would be to base continuing education courses and in service training on the outcomes of patient record audits There would have to be a means whereby an individual hospital could derive what courses were needed by its own physicians nurses and allied health professionals based upon their performance as compared to the expected standards of practice The computer system operating via the satellite could provide this information

Such a computerized system is already operational at Ohio Medical Advance Institute In conjunction with ROCOM (a branch of Hoffman LaRoche) the system provides a concurrent retrospective and outcome audit of patient records It is able to evaluate records according to the PSRO standards and provide information as to how an individual physician performs as compared with other physicians in the same hospital It also can compare one hospital with another in the ways certain diseases are managed

Using such a computerized system the VA Communications Center could provide educational and training programs when needed to update and improve the standards of care in each facility within the network Once a need for information had been identified either by the hospital peer review group responsible for records audit or by an individual practitioner for himself the VA satellite network would provide access to appropriate educational and training resources to meet the need

If the information requirement was very specific related to the diagnosis or management of a particular patient and time was an important factor this need would come under the category of a consultation The system for providing consultations will be considered in the next subsection If the information requirement was more general perhaps to bring a group up to date on a new procedure or to refresh them in areas they learned at one point but have since forgotten then the problem could be dealt with through continuing education or in service training

With such a system local chiefs of continuing education or in service training could have access through the Communications Center to computerized listings abstracts and when needed full print outs of journal articles publications and other medical documents possibly through an arrangement with the National Library of Medicine A similar cataloguing of non print media—video tapes films film strips and others—would also be provided through the Communications Center The catalog of non print media would list these media by key identifying words print outs from the computer would list program titles abstracts where the programs are available target audience objectives and ratings by a review committee as to technical and content excellence

Human resources might be tapped in a similar way A computerized database available at the Communications Center would include individuals listed according to specialty or skill The database could be queried by anyone interested in gaining information on a particular subject or technique and discussions might be initiated between the individual making the query and the specialist or among several learners and specialists If queries were made often about a particular skill or aspect of a specialty a video tape might be produced to cover frequently requested information The production capabilities of the Communications Center would be called upon to develop produce and disseminate such video tapes

The need for the production of new video tapes might come to the attention of the center through several other sources also Frequent requests for journal articles on a specific topic might initiate discussion about producing a program on the topic Requests for non print media that go unfilled because none are available on the subject also might initiate the production of programs to fill the gap New programs or methodologies introduced by the VA for its health system might be initiated with a carefully produced video tape on the subject to be presented live and followed by a two way discussion via satellite To produce such video tapes the production staff would call upon appropriate specialists within the VA as well as those outside to act as faculty coordinators

Another function of the production component of the center would be to make video tapes of special techniques developed in individual VA centers This way if a particularly excellent methodology for sterilizing surgical instruments or rehabilitating a spinal cord injured patient was developed in one facility it could be disseminated quickly and effectively to all appropriate facilities

The satellite would be utilized to disseminate these materials when two way discussion was an integral part of the learning For this purpose only a few hospitals would be linked simultaneously for electronic discussion by satellite They could be divided according to interest or geography For example if the subject of a particular program was highly specialized so that only a few individuals in several VA hospitals were interested in it the discussion group might include ten or twelve hospitals spread from Maine to Tennessee If the subject were more general so that many people in most hospitals would like to participate the discussion group might encompass a smaller geography and many discussions on the topic could occur simultaneously

The primary restriction on the use of the satellite for these educational purposes would be bandwidth requirements Two way television requires the widest spectrum so that few other communications can flow back and forth while a two way television program is being carried by the satellite Most instructional sessions do not require two way video however In fact a great deal can be accomplished using a narrow band audio channel supplemented with slow scan capabilities for carrying visual information Discussions via computer using cathode ray tubes for real time communication and printed read outs for reference would be another use of narrow bandwidths carried by satellite

Consultation. When a physician or other type of practitioner has a specific question related to the diagnosis or management of a patient s illness and time is an important factor his need for information is in the category of a consultation He would then be able to access the Communications Center Consultation System

When he called into the center either via satellite or by telephone he would be placed in contact with a consultation coordinator The coordinator would first try to provide the information needed through available literature an instant check via computer If the information derived by this means was inadequate the coordinator would then go to the human resources database to find an individual or several individuals who were specialists or skilled in the problem area These individuals would be coded according to their availability to act as consultants (All specialty areas included in the database would be covered 24 hours a day every day by individuals prepared to act as consultants for certain time periods covering the specialty in the same way that 24 hour emergency rooms are covered by groups of physicians) The inquirer could then contact the individual acting as consultant for the specialty area for that time period

For specialties for which there are many requests for consultations individuals might be retained to serve at the Communications Center as resources for that specialty They would answer questions and otherwise serve as consultants for practitioners in VA hospitals throughout the country They would also act as faculty coordinators for videotape programs and for other materials produced in their specialty area

Diagnoses. The availability of telemetry incorporating electronic sensors that can operate over great distances means that a consultant can examine a patient with the help of a nurse or physicians s assistant or other trained personnel and observe the patient s X rays and laboratory findings virtually as well via satellite as he can from the same room with the patient and consulting physician The centralization of special diagnostic equipment located in the same physical complex as the specialists trained to use it and to interpret its results would make the most efficient use of both specialists and equipment

A comment heard frequently when programs on special diagnostic devices were shown via ATS-6 to the ten participating hospitals was It was interesting but the program wasn t particularly useful to us We don t have that equipment here and we probably won t have it in the future either

The reason most VA hospitals are not equipped with sophisticated and expensive diagnostic machines is that special training is required to use them and the number of patients who could benefit from the use of such devices is not sufficient to warrant the enormous expenditure for every hospital The cost for a few such devices would be justified however if all the facilities included in the satellite network could use the devices via satellite for the patients who come to their hospitals and if the results could then be interpreted by specialists at the Communications Center Ultimately it is possible that all patients seen at VA hospitals and centers could be examined by a central computerized system of multi-phasic screening

The computerized diagnostic system could also be carried to the isolated communities served by the nonmetropolitan VA hospitals Nurses or physician assistants might take transportable computer terminals with them for home visits The probabilities program could be accessed for assistance in taking histories and making home diagnoses When determining treatment or finding resources for rehabilitation and home care the terminal could again be used to access the computer The nurse s decisions would be checked by the computer which would add some alternatives if the decisions weren t justified A physician at the center would be on hand for further backup and confirmation of action if needed

Cost Effectiveness

The subject of cost has woven a thread throughout this report from the first mention of the VA s participation as an experimenter on the ATS-6 to this last discussion of con clusions and possible future uses of satellite communications. Cost and benefits will be considered next in a more specific discussion of this important aspect of a satellite communications system for the VA.

Naturally, an experiment, involving only ten hospitals cannot be particularly cost-effective since all of the production and related activity wil be directed to only several hundred participating health professionals. The experiment is justifiable, however, despite its high cost per professional/hour, if it can demonstrate a potential cost-effectiveness when such educational and consultative linkages are projected over the entire VA system. The ATS-6 experiment did indeed demonstrate that such linkages lead to positive changes in many cases, and it is clear that *terrestrial* facilities for establishing the linkages would cost many times the amount of a satellite interconnection. Two important questions remain regarding cost-effectiveness:

1. Are patient care benefits created by weekly interactive professional exchanges worth an investment of $2.50 per hour for each participating health professional? (This is the maximum projected cost for a system-wide weekly exchange, including the highest projected cost for satellite time, production and management functions. It is based on a total overall cost of $10,000 per hour divided by 25 health professionals in each of 161 hospitals or 4,000 participating professionals.)

2. What will be the actual hourly tariff for a nationwide television satellite linkage involving all VA hospitals? (The maximum tariff projected to date has been $2,000 per hour for one-way video nationwide. This figure was used to compute the hourly cost per health professional cited above. However, if the hourly satellite tariff is less, it would of course reduce the cost per professional/hour accordingly. Some estimates have been as low as $500 per hour.)

The answer to question number one must be determined by the VA Central Office. In the opinions of the project contractors and authors of this report, even the pessimistic figure of $2.50 per participating professional is a worthwhile investment considering the likely outcome on patient care. The system becomes much more cost-effective when resulting software is distributed and retrieved on videocassette. Health professionals who are exposed to the materials in a passive or non-interactive viewing situation may be reached for considerably less than $1.00 per viewer per hour. Although it has been demonstrated that such passive viewing is less desirable than interactive participation, it is sometimes *the only means* of reaching certain members of the health team (i.e., night shift *nurses and paramedical personnel*).

The uplink frequency restrictions which prohibited actual teleconsultations on a one-to-one basis have made it impossible to develop realistic cost projections for such teleconsultations at this point. Additional experimentation is needed, with carefully controlled one-to-one teleconsultations, in order to project the ultimate cost of such linkages with video, slow scan, audio, and the extension of diagnostic tools by satellite. Future experimentation in this area should be designed to assess utilization patterns, so that cost projections will reflect 8-hour, 16-hour, and 24-hour service.

Finally, with regard to cost, it must be pointed out that a conventional terrestrial microwave linkage of 171 VA hospitals would cost upwards of $25,000 per hour plus installation and construction charges. If it is determined that these linkages are of significant value to Veterans Administration hospital personnel and patients, the $2,000 per hour projected maximum cost for a noncommercial nationwide satellite linkage is clearly an important breakthrough.

Relationship of the VA Satellite-Mediated Communications Network with the Outside Medical Community

The VA Satellite Communications Network could potentially serve many functions for the medical communities surrounding the VA hospitals included in the network. These VA network hospitals could become teaching centers for the physicians, nurses and allied health professionals practicing in the community. When facilities were available, these professionals would be invited to participate in continuing education and in-service training courses offered at the VA hospitals. They might choose to become subscribers to the videotape programs developed and produced at the center, and to participate in regional workshops *offered via the* satellite. The possibilities of interchange with the medical community are numerous, both for the development of programs, and for their utilization.

The VA system for computerized patient care management, based upon the Problem Oriented Medical Record, may one day serve as a model for other hospitals and medical centers. Such medical care providers might be invited to participate with the VA in establishing a computerized, continuously updated patient care audit system that will be utilized throughout the nation. Such a nationwide standard of practice seems inevitable, based upon the more and more commonly held belief that excellent medical care is a patient's right.

The "local standard" of medical practice that now inhibits such a nationwide standardization, will probably be both unfeasible and inadequate in the future. As discussed earlier in the section, the legislation requiring medical audit according to local standards has proved difficult to adhere to when hospitals try to establish their own standards of practice. But the "local standard" may be inadequate for another reason, too. Legalistically, the standard of medicine practiced in the community has until now been the measure for adjudicating malpractice suits. It means that if the physician-defendant performs according to the standards of his peers in the community, he should not be found guilty of malpractice.

The precedent set by a 1968 Massachusetts case, *Brune vs Bellinkcoff*, may change that standard. According to the decision in the case, the "locality rule" is unsuited to the conditions of the times. Medical practice should no longer be "Balkanized," so that care delivered in small communities distant from teaching centers is measured by different *standards* than those for larger metropolitan areas. In Massachusetts the new acceptable measure would *be the* average *qualified* practitioner of the speciality, wherever *he* may practice, "taking into account the changes in his practice."

The Massachusetts "average practitioner" standard has not yet taken the place of the "local standard" for most states. But, the legislation requiring medical audit according to preset standards may provide the impetus for "de-Balkanization." For many reasons, from efficiency to the expectations of the patient, a nationwide standard seems inevitable; and the largest health care delivery system in the nation would seem to have a logical place in its derivation, administration, dissemination and maintenance.

RECOMMENDATIONS

A satellite-mediated, VA health network, interconnecting 383 VA facilities and managing medical audits, educational programs, diagnoses and consultations for its own and other facilities, is probably a far future achievement. Some *technological advancements and philosophical* changes must first be accomplished. In the meantime, a general recommendation resulting from the VA/ATS-6 communications experiment would be that the Veterans Administration continue in its role as an active leader in the field of satellite communictions.

Specifically, recommendations for immediate action are:

1. Since it has been demonstrated that satellite communications have an over-all positive impact in terms of seeking and accepting new knowledge on the medical staff and other health professionals in isolated VA hospitals, the VA should continue experimentation with available satellites provided that: (a) the expenditure *for experimentation* is within reason (leading toward a permanent satellite service); and (b) the available satellite is technically capable of providing the proposed linkage to VA hospitals on a dependable basis.

2. An appropaiate VA representative should be given the responsibility for maintaining contact with the National Aeronautics and Space Administration, the Public Service Satellite Consortium, and the domestic carriers, so that the agency will be aware of future satellite opportunities.

3. The VA should become a member of the Public Service Satellite Consortium or its governmental counterpart and participate in negotiations for long-term domestic satellite linkages for at least all of its non-urban hospitals.

4. Because of its experience with ATS-6, the VA should assume a leadership role among other government agencies in exploring the feasibility of a government-shared satellite, should the consortium and other common carriers fail to provide necessary resources within a reasonable period of time.

5. As part of its outreach program, any future VA satellite communications should be made available to hospitals and practitioners outside the VA system.

6. An ultimate permanent nationwide linkage of all VA facilities should involve satellite tariff charges of $2,000 per hour or less. (Some estimates run as low as $500 per hour. This works out to $12.50 per hospital or about $.31 per viewer based on ATS-6 attendance averages. Not including production related changes.)

7. In a permanent (non-experimental) satellite Post-Graduate Education Series, *all* programs should be accompanied by printed study guides.

8. Until additional satellite linkages are available to the VA, consideration should be given to providing films and video tapes for continuing education of health professionals in non-affiliated VA hospitals.

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SATELLITE TECHNOLOGY DEMONSTRATION

EXECUTIVE REPORT

SATELLITE TECHNOLOGY DEMONSTRATION
FEDERATION OF ROCKY MOUNTAIN STATES INC.

The following document has been prepared to provide the reader with a brief but comprehensive review of the Satellite Technology Demonstration (STD) from its inception in January, 1972, through August, 1975.

The significance of the potential contributions of the Demonstration was expressed in a 1972 statement by Cecil D. Andrus, Governor of Idaho:

"I feel confident that there is a promise of real benefit to mankind in this project. If we can truly provide a system of communication among the people of this region, we must be but moments away from the time when we can say we have helped sblve the basic educational disparity between the community school and the fundamental principles of liberty, equality, and open opportunity for all people."

This potential was demonstrated. As Project Director, I know that the realizations and accomplishments of the STD will have a far-reaching impact on the future of telecommunications.

Gordon Law

Dr. Gordon Law
Project Director, STD
September 15, 1975

Acceptance of social or technological change is revealed in our use of new terminology to describe our experience with innovation. Everyday conversations of STD users reflect the changing language of a new era of telecommunications. Words such as *uplink parabolic antenna* and *down converter* are a part of the vocabulary of students and teachers who have incorporated this new terminology in their lives.

Hey how come you missed the bus home last night?

Pointing exercises

What exercises? I didn t know you were that athletic

No, I had to help Mrs Foster align the parabolic antenna to pick up ATS-6.

Scientific stuff huh?

Yeah, sort of It's for the satellite class.

Why do you want to stay after school?

I m on the satellite pointing team [illegible] know [illegible] for NASA.

You mean like Cape Canaveral? You re kidding!

No joke. We had to point the antenna straight at the satellite to get a reading of at least 20 d.b s on the down converter so the picture on the monitor would be sharp for tomorrow's class. I got to talk to the scientists of Goddard Space Mobile on the ATS 3

Far out!

Yeah! It s wild

Suite 300 - B
2480 W 26th Avenue
Denver Colorado 80211
Phone 303 458 8000

**Federation of
Rocky Mountain States, Inc.**

The Honorable F David Mathews
Secretary of Health Education and Welfare
300 Independence Avenue, S W
Washington, D C 20201

September 15, 1975

Dear Mr Secretary

The Satellite Technology Demonstration was the first major effort to use a communications satellite, the ATS-6, for the delivery of social services to geographically isolated communities This Demonstration and other Health, Education, Telecommunications Experiments hold the promise that social services can be extended to more people at reduced costs This Project has brought us full circle The nation probed space originally to learn more of the universe and of our own earth However, with the advent of the STD we are now using space discoveries and space itself in service to mankind

This technology is now available and has been proven feasible for practical use, and the demand for it has been documented This Project has set an inexorable trend which will continue until the expressed needs of the user populations have been satisfied Our challenge will be to continue development and apply judiciously the use of this capability, motivated by potential human benefits The technology has been exposed as an aid to the practitioner It is not a trouble-free aid, and is fraught with numerous pitfalls In spite of this, it holds great promise

The ATS-6 has now been moved from its original position to provide telecommunications service to India This allows United States users time to evaluate and reflect upon their experiences during the first year of operation with this versatile and complex communications technology

The Federation of Rocky Mountain States was proud to participate in the Satellite Technology Demonstration Our participation exemplified a basic tenet of our organization--that problems and opportunities are no respecters of geographic boundaries, and that states can pool their resources and effectively participate in regional projects

The Federation is indebted to many agencies and individuals in education government, and business whose contributions made the Satellite Technology Demonstration a success We are particularly indebted to the STD staff for their dedicated efforts, to the personnel in the state sponsoring agencies, and to the teachers and site coordinators and students in our local sites for their support and contributions Ours has been a regional project, which we have successfully integrated into the activities and programs of ongoing state and local agencies On a smaller scale, we have been a Demonstration of what can occur on the national, even international level given careful planning and incorporating the ideas and concerns of the constituencies participating in the programs

The technical capability has arrived--we eagerly await its broader application

Sincerely,

Jack M Campbell

Jack M Campbell
President

"It all started early in the spring of 1973 when I received a letter from a new project called the Satellite Technology Demonstration inviting me to a state get-acquainted meeting to discuss the use of space-age technology for distributing educational services into selected schools in the region Many questions were asked and nearly everyone at the meeting expressed interest in obtaining further information

When Project representatives came to our town they talked with staff members and me school board members and people in town They learned that the population of our community is about 2 300 but that our school population is around 900 because youngsters come from farms as far as 20 miles away They seemed particularly interested in our rural setting and the school's willingness to support an experimental program As a result we were notified in the summer of 1973 that we had been selected as an STD site

By the spring of 1974 things began to happen We had to decide which students would participate which teacher would serve as our local coordinator and which room would be used for television viewing We also had to order our color television monitor and videotape cassette recorder

By late spring our plans were made and teacher and student interest was reasonably high Their interest and curiosity were markedly increased about a week before summer vacation when the STD technicians came and installed a receiving antenna and a protective fence

During the summer the technicians returned to complete the equipment installation and to make final tests Also during the summer Mrs Martin the teacher selected as local coordinator and Mr Pappas the junior high principal attended a three-day training session conducted by the Project

As soon as school opened in the fall Mrs Martin was busy obtaining pre-test data on the students enrolled in her STD class She also collected data from the school staff and members of the community Everyone who saw the programs was amazed at the high quality of the video and audio reception we were

A composite reaction of the 58 school superintendents who participated in the STD would reflect their awareness that change is inevitable, their willingness to change, their belief that technology must be applied to education, and their desire to extend their participation to future satellite projects.

able to obtain Initially there were difficulties with the quality of the audio interaction system which used a different satellite However within a couple of months the problems were worked out

The students enjoyed the programs and seemed to learn from them The librarian and counselor stated that students asked more questions and showed more interest in careers While there were some parts of programs and audio interaction which they would like to see changed they encouraged other students to take the course second semester

Some of the staff took the in-service training course for college credit The STD made arrangements with one of our state colleges to grant graduate credit for participation

One of the most popular services the STD provided was called Materials Distribution Service Excellent films on many subjects for all grade levels were available to us It was an outstanding service for our schools Some days we had as many as four or five classes viewing different MDS films which we had videotaped Because of copyright expenses we will not be able to afford all the MDS films we taped and are now reviewing them to select those we will keep and reuse

The STD also provided a program for community adults Although the people who came to watch seemed to enjoy it we were never able to attract the size audience we would have liked I believe that any future programming of this type should be a series of short courses such as budgeting first aid landscaping and community planning

In looking back I believe everyone in our school and community feels that our involvement in the STD was a good experience The Project had its strengths and its weaknesses and the reporting was a lot of work but we gained from it and realize that it has great potential

Would we be willing to participate in the next satellite project? You bet! We're hoping that our school will become the communications center of our community

GOODBYE TO THE GREAT DIVIDE

In 1895 Guglielmo Marconi directed wireless signals from one end of a room to the other Six years later powerful transitters exchanged "marconigrams" between Poldhu England and St Johns New foundland

In 1966 NASA's first Applications Technology Satellite the ATS 1 linked isolated Alaskan communities via a satellite/radio network Eight years later NASA's sixth communications "bird" the ATS-6 beamed live full-color television programs to participants in telecommunications experiments in sparsely populated regions of the United States In the Rocky Mountain region the experiment was the Satellite Technology Demonstration (STD)

Modern communications technology typified by daily satellite transmissions which bridge entire continents confirmed Marconi's prediction that telecommunications would become the almost unnoticed working equipment of civilization " Now new vistas of telecommunications technology have been explored as federal state and local agencies in the fields of health education and social services seek to develop new technological means to satisfy human needs and solve social problems

Robert Jastrow Director of the Goddard Institute of Space Studies foresees a fifth revolution involving space telecommunications which will be even more radical than the four previous revolutions of speech writing printing and radio "In the long run" Jastrow predicts "the new satellites will provide a nervous system for mankind knitting members of our species into a global society"

Fifty-six communities scattered throughout eight Rocky Mountain states have completed a preview of this telecommunications revolution Ranchers farmers carpenters bankers, teachers, students, and others in communities as economically and culturally diverse as Peñasco New Mexico and West Yellowstone Montana have used the powerful medium of satellite television to maintain dialogue with the staff of the STD The process proved that extensive and inexpensive communication across large expanses of the earth is not only possible but desirable and productive Along with performing highly technical and scientific functions of data collection ionospheric analysis and high altitude photography satellites have now secured a welcome place in the school classroom

The STD staff succeeded in transforming an untested communications concept into the largest non military extra terrestrial telecommunications system in the world As television continues its second quarter-century the Satellite Technology Demonstration's pioneering efforts provide a documented report of potential benefits awaiting mankind

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THE FEDERATION

The Federation of Rocky Mountain States Inc headquartered in Denver Colorado is the parent organization of the Satellite Technology Demonstration

The Federation was established in 1966 by the Governors of the states of Colorado Idaho Montana New Mexico Utah and Wyoming They were joined by business and industry to provide a forum to address problems and promote the orderly development of the region

The organization continues to work in the areas of natural resources, regional planning market development arts and humanities environment transportation human resources and telecommunications and was the catalyst for the establishment of public broadcasting in the region It was this experience coupled with its educational work that prompted the U S Department of Health Education and Welfare to approach the Federation to become the planning and implementing agent for the Satellite Technology Demonstration

The Satellite Technology Demonstration was designed to utilize *NASA s Applications Technology* Satellite (ATS-6) the most complex versatile and powerful spacecraft ever developed The ATS-6 served as a broadcasting station 22 300 miles in space With sophisticated electronics aboard it was used to conduct a series of technological and scientific experiments

The STD was a part of the larger Health Education Telecommunications (HET) Experiment which delivered television programming to small low-cost receiving stations in Alaska the Pacific Northwest the Appalachian region and the Rocky Mountain states The HET Experiments were developed for areas where people are relatively isolated both geographically and culturally

The Rocky Mountain West is a panorama of striking contrasts covering over 860 000 square miles but inhabited by only 4 percent of the nation s people The land contains a spectrum of ethnic groups cultures and subcultures Perhaps nowhere in the nation do ethnic groups cling more to their ancestral ethos than do the Mexican Americans Native Americans and Basques of the Rocky Mountain West As this enormous rural empire moves toward urbanization the contrasts between the past and the future become more evident

In this mountain setting the Department of Health Education and Welfare was seeking answers to such questions as Can satellites deliver information to people who cannot be reached easily quickly or economically by other means? What are the actual costs involved? How do people in rural areas react to information being received and sent via satellite? What services and what presentation techniques are best suited to a satellite broadcast system?

The Satellite Technology Demonstration sought answers to these questions while pioneering the satellite delivery of educational and social services to citizens in remote areas of the Rocky Mountain states The two major Project objectives were to demonstrate the feasibility of a satellite-based media distribution system for rural populations and to test and evaluate user acceptance and the cost of various delivery modes using a variety of materials



SATELLITE TECHNOLOGY DEMONSTRATION

In the late sixties the Federation played an important role in developing a *regional educational television* corporation which has now become the twelve-station Rocky Mountain Corporation for Public Broadcasting These stations because of their locations in major cities reach over 80 percent of the mountain states population but do not serve many of the region s citizens who reside in rural isolated areas

In 1968 1969 and 1970 the Federation submitted proposals to the Office of Education Department of Health Education and Welfare to utilize satellite potential by developing and delivering programming to rural isolated schools None of these proposals was funded

Early in 1971 the DHEW requested that the Federation submit a proposal for use of broadcast time *on ATS-F (the designation for the ATS-6 prior to* launch) The Federation responded with a preliminary plan for programming in career education early childhood education and higher education A significant cooperative effort was anticipated among Denver-based regional and national educational agencies to implement the plan

In May of 1971 the Office of Education awarded the Federation a planning contract to prepare for a satellite experiment Extensive planning was conducted with regional input from state governments teacher groups students the business community broadcasters and minority group representatives The following content needs were identified early childhood education occupational awareness occupational training communications skills environmental studies a variety of college academic courses public service education counseling and communications

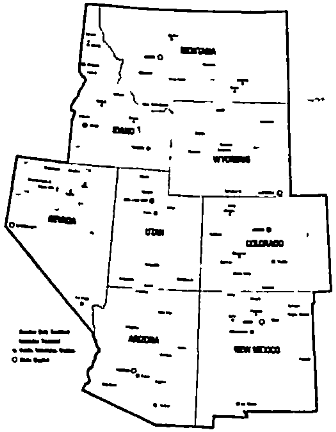
The Office of Education responded to the Federation proposal by making an FY '73 commitment of $5 000 000 for a limited satellite "experiment-demonstration to include career education and early childhood education programming

In January 1972 a six-month planning grant provided for program development in career education and early childhood education and established a production-engineering component responsible for ground system equipment and all production Engineering planning was based on the assumption that program transmission would include public broadcasters in the region cable and translator systems and individual sites unreachable by existing systems Planning addressed one-way video two-way video one-channel audio four-channel audio computer assisted instruction computer-managed instruction and remote uplink video-audio mixes to be used in various combinations

The history of the STD was characterized by a shifting of Project objectives by the funding agencies changing federal agency and management responsibilities and limiting the Project scope Limitations included fewer installations types of terminals technical capabilities broadcast schedules and content development All these changes — related to reduced funding — altered the STD

The Project evolved into a quasi research experiment and technical demonstration with limited objectives Nevertheless individuals and organizations involved in planning and implementation activities

The Network Coordination Center in Denver Colorado was the nucleus for receiving transmitting relaying monitoring and controlling HET ground network activities throughout Alaska, the Pacific Northwest the Appalachian region and the Rocky Mountains



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continued to pursue a "service-delivery" system rather than a "limited-experimental mode The service orientation remained because there was a regional demand to be addressed which far exceeded the available funding It is commendable and noteworthy that during all of the negotiations (which reduced the number of sites broadcast time programming scope and number of participants) the individual school districts maintained interest in the STD and sought to be included in the Project

In addition to the narrowed scope of the Project other difficulties were encountered Late payments on the federal contracts and grants imposed hardship in planning and implementation schedules The Federation developed new strategies in response to the delays and changing objectives of the funding agencies It also organized the input from state agencies local communities educational groups and involved members of business and industry These constituencies were kept informed of changes as they occurred and of the reasons for such changes Within the STD project reshaping refinement and accommodation were taking place to develop an organization responsive to user needs Programs were produced to specifications derived from the needs of regional audiences and were modified by suggested changes

Several components were established to execute Project tasks Management was charged with the responsibility of developing and implementing Project revisions supervising the work of the various components managing budgets and submitting successive proposals

The Broadcast and Engineering component was involved in the design of transmitter and receiving hardware and the design bidding and procurement of the master earth station in Morrison Colorado This component worked closely with field service personnel in identifying receiving sites which had to meet certain demographic characteristics for evaluation purposes Military and other regulatory agency frequency clearances had to be secured for each site The design testing procurement and installation of equipment at the rural Rocky Mountain sites was a herculean task In addition to designing the low-cost ground transmitters and receivers the Broadcast and Engineering staff designed and built the Network Coodination Center in Denver capable of interfacing with NASA centers at Greenbelt Maryland Mojave California and Rosman North Carolina The component was also responsible for installing the ground equipment in the Appalachian region and for coordinating activities in Alaska the Pacific Northwest and the Appalachian region

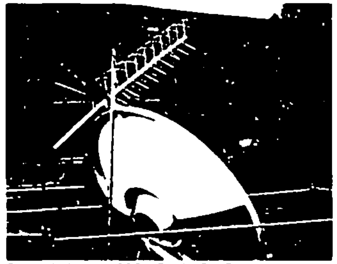
The Program component conducted an educational needs assessment in the eight participating states This component also reviewed and evaluated existing career education materials developed the preliminary educational content objectives and produced the programming ultimately broadcast by satellite

Two courseware teams were charged with writing and producing the junior high career education series ("Time Out) to be delivered via satellite Teacher and student guides were developed to supplement this series Also produced was an adult community-oriented program series of 10 programs entitled "Footprints and a graduate level in-service series of 16 programs entitled Careers and the Classroom A New Perspective for Teachers" Another function (Materials Distribution Service) consisted of transmitting over 400 existing films which the sites recorded on videotape for classroom use at their convenience

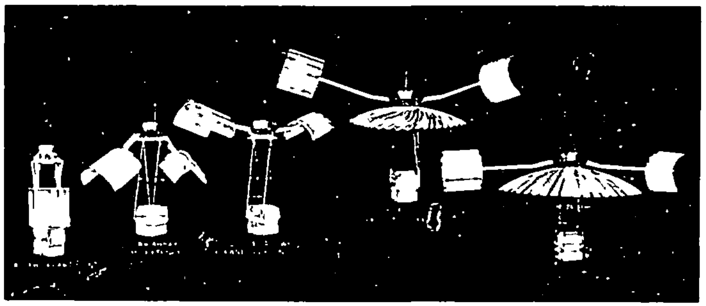
The Research component designed and implemented data-gathering and evaluation procedures developed instruments to evaluate the performance and costs of both hardware and software and studied attitudes of students parents teachers administrators and the general public A national research committee was created to advise the component

The Utilization component was established to provide field services Staff members visited and gathered demographic material on potential sites — an activity which required close coordination with the governor's office in each of the eight states the state departments of education the state telecommunications agencies and numerous professional and civic organizations School boards superintendents principals mayors county commissioners tribal chiefs state legislators state department heads governors aides and governors were kept current on STD site selection and changes in Project scope or orientation The component assisted the content specialists in determining the levels of greatest educational need and in developing the pilot programming which provided guidance for content development

As the Project matured the Utilization component was charged with establishing a service component in each state This involved employment of a resident state coordinator to work with STD staff and all in state entities involved in the Project At each selected site a local part time coordinator was selected by the school superintendent The entire state structure was jointly funded by Project state and local funds with a major share paid by local and state governments Contracts were negotiated with each state and site to clarify such details as insurance transportation broadcasts during 'out-of-school hours regional meetings equipment custodial care and security

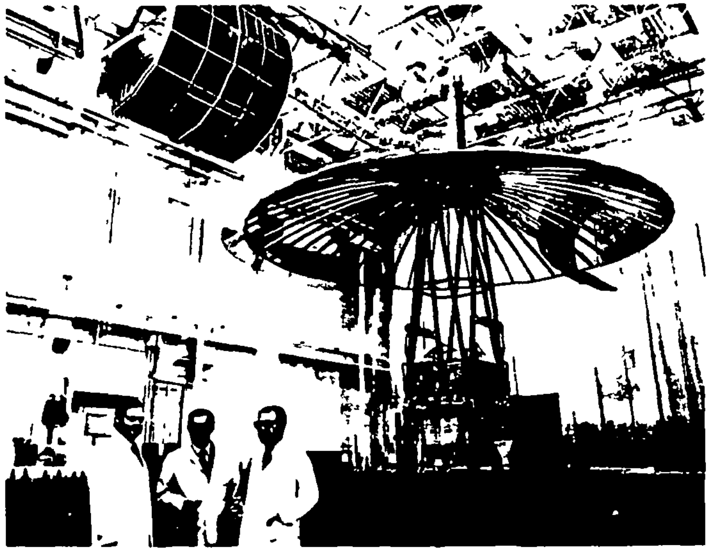


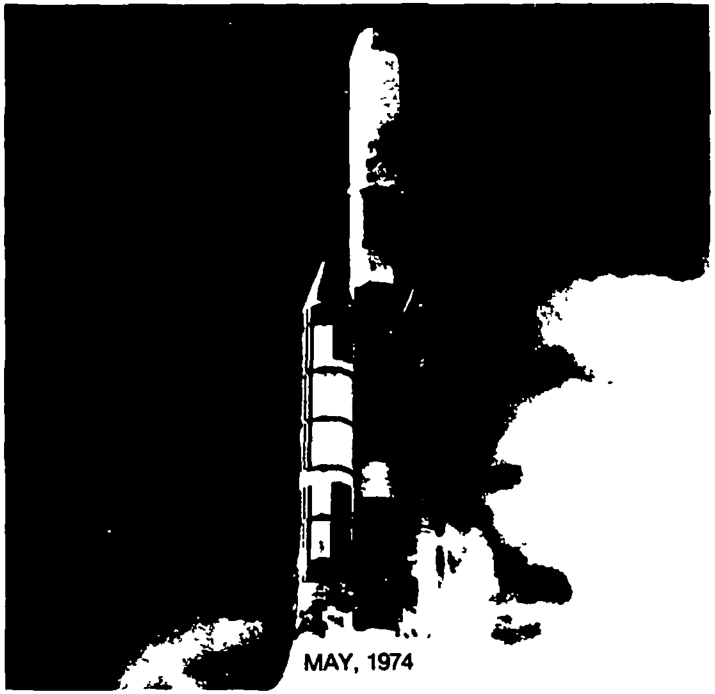
One hundred nineteen 2.5 GHz Receive-Only Terminals used in one or more of the HET experiments received television services provided by the ATS-6 The terminals consisted of a 3 05 meter (10 ft) segmented parabolic reflector an antenna-mounted low-noise transistor preamplifier and an indoor demodulator unit At 47 of the HET sites 24 of which were STD sites the circularly polarized helical antenna simultaneously transmitted and received two-way voice and data signals via the ATS-1 and the ATS-3



Public information activities a part of Project management were geared to develop awareness and acceptance among the many STD constituencies A flow of accurate information was vital especially since the Project was new complex and operated on such a large scale Public information audiences included local state regional national and international constituencies Emphasis however was placed on public information activities at the state and local level Brochures printed displays media presentations and a mobile display were utilized Requests for presentations at meetings by STD project staff were coordinated by the public information office

The ATS-6 which was used for the Health Education Telecommunication experiments, was one of the most complex, versatile and powerful comunication spacecrafts ever developed Here the satellite is deployed for testing by Fairchild Industries engineers at Germantown Maryland



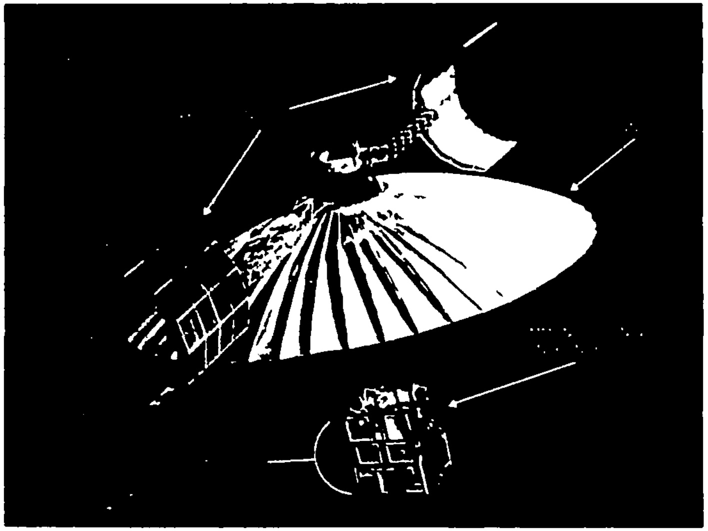


MAY, 1974

On May 30 1974 NASA launched the ATS-F from Cape Canaveral As it moved into its geosynchronous orbit 22 300 miles over the equator the ATS-F was designated ATS-6, *indicating its new operational* status It was now ready to respond to signals from the ground and to support 23 separate experiments Six of these concentrated on the delivery of social services in health and education to selected rural residents. The largest of the six was the Satellite Technology Demonstration located in Denver Colorado

While there were many last-minute adjustments to equipment retakes of television material and calls to suppliers who failed to meet delivery schedules the Project was ready and anxious to become operational

A4-59



THE ATS-6 SPACECRAFT

The ATS-6 spacecraft is the most complex and powerful communications system developed in the 15-year history of communications satellites. Its high powered receiver/transmitter system coupled with a large parabolic reflector antenna relayed high quality color television, audio and digital signals simultaneously to a large number of small inexpensive ground stations scattered over a large geographic area.

The spacecraft weighs 3,090 pounds, is 26 feet high and with solar array booms extended measures 52 feet from solar panel to solar panel. More than 21,000 solar cells capture energy from the sun to power the satellite's command, propulsion, attitude control, telemetry and experimental mechanisms.

THE COMMUNICATIONS SYSTEM

Only a few years ago man had to build giant earth stations costing hundreds of thousands of dollars to communicate with the satellites launched into space. However, the ATS-6 introduced a powerful new broadcast capability to the art of satellite telecommunications. Unfolded in space, the satellite's parabolic reflector resembles a giant umbrella large enough to cover a house. The communications signals concentrated by the inverted bowl-shaped structure are so powerful and so highly directional that they can be picked up by a low powered receiving system. The STD established that the high gain antenna and high powered transmitters on the AST 6 can communicate with simple, inexpensive ground terminals.

The two television transmitters provided remote areas with a reception quality better than that enjoyed by many urban communities served by conventional commercial and public television channels. Each transmitter produced a beam approximately 500 miles long and 300 miles wide which formed a giant "footprint" on the earth. In a single broadcast STD could cover an area from Canada to Mexico.

The STD project was planned to test the communications capabilities provided by the ATS-6. During the 1974-75 school year the STD broadcast 450 hours of programming to rural schools. Half the time allotted to the STD each day was used to transmit to the eastern half of the Rocky Mountain region. On command from NASA control center at Goddard Space Flight Center in Greenbelt, Maryland, the spacecraft was repointed and the "footprint" transmission shifted to the western half of the region where the programming was repeated.

The signals transmitted by the ATS-6 were intercepted on the ground by antenna/receivers designed by Denver based STD Engineers. These receivers, which cost about $4,600 installed, were the lowest priced equipment of their type ever produced. Twenty-four installations, all at schools, were designated as IT's (Intensive Terminals) and had two-way audio capability. The other 45 installations were called ROT's (Receive-Only Terminals). The ROT's received the satellite signals but could not communicate back through the satellite system. Twelve of the ROT installations were at public television stations in the region, enabling live or delayed broadcasts of

The STD uplink was designed for operational simplicity and low cost. The equipment for the station, which was operational 99.64% of the time, was arranged to maximize convenience of operation and reliability.

A4-60

STD programs. Public television broadcasts added thousands of viewers in the region's urban areas to the STD audience.

A color television signal, which could be accompanied by up to four voice channels of broadcast quality, was transmitted to each footprint. The ATS-6 was also able to send and receive telephone, telegraph, television, radio, facsimile, and computer data impulses to and from selected sites in the Health, Education, Telecommunications Experiments.

The ATS-3 (which was launched November 5, 1967, and is in geosynchronous orbit over the Atlantic Ocean) was used to relay audience responses from the 24 Intensive Sites to the studio teachers in Denver. Thus, a student in a classroom in Challis, Idaho, was able to communicate with specialists at the Denver Network Coordination Center (NCC) via the ATS-3, enabling instantaneous response and participation. Furthermore, the ATS-3 allowed participants at IT sites to communicate with each other. The research findings clearly support that the interactive capability was one

HET COMMUNICATION NETWORK

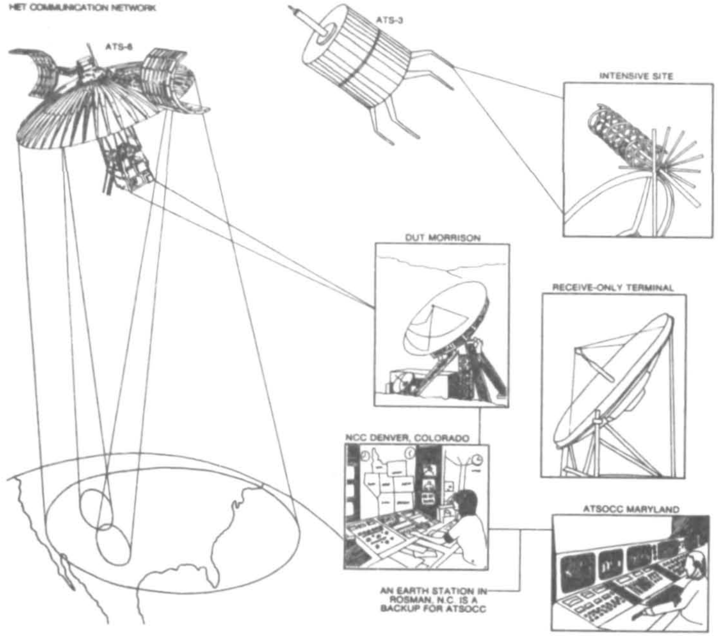
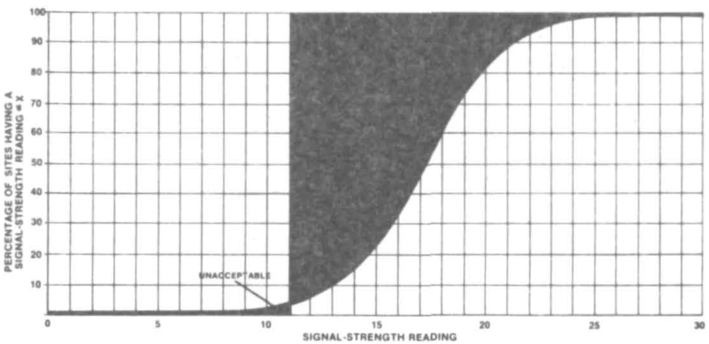


FIGURE 1 CUMULATIVE PERCENTAGE HP SIGNAL-STRENGTH READINGS



of the key features of the Demonstration.

The STD and NASA were vitally concerned with signal quality. The question was, "Can new spacecraft technology, coupled with the STD-engineered low-cost ground receivers, produce a television signal of sufficient quality and consistency to become a reliable educational, training, and social service tool?" The answer was, "Emphatically, yes."

The hardware performed efficiently throughout the life of the Project. Referencing Figure 1, the data shows that the signal quality exceeded design specifications 98 percent of the time. STD participants rated both video and audio intelligibility as equal to or exceeding the quality of commercial television signals. Temperature changes had no discernible effect on picture or sound quality. Normal cloud, rain, and snow conditions had no measurable effect on reception. Extreme ice build-up on the antenna surface, when left unattended, caused only minor picture distortion. The equipment failure rate was about one percent, resulting in a mean time for repair of slightly less than one program interval. No site was inoperable more than one day as a result of failure of system equipment.

During the first few months of operation, voice communications signals from ATS-3 suffered from extreme, unpredictable fluctuations in quality. Modifications made to the transmission equipment to reduce the effects of radio frequency interference in the Denver metropolitan area resulted in improved voice interaction performance during the second semester's programming. In addition, NASA also agreed to full power operations of the spacecraft. Digital transmissions successfully tested late in the programming year demonstrated that the employment of digital capabilities would have enhanced the effectiveness of the delivery system.

Local school staff personnel were trained to operate the transmitting and receiving equipment. Even though few had previous electronic or radio communications training, all learned to operate the equipment quickly and expertly. Consequently, operator error accounted for less than one percent of the broadcast system downtime.

The Denver-based facilities for the coordination of the HET network were designed and built by STD engineers. The satellite access terminal or uplink, although designed without total redundancy capabilities, worked well. Failure time including that caused by local power outage was 117 minutes, or less than one-half of one percent of operational time. In fact, the quality and reliability of the uplink facilities exceeded expectations.

CAREER EDUCATION PROGRAMMING

Because of national and state priorities which existed prior to the funding of the Project career education was selected as the topic of STD programs A subsequent study conducted by the STD revealed two factors that served to define the intended audience for the broadcasts First it was determined that career education had been a developing program in elementary schools for some time Second, many high school students had access to vocational and other hands-on" experiences but an educational void existed in the middle grades Accordingly it was decided that the programming would focus on students in grades 7 8 and 9

During the course of the STD career education programs were broadcast to students at both Open and Closed Sites Closed Sites were those where STD equipment had been installed to receive programming directly from the ATS 6 Open Sites were schools which received the programs from public television s ations or via cable and translator systems

The career education programming entitled Time Out" was broadcast Monday through Friday during both the first and second semesters of the 1974 75 school year Pre-taped segments of the Monday through Thursday programs lasted 28 minutes 50 seconds to allow public television stations to carry the series in a standard half hour time period These pre-taped segments included dramatized situations and existing filmic materials selected according to appropriateness The series emphasized self assessment career exploration and decision making stressing the options available to each student in relation to individual needs and abilities An additional six minutes of daily programming featured live audio interaction between students and the Denver staff In contrast to the pre recorded programs 12 Friday programs per semester were broadcast live and were produced with a variety of formats Although extensive modifications were precluded by time and budgetary constraints second semester programs included revisions based on audience and STD staff review of the first semester broadcasts

The production of Time Out was accomplished through a production system new to educational television called the "courseware team" approach Existing materials were previewed for integration into the series A content process was developed to guarantee the educational integrity of the programs

TABLE 1
JUNIOR HIGH SCHOOL AUDIENCES
1974 75 SCHOOL YEAR

	TOTAL JUNIOR HIGH (7,8,9) ENROLLMENT	JR HIGH ENROLLMENT RECEIVING PTV %	JR HIGH ENROLLMENT RECEIVING PTV NUMBER	TOTAL JUNIOR HIGH DISTRICT ENROLLMENT FOR STD OPEN SITES	CONFIRMED OPEN AUDIENCE' PARTICIPATION	CONFIRMED CLOSED SITE' PARTICIPATION
ARIZONA	131,000	70	91 700	14,836	888	402
COLORADO	143,380	89	128,718	33,794	1,858	780
IDAHO	50,083	78	39 000	30,279	2,548	881
MONTANA	45,211	34	15,494	11,480	1,830	728
NEVADA	34 136	87	29,800	23,808	1,840	888
NEW MEXICO	78,900	71	56,080	36,829	3,343	431
UTAH	74,547	98	73,000	58,540	3,404	783
WYOMING	21 988	70	15 300	13,250	2,213	1,030
TOTALS	579,218		447,343	225,538	18,819	5,883

Not every junior high school in the districts had access to PTV and not all open site junior high school students viewed STD programming

'Confirmation based on print material orders and direct contact There is evidence that others participated in STD programming but not on a regular basis and without use of print materials

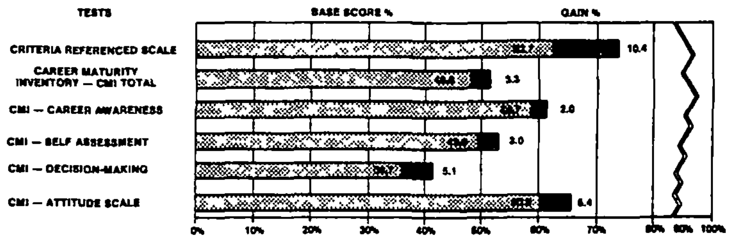
Various television formats and vehicles were analyzed to identify those appropriate to the junior high school audience An in house studio facility was built for the production of the pre-taped and live segments of the programming

The developmental process included four major steps with several activities within each step These steps included (1) identification and development of content (2) development and refinement of scripts (3) production and refinement of programs and (4) refinement of television programming during the operational period This sequence of activities was designed to assure optimum program quality within the available resources The data base shows that students posted significant knowledge gains after viewing the programs The largest gains were made by the students at the IT sites who participated in the audio interaction

By presenting meaningful informational broadcasts the STD helped adolescents develop decision-making skills and encouraged better utilization of educational and training resources in the region s rural schools

Print materials designed to supplement "Time Out included a teacher guide and a student magazine The teacher guide contained a variety of discussion

FIGURE 2
PERCENTAGE OF CAREER RELATED KNOWLEDGE GAINS



questions and activities enabling them to select *appropriate materials for* their students The guide included an introductory issue and four subsequent updates The student magazine was issued four times per semester to each student *in the 56 participating* sites and contained articles games puzzles and artwork designed to encourage student acceptance and learning All print materials were available for purchase by Open Sites The materials were revised for *second semester use*

Print support materials were also available for the *other* STD programs Footprints Careers and the Classroom and the Materials Distribution Service (MDS) An MDS catalog listed the titles alphabetically and provided program information for teachers to use in ordering films for satellite distribution Teacher guides included suggestions regarding classroom applications of the films In service participants *received* updates which included an outline of the presentation and background information on the program speaker

Site coordinators received materials for publicity *and follow up activities connected with Footprints Flyers* posters and other promotional materials were used to attract audiences If community interest suggested additional activities listings of available local state and national resources and suggestions for subsequent activities were available

STD STUDENT POPULATION

Analysis of population data indicated that 5 593 students at the 56 STD Closed Sites viewed Time Out" and an additional 16 919 students viewed the programs *as they were re-broadcast* by participating public elevision stations in the region These 22 512 students comprised the total confirmed Time Out audience *Demographic data on* the STD research classes numbering 3 446 students at the 56 sites have been presented in Figure 3

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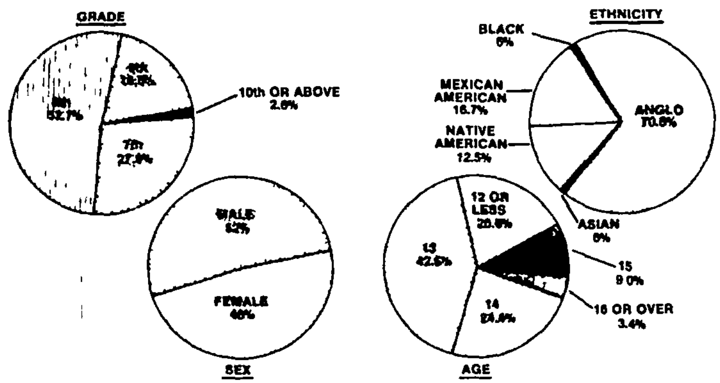
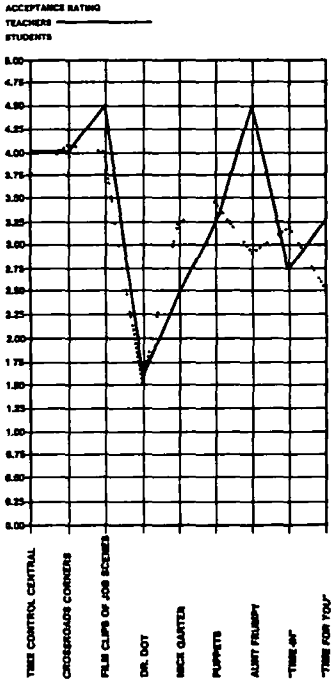
FIGURE 3



AUDIENCE ACCEPTANCE OF TIME OUT

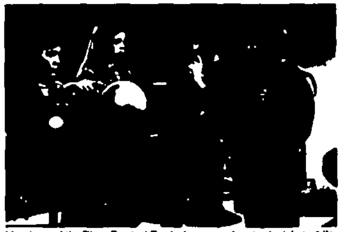
FIGURE 4

ACCEPTANCE RATINGS OF "TIME OUT" ELEMENTS BY STUDENTS AND THEIR TEACHERS



The "Time Out" series *utilized a number of* different formats to explain career concepts Time Control Central was a major format and used a science fiction set and a futuristic approach It provided a vehicle to move forward or backward in time to access *a computer for information* to recall film clips, and to *smoothly bridge other program formats.*

Program formats included Crossroads Corner which featured teenagers in a rural setting film clips of job scenes Dr DOT a carnival-type character used to explain the Dictionary of Occupational Titles, Nick Garter a comic detective puppets used to explain attitudes, Aunt Frumpy who answered letters, "Time In" which was six minutes of daily audio interaction and "Time for You" 12 Friday 30-minute interactive *programs Acceptance* levels for all program segments have been specified in Figure 4



Members of the Time Control Central crew work out a decision while junior high students gather at Crossroads Corners store to talk about career education Both formats were used in STD's "Time Out" series

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FOOTPRINTS

"Footprints" was selected as the title for the adult evening series The purpose of each program was to provide assistance to communities in recognizing some of the area s problems and concerns The final schedule of program titles and topics included Order No 461111-LT7 (mail order consumerism) The Space Between Us (interpersonal communication) "The Great Land Race" (land use) "For Purple Mountain Majesty (cultural heritages) 'The Job Jungle (career development for all) Super Cooperatives (farm cooperatives) Misterogers! Every Child's Neighbor' (early childhood education) "Is There a Doctor in the County?" (rural medicine) Don t Hold Us Back (senior citizens) and "Brass acks (a summary of the STD with a look to the future)

Aside from two programs (Purple Mountain Majesty which was completely pre-recorded and Brass Tacks which was a *live panel discussion)* the format for "Footprints consisted of an opening title sequence *pre recorded topic exposition* interaction and closing sequence Panel members and moderators were selected for their subject matter knowledge and their ability to communicate Sites were asked to contribute suggestions concerning the selection of *these participants Although attendance for evening* programs was small interaction was lively and was perceived by viewers as being most useful and pleasurable The evaluation reveals that the Footprints" series was generally well accepted by evening audience members

MATERIALS DISTRIBUTION SERVICE

The STD s Materials Distribution Service (MDS) was designed to increase the scope and flexibility of rural school curricula Through this service the STD Closed Sites were able to gain access to a variety of high quality films and videotapes which were broadcast via the ATS-6 These filmic materials were recorded and used by the schools at their convenience throughout the 1974-75 school year Because of copyright restrictions public television stations could not receive and broadcast this service consequently Open Sites were unable to participate

The content of the MDS film library was determined primarily by teachers at the participating sites These teachers selected films from catalogs provided by the Encyclopaedia Britannica Educational Corporation and the Great Plains National Instructional Television Library Their selections were tabulated and on the basis of these results the STD obtained a total of 426 films — 300 from Encyclopaedia Britannica 100 from Great Plains and 26 from various other sources (Of these approximately 35 films were intended for use in conjunction with the "Footprints programs) The final list of films covered topics from all subject areas (K 12) and contained materials suited to the interest of students Using a catalog and teacher guides developed by the STD site personnel requested films for broadcast On this basis a broadcast schedule was developed for each three six-week periods per semester

Although the MDS was not officially incorporated as a part of the STD project until November, 1973 the participating STD sites enthusiastically supported the program Despite the fact that school budgets had already been determined for the 1974 75 school year 54 of the 56 participating schools found the means to purchase *the videotape cassette recorders and* the quantities of tape necessary to make effective use of the service

MDS was extensively utilized During the 1974-75 school year 7 068 recordings were made and a total of 190 078 viewings have been documented In all a total of 162 hours of satellite time was used for Materials Distribution

The only problem encountered in the broadcasting of MDS was a lack of sufficient satellite time to meet all the film requests from participating sites In the *future this problem could be alleviated by the use of* video compression which would enable the distribution of more video material in a shorter period of time

The impact of the Materials Distribution Service will be felt far beyond the life of the STD The equipment and quantities of tape purchased by the sites will be of use in their educational programs Furthermore upon conclusion of the MDS program the STD was able to negotiate an arrangement with the *Encyclopaedia Britannica* Educational Corporation whereby participating sites were allowed to purchase the titles they had videotaped at a relatively low cost Those videotaped films are now a permanent part of the schools resources

TABLE 2
MATERIALS DISTRIBUTION SERVICE ATTENDANCE

NUMBER OF FILM RECORDINGS	NUMBER OF SHOWS TO AUDIENCES	TOTAL AUDIENCE ATTENDANCE	AVERAGE MATERIAL RATING'
7,068	4,700	190,078	1.81
ATTENDANCE BY AUDIENCE TYPE			
K-6	7-9	10-12	ADULT/OTHER
58,949	75,078	53,488	2,565

Material Rating' (Based on perceived audience acceptance and benefit) 1 = Excellent 2 = Good 3 = Fair 4 = Poor

CAREERS AND THE CLASSROOM
A NEW PERSPECTIVE FOR TEACHERS

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To broaden the impact of the STD project a teacher oriented series of career education programs was developed to supplement the student-oriented "Time Out series This series entitled "Careers and the Classroom A New Perspective for Teachers" was designed to inform all interested educators in participating districts about career education and to encourage them to utilize the principles of career education in their classroom activities Broadcast bi weekly from September 5 1974 to May 1 1975 the programs in this series dealt with 16 career related topics Program titles included in the series were "Career Education Is for Everyone Continuing Education s Role" The Dictionary of Occupational Titles" "Honest Self Assessment Values and Strategies in Decision-Making Organizing and Facilitating Independent Learning" "Career Guidance Resources Career Education and the Standard Academic Curriculum" Overcoming Biases in Counseling Students Ecology/Environment — How Do They Impact Upon Careers" Unions and Career Education "Job Security Tomorrow s Careers "Earning a Living Is Not Enough — The Art of Intelligent Spending Effects of Change on the World of Work and Career Education Today"

Each program in the Careers series had a similar format Two STD staff moderators introduced the presenter responsible for a given program The presenter lectured for 10-30 minutes followed by an interaction session via satellite Each program was 55 minutes in length

All site participants in the Careers series received information about each program The program reviews contained biographies of the presenters and outlines of the presentations In addition during the course of each program presenters would frequently recommend supplementary materials to be used for further work on an individual basis

Several regional colleges and universities offered graduate credit to participants in the Careers series and 554 educators took advantage of this opportunity In addition 322 teachers who participated in the program received recertification credit from their state department of education The "Careers series met the needs of teachers for this type of programming The teachers however expressed a preference for multi media presentations rather than a talk show format

SPECIAL PROGRAMS

In the Denver studio the Colorado Concert Ballet performs via ATS-6 for ballet master at Lincoln Center for the Performing Arts Special program with live interaction, was produced by STD for the American Association for the Advancement of Science annual meeting in New York City

In addition to the regularly scheduled program series described earlier (Time Out Careers and Footprints) the STD staff also developed and produced a number of programs for specialized audiences Eighteen special satellite "feeds were made between July 9 1974 and May 16 1975 Each of these further demonstrated the flexibility of a satellite-based broadcasting system

On July 31 1974 a special presentation was broadcast from Denver to Washington D C giving general information about the STD and showing a portion of the Villa Alegre series developed by Bilingual Children s Television In attendance at this presentation were individuals representing the Congress National Institute of Education the Office of Education NASA the United States Information Agency Fairchild Industries and several unaffiliated but interested individuals This broadcast was one of several made to individuals representing the private sector the legislative and executive branches of the federal government and various regulatory agencies

Special presentations were made to the Space Applications Board of the Academy of Engineers the Institute of Electronic and Electrical Engineers the Russian Minister of Health the Space and Missile Systems Organization the Society of Motion Picture and Television Engineers the National Association of Educational Broadcasters and the American Association for the Advancement of Science

Several special news programs were transmitted through the Project s network to the residents of Juneau Alaska. These programs included the resignation of President Richard Nixon and the acceptance speech of President Ford Programs were fed from Washington D C to Denver via the Public Broadcasting Service land lines The broadcast link from Denver to Juneau was provided by the ATS-6

The leading project scientist for NASA s Viking Project utilized the STD network to make two presentations describing the Viking Mars mission Science students at Intensive Sites were given the opportunity to question the guest scientist while other participants viewed and listened to his immediate responses

A program prepared on behalf of the American Association for the Advancement of Science involved the live broadcast of a ballet performance This program originated from the STD studio and was broadcast to the Lincoln Center for the Performing Arts in New York City to an audience of UNESCO representatives and others interested in the application of science and technology to the arts To demonstrate the interactive capability the performance was critiqued live from New York City

A special program feed to the Rocky Mountain Regional Medical Conference in Bozeman Montana, demonstrated the potential use of satellite broadcast systems in the medical field Such systems would be able not only to serve as a teaching tool for medical personnel far from urban areas but also to provide medical assistance in life-and-death situations

The Emergency Medical Technicians Refresher Course was a joint effort of the Federation the Mountain States Health Corporation the Rocky Mountain Corporation for Public Broadcasting and the Robert Wood Johnson Foundation It consisted of a series of seven programs designed to serve as a refresher course for certificated emergency medical technicians This series made available to technicians in remote areas the expertise of leading medical authorities in the region

INTERACTION

Live interaction via the ATS 3 was a major aspect of the STD project This capability which allowed STD participants to communicate with one another and with STD staff in Denver was intended to achieve three objectives. to increase the educational value of STD programming to increase the acceptance of such programming and to investigate the effectiveness of various live program formats

Interaction Using the ATS 3

The interaction system employed by the STD involved the use of NASA s ATS-3 This system was an integral part of the junior high school education series Sixty nine of the eighty one half hour programs in this series were pre-recorded presentations followed by six minutes of live programming during which students asked questions and provided comments concerning the broadcast During the first semester these six-minute segments entitled "Time In " were moderated by two staff members at the STD studio in Denver Additional STD personnel off-camera provided a knowledge pool" for answers to content-specific questions most of which involved requests for information about training requirements and aptitudes interests and temperaments associated with various careers

There were also 12 half hour live presentations each semester entitled Time Out. Time For You These programs were designed to stimulate interaction between STD students and content experts in the Denver studio During the first semester STD experimented with a variety of formats in this area including mini-dramas in which teenagers presented conflict situations intended to elicit comments from participating STD students debates in which two Intensive Sites supported opposing positions on a given career topic while students at the remaining sites provided questions and comments and "knowledge pool" programs which were essentially an extension of the "Time In broadcasts encouraging students to seek information relating to various career alternatives

During the second semester of "Time Out. Time For You" broadcasts the panel show format was retained and two additional types of live programming were provided The first new program series featured experts from several educational areas beyond the secondary level Representatives from colleges universities junior and community colleges private and public vocational technical schools and union apprenticeship programs responded to student questions in their respective areas of specialization The second type of new programming was produced at the local level by students Interested sites were encouraged to prepare program segments dealing with careers in their own communities Films slides scripts and audio tapes were collected organized and sent to Denver where the STD production staff prepared the materials for broadcast Following each individual site presentation the remaining Intensive Sites were given the opportunity to comment on and ask questions about the program

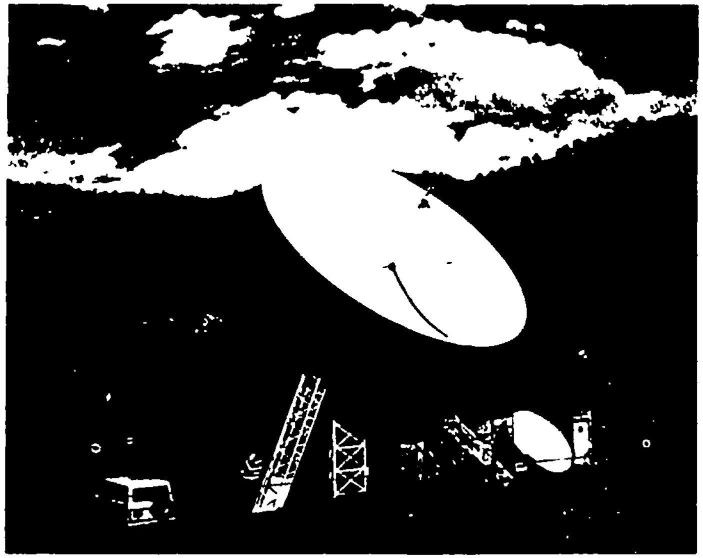
Interaction Without the Satellite

In the live segments of STD programming which emphasized interaction and involved Intensive Sites directly every attempt was made to include students at the ROT Sites Program topics were announced as far in advance as possible and questions by mail were solicited Letters received from students at ROT Sites were acknowledged and answered during the live broadcasts

Digital Interaction

The original STD proposal included plans for live interaction through the use of digital pads at participating STD sites Unfortunately a lack of funding precluded full implementation of these plans The STD was able to conduct a series of limited tests during the spring of 1975 which demonstrated the feasibility of such a system

To interface with the global-beam of the ATS-6 the uplink earth station at Morrison Colorado operated at 4 and 6 GHz The station used a 3 kW transmitter an uncooled low noise parametric amplifier and an 11-meter (36 foot) prime focus parabolic antenna.



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SUMMARY OF STD SERVICES

The Satellite Technology Demonstration designed developed implemented and tested an elaborate technical communications network programming for a wide variety of users and a comprehensive field support system

Despite extreme weather conditions the technical network operated efficiently with a minimum of interruption of services Signal quality far exceeded minimum design specifications The STD designed ground receivers proved to be a suitable low-cost network component complementing the high powered transponders of the ATS-6

The STD programs attracted a larger share of the viewing audience than public television broadcasts in general "Footprints" attracted 3 31 percent of contacted viewers and "Time Out" was viewed by 4 13 percent of the non-school respondents in comparison to a February 1975 Nielson survey which found 2 8 percent of the general audience viewing public television Acceptance of the programming was generally high and student knowledge gains were gratifying The largest gains were made by Mexican American students which is of particular interest since the programs were generic in design and not intended *for any specific audience*

The field support system involved over 200 state and local educational professionals and technical specialists in carrying out the planning development and operational tasks of the STD A significant legacy of the STD is the user' system comprised of professional policy makers managers teachers citizen boards advisory panels parents and young people in 8 states 56 communities and 12 public television coverage areas

The STD delivered educational materials and services to a wide range of audiences in an area nearly one-fourth the size of the United States at a cost of slightly over $11 000 000 While a satellite system has been demonstrated to be a technologically feasible means of distributing educational services any judgment about the efficiency of the system must be made after carefully comparing costs to the advantages of satellite distribution under specified conditions

PROJECT COSTS

Project Funding and Expenses

The Satellite Technology Demonstration was a cooperative endeavor involving the coordination of efforts among local schools state departments of education state governmental agencies federal agencies public broadcast stations and their regional network and the Federation of Rocky Mountain States Inc

Three federal agencies provided the STD funding totaling $11 329 423 The contributions came from the National Institute of Education $4,252 412· Office of Telecommunications (DHEW) $2 279 530 and the United States Office of Education $4 797 481 The STD was completed in three major phases. planning development and operation The approximate costs were planning $4 000 000 development, $4 600 000· and operation $2 700 000

The STD component structure was based on functional activities related to the products and services. The costs for each have been shown in Table 3

TABLE 3
COSTS BY COMPONENT

BROADCAST AND ENGINEERING COMMUNICATIONS NETWORK DESIGN AND IMPLEMENTATION INCLUDING THE DENVER UPLINK AND NETWORK COORDINATION CENTER FACILITIES.	$2,[illegible]
PROGRAM CONTENT DESIGN AND VIDEO PRODUCTION.	2,[illegible]*
UTILIZATION FIELD ORGANIZATION AND SUPPORT SERVICES.	1,[illegible]
RESEARCH DESIGN, DATA PROCESSING, AND ANALYSIS.	[illegible],000
ADMINISTRATION MANAGEMENT PUBLIC INFORMATION, AND SUPPORT COSTS, I.E., RENT UTILITIES, AND SUPPLIES.	2,[illegible]

Does not include the $1 700,000 cost of early childhood programming which was phased out of the Project in July 1973.

STD PROGRAM AND SITE SUPPORT

A major STD activity involved the development and delivery of career education programs to junior high school students An analysis of the expenses incurred during the development of these programs revealed their cost to be approximately $24 500 per hour This represents a significant achievement when compared with the production costs of other dramatic educational series produced for public television stations which range from $30 000 to $60,000 per hour A similar analysis indicates that the production cost per hour for the teacher in-service series "Careers and the Classroom" was approximately $6 000 per hour and the approximate cost per hour for the "Footprints" series was $750

The estimated cost of an STD site during the 1974-75 operational year (including equipment and human support services) was approximately $9 000 for a Receive-Only Site and $13 600 for an intensive Site

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IN-KIND SUPPORT

One of the goals of the STD was to document the cost of delivery modes using varied STD materials These costs were studied and extensive information is now available to provide guidance for the planning of future educational satellite technology applications

An implicit long-range goal of the STD was to obtain state and local in-kind support to demonstrate Project commitment and the importance of local commitment in the adoption of appropriate programs and services The level of in kind support was encouraging to the STD and to outside observers particularly those contributions made by school districts with limited funds

In-kind support included expenses incurred by states and sites in addition to the STD s site support grant Examples of such expenses are professional and classified salaries office space phone services and office supplies An average of $54 972 was contributed by each state during the life of the Project Local in kind support has been itemized in Table 4

TABLE 4
SITE IN-KIND SUPPORT

	AVG PER SITE	TOTALS
STAFF SUPPORT[1]		
PROFESSIONAL	$ 3,094	$ 171,015
CLASSIFIED	778	43,412
COMMUNICATIONS (PHONE POSTAGE)	49	2,743
SUPPLIES (VIDEOTAPE, OFFICE SUPPLIES)	1 730	97 330
EQUIPMENT (TV MONITOR VTR ETC)	2,817	157 737
EQUIPMENT MAINTENANCE	48	2,715
AVERAGE SITE EXPENSE	$ 8 481	

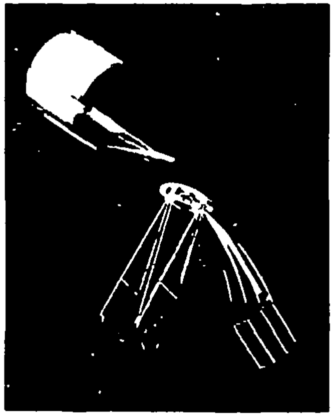
[1] Excluding site coordinator salary provided by STD site support grant

In future projects, savings would be realized as the result of economies in large-scale purchase of equipment and facilities Additional reductions in per user/hour costs would be effected by increasing the number of program offerings to users The STD s per site cost for the operational year was determined by adding the average site expense of $8 481 (as reflected by in kind support) to the Project costs for installation and operations (See Tables 4 and 5) In subsequent operational years expentitures at STD sites would be reduced because of elimination of the initial start up cost

TABLE 5
SITE COSTS INCLUDING IN-KIND SUPPORT

	IT	ROT
PRO-RATED STD SITE COSTS	$ 13,618	$ 8,978
IN-KIND SUPPORT	8,481	8,481
TOTAL AVERAGE COST PER SITE	$ 22,099	$ 17,479

IMPLICATIONS AND CONCLUSIONS



The STD provided valuable experiences in the application of satellite technology to serve human needs These experiences lend vital support and guidance for future developments utilizing the nucleus of experienced people available to facilitate such endeavors The corps of persons with satellite experience is a valuable resource for the nation and the region representing a capability for implementing future satellite projects

The STD also provided significant information and results from which implications can be assessed and conclusions reached For example the Broadcast and Engineering staff found that the low cost receiving and transmitting equipment provided exceptional picture and voice quality thus offering encouragement for the development and design of similar hardware in the future The equipment was reliable and easy to repair and while occasional malfunctions did occur performance records indicated little downtime Cost and maintenance factors put the equipment within reach of small school districts in rural communities

Another positive feature of the equipment was that it could be properly operated by non-technical non-professional personnel who required a minimum of instruction and supervision This offers encouragement for emerging nations which will use satellite communications for small isolated communities unable to afford the costs of highly skilled technicians The equipment was also adaptable to a variety of locations installations weather factors and user demands

A remarkable achievement of the STD was the coordination and blending of diverse interests and contributions of many people and organizations at the local state national and international levels Individual efforts reflected the tremendous enthusiasm and interest of participants One reason for the positive involvement was that the Project design elicited local response so that programming could be modified to meet the needs of participating students

A field support effort was implemented to help tailor the general STD programs to respond to unique local cultural linguistic and other demographic factors These human support mechanisms contributed to program acceptance by students teachers parents and the community

In a survey conducted by the Federation of Rocky Mountain States Inc teachers administrators and school board members requested continued and expanded programming via satellite. Respondents indicated that more comprehensive services (student programming in-service programming distribution of existing materials specific skills training for adults etc) are needed to justify the expenditure of additional funds Essentially the respondents seek further involvement expanded technical capability and more diverse services

The success of the Emergency Medical Technicians Recertification program demonstrated that satellites can provide quality training in many professional and technical areas In-service training has been requested and could be provided for police firemen wastewater operating engineers and city planners Satellite communications would appear to offer much potential for in service training by making expertise available to large numbers of professionals

A significant adjunct of the STD and the HET *Experiments* was the incorporation of the Public Service Satellite Consortium (PSSC) The PSSC was organized by selected ATS-6 users and by other organizations who recognized that the accomplishments of HET were compatible with and supportive of their communication educational and social needs. Numerous organizations including states, regional commissions and compacts national agencies, and national professional organizations have joined or plan to join the PSSC A major goal of the Consortium is a satellite dedicated to social service with technical attributes based on the needs of the user organizations

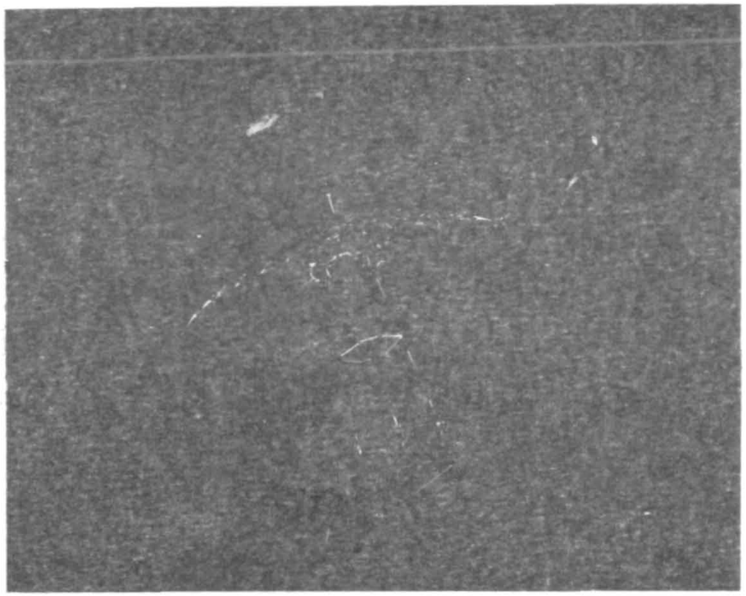
There are audiences agencies and organizations who believe that satellites are communications devices "whose time has come" On the basis of the ATS-6 experiences, the users are now ready for the benefits of a full-scale satellite delivery system There is local and regional enthusiasm for using the new technology The test bed which includes local receiving equipment, the Network Coordination Center the uplink trained staff and committed users, remains in place in the region awaiting the return of the ATS-6 from India

With ATS-6 and the Satellite Technology Demonstration the social implications of satellite communications are no longer a matter of conjecture discussion or debate they are a reality which we must exploit. *Telecommunications via satellite is certain to* increase substantially in the next decade Fitting satellite technology to the needs of all Americans—urban and rural—will be difficult but the rewards and promises are substantial

Satellite Technology Demonstration
Federation of Rocky Mountain States Inc
2480 West 26th Avenue
Denver Colorado 80211 (303) 458-8000

More detailed information on the Project is available from the Federation of Rocky Mountain States Inc

This report was produced with funding from the National Institute of Education The views expressed do not necessarily reflect those of the National Institute of Education or the U S Department of Health, Education and Welfare



ATS-6 HEALTH EXPERIMENT

Indian Health Service / Alaska
WAMI Experiment in Regionalized
Medical Education / Seattle, Washington

Phase I: Planning and Development

ATS-6 HEALTH EXPERIMENT

Indian Health Service: Alaska
WAMI Experiment in Regionalized Medical Education:
Seattle, Washington

Phase I: Planning and Development

Prepared by

University of Washington Project Office
ATS-6 Health Experiment Management and Technical Operations

Contract No. NIH-CG-73-2003

Lister Hill National Center for Biomedical Communications

December 1974

UNIVERSITY OF WASHINGTON
Seattle, Washington

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PREFACE

On May 30 1974 the National Aeronautics and Space Administration placed in orbit 22 300 miles over the equator the most complex versatile and powerful communications spacecraft ever developed

From its geostationary position almost directly over the Galapagos Islands Applications Technology Satellite 6 will serve as a relay station for the most extensive experiments conducted to date in the field of satellite communications The most ambitious of the experiments planned for ATS-6 are those sponsored by the U.S Department of Health Education and Welfare

Using color video voice and a variety of data signals the DHEW programs will deliver televised services in health care and education to thousands of Americans living in areas too remote to reach through ground based media Appalachia the Rocky Mountain states Alaska and Washington are the areas selected for the DHEW experiments

This report describes the work performed by two of DHEW's experimenters the Indian *Health Service in* Alaska and the WAMI (Washington Alaska Montana Idaho) Experiment in Regionalized Medical Education at the University of Washington to develop the programs systems, and instrumentation required to implement satellite relayed communications in health care and medical education within this vast northwestern region

DEVELOPMENT OF SATELLITE TECHNOLOGY

Nearly fifteen years have passed since the National Aeronautics and Space Administration (NASA) placed the world's first communication spacecraft in orbit Within these years the technology progressed from the simple reflective balloons of the *Echo* series to the sophisticated instrument called ATS-6

ECHO TO SYNCOM

The first communications satellites were large spherical craft ranging in size from 100 to 135 feet in diameter They circled the globe at altitudes of from 600 to 6700 miles—some capable of viewing only about 3 percent of the earth's surface at any given point in time *Echo I* a simple uninstrumented balloon launched in 1960 was the pioneer of communications spacecraft Radio signals were bounced off its reflective surface for return to earth where powerful receiving equipment was required to catch the faint weakened signals The *Courier* craft *first placed in orbit in the same year* carried the technology a step farther with self-contained receiver transmitters that amplified the signals and played them back on command The more sophisticated *Telstar* sent up for American Telephone and Telegraph in 1962 captured international attention when it relayed the first live television broadcast from Europe to the United States

The next generation of communications satellites were small spin-stabilized cylinders instrumented for increasing complexity and power The *Relays* were introduced in 1962 Their more extensive array of solar cells (to obtain energy for operation from the sun) could power an 11-watt transmitter From their intermediate altitude orbits 800 to 4600 miles above the earth they were used to relay transoceanic telephone, teletype and television transmissions and for telemetering *measure*ments of radiation The *Syncoms* first launched in 1963 were the first craft to be placed in high synchronous orbits Spacecraft placed at this altitude roughly 22 300 miles above the earth keep pace with the earth's rotation and thus remain with some variation over the same general geographic area at all times A satellite at synchronous altitude views about 45 percent of the globe Three satellites strategically placed at this altitude could cover the entire earth

THE ATS SATELLITES

The Applications Technology Satellite (ATS) program which produced the highly advanced spacecraft to be used in DHEW's Health Education Telecommunications Experiments evolved from studies based on *Syncom* All of the satellites in this series would achieve orbits that were geostationary rather than merely geosynchronous At 22 300 feet *over the equator* their fluctuation in position with respect to the earth would be negligible They would also be gravity gradient as well as spin-stabilized so that the craft's antennas would maintain a fixed orientation with regard to the earth allowing radio beams to be directed with far greater precision

The first of these new satellites *ATS-1* was placed in orbit in 1966 (figure 1) Since then ATS 1 has been pouring a steady stream of data back to its ground stations for a large number of technological and scientific experiments

A failure in the launch system of ATS-2 sent up in 1967 caused it to enter an unworkable orbit It reentered the earth's atmosphere in 1969 and was destroyed ATS 3 took up its station over the Atlantic Ocean in 1967 and all systems have been operating as expected since that time This satellite sent back the first color photograph of earth in space ATS 4 entered an improper orbit during its 1968 launch and was subse

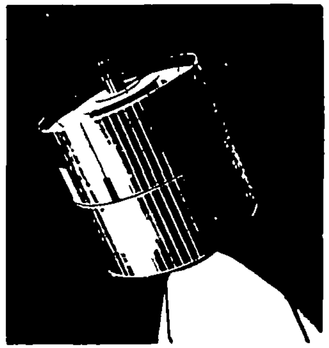

Figure 1 The first Applications Technology Satellite ATS-1 ATS 1 has been used by the Indian Health Service in Alaska since 1971 to provide medical consultation by voice to 26 villages in Alaska's interior It will continue to be used in support of the ATS 6 experiment program

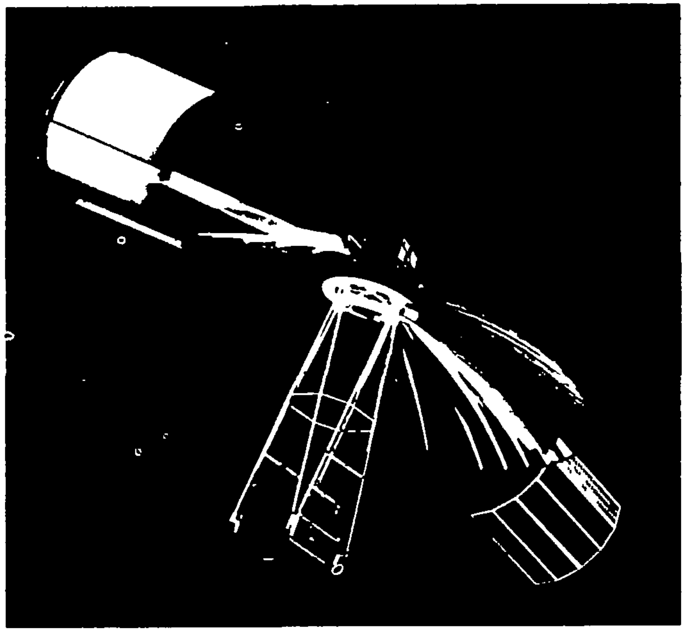

Figure 2 *ATS 6, vehicle for the most extensive satellite communications experiments devised to date*

quently destroyed ATS 5 launched in 1969 is the third of the ATS series to remain in operation to the present

The most recent product of the program ATS 6 was sent up from Cape Kennedy Florida aboard a Titan III launch vehicle on May 30 1974 (figure 2) ATS-6 will be used to test a variety of new space communications concepts requiring the use of geostationary spacecraft All totaled it carries more than 40 technological and scientific experiments many of them international in scope But the most significant difference between this satellite and its predecessors is its power

Only a few years ago a large and expensive earth station was needed to communicate with a satellite in synchronous orbit The ATS series satellites were designed with the express intent of reducing the power requirements for earth stations by increasing the power and precision of the satellite s receiving and transmitting capabilities Now video signals can be sent to and received from an ATS by terminals equipped at a fraction of the cost

This economic advantage has opened the way for experiments with satellite service by a large number of potential users DHEW s Health Education Telecommunications Experiment will demonstrate the social value of this achievement in a series of programs that presage new directions for satellite communications technology in the fields of health and education

THE HEALTH-EDUCATION TELECOMMUNICATIONS EXPERIMENT

Some three years prior to the launch of ATS-6 plans to define the services this new spacecraft would be designed to perform were reaching culmination The U S Department of Health Education and Welfare saw the capabilities of ATS-6 as offering unusual potential for applications in the areas of health and education A joint proposal made to NASA by DHEW and the Corporation for Public Broadcasting in June 1971 formed the basis for an agreement to use this satellite for experiments that would provide improved services in health and education to regions particularly remote from the mainstream of social and technological progress

ELECTRONIC COMMUNICATION IN HEALTH AND EDUCATION

Two agencies within DHEW bear major responsibility for applying advances in communication technology to services in health and education the Lister Hill National Center for Biomedical Communications (a division of the National Library of Medicine within the National Institutes of Health) and the National Center for Education Technology (within the National Institute of Education) Both have already made considerable strides in demonstrating the value of electronic communications in their respective areas of concern

The Lister Hill Center works at devising ways to combine the technology of communications with that of library computer and medical science for applications in health care and medical education The objective of a number of experimental/demonstration projects initiated by the Center in recent years has been to ease problems caused by shortages of medical manpower mainly by extending the resources of areas that possess sufficient manpower to areas that do not Land lines terrestrial radio (which includes television) and even satellite repeatered voice links have been used to form communication networks which unite clinics hospitals and professional and paramedical personnel Through these networks, the medical expertise available at larger population centers can be utilized for such purposes as medical consultation training or continued education at locations where staffing is less complete Those communications which are televised have been found particularly effective and satisfying to the users

Of the many demonstration projects receiving support from the National Center for Educational Technology *Sesame Street* is probably the most widely known example

TARGET POPULATIONS FOR ATS 6

Shortages of medical manpower are found nationwide including the central areas of some of our major cities In these areas of highly concentrated population access to health care may be less than optimal but the possibility of access still remains as medical manpower is usually abundant In areas more remote and particularly in very small and isolated communities medical services are often totally nonexistent and the distance to towns where care is available may be insurmountable Public communications systems in these areas are also usually limited or nonexistent

Televised educational broadcasts find their largest audiences in urbanized areas where public schools are largely well provided The populations missed are those living in areas too remote for television reception—the same areas in which all forms of educational opportunity are often limited

The immediate need for enrichment of services in health and education appears to be greatest in regions which are geographically remote Many of these regions also contain large numbers of the minority and the poor

THE UTILITY OF ATS 6

Three areas of the United States stand out as suffering particular isolation the Appalachian Mountain region the Rocky Mountain region and the state of Alaska Many areas of the Pacific Northwest could also be considered in this category though the isolation is less severe and some form of communication is usually available

In the first three regions mountain barriers make radio and television reception from ground based transmitters difficult or impossible In Alaska atmospheric disturbances interfere with radio wave communication posing an additional problem Great distances separate small communities and the cost of installing land lines between them has generally been found prohibitive when balanced against the small number of people each installation would serve Modern communications systems will probably not be brought to these remote areas until their benefits can be demonstrated and the capital investment in permanent installations justified

Signals transmitted via ATS 6 are not affected by the barriers which preclude ground-based transmission and

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which have kept these communities in isolation. The cost of the earth stations required for transmission and reception of signals for relay by ATS-6 is low enough to permit their installation in hundreds of small communities. Because ATS-6 is instrumented to perform many complex activities very quickly, it can be used to meet the specialized requirements of a very large number of very small groups.

It appears that the kind of communications systems pioneered by the Lister Hill National Center for Biomedical Communications and the National Center for Education Technology could be applied to great benefit within these regions. However, there is no way of knowing whether these new applications in the service of health and education would effectively serve their intended purposes until the systems are tried. Through the use of ATS-6, trial systems can be implemented at minimal cost so that their effectiveness can be tested and evaluated without risking large capital outlays on permanent installations.

DHEW will use ATS-6 to introduce new technologies to these remote regions and test their workability, while at the same time extending to them some of the services they so urgently need. These demonstrations with the ATS 6 satellite make up the Health Education Telecommunications (HET) Experiment.

ORGANIZATION OF THE HET EXPERIMENT

Three agencies within DHEW are sponsoring the HET Experiments. The National Center for Educational Technology is in charge of experiments in education in Appalachia, the Rocky Mountain states, and Alaska. The Lister Hill National Center for Biomedical Communications is responsible for experiments in health care and medical education in Alaska and Washington. The Veterans Administration will carry out experiments in telemedicine between VA hospitals in the Appalachian region.

DHEW, through its HET Project Policy Committee, has ultimate responsibility for the program content of each of the experiments as well as for implementing the vast earth station complex that has been established throughout the participating regions. The experiment programs themselves were planned by the local organizations involved in each of the experiment areas in conjunction with their sponsoring agency in DHEW.

The sponsoring federal agencies are bearing most of the costs associated with program and system development and all costs for earth station equipment and installations. Cooperating federal agencies provide supplementary support.

The ATS program is directed by NASA's Office of Applications. Project management is under NASA's Goddard Space Flight Center in Greenbelt, Maryland. NASA provides the satellite, technical assistance, and access to the NASA ATS ground stations used for transmission in many of the HET Experiments.

Transmissions from all earth stations involved in the HET Experiments will be controlled and coordinated by the HET Network Coordination Center in Denver, Colorado. This station, established by the Federation of Rocky Mountain States, also functions as the central transmission point for the Rocky Mountain experiments as well as a number of those to be carried out in the Appalachians.

TRANSMISSION SYSTEMS

During its first year of operation, ATS-6 will remain in its present location at 94 degrees west longitude over the equator, in communications view of the entire continental United States. From this position it will cover the three major geographic regions participating in the HET Experiments: The Appalachian mountain region, the Rocky Mountain region, and the states of Alaska and Washington.

ATS 6 has two high powered transmitters operating in the 2500-2700 megahertz range which will be used to relay two separate, high quality color television signals, each accompanied by four audio channels. The audio channels can be used to broadcast in several languages simultaneously, or to transmit biomedical or other data concurrent with voice.

The two signals will produce a pair of nearly tangent beams that form giant footprints 1000 miles long by 300 miles wide when focused along latitudes within the continental United States. Earth stations located within either footprint will be able to receive ATS 6 transmissions. These footprints will cover one geographic region for a predetermined period of time and then be shifted (by reorienting the satellite) to cover another. On some days of the week the satellite will be reoriented as many as 12 times to cover different parts of the country.

The majority of the ATS-6 experiment sites will be equipped for reception only. The equipment for most of these receiving stations consists of an ordinary TV set, a converter, and an antenna. The antennas are small, inexpensive fiberglass dish-shaped devices. The receivers will be installed either directly, each serving a single TV set in a hospital, clinic, school, or community facility, or they will be tied in with public broadcasting microwave or cable systems already in operation in the participating states.

The Alaska and Washington sites involved in the Lister Hill Health Experiments will, in contrast, be equipped individually for ATS-6 transmission, and the total equipment requirements will be considerably more complex.

Two earlier satellites, ATS-1 and ATS 3, will be used for two-way voice and data transmissions in support of ATS-6 during the HET experiments. The possibilities for transmission via the earlier satellites include telephone, telegraph, facsimile, and computer data. Combined with ATS 6, these systems offer countless communication options.

THE EXPERIMENTS

The Education Satellite Communications Demonstration

The three projects sponsored by the National Center for Educational Technology take varied approaches in using ATS 6 to improve educational opportunities within their regions.

Elementary and secondary school teachers at 15 sites throughout the mountainous, remote Appalachian region will receive in-service courses in the teaching of elementary reading and in career education for their pupils. In the eight-state Rocky Mountain region, courses in career education will be provided for junior high students, and evening programs will be broadcast on topics of interest to adults. Teachers will be able to order videotaped materials and receive them quickly via satellite.

In Alaska, people who live in villages that can be reached only by airplane—and then only when the weather is good—will have a chance to learn by satellite broadcasts about other people and cultures in their state. There will also be in service training for teachers, administrators, and paraprofessionals, and live television and two-way voice communications for educational programs in village schools.

Veterans Administration Exchange of Information Program

Ten Veterans Administration hospitals located within the footprints for the Appalachian educational experiment are participating in the VA's program. These experiments will give remote practitioners comprehensive access to consultation from specialists, and provide interactive training programs to professionals and paraprofessionals.

ATS 6 Health Experiment

The experiments sponsored by the Lister Hill National Center for Biomedical Communications consist of two separate programs. One for the Indian Health Service in Alaska, and a second for the WAMI (Washington Alaska Montana Idaho) Experiment in Regionalized Medical Education based at the University of Washington in Seattle. These two demonstrations, the most sophisticated and complex of the HET Experiments, are the subject of this report.

The Indian Health Service experiment will implement a coordinated telemedicine and health information system at five Native health care facilities in Alaska. Interactive television and biomedical telemetry will permit health aides at remote villages to consult regarding their patients with physicians at a service unit hospital and with medical specialists in Anchorage and Fairbanks. Additional video programming will be transmitted from Fairbanks for the continuing education of health providers and for the health education of the Native population at the village sites.

The project is directed by the Indian Health Service in Anchorage.

The WAMI experiment will apply interactive video, audio, and data to link students receiving basic science instruction at the University of Alaska and students receiving clinical training at the Washington town of Omak, with students and faculty at the University of Washington School of Medicine. The programs will include lectures and demonstrations, administrative and student conferencing, computer-aided evaluation, medical consultation, and grand rounds and other programming for continuing medical education. This project is directed by the WAMI program.

The IHS and WAMI experiments are covered in detail in the section following.

EVALUATION AND ANTICIPATED OUTCOMES

During the nine month period for which the HET experiments are scheduled, the individuals and organizations participating in the experiments will be collecting data to be used in their evaluation. The DHEW agencies want to find out what the people using the systems think of information received and sent by satellite, and what subjects and ways of presenting the information are most effective in this medium. The results of the evaluations will provide DHEW with the information needed to help formulate future plans for using satellites as a means of conveying services in health and education.

THE ATS-6 SPACECRAFT

Physical and Functional Description

The ATS-6 spacecraft (figure 3) weighs approximately 3090 pounds and measures 26 feet from top to bottom An Earth Viewing Module at the bottom of the spacecraft houses controls and experiments, and is connected by a tubular support truss to a 30-foot diameter reflector antenna Two structural arms, each supporting a solar array extend from a hub that supports the reflector An Environmental Measurement Experiments package is mounted on top of the hub The width of the spacecraft at the solar array is about 52 feet

The Earth Viewing Module consists of three sections. The Experiment Module at the bottom houses a number of antennas and the experiments requiring an earth viewing location such as the HET Experiment The Service Module in the center contains the attitude and control system *telemetry and command* ("housekeeping") equipment and parts of the power supply subsystems. The top section or Communications Module houses the receiving and transmitting equipment antenna feeds and associated components.

The reflector antenna, which resembles a huge umbrella measures 30 feet across and is made of lightweight copper-coated dacron mesh fastened to aluminum ribs. It is the largest parabolic antenna ever placed in orbit

The semicylindrical panels at the end of the craft's two long deployable arms contain 21 600 solar cells These cells derive the power required for spacecraft operation from solar energy storing some of it in batteries for use during short periods when the craft is in the earth's shadow or when peak power loads exceed the solar array capability One of the two panels is always faced toward the sun

The Environmental Measurement Experiment package on top of the solar panel and antenna array contains eight scientific experiments for studying solar cosmic rays the earth's magnetic field etc.

The antenna picks up signals sent by an earth station and reflects them down to a transmitting/receiving device inside the Communications Module This device contains six receivers and nine transmitters capable of operating on about 20 frequencies ranging from 136 megahertz to 6 gigahertz. The system operates like a switchboard converting signals from one frequency range to another for transmission over different segments of the signal path as required for reception by the target earth station. The transmitter radiates the signals back up to the antenna to be reflected back down to the receiving station A quarter of a second is required for a signal to make the full circuit from earth to satellite back to earth

The telemetry and command system provides a closed radio command loop between ground controllers and the spacecraft for control and monitoring of the spacecraft Commands are initiated at the ATS Operations Control Center at Goddard and transmitted from the ATS ground stations at Rosman North Carolina or Mojave, California Two earth viewing horn antennas located on the bottom surface of the module are used for transmission and reception of these signals.

Commands for change in the spacecraft's attitude or tilt are executed by the attitude control and propulsion system In order to change coverage areas, the spacecraft can be reoriented to point anywhere on the visible earth disc. The craft can tilt at a rate of 0 6 degrees per minute.

Fairchild Industries of Germantown Maryland was *prime contractor for development* integration, and test of the ATS-6 The cost of the mission to NASA is about $180 million for the spacecraft including development and test and backup hardware and about $25 million for the launch vehicle and services

Experiments

For its first year of operations, ATS-6 will remain in its present location at 94 degrees west longitude over the equator From this position it will be used to conduct the HET Experiment air and ship navigation and traffic control experiments transmissions to and from other orbiting satellites measurements of radio interference problems involving ground and satellite communications systems and the effects of rainfall on millimeter wave frequency transmissions. Additional meteorological scientific and engineering experiments will be conducted to refine concepts of weather research, get a better understanding of our solar-terrestrial environment and provide new technology for future spacecraft

Soon after completion of the HET experiments ATS-6 will be moved to a position over the eastern edge of Lake Victoria in Kenya, East Africa for use by the Indian Government India will use the satellite for about 4 hours a day for one year to transmit programs on improved agricultural techniques family planning and hygiene occupational skills, and teacher education to terminals in some 5000 villages

While over Africa the spacecraft will also be used to track and relay television and other data from the Apollo-Soyuz spacecraft as they orbit earth in a 10-day joint US-USSR space-docking experiment to advance international cooperation in manned space flight

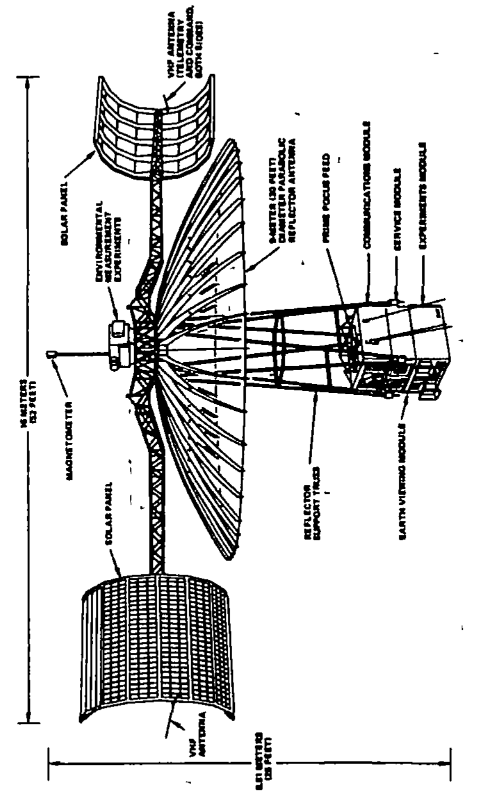

Figure 3 *The ATS 6 spacecraft*

The new capabilities pioneered in these experiments are expected to be fed into operational satellite systems established by both the public and private sector in the future

Success with satellite repeatered communication experiments would make it appropriate for DHEW to favor regional approaches to the dissemination of its services since the economical satellite coverage areas would in all likelihood be regional Decisions with respect to the location of production and distribution centers for media materials will be heavily influenced by the experiment s outcome

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ATS-6 HEALTH EXPERIMENT

The experiments sponsored in Alaska and Washington by the Lister Hill National Center for Biomedical Communications will demonstrate a variety of ways in which communication technology can be used to assist in bringing modern medicine to communities with urgent needs for medical manpower The two organizations participating in the Health Experiment the Indian Health Service in Alaska and the WAMI Experiment in Regionalized Medical Education based in Washington address this common problem in two basically different ways each of which offers unusual opportunities for exploring the capabilities of satellite telecommunication

THE PROBLEM OF MANPOWER DISTRIBUTION

In identifying applications for communications technology in the field of health care the Lister Hill Center saw the satellite as one means of bridging the gap between the wealth of medical services concentrated in our urban centers and the acute deficiencies in many less populous settings

A major reason for the growing disparity between the medical resources of urban and rural areas appears to be that the practice of medicine has become increasingly specialized and increasingly dependent upon the expensive technology massed in urban centers Quality medical care thus becomes more and more dependent upon intraprofessional cooperation and communication and on practice in the urban environment where the needed technology and full complements of specialized expertise are available Medical care and personal satisfaction with practice in isolation has become less than optimal and hence less attractive to young physicians

With the increasing emphasis on specialization there has been a corresponding reduction in the number of physicians oriented toward general care The result is a shortage of primary care physicians Because primary physicians generally serve as the initial point of entry into the health care system access to the system has become restricted and general medical service is at a premium This shortage is most keenly felt in rural areas where small population groups can usually support no more than a single physician serving at the primary level

The problems are these how can more entry points and primary care services be provided, particularly in isolated areas which have not been able to attract or which cannot support physicians, and how can rural communities be brought intellectually and technologically closer to the urban environment so that medical care in remote settings can benefit from urban expertise?

THE POTENTIAL OF TELECOMMUNICATIONS

In many parts of the country points of entry into the health care system are being multiplied by assigning the responsibility for first line care to paraprofessionals who are supervised often at a distance by professional personnel In addition some medical schools have begun developing programs that encourage more of their students to enter the fields of primary care particularly in nonurban settings These measures will help to place health manpower where it is most badly needed but they fail to provide adequate mechanisms for the intraprofessional communication essential to minimizing rural isolation and improving the quality of medical services

Several communications systems already developed by Lister Hill use modern technology to help bridge this gap The approach has been to utilize more efficiently the manpower resources that already exist

For example two way audiovisual systems link selected hospitals in Massachusetts New Hampshire and Nebraska These links have been used for group seminars group training in psychiatric and speech therapy for training general practitioners to handle psychiatric problems and for the treatment of psychiatric patients themselves The systems thus extend the medical manpower of hospitals that possess these resources to hospitals that lack them If more widespread use could be made of such systems some of our manpower problems could be considerably reduced

APPLICATIONS FOR ATS 6

In the regions in which telecommunication systems have been implemented capability for video transmission via land lines or terrestrial radio already exists and the services can be provided without large capital expenditures These media do not exist in many areas where special service telecommunication would be of particular benefit The cost of introducing ground based networks would be immense—and unjustifiable unless the value of the communications they would carry were firmly established ATS-6 can stand in for permanent systems while the value of such communication is tested

ATS 6 HEALTH EXPERIMENTERS

Two communities identified as offering prime potential for experiments in telecommunications were the Indian Health Service in Alaska and the Washington based WAMI Experiment in Regionalized Medical Education

In Alaska the Indian Health Service administers regional systems in which Native health aides or nurses provide first-line care to the inhabitants of isolated villages too small to support the services of full-time physicians. The villages are linked to service unit hospitals for patient care at the secondary level and the unit hospitals to larger centers for problems more complex Radio contact between hospital physicians and the village aides and their patients enables the physicians to provide some support to the widely scattered villages but adequate and reliable communication without resort to unnecessary travel remains a problem of major proportions

A program for regionalized medical education developed by the University of Washington School of Medicine decentralizes components of instruction to universities and community practitioners throughout the four state region of Washington Alaska Montana and Idaho (W A M I). Its approach to correcting problems of manpower maldistribution is to encourage young physicians to choose rural practice by training them in nonurban settings The program is markedly successful but University of Washington faculty must spend considerable time in traveling to the widespread WAMI units for purposes of administration coordination and instruction Time could be saved and the decentralized programs broadened if resources at the University of Washington School of Medicine could be more readily shared with the distant sites

THE EXPERIMENTS

In a series of demonstrations collectively called the ATS-6 Health Experiment satellite communication networks have been established to link five sites within the Indian Health Service system in Alaska and three sites in the WAMI system As one of the sites participating in the WAMI network is the University of Alaska the Health Experiment will include a tie between the two states

The two experiments differ considerably in nature as the detailed descriptions in the two chapters following will demonstrate. However because the equipment requirements were quite similar (both networks have transmission as well as reception capability) and one Alaskan site would be used by both experimenters general management and planning and development for the technical aspects of the two experiments was coordinated as a single effort

ORGANIZATIONS INVOLVED

The principal agencies involved in the Health Experiment are the Lister Hill National Center for Biomedical Communications the National Aeronautics and Space Administration (NASA) the Indian Health Service (IHS) the WAMI Experiment in Regionalized Medical Education (WAMI) and the Federation of Rocky Mountain States (FRMS) The University of Washington is involved as project manager and under separate contract as WAMI evaluator Most of the University's technical work was subcontracted to the Westinghouse Electric Corporation Westinghouse also performed under subcontracts to other agencies involved in the Health Experiment Stanford University in California is the evaluator for IHS

Lister Hill is sponsor and primary coordinator of the Health Experiment This responsibility includes major financial support for the project by the provision of funds for peripheral equipment installation maintenance and project management The Center was also responsible for design procurement and installation of the terminal equipment required at each of the IHS and WAMI sites The Indian Health Service (for the Alaska experiment) and the Health Resources Administration (for WAMI) have provided financial support for the development of program plans and software and the additional personnel required to implement the experiments

The actual experiment plans plus the software required for the experiment programs were developed by the individual experimenters WAMI and the IHS

The University of Washington is project manager of the Health Experiment under contract to Lister Hill This function is served by the office for ATS-6 Health Experiment Management and Technical Operations within the School of Medicine The office acts as liaison between the two experimenters and all of the other agencies involved in the Health Experiment including Lister Hill NASA and FRMS

On behalf of the two experimenters the management office provided for surveillance of the proposed sites selection of the peripheral communications equipment modification of the site facilities as required for equipment installation installation of all peripheral equipment as well as the terminal equipment at Seattle and Omak and the preparation of operating plans training manuals, and other necessary documentation

Arthur D Little, Inc of Cambridge Massachusetts under subcontract to the University of Washington documented the experiment parameters (sites experiment program content etc) set forth by the individual experimenters the IHS and WAMI The majority of the technical tasks were subcontracted to the Westinghouse

Electric Corporation Under this contract Westinghouse will also be responsible for the continuing maintenance of the terminal and peripheral communication equipment at the IHS and WAMI sites

The IHS experiment is being evaluated by the Institute for Communication Research of Stanford University California The WAMI experiment evaluation is being performed by the Office of Research in Medical Education at the University of Washington

TERMINAL AND PERIPHERAL EQUIPMENT

The ATS-6 earth stations or terminals were designed to meet the needs of the IHS Health Experiment the WAMI Health Experiment and the Alaskan Education Experiment sponsored by the National Center for Education Technology as some sites involved in all three experiments will overlap DHEW's ATS-6 User Policy Committee established the basic characteristics of the terminal equipment Detailed specifications were written jointly by Lister Hill NASA and FRMS

A building block philosophy was adopted which would permit stations with three different levels of communication capability to be assembled from the basic components to fit the specific role each site would assume in its communication network

The *basic* station is the ATS-6 receive-only terminal It consists of an external antenna and amplifier and an indoor receiver to supply the video and four-channel audio output The four audio channels can simultaneously convey voice and a variety of data signals

The *intensive* terminal is made up of an ATS-6 receive-only terminal plus the transmitting receiving equipment in use with the ATS-1 satellite The user of an intensive terminal can not only receive video and voice plus data via ATS-6 but can reply by voice via ATS 1

The *comprehensive* terminal is an intensive terminal with added ATS-6 transmission equipment which gives the user the ability to originate full video audio and data

The IHS and WAMI Health Experiments will utilize only intensive and comprehensive systems

Hewlett Packard Hughes Aircraft Prodelin and Westinghouse were all involved in developing the terminal equipment required for use in the ATS-6 experiments under contract to DHEW

Simplicity was a primary consideration in equipment design as it was envisioned from the outset that most stations would be operated solely by health providers and teachers The terminal hardware has the following characteristics

Solid state throughout (transistorized for longer life, higher reliability smaller size lower power usage)

No high voltages in the equipment (safety)

Relatively few circuit boards (first level maintenance consists of plugging in boards until the defective one is found)

Very few switches and adjustments (simplicity of operation)

Simple go/no go indications for critical voltage level signal level etc (simplicity of operation)

Low cost

The peripheral equipment required for the IHS and WAMI sites varies according to their transmission requirements The term peripheral equipment applies to all apparatus and supplies other than the basic satellite terminal equipment necessary to conduct the experiments This includes television cameras and monitors, speech input and output equipment control consoles and switching arrangements, and test equipment

NETWORK CONTROL

The HET Network Coordination Center (managed by the Federation of Rocky Mountain States) will from its large terminal in Denver Colorado enable each ATS-6 system at the time it is scheduled for satellite transmission and disable it when transmission is complete The control signals for this action will be transmitted via ATS 1 for the IHS and WAMI systems

NCC is also responsible for cutting off transmission at any time if instructed to do so by the Department of Defense (e g in case of a national emergency) or if regulations established by the Federal Communications Commission are violated

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The Indian Health Service Experiment

Alaska's 265 cities towns and villages are scattered over a land area of 586 412 square miles Two-thirds of these communities cannot be reached by railroad or highway and are accessible only by aircraft or boat In the interior winter begins around late September and lasts until early May Deep snow and violent storms isolate many communities for weeks at a time

The severity of the weather the mountainous terrain and the vast distances separating inhabited areas impose severe limitations on all traditional ground-based systems of communication Telephone land-lines have been built between only a few of the larger communities, and in the winter service is intermittent Inter-city coaxial or microwave cables do not exist Land based radio the only mode of emergency communication is frequently disrupted by storms and by the ionospheric disturbance peculiar to high latitudes—when it is not totally blocked by mountain barriers

The Alaskans need for more and better ways to communicate with one another is enormous

THE ROLE OF THE INDIAN HEALTH SERVICE IN ALASKA

Some 53 000 of Alaska's 325 000 people are Eskimos Aleuts and Indians These Native groups are the main inhabitants of the state's remotest areas The provision of health care to the people of Alaska's small scattered Native communities is a problem of major proportions

The organization responsible for the health care of the Native people is the Alaska Area Native Health Service (AANHS) The AANHS is the local agency of the federal government's Indian Health Service a division of the U S Public Health Service It serves the Native people through a system that relies heavily upon consumer guidance first line care provided by people indigenous to the isolated communities and networks that extend to them professional support

The Alaska Natives are organized into twelve Native Regional Corporations each having a specific ethnic and geographic identity Together they form the Alaska Federation of Natives Each Regional Corporation appoints a Health Board whose Native members speak for the Native people with their full authority in all matters of health Representatives from these regional boards serve on the central Alaska Native Health Board which advises the AANHS as to the health problems Alaska Natives see as of primary concern The Indian Health Service through AANHS responds to these concerns by expanding or developing new Alaskan programs

Health care is delivered through a system of seven Service Units that together cover the entire state A hospital is the headquarters for each Unit and the hub from which services radiate to communities within the Unit's boundaries Village health aides provide first line care within the communities guided by written orders and radioed instruction from the hospitals physicians The entire program is administered from Anchorage Here AANHS maintains a large staff of health professionals and administrators to provide support to the Service Units and a large medical center for referral of medical problems that cannot be handled at Unit hospitals

Almost half of the AANHS employees stationed throughout Alaska are Native people, but few of these are professionals Health professionals and support personnel assigned to larger centers in the bush serve there for only a limited time The usual tour of service is two years Austerity of program support heavy clinical workloads and extreme isolation from other professional groups contribute to rapid turnover of physician personnel

The AANHS program that trains Alaska Natives to provide first line care in their own communities began in 1968 The aides receive eleven weeks of training in Anchorage then return to the villages as employees of their own Native Councils There are now 185 aides serving in over 150 villages

As the health level of the Alaska Natives has begun to improve emphasis is shifting from the hospital to the village setting The Alaska Native Health Board now assigns highest priority to development of the community health aide program and to improving the communications systems that provide them with professional backup In a recent address the Board's chairman asked

> try to imagine yourself as a community Health Aide—responsible for all health care of your village hundreds of miles from the nearest hospital The temperature outside is minus 30 The winds are gusting to 75 knots so you know the planes can't fly The temperature of the baby you are trying to treat is 104 and he is convulsing The mother is terrified and so are you and as if all of that isn't enough when you try to call the doctor for advice and assistance—*the radio doesn't work!* The outcome is almost predictable the baby becomes an infant mortality statistic the mother becomes a mental health statistic the health aide becomes a personnel turn-over statistic

The health aide has become the cornerstone of the Alaska Native's health delivery system and the communication system its lifeline But ground-based radio transmission cannot provide reliable service

THE ADVENT OF ATS-1

In 1971 the Lister Hill National Center for Biomedical Communications initiated an experiment to improve communications between health aides and physicians by using ATS 1 to provide reliable voice communications Radio signals transmitted via ATS 1 would jump mountain barriers and be largely impervious to ionospheric disturbances The Tanana Service Unit an area in central Alaska about the size of Texas was chosen as the target

Satellite earth stations were installed in 26 villages in the Unit to relay voice consultation between village health aides and physicians at the Service Unit Hospital in the central community of Tanana The quality and reliability of the radio transmissions improved immediately At the end of the first year the number of physician health aide contacts in villages equipped with ATS 1 terminals had increased by 400 percent

Both the aides and the physicians are convinced that daily consultations via ATS 1 have improved the quality of health care and a number of lives have been saved because this system exists The Tanana area people particularly those living in the most remote communities no longer regard the system an experiment but as a vital and integral part of their health care system

Although reliable voice consultation has helped considerably often words alone cannot convey enough information to the physician about the patient to allow him to make a diagnosis A decision must then be delayed until more definitive symptoms appear or until the patient can be flown to a medical center Delays in diagnosis and unnecessary evacuation could in many cases be avoided if the physician had adequate information especially visual information Television communications may provide a partial answer

DEVELOPMENT OF PLANS FOR ATS-6

In 1973 the Lister Hill National Center for Biomedical Communications the Indian Health Service the Health Resources Administration and the Health Services Administration began working with representatives of the Alaska Native Health Service to develop a program that would broaden the scope of inter facility consultations through use of the ATS 6 satellite

It was agreed that the ATS-6 experiments would be conducted within the Tanana Service Unit and that the program would support health care objectives assigned highest priority by the Native Health Boards and the Indian Health Service From the perspective of the Tanana people one of the major benefits to be derived from participation in the ATS-6 project was to assure continuation of ATS-1 to villages at least through the time of the experiment Another was the opportunity to implement a computerized Health Information System

Together the ATS-6 project staff and the Alaska Native people through their Health Board and Satellite Review Board representatives selected the experiment sites the health problems to be addressed, developed the necessary software and mobilized community participation

An ATS-6 User Policy Committee established by DHEW and made up of representatives from the participating agencies, coordinated planning of the ATS-6 health experiments with the ATS-6 education experiments being organized for Alaska by the National Center for Educational Technology

ATS-6 EXPERIMENT SITES

The Alaskan Health Experiment links five facilities in the Alaska Area Native Health Service system (figure 4)

- the Indian Health Service clinics in the villages of Galena and Fort Yukon
- the Service Unit Hospital in Tanana
- the Alaska Native Health Center in Fairbanks
- the Alaska Native Medical Center in Anchorage

All of the sites except Anchorage are located within the Tanana Service Unit This Unit covers 165 650 square miles and has a Native population officially estimated at 6 220 distributed throughout 28 communities including Tanana and Fairbanks Temperatures in this part of the interior can range from 90 degrees in mid-summer to 60 below zero in the dead of winter when the days are about three hours long

Athapascan Indians are the major Native ethnic group Traditionally the Athapascans were nomadic following the moose and caribou for subsistence Now they live near the great rivers where fishing hunting and trapping provide their basic means of livelihood

Communications of any type are, at best poor—with the exception of the temporary system provided by ATS 1—and commercial air service is the primary mode of transportation. Service is twice weekly to most villages In the summer (when the rivers are not frozen) speedboats and dories with outboard motors provide local transportation Snowmachines and dog sleds are used in the winter

PHS Alaska Native Health Clinic, Galena

Galena, a community of 425 people, is located on the Yukon River at the western extremity of the Tanana Service Unit (figure 5) It is one of only three villages in the Unit to have its own clinic building (figure 6). This facility, like other village clinics in Alaska, is Native built and leased by the Public Health Service. Health aides in most communities hold clinic in their own homes.

The clinic is operated by a single health aide. A physician's assistant appointed through the National Health Service Corps has recently been assigned to this community, and a public health nurse trainee is available on a part-time basis.

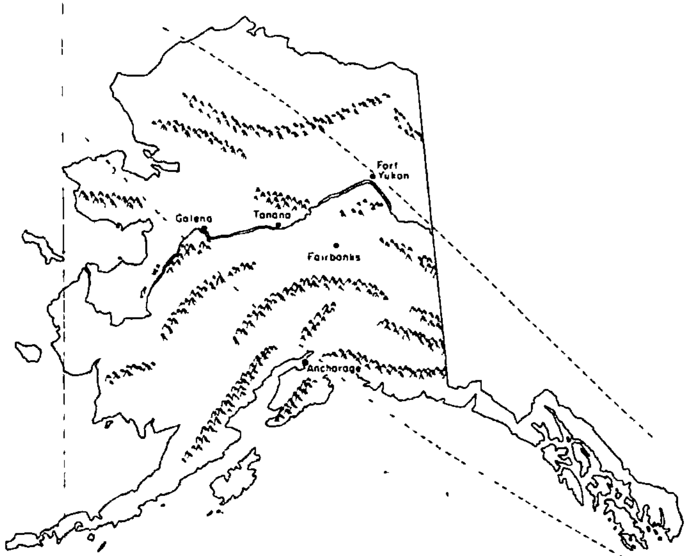

Figure 4. The five Indian Health Service sites participating in the Alaska ATS 6 experiment. Mountains block line of sight radio transmissions and ionospheric disturbances at these latitudes disrupt signals at lower frequencies. Signals transmitted via ATS-6 are not affected by these barriers.

Figure 5. Aerial view of the village of Galena

Figure 6. The Alaska Native Health Clinic at Galena. ATS 1 antenna in foreground.

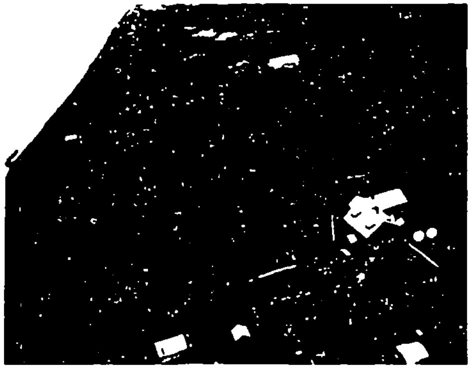

Figure 7 Aerial view of outskirts of Fort Yukon Large two story building is the village health center

Figure 8 Entrance to Alaska Native Health Center at Fort Yukon

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PHS Alaska Native Health Center Ft Yukon

Ft Yukon (population 630) is situated 150 miles north east of Fairbanks The town takes its name from an old fort built by a French fur trading company in the last century

The Health Center occupies a two story log building constructed in the early 1900s (figures 7 and 8) This facility unlike the village clinics is considered a satellite of the Tanana hospital and is managed by a nurse

The clinic is on the ground floor employee quarters on the second Of the Center s 4 6 personnel the nurse is the only staff member not hired locally

The nurse at Ft Yukon provides 24 hour a day health service to the village residents, consulting frequently with physicians at Tanana or Fairbanks (at present via ATS-1) She also makes home visits dispenses medications and manages monthly field clinics (provided by Tanana doctors) and frequent dental and specialty clinics held in the village Villagers made 3 277 visits to the clinic last year

PHS Alaska Native Hospital Tanana

Tanana located at the junction of the Yukon and Tanana Rivers is the central community of the Service Unit Its 26 bed general medical surgical hospital is a two story wood frame structure built in 1941 (figures 9 and 10) The hospital which employs 45 personnel (including three physicians) provides obstetrical newborn nursery and adult patient care The average daily patient load is about 13 The hospital s clinic provides 24 hours a day outpatient and emergency care and recorded 4 791 visits last year

Approximately half of the Tanana hospital staff are local residents

Figure 9 Alaska Native Hospital at Tanana

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Figure 10 Dories moored along the banks of the Yukon River at Tanana

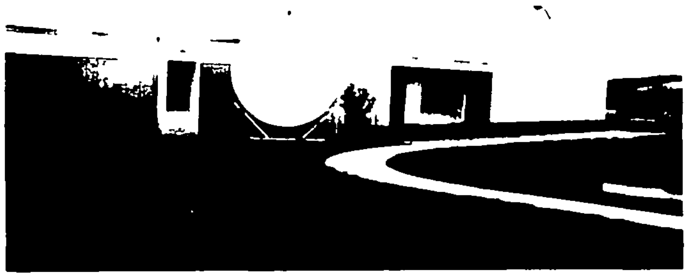

Figure 11 Alaska Native Health Center Fairbanks ATS 6 antenna prominent near entrance

Tanana is one of a number of Native communities incorporated as a city. Most other small settlements continue to govern themselves through Village Councils headed by a Chief, Elders and Young Leaders.

PHS Alaska Native Health Center Fairbanks

Though the hospital at Tanana continues to serve as the center for direct support to the villages, a large portion of the Service Unit's activity is based at the Alaska Native Health Center in Fairbanks (figure 11).

A combined Native Health Service clinic and community hospital were built in Fairbanks in 1972 to meet the increasing demand here for services, partly due to migration of Native people to the city. The clinic, which employs 27 personnel, recorded 9 794 outpatient visits last year. Its physicians have staff privileges at adjacent Fairbanks Memorial Hospital, which is used for all short stay general medical admissions. Bassett Memorial, the U S Army hospital on Ft Wainwright, is used for major surgical and accidental injury care.

Fairbanks, with a population reported at 27 150 in 1973, is the second largest city in Alaska (figure 12).

Figure 12 Fairbanks, looking toward the White Mountains. Large complex of buildings at center is the University of Alaska.

PHS Alaska Native Medical Center Anchorage

The Alaska Native Medical Center in Anchorage (figure 13) serves as a primary care and referral facility for Native people residing in or visiting the Anchorage Service Unit, and as a referral center for the Alaska Native Hospitals in the other six Service Units.

The Center has a staff of 495. Its 267 bed hospital provides comprehensive health service and supports the training program for Alaska Native health aides.

The administrative offices of the Alaska Area Native Health Service, which manages the state's Indian Health Service program, are located nearby. There are 204 personnel on the administrative staff. All management functions required for ATS-6 experiment coordination are also provided from this site.

Anchorage, Alaska's largest city, has a total population of 78 929.

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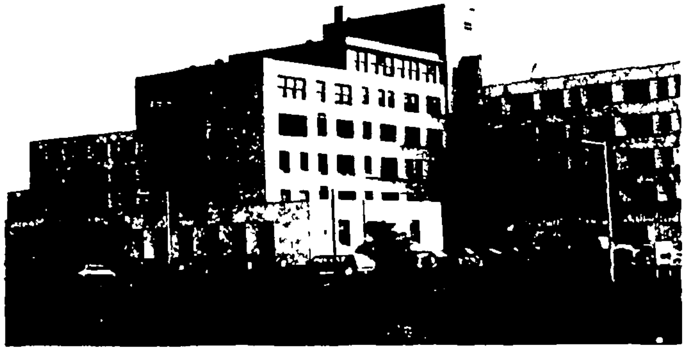

Figure 13 Alaska Native Medical Center in Anchorage

THE ROLE OF EACH SITE AND ITS TERMINAL EQUIPMENT REQUIREMENTS

Each of the five sites will be involved in three types of experiments medical consultation continuing medical education for health providers and health education for consumers A system for the telemetric retrieval of medical records stored in a computer bank at Tucson Arizona will be an integral part of the medical consultations

The communication capabilities required at each site were dictated by the role each will play in the three experiments

For the health education and continuing medical education experiments the facility *extending* the resource must be capable of video transmission The technology and medical expertise required to develop programs in health and continuing medical education reside in the urban centers The Alaska Native Health Center at Fairbanks was assigned responsibility for originating these programs because the extensive facilities and personnel resources available at the educational television studios of the University of Alaska could be utilized for this purpose Fairbanks thus requires capability for video transmission and was provided with a comprehensive terminal (This terminal will also serve as a transmission point for WAMI experiments) Some programs will originate in Anchorage but these can easily be tape recorded and sent to Fairbanks for transmission Anchorage will not require transmission capability and is provided with the intensive complement only The health care consumers and providers of the Tanana Service Unit will be the object of these broadcasts

For televised medical consultation the prime requirement is for video transmission capability on the part of the facility that *requires* assistance the physician must "see" the patient In the teleconsultation experiments the physician resources of the service unit hospital at Tanana will be extended to the villages and the more highly specialized medical resources of the urban centers will be extended to all three sites in the Tanana Service Unit Thus Tanana Galena and Fort Yukon require capability for ATS-6 transmission

For all five sites transmission and reception via ATS 1 is *an essential supplement*

TELECONSULTATION EXPERIMENT

The communication needs for the medical consultation experiments imposed the most complex requirements on the systems and equipment developed for the Alaskan sites It is therefore most convenient to describe the basic setup in terms of the experiment in teleconsultation

The primary purpose of the consultation experiment is to enable physicians at the hospital in Tanana to diagnose the medical problems of village patients and guide village health providers in proper treatment without the *physician having to travel to the village or the patient to* Tanana The secondary objective is to enable Tanana physicians to consult with specialists at Fairbanks and Anchorage regarding their own patients at the hospital as well as patients at the villages The satellite communication links will be used to meet these requirements in the following way

How the Systems are Used for Interaction

The two villages and Tanana each have comprehensive earth stations Each station is equipped to transmit to or receive from other stations, via ATS-6 a wideband signal consisting of one video and four audio band channels The video band carries the television picture and the audio bands are used for simultaneous voice and medical telemetry

The stations are also equipped to transmit to and receive *from other stations via ATS 1 a signal consisting of a* single audio channel This channel is used for *either* voice teletype transmission or medical telemetry Signals to and from the HET Network Control Center in Denver Colorado to enable and disable the ATS 6 system are also transmitted through ATS 1

In communicating with another comprehensive station the ATS 6 signal can be used only in half-duplex fashion For example Galena can transmit the composite video/audio/data signals to Tanana and can in turn receive a composite ATS 6 signal transmitted by Tanana but it cannot transmit and receive simultaneously

In order to permit the participants to interact with each other the system can be used in one of two ways

In one mode interaction is achieved by one site transmitting video/audio via ATS-6 while the opposite site transmits audio only (talks back) via ATS 1 In the alternate mode the two parties take turns transmitting audio/video via ATS 6

Fairbanks with its comprehensive system will also be able to use either mode of interaction Anchorage which can receive but not transmit via ATS 6 will be capable *only of talking back via ATS 1*

How the System Operates for Teleconsultation

Tanana physicians will call the village clinics via ATS 1 *periodically to discuss medical problems* with the aide (at Galena) or nurse (at Ft Yukon) as they have been doing for the past two years Clinic patients who might benefit from visual consultation will be scheduled for time on the ATS 6 satellite

A typical consultation between a village clinic and Tanana might proceed as follows (For convenience the clinic health provider will be identified as "aide rather than "aide or nurse ")

Prior to the time scheduled for consultation the village clinic and Tanana will independently retrieve the patient s records from the Indian Health Service Health Information System (HIS) computer in Tucson Arizona

*Record retrieval is achieved by means of teletype com*munications via ATS 1 between the unmanned HIS computer in Tucson and the requesting IHS site The health provider connects ATS 1 to the DATA terminal then types out the request message on the clinic teletypewriter Within about 2 minutes the information arrives —that is the clinic teletypewriter has completed its automatic type-out of the record

In order to ensure the confidentiality of these records, the information transmitted by the computer is coded so that only the five Alaskan sites equipped with decoders *can translate the message In addition the computer* addresses the transmission selectively so that only the specific site requesting the record can print it

The records can also be retrieved by ATS 1 while the ATS-6 video *link is in use during the course of a con*sultation

Approximately 15 minutes before scheduled consultation time the village clinic will contact HET network control in Denver via ATS 1 to request that the Alaska ATS-6 systems be enabled At the same time NASA will *transmit a signal to ATS 6 to reorient the satellite to* point toward the Alaskan stations

The aide at the clinic and the physician at Tanana will then turn on a switch in their radio room that permits operation of both the ATS 6 and ATS 1 communication systems Once the system has been activated and the set is set for the appropriate communication modes all other operating functions can be controlled from the point of use e g the examining room

A4-82

INDIAN HEALTH SERVICE EQUIPMENT

The terminal and peripheral equipment provided for Galena, Ft. Yukon, and Tanana are identical in all major respects. *The physical arrangements are similar.* The equipment required to televise consultations is set up in an examining room. The station's terminal and other equipment not needed for patient presentation is grouped in a radio room or equivalent space. ATS-6 antennas and preamplifier are installed outdoors.

The equipment and facilities for conduct of the experiments (examining room and radio room) are similar for Fairbanks. The Anchorage *complement differs only in* that it does not include equipment for transmission via ATS-6 and requires no examining room setup.

The radio room equipment is grouped in three major assemblies (figure 14). The arrangements are compact. *Placement of components* within the racks varies somewhat among the sites.

Utility shelves hold the ATS-6 and ATS-1 transmitters and receivers, the ATS-6 video scrambler, and several other components for the ATS-1 system. They also accommodate some high-frequency radio equipment not used in conjunction with the health experiment.

The electronics rack contains a black and white TV monitor, the master control panels for ATS-1 and ATS-6, audio scramblers, and other components, including junctions for camera, video cart, and microphone.

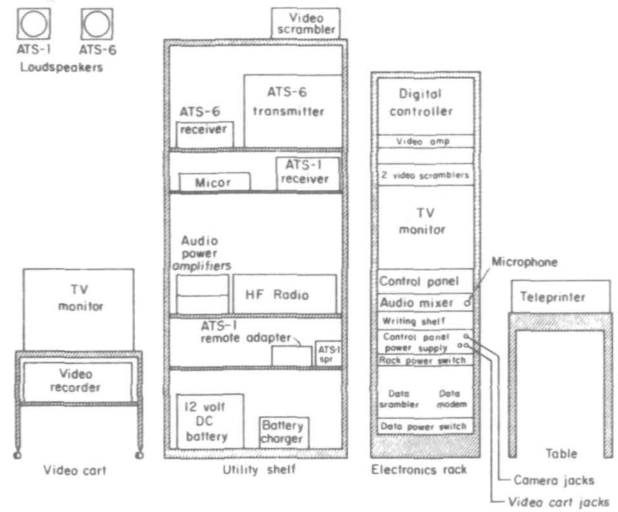

Figure 14. *Radio room equipment.*

The teletypewriter used to request and receive patient records from Tucson is located on a table and the associated data modem and data scrambler in the bottom of the electronics rack. Loudspeakers for ATS-1 and ATS-6 audio are mounted on the wall.

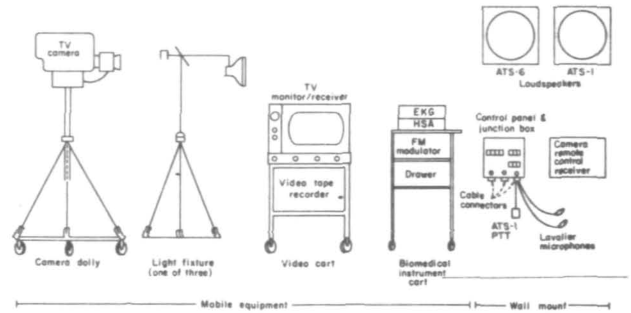

Figure 15. *Examining room equipment*

All contacts are initiated in the radio room by turning on the appropriate equipment and setting the controls as necessary to enable operation in the appropriate room. All other functions can then be controlled at the point of use.

The examining rooms are outfitted with the equipment the health providers need while engaged in teleconsultation (figure 15).

The monochrome camera is equipped for both local and remote control of pan, tilt, zoom, and focus (PTZF). It has a telescopic to wide angle lens so that it can be used for anything from eye exams to lectures. Three lights are provided for illuminating the patient examining area.

A TV monitor/receiver for video display of outgoing or incoming pictures is mounted on a cart along with the video recorder. The PTZF controls are located below the monitor so that the results can be viewed as the adjustments are made.

On the unit installed in Tanana, a switch for remote control of the cameras in the villages is added. The monitor will display only the black and white video being transmitted for the teleconsultations, but can receive color for the health and continuing medical education broadcasts.

Equipment for transmitting electrocardiograph (EKG) and stethoscope (heart, lung) sounds—the EKG and heart sound amplifier (HSA) and signal modulators—are also mounted on a cart. Two drawers are provided to store the cables and transducers used with the equipment.

The audio input equipment includes two lavalier microphones, a desk microphone, and a preamplifier. The audio output equipment consists of a power amplifier and wall-mounted loudspeakers for the ATS-6 and ATS-1 signals. A push-to-talk (PTT) switch held in hand during consultations allows the operator to select for audio transmit or receive via ATS-1, and at Tanana allows the additional option of selecting remote camera control.

The camera, lights, video cart, and biomedical instrument cart are all mobile, so that they can be moved around the examining room as needed or into the radio room for use there.

Only the loudspeakers and the combination control panel/cable junction box are fixed. The two lavalier microphones and the ATS-1 push-to-talk switch are connected directly to the junction box.

Television pictures can be received and doctor calls and data retrieval conducted from the radio room as well as the examining room. The video cart can be connected to the junction on the control panel and operated from the radio room for recording and playback of broadcast material.

A4-83

At the time appointed for the consultation the aide will be in the examining room at the clinic with the patient seated or lying before TV camera The physician will be in either the radio room or examining room at the Tanana hospital—probably in the radio room

Both aide and patient will have lavalier microphones around their necks connected to the control panel mounted on the wall to carry their speech via ATS-6 or ATS I An ATS I push-to talk switch also attached by a long cord to the control panel/junction box will be available for use when needed

The physician will be seated in front of the TV monitor (the mobile cart mounted unit) in the radio room with his microphone for voice input and with the ATS I push to-talk switch at hand

For the village the prime mode of operation via ATS-6 will be transmit since for the most part the physician at Tanana needs to see the patient For Tanana the prime mode via ATS-6 will be receive with ATS I talk-back However the physician may begin the teleconsultation with transmission from Tanana so that the patient can see him before the examination begins

To begin the teleconsultation the aide will summarize the current problem for the physician and the physician will obtain additional information by questioning the patient or the nurse A physical examination will normally follow beginning with visual observations of the patient

The physician will operate the TV camera at the village by remote control to obtain the picture of the patient he wants to see He will thus be able to make his observations quickly and efficiently without having to give verbal instructions to the aide for camera operation The signals for remote camera operation will be transmitted via ATS-1 A control on the physician's ATS I push-to-talk switch allows him to select either voice transmit voice receive or remote camera control Controls on his TV monitor allow him to adjust for camera pan tilt zoom and focus

The next step in the examination will generally be auscultation in which the physician listens to the patient's heart lung and abdominal sounds by stethoscope

The aide will connect the stethoscope to the "heart sound" amplifier on the top of the biomedical instrument cart As she applies the stethoscope and listens to the sounds the physician will be hearing the same sounds over a headset via one of the ATS-6 audio channels Video and voice interaction can continue simultaneously

If an electrocardiogram is needed it too will be transmitted to the physician via ATS-6 through another connection on the biomedical instrument cart The aide may also perform other tests and report the results verbally

During the course of the consultation the physician may assume the ATS-6 transmit mode to demonstrate to the aide how to perform a procedure The aide could then transmit voice responses or EKG or heart sound telemetry via ATS I

If needed the Tanana physician will "call in" the specialists at Fairbanks or Anchorage or both to examine the patient When additional consultants are called in they will receive the patient's televised image the audio and the biomedical signals from the village via ATS 6 along with Tanana (figure 16) The consultants can all confer in party line fashion on the ATS I link

After the consultation the physician will update the patient's medical record

Additional Features of the System

During either transmission or reception a tape recording can be made of the video picture and associated voice plus any talk back occurring over ATS I The video tape can be transmitted at any time in place of camera video

This playback mode can be used to present a patient to outside consultants if the patient is not expected to be available at broadcast time The health provider at the transmitting site can add voice comments to the broadcast at the time of playback It could also be used by the consultants to present special training material for the villages e g a report on one of their cases, what to look for next time or how to continue to treat the patient

In order to maintain the privacy of the physician-patient contact all video and audio associated with the consultation will be scrambled (A "scrambled" video picture is shown in figure 17) Only the sites involved in the consultation will have the equipment necessary for automatic decoding of the teleconsultation transmissions

The biomedical equipment provided for the ATS-6 experiment can also be used for an audio-only contact via ATS I to permit an expanded voice doctor call with optional medical telemetry receive That is, either heart sound or EKG can be transmitted in place of voice Doctor calls would be made in the clear (unscrambled) to villages equipped with ATS I but not involved in the health experiment while the ATS-6 experiment sites can use the link with voice scramblers

Video presentations for teleconsultation purposes from the examining room at Fairbanks are expected to be demonstrations of procedures during consultations with

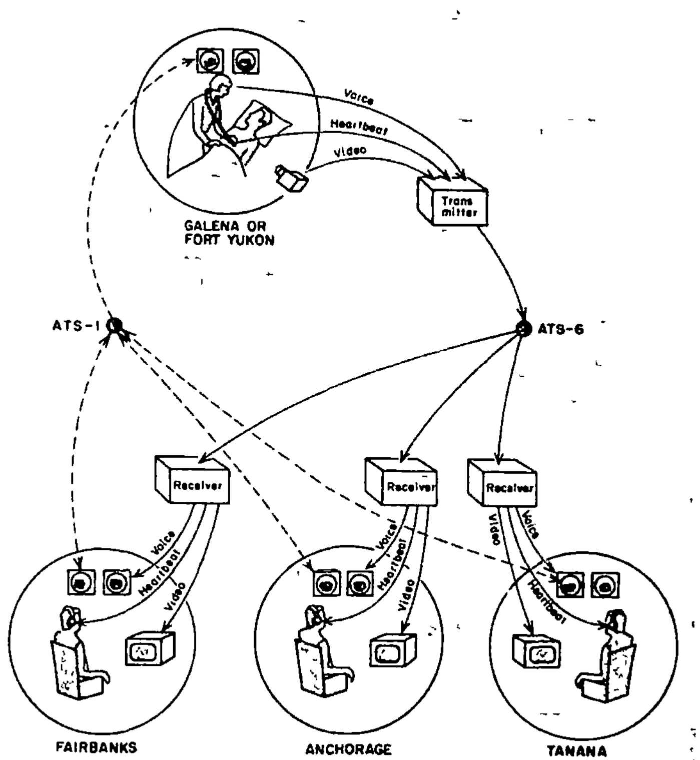

Figure 16 Teleconsultation between a village and Tanana with Anchorage and Fairbanks called in The village transmits video audio and biomedical data to all three consultants via ATS-6. The consultants talk back in party-line fashion via ATS I

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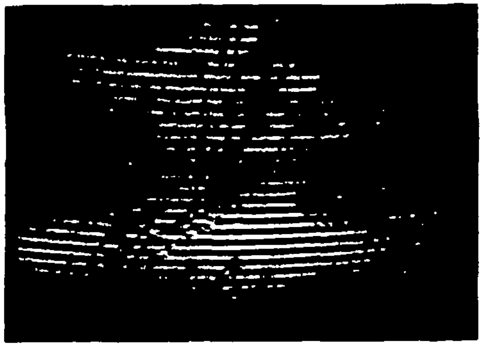

Figure 17 *A scrambled TV image on a village monitor Audio and video scrambling preserve patient privacy*

Tanana or the villages, or the prerecording of instructional material for those three sites. Video might also be used to present patients to Anchorage or Tanana for consultation, or to show visiting patients back to their families and the village aides to aid in continuing treatment after the patient returns home.

CONTINUING MEDICAL EDUCATION AND CONSUMER HEALTH EDUCATION EXPERIMENTS

The health education programs are aimed at increasing the Native people's understanding of the entire telemedicine system, and their general knowledge of health The programs in continuing medical education will help to improve the skills of village health aides, and keep all of the IHS health providers participating in the ATS-6 Health Experiment abreast of advances in medical science. Typical program subjects will be seminars, case presentations clinical grand rounds, and specialty conferences.

Both continuing medical education and consumer health education programs will probably be pretaped at the Alaska Native Health Center in Fairbanks, then broadcast directly from the Educational Television studios at the University of Alaska. Programs originating at Anchorage will be taped at the Alaska Native Medical Center and transported to Fairbanks for transmission

The health education programs will be transmitted to the Native populations in Tanana, Galena, and Fort Yukon. The cart-mounted TV monitors used for teleconsultations in Galena and Fort Yukon will be wheeled into the clinic waiting rooms for public viewing At Tanana, a monitor permanently installed in a conference room will serve as the public viewing area. The programming will either be live at the time of public viewing or taped at the receiving site and played back at a more convenient time

Programs in continuing medical education will be broadcast to health providers at Galena, Fort Yukon, Tanana, and Anchorage.

IHS EXPERIMENT SCHEDULE

The IHS experiments began in September 1974 and will extend through June 1975 Alaska's IHS sites have been assigned ATS-6 satellite time on Monday Wednesday and Friday of every week The time slot is the same every day from 11 30 a.m to 12 35 p.m Alaska Standard time Time assignments on the ATS-1 satellite are scheduled to begin one hour earlier (10 30) and end 15 minutes later (12 40) than for ATS-6

This scheduling will allow the IHS 150 sessions on ATS-6 Of these, approximately 120 are expected to be devoted to teleconsultation. At each transaction each participating unit will be given the opportunity to present patients having problems considered urgent by the providers. If there are no patients for whom consultation is required at that time, health education programs will be broadcast instead. Any remaining ATS-6 time will be used for technical problem-solving with regard to functioning of the communications equipment

The other 30 sessions will be used for broadcasts of continuing medical education and consumer health education programs from Fairbanks to the other four sites

Provision has been made in the protocols developed for the IHS Experiment that permit the Alaska sites to break in on any other station in its own network (which includes the Education Experiment network) in the event of a life or death medical emergency If such need should arise at one of the IHS sites the health provider would operate the ATS-1 push-to-talk switch repeat the international code word MAYDAY MAYDAY MAYDAY " release the switch and ask NCC to enable the IHS network

EQUIPMENT INSTALLATIONS

Galena

The clinic at Galena is an 18 by 20 foot single-story log cabin The front entrance leads into a waiting area

The radio room and examining room are one large space formed by combining and expanding the original nurse's office and examining room (figure 18) The cables to the mobile equipment in the examining room are draped along the floor and connected to the wall mounted control panel/junction box

Since the radio room and examining room at Galena are combined, the video cart can always be left connected to the examining room when swung into the waiting room for public viewing of health education broadcasts However the junction panels and controls to permit separate room functions are provided in anticipation of the building of a new clinic where space would be available for separation of these two areas

The equipment layout in the examining room/radio room at Galena is shown in figure 19 The layouts at Fort Yukon and Tanana are similar

The ATS-6 antennas are installed behind the clinic near the river (figure 20)

Fort Yukon

The clinic at Fort Yukon is a larger two-story structure The front entrance leads into a waiting room with the radio room and examining room located on either side As at Galena the video cart will be wheeled into the waiting room for public viewing.

Cables between the rooms are routed along floor joists in the basement and terminate at a combination control panel and cable junction box in the examining room and at the equipment rack in the radio room The ATS-6 antenna are located on the south side of the clinic building (figure 21)

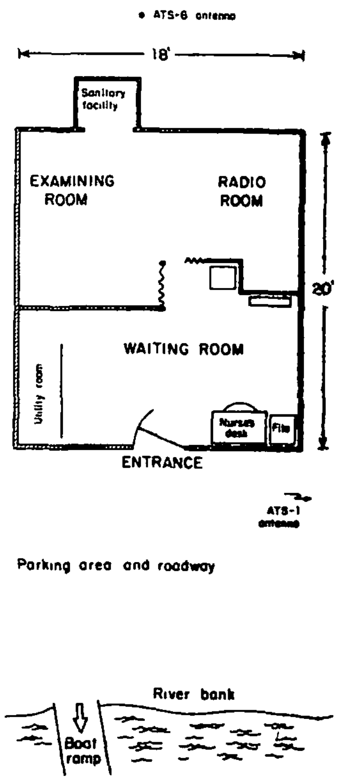

Figure 18. Galena floor plan.

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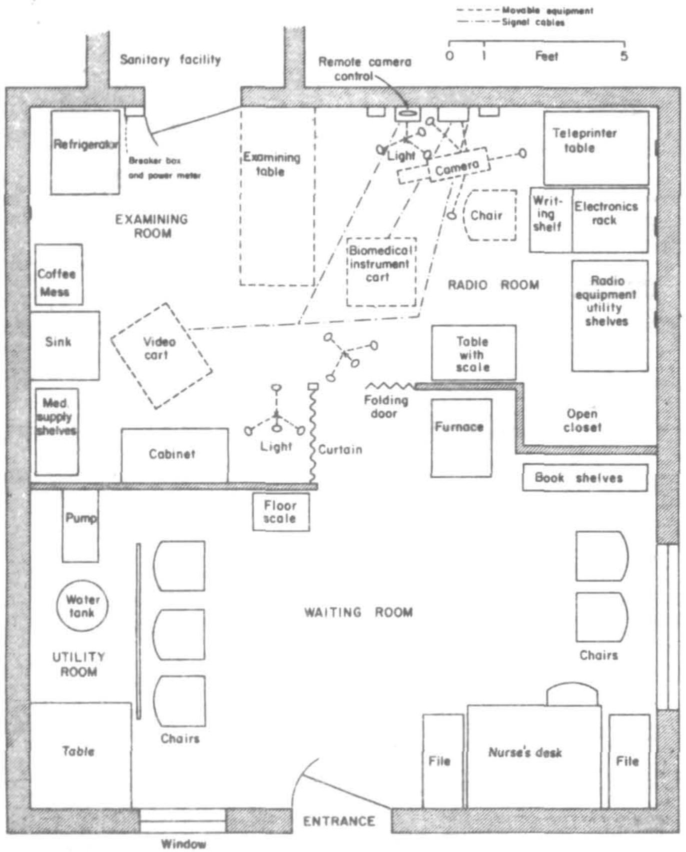


Figure 19 Equipment layout in Galena clinic examining room/radio room.

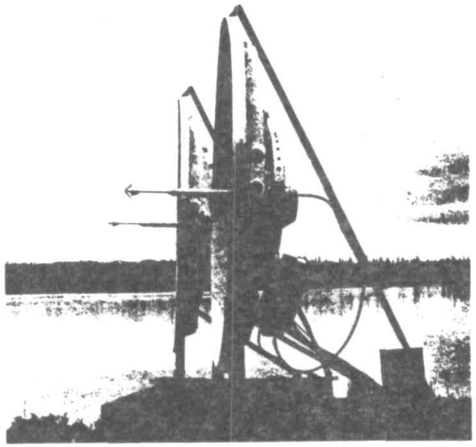
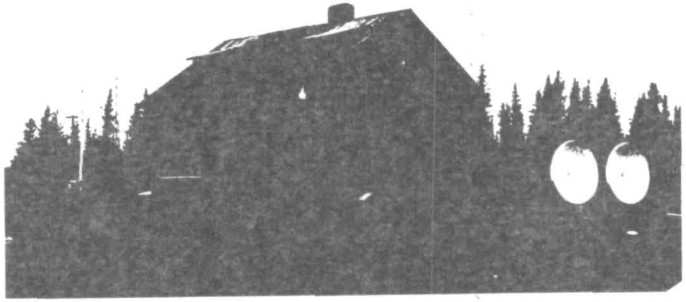


Figure 20 Galena's ATS-6 antennas. Yukon River in background.

Figure 21 ATS-6 antenna pair installed at the south side of the Fort Yukon clinic.



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Tanana

The radio room at Tanana is adjacent to the medical records and admitting office and consists of the old radio room expanded into the former head nurse's office. The radio room and examining room are diagonally across the hall from each other.

Cables between the rooms are routed in the false ceiling overhead and terminate at the control panel/cable junction box in the examining room and the junction panel in the radio room. The completed radio room installation is shown in figure 22.

A conference room on the second floor will be used for public viewing of continuing medical education and consumer health education broadcasts. A video cart with a color TV monitor/receiver is stored in the adjacent attic area and wheeled into the room when needed. The cables from the radio room junction box to the conference room TV monitor are routed through the false ceiling following an existing cable run for a citizens band radio.

The ATS-6 antennas are installed at the front (west side) of the hospital (figure 23).

Alaska Native Medical Center at Anchorage

The Alaska Native Medical Center's ATS-6 reception capabilities and equipment, and all of its ATS-1 equipment, are essentially the same as those for the Tanana Service Unit sites. It has no equipment for ATS-6 transmission.

The areas in the hospital used for the experiment are a classroom and a radio room. The radio room contains the color TV monitor (ANMC has only one monitor) and video tape recorder mounted on a mobile cart. The teletypewriter and ATS-1 console are kept on a desk.

Figure 22. Radio room equipment at Tanana

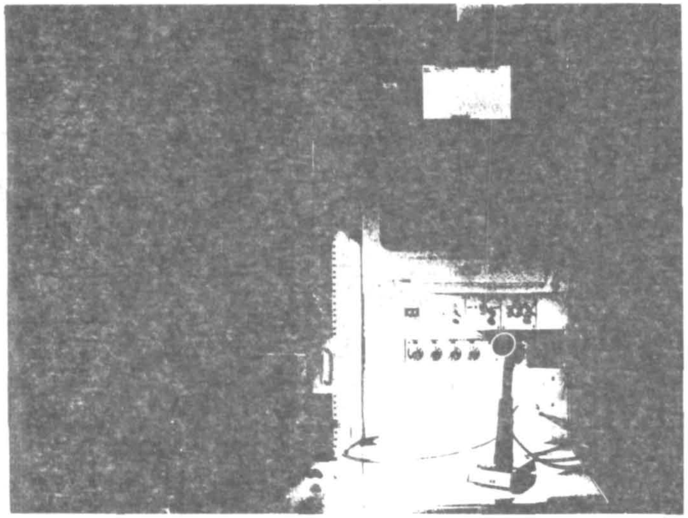

Figure 23. ATS-6 and ATS-1 antennas at Tanana

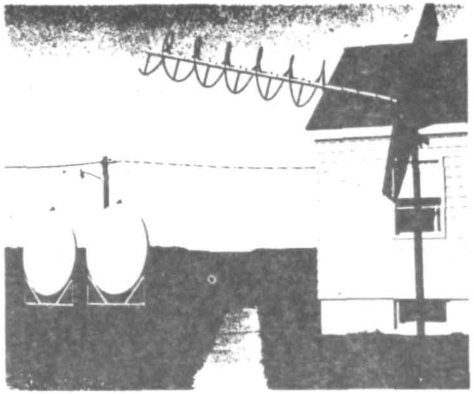

Figure 24. Electronics rack and TV monitor, Alaska Native Medical Center, Anchorage

Beside the desk, a single electronics rack holds all of the other ATS-1 and ATS-6 terminal and control equipment plus the equipment required for receipt of biomedical data. Doctor calls and data retrieval will be conducted from the radio room. The electronics rack and monitor are shown in figure 26.

The mobile video cart will be set up in the classroom for group viewing of programs in continuing medical education and health education. The cart will then be connected directly to the control panel/junction box permanently mounted on the classroom wall.

A microphone and the push-to-talk switch for ATS-1 voice transmissions will be moved from the radio room and plugged into the classroom junction if required for a particular contact. All controls other than the PTT switch must be preset in the radio room.

The ATS-6 receive antenna is located on the roof of the medical center building (figure 25).

Alaska Native Health Center at Fairbanks

The Alaska Native Health Center (ANHC) is equipped for transmission and reception via both ATS-6 and ATS-1 but the terminal equipment interface at ANHC is different from that of the other sites. All except the ATS-6 receive terminal and antenna are remotely located.

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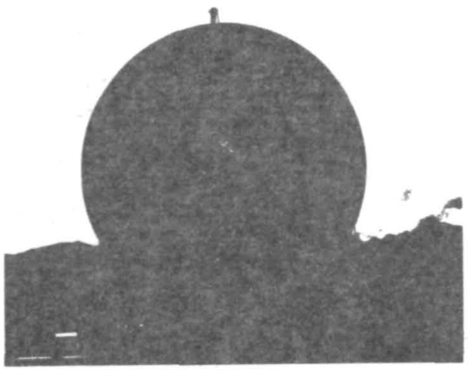

Figure 25. ATS-6 receive antenna on roof of Alaska Native Medical Center. View looks across Anchorage toward the Kenai Mountains.

The ATS-6 transmit terminal is installed approximately 4 miles from ANHC in the Gruening Building at the University of Alaska. ANHC time shares this terminal with other HET users. The camera video originated at ANHC is transmitted over a microwave link to the educational television studio at the University for routing to the ATS-6 transmitter. ATS-6 voice, transmitter keying control, and medical telemetry are routed to the studio over three telephone lines. Continuing medical education and consumer health education programs are expected to be video taped at ANHC, then broadcast from the University studio.

The ATS-1 terminal used by ANHC is located at the Minitrack site and operated under the cognizance of the University of Alaska Geophysical Institute. ANHC access to this terminal is by telephone line to the University TV studio for further routing to the ATS-1 transceiver.

Since the University educational TV station must act as central switching facility for HET users that share time on the Fairbanks ATS-6 and ATS-1 systems, ANHC will have to coordinate with the station in order to use these links. Once the linkage has been established through the University station, the ANHC station will control its subsequent IHS operations for that transmission.

A radio room and examining room are the areas utilized for ANHC broadcasts. The ATS-6 receive terminal equipment and the peripheral equipment complement are identical with those of the village sites.

Most activities will be conducted in the radio room. Video presentations from the examining room are expected to be demonstrations of procedures during consultations with Tanana or the villages, or the prerecording of instructional material for those three sites. Video presentations may also be used to show visiting patients back to their families and the village practitioners to aid in continuing treatment after the patient returns home, or to present patients to Anchorage or Tanana for consultation.

The ANHC receive antenna is located on the front lawn near the entrance to the Center (figure 11, page 18).

OPERATIONAL STATUS OF THE ALASKA SYSTEMS

Installation of most of the terminal and peripheral equipment for the Alaska sites was completed in August, and the remainder in September and October. Field engineers who performed the installation continue to instruct the health providers in equipment operation.

The variety of equipment and large number of communication options available with the IHS systems increases the complexity of operation and the possibilities for equipment failure. Further, changes in personnel at the sites creates the potential for operation of the equipment by people who are inadequately briefed. The ability of *the health providers to handle these problems will be a* critical part of the experiment. (Actual maintenance service is on call from Westinghouse field technicians.)

Operational tests of the system were made early in September. No difficulties were experienced with transmitter or receiver beyond the normal adjustments required, and the health providers appeared able to handle the equipment operations smoothly. However, some difficulties have been experienced with the peripheral equipment. The performance of the video scramblers and the ATS-1 data link to Tucson for retrieval of HIS patient records have been unacceptable to date.

EVALUATION AND IMPLICATIONS FOR THE FUTURE

The primary purpose of the IHS experiment is to assess the workability of the ATS-6 communications system and equipment and the value of telecommunications for IHS. The nine-month trial with ATS-6 will yield data to help confirm or refute the following hypotheses. These, in essence, are the objectives of the IHS experiment.

- Telemedicine, supported by a good medical record system, will reduce the percentage of patients failing to receive diagnostic, therapeutic, or followup help; and will increase the capability of physicians at remote locations to diagnose village patient problems, to the extent that 11 only patients requiring first-hand physician services need be transported to hospitals, 21 visits by physicians to remote villages will be substantially reduced, and 31 patients retained in the villages can be adequately treated there.
- The increased availability of expert consultation will increase the Native peoples' sense of security.
- Educational programming supported by the new technology will give the Native population a better understanding of health and the health care delivery system.

Evaluation

A large quantity of data will be collected before, after, and during the course of the experiment to determine whether these objectives are being met. The Institute for Communication Research of Stanford University in California will be collecting the data and making the final evaluation.

The evaluation will be concerned with the suitability of the equipment (cameras, biomedical equipment, etc.), the ability of the health providers to effectively use the equipment, their acceptance and patient acceptance of the system, and the impact of the system on patient care.

"Before" interviews and questionnaires will determine what attitudes the health providers and villagers have about the ATS-6 system before the experiments begin. They will also be used to record information on how many patients are presently seen, what their major health problems are, their satisfaction with the care they receive, the number of hours presently spent in consultation with remote facilities, and so forth. The health providers themselves will maintain logs to describe the activities taking place during each ATS-6 transmission. An evaluation of the new Health Information System patient record system being implemented along with ATS-6 will be included as a separate item. These data and post-experiment surveys will be used to determine what changes the ATS-6 system has brought about.

Implications for the Future

After June 1975, when the ATS-6 satellite is moved to view India, all satellite communications within the Tanana Service Unit will come to a halt. There are no plans at present to continue the earlier IHS ATS-1 experiment past the cutoff date for ATS-6. However, the information gained from the two experiments will be put to immediate use in the planning of an improved operational health communication network for the state of Alaska.

A steering committee made up of representatives of the Alaska Area Native Health Boards and the Regional Corporations has been organized to plan and develop a statewide health communication plan. The resources of the staff of the Alaska Federation of Natives, Inc., the *Indian Health Service, and communications experts will* all be called upon for this effort. The committee will be working closely with the Office of Telecommunication and Office of Planning in the state Governor's office to ensure that the design and equipment requirements for this network are compatible with the overall Alaskan communications system, and flexible for future expansion of services.

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The WAMI Experiment

THE WAMI REGION

Nearly 60 percent of the medical manpower in the four-state region of Washington Alaska Montana and Idaho (W A M I) is concentrated in twelve cities—the three largest in each state These cities occupy less than one quarter of one percent of the land area of the WAMI region and contain about 25 percent of its population Physician to population ratios in these urban centers range from 130 to 250 physicians per 100,000 people

The remaining 75 percent of WAMI s population live in smaller cities communities and farms sprawled over an area of roughly 879 000 square miles Physician to population ratios in these areas average out around 80 to 100 000 but the distribution of manpower is highly unequal and many counties have no physicians at all

Fewer than 30 percent of WAMI s physicians are general or family practitioners—the consequence of a long and steady decline in the number of physicians attracted to primary care A survey of the specialties of physicians obtaining their first license in two of the WAMI states in 1973 showed that only 15 percent were beginning practice in general or family medicine

All four states are concerned about the deficiencies in physician manpower to be found throughout their large rural areas particularly where shortages exist in the fields of primary care They are further concerned that the deficiencies could worsen if positive steps are not taken to restore the balance

THE REGION S CENTER

Physician manpower in t WAMI region is most highly concentrated in the metropolitan area of Seattle Washington mainly because Seattle is the most populous and urbanized city in the region and the site of its only medical school The University of Washington School of Medicine is one of five schools of health science that comprise the University s large center for health sciences research and education

Agreements maintained through the Western Interstate Commission for Higher Education have for many years provided for tuition supplements to students admitted to University of Washington health science programs from eleven northwestern states (plus Hawaii) which cannot provide these opportunities locally The Center has thus come to serve as a regional resource for education in the major health professions It has also assumed growing importance as the regional resource for continuing education in these fields and for the highly sophisticated levels of medical care its physician faculty and teaching hospitals can provide

The University s School of Medicine has been hard put to meet the demand for medical education by residents of the State of Washington as well as by residents of surrounding states—even for its immediate neighbors Alaska Montana and Idaho This is a source of some consternation to the "A M I group as it has become increasingly apparent that physicians tend to practice near the areas in which they are trained and in areas where activity in medical education enriches their opportunities for professional growth and interaction

There appears to be little immediate prospect for the development of medical schools in these three states which rely most heavily upon Washington for the medical education of their residents

Recognizing the pressing need to extend opportunities in medical education for and within these three states the University of Washington School of Medicine in 1969 under a grant from the Commonwealth Fund of New York began plans for an experimental program in regionalized medical education The first of the WAMI students entered this innovative program in the fall of 1971

WAMI EXPERIMENT IN REGIONALIZED MEDICAL EDUCATION

The WAMI program has two primary objectives 1) to increase the number of medical school positions open to residents of the WAMI region without the huge capital and operating expenditures required for new institutions and 2) to improve the distribution of physician manpower in the WAMI states by structuring this program in such a way as to encourage its graduates to practice in those communities and in those specialities where manpower needs are most acute

These objectives are accomplished in two phases corresponding to the basic science segment of instruction provided in the first year of the medical curriculum and the clinically oriented training of the last two years of medical school Physician residents in the primary care disciplines also receive training in the "Community Clinical Units "

Decentralization of basic science instruction is accomplished by using the faculty and classroom facilities available at other universities in the WAMI region to teach portions of this initial phase of the UW medical curriculum For the past three years WAMI students have spent their first academic quarter in medical school at one of the peripheral universities for their beginning basic science instruction They then return to the University of Washington for the remainder of the basic curriculum Upon completion they are ready to begin the predominantly clinical phase of their training

Decentralization in the clinical years is accomplished by using the offices of private physicians in small communities throughout the WAMI region for selected units of clinical experience WAMI students in their third and fourth years of school each spend six weeks at these Units in training under the supervision of community physicians in their private offices The same private practices serve as fields for experience at postgraduate level providing six week to three month rotations for resident physicians

Thus instruction is carried out within the participating states using manpower and material resources available within the states and concentrating on clinical instruction in nonurban areas where students and resident physicians can be exposed to models of practice in the community setting Medical education benefits from the experience of able private practitioners who otherwise would have no impact on student teaching They in turn profit from the stimulation of student inquiry and close professional contacts with their colleagues at the School of Medicine The community practices selected for the WAMI program provide training in fields of primary care with emphasis on family practice

The WAMI program now extends to four other universities and thirteen community clinical training units throughout the four state region (figure 26) A total of 121 students have begun their medical education at one of the four WAMI universities Approximately 212 students have completed community clerkships in family medicine internal medicine obstetrics gynecology pediatrics or psychiatry In addition 40 physicians have served some portion of their residency training at one of the community sites and opportunities for postgraduate positions are being expanded rapidly

The WAMI system is considered a notable success and federal funding added to the Commonwealth Fund s support in 1972 is helping to see the program through its experimental stage Phase-out of financial support from both of these outside sources will begin in July 1975 The participating states will then be expected to bear the full costs of educating their residents if the program is to continue. All three states appropriated supplementary funds for the 1974–75 term as the first step toward permanent support

OPPORTUNITIES FOR IMPROVEMENT IN THE WAMI SYSTEM

There are several ways in which the efficiency of WAMI program operation could be improved One basic thrust of WAMI is to contain costs by utilizing existing resources and avoiding duplication Ample human resources lacking at the WAMI sites are available at the School of Medicine in Seattle but extending them over the distances involved takes time and money

The instruction in basic sciences prescribed for the first year of medical education requires the support of a very broad-based faculty A single course as taught at the University of Washington may call for lectures by as many as six instructors, each contributing knowledge from his own particular area of expertise The first quarter courses that have been taught at the peripheral universities are somewhat less demanding of diverse inputs than those for the second and third quarters but still require faculty who are not always available on site University of Washington faculty must therefore travel to the distant universities to provide some of the needed instruction

In autumn 1974 basic science instruction at the University of Alaska will be extended to a full year This extension of the University Phase which will considerably enlarge the capacity of the system if it can be done at the other three universities as well will obviously require still more University of Washington faculty travel or the employment of additional faculty at the university site The need is particularly critical in those courses in which substantial clinical input is required. Clinical (physician) faculty are rarely available at the WAMI universities

The same general situation exists with respect to instruction at the Community Clinical Units The full range of clinical expertise available in the large medical center which is needed to support training even in such general fields as family medicine is not available in small communities And since a student s progress in learning clinical skills must be assessed mainly by direct observation UW faculty must make frequent on-site visits to ensure that the training they receive at the community sites is comparable to that provided within the University based system These contacts also help to relieve somewhat the sense of isolation from the mainstream of educational activity felt by student and physician alike

A third area of concern is the need for continued and frequent communication between the home school and both the university and community clinical sites for purposes of administration and coordination of the WAMI program

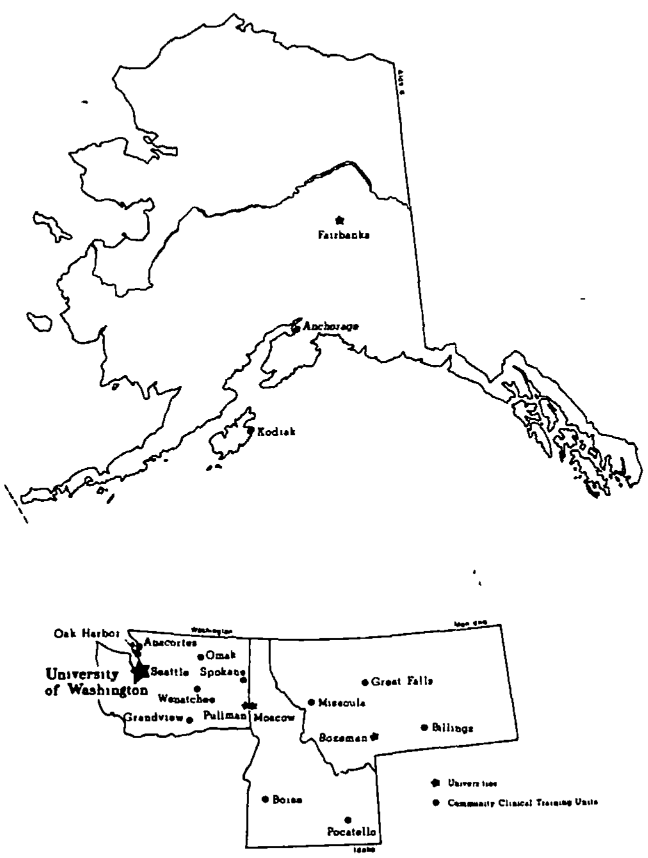


Figure 26 Universities and Community Clinical Units participating in the WAMI Experiment in Regionalized Medical Education

In the past these needs for resource sharing and personal contact have been met in part by moving personnel between the various sites This is extremely costly and time consuming because of the enormous distances separating many of the WAMI units And for most of the interactions required there appears to be no alternative to face to-face contact

Interactive televised communication via the ATS-6 satellite may help to remove some of the barriers distance has imposed on optimal development of the WAMI program

DEVELOPMENT OF PLANS FOR ATS-6

When the Lister Hill National Center for Biomedical Communications issued invitations in 1972 for proposals on health related experiments using the ATS-6 satellite the WAMI program responded with a plan for testing its use in support of decentralized medical education The Center saw this application of ATS-6 as a highly productive means of exploring new techniques in telecommunication and awarded a contract to WAMI for implementation of the proposed experiment early in 1973

WAMI selected two sites for satellite linkage with the medical school at the University of Washington the University of Alaska at Fairbanks and the Family Medical Center in the central Washington community of Omak (figure 27)

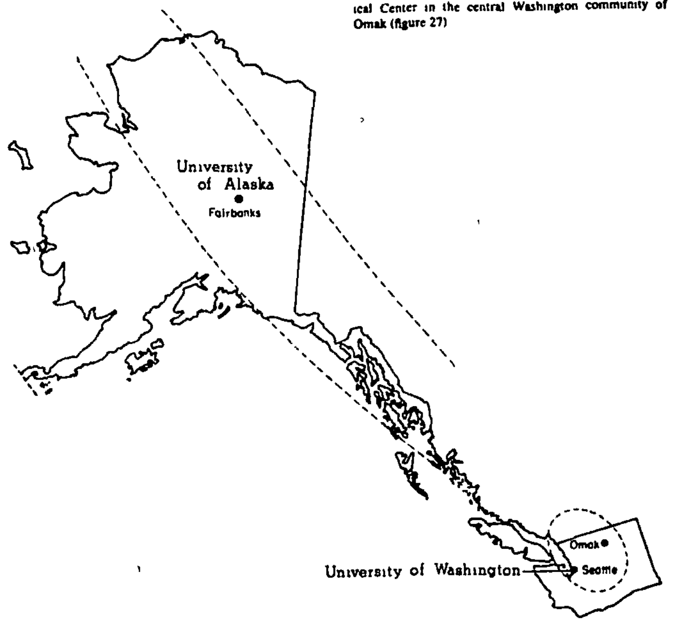


Figure 27 ATS 6 satellite footprints covering the three sites involved in the WAMI ATS 6 experiment The difference in the area covered by each footprint (shown by dashed lines) reflects the difference in satellite look angle

Beginning with fall quarter of 1974 the University Phase at the University of Alaska will be extended to a full year Depending upon the results of this venture the basic science programs at the other WAMI universities may be expanded later If it appears that a substantial amount of instruction could be provided by telecommunication —as opposed to increased travel by UW faculty or the employment of more faculty at the AMI sites —the financial feasibility of further expansion would be greatly increased and the WAMI states will have a better idea of what the costs might be The barriers of distance and cost of travel are also greatest between the home school and this Alaska site

The private practitioners who provide clinical training opportunities in their offices in communities throughout the WAMI region need much more frequent contact and supervision than can be provided by faculty visits and seminar training sessions Telecommunications may not only allow UW medical faculty to monitor more conveniently and frequently the progress of students under their supervision but also to keep in closer touch with the changing requirements of medical practice in non urban communities as a test against the adequacy of the medical school s established curriculum The town of Omak is one of the more isolated of the WAMI C C U s and falls conveniently within a satellite footprint linking it with Seattle Focus on this clinical unit which provides training in family medicine is also in keeping with the WAMI program s strong emphasis on family practice

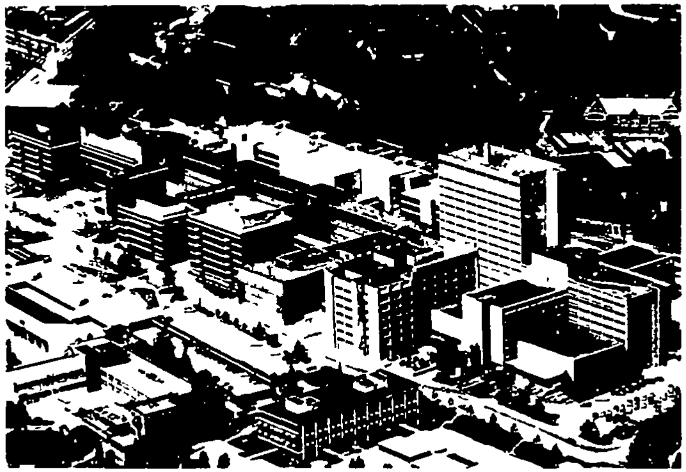
The faculty and WAMI program coordinators at the two selected sites and at the University of Washington were all involved in planning the programs to be developed for the ATS-6 experiments Program plans and software such as audiovisual aids were generated by individual faculty members in consultation with program coordinators

ATS 6 EXPERIMENT SITES

University of Washington Health Sciences Center Seattle

The University of Washington Health Sciences Center (figure 28) supports five major schools of health science two University managed teaching hospitals and one of the largest medical research programs in the nation More than 3 800 students are trained at the Center each year

Figure 28 University of Washington Health Sciences Center Seattle Washington



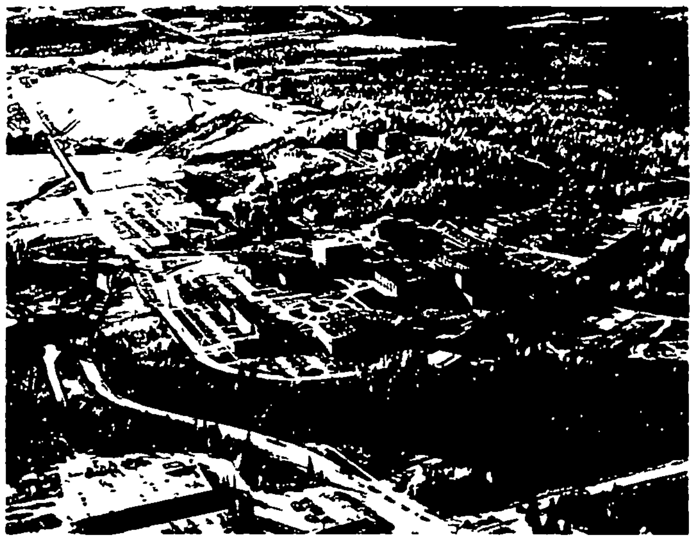


Figure 29 University of Alaska Fairbanks

The School of Medicine which sponsors the WAMI Experiment in Regionalized Medical Education opened in 1946 with a first year class of 50 medical students Its entering class now stands at 135 with a total enrollment of nearly 500 An additional 200 students are enrolled in allied health programs and 280 postdoctoral fellows are engaged in training and research The School also trains approximately 450 resident physicians throughout a system of some 35 hospital and other clinical facilities (excluding the University s own two hospitals and the clinical WAMI units) scattered throughout the state Many of these affiliates also provide clinical experience for medical students

The University of Washington itself has an enrollment of 34 000

University of Alaska Fairbanks

Fairbanks with a population of 27 150 is Alaska s northernmost city and the site of the University of Alaska (figure 29)

In January and February the temperature in Fairbanks may drop to 80 degrees below zero The daylight hours are brief as the sun rises at 9 or 10 a m and sets about five hours later Heavy down filled parkas are standard issue to Seattle faculty and administrators visiting Fairbanks on WAMI business in the winter months

The University of Alaska pioneered the University Phase of the WAMI program in 1971 with an entering class of nine students. In fall 1974 it makes another advance as the first WAMI university to offer basic science instruction for the full academic year Twelve medical students the fourth University of Alaska WAMI freshman class enter the University this fall

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Family Medical Center Omak

Omak with a population of 4 400 is the largest town in Okanogan County Its Family Medical Center Community Mental Health Clinic and Mid Valley Hospital provide direct care to most of the county's 22,500 inhabitants Omak also serves as a referral center for physicians practicing in outlying areas of Okanogan and neighboring counties

The Family Medical Center (figure 30) was one of the first two private practice groups to join the WAMI program as a Community Clinical Unit when the program was initiated in 1971 Center physicians have since trained 41 WAMI students The students are taught by the doctors in their private offices for six weeks each as part of their third or fourth year clinical experience in family medicine Resident physicians began rotations to Omak in 1973 They stay at the Unit for one to three months, working with the Omak physicians and their patients in the physicians offices and at Mid Valley Hospital

THE ROLE OF EACH SITE AND ITS EQUIPMENT REQUIREMENTS

The WAMI terminals provide for communication via both the ATS 6 and ATS 1 satellites All three sites will have comprehensive communication capabilities Transmissions will be between either Seattle and Fairbanks or between Seattle and Omak

The university-to-university broadcasts will focus on basic science instruction administrative interactions computer aided evaluation and medical consultation Transmissions between the University of Washington and Omak include student case presentations evaluative and administrative conferencing patient consultations and programs in continuing education for community practitioners

Seattle/Fairbanks

The link between Seattle and Fairbanks will be the only one in the entire HET Experiment in which transmission via ATS 6 is possible in the full duplex mode That is video/audio/data can be transmitted and received in both directions simultaneously The full duplex capability is possible in this link because Fairbanks and Seattle will be transmitting at different frequencies Fairbanks on S band and Seattle on C band. (All other terminals involved in the HET Experiment except Omak operate on S band) It was necessary to equip the Washington sites for C band operation to avoid interference with other S-band transmissions in the area

The ATS 1 half-duplex or push to talk" link is also available for the Seattle/Fairbanks network but will not be needed for programmed interaction It will be used for auxiliary communications before and during broadcasts but is intended primarily for contact with NCC control

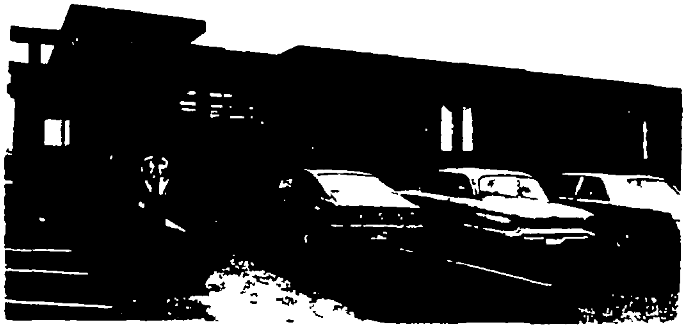

Figure 30 Family Medical Center Omak

The pattern of the curriculum administrative and consultation experiments to be conducted between these sites is interactive Two way communication using video and speech The lecturer or other program originator may be at either Seattle or Fairbanks while persons at the opposite site participate with questions and discussion

Since this interaction will require only the video channel and one of the audio channels for speech the remaining three audio channels can be used simultaneously for other purposes The computer aided evaluation experiments will use the three spare audio channels in each direction for digital data communications between teletypewriter terminals located at Fairbanks and an Ohio State University computer system accessed from Seattle Typically CAE experiments will be conducted simultaneous with lectures or demonstrations

Both the Fairbanks and Seattle terminals will utilize the studios equipment and staff existing at the universities educational television studios This will allow programming of professional-quality color productions At both sites all experiment programs (except CAE) will be broadcast from the television studios

Seattle/Omak

The ATS-6/ATS 1 link between Seattle and Omak will be full duplex (fully interactive) for audio but unlike the Seattle Fairbanks connection only half duplex for video Omak is equipped to transmit full video/audio/data via ATS 6 but on the same frequency as Seattle Thus the sites cannot transmit simultaneously Interaction will be achieved through talk back via ATS 1

The system is designed in such a way that when Seattle is transmitting to Omak on ATS 6 Omak is automatically transmitting to Seattle voice only on ATS 1 When the picture and sound for ATS-6 are originated in Omak ATS 1 provides audio capability from Seattle to Omak

In contrast to the university sites where trained TV studio technicians are available Omak medical personnel will themselves be required to perform all equipment operations For this reason transmissions from Omak will be in black and white—it is generally agreed that trained technicians are needed for color camera operation The Omak equipment includes a black and white view finder type camera a small videotape recorder picture monitors and audio equipment However plans have been made to lease a color camera for a short period of time so that several transmissions from Omak can be made in color This will allow the participants in these experiments to compare their reactions to video in color versus black and white

As there was no space available at the Family Medical Center (the Omak clinical training unit) for installation of the equipment a basement room in the Mid Valley Hospital in Omak is being used instead as the experiment and broadcast site

UNIVERSITY PHASE EXPERIMENTS

The experiments being conducted between the University of Washington in Seattle and the University of Alaska at Fairbanks include lecture/demonstration/discussions for formal coursework* administrative and faculty conferences admissions interviews computer aided evaluation and medical consultations The participants are the 12 WAMI students enrolled in the University of Alaska for the first year of the basic science curriculum faculty and WAMI program coordinators at both universities Fairbanks physicians and Seattle based administrators and students

Curriculum Lecture/Demonstration/Discussions

The basic science curriculum broadcasts take the form of lectures and demonstrations in combination with interactive discussion The emphasis is on interaction to make optimum use of the full duplex video audio transmission capability of the Seattle Fairbanks link in creating a sense of close contact between participants at the two sites (figures 31 32 and 33)

The material UW basic science and clinical faculty deliver in transmissions from Seattle will be that requiring specialized knowledge not available among the University of Alaska faculty These transmissions will cover such topics as immunology oral pathology and the nervous system The role of clinical faculty is to supplement the basic course material that explains human physiology with descriptions and demonstrations showing clinical evidence of related dysfunctions

A smaller number of transmissions from Alaska to Seattle will draw upon the Alaska faculty's special knowledge of the etiology of medical and social problems common to the Alaskan environment These will include lecture/discussions on parasitic disease temperature regulation cold injury and cross-cultural psychiatric problems

Administration

A great deal of time and expense is presently expended to bring WAMI faculty and program coordinators at the university sites together with their University of Wash

Figure 31 Alaska students view of a Seattle lecturer on the TV receiver Monitor at left shows the picture of the Alaska WAMI students assembled in the KUAC classroom/studio as it is being seen by the lecturer in Seattle

Figure 32 A lecture set at the Health Sciences Center TV studio Three technicians are required for broadcast operations

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Figure 33 The barrage of equipment to which experiment participants must become partly oblivious in order to focus on their intended audience During actual transmissions the TV monitor showing the audience at the opposite site will be directly in front of the lecturer

ington counterparts for the periodic administrative interactions essential for efficient program operation Admissions interviews for the selection of new WAMI students also require extensive travel Face-to face contact appears to be extremely important for this kind of decision making The administrative experiments will determine whether the same sense of in-person contact can be achieved when people meet face to face by television

Some of the transmissions are allocated to meetings between WAMI coordinators for discussion of administrative matters Others will be between faculty who teach the same courses at the UW and UA In the admissions interview experiment the Medical School Admissions Committee at Seattle will meet with a member of the UA faculty and a group of Alaskan young people applying for admission to the UW School of Medicine It is hoped that the video contact will contribute significantly to the Committee's ability to evaluate the applicants responses during interview Followup student counseling will be a part of this experiment

Computer Aided Evaluation

The computer-aided evaluation (CAE) program made available in Alaska by ATS 6 will add depth to the instructional program by introducing the option of independent study

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A wide variety of basic science courses are already available in computer-aided format to over 70 institutions in the United States through a communications network sponsored by the Lister Hill National Center for Biomedical Communications A computer at Ohio State University controls the network As the land lines required for transmission of these data do not exist between the lower 48 states and Alaska a satellite link between Seattle and Alaska is the only means available now for extending the program to Fairbanks

Three CAE teletype terminals have been installed at the University of Alaska for use by the WAMI students The students punch in their answers to the study course questions and receive immediate feedback from the computer at Ohio State University as to their accuracy The teletypewriter also punches out a summary card to record the student s score for that study program allowing later comparison with the scores of other students using *the program*

The CAE sessions planned between Seattle and Fairbanks will take place concurrent with other experiments such as the lecture/demonstration/discussions or administrative conferences While the latter broadcasts use the video and one audio signal the CAE will use the remaining three audio channels for the transmission of CAE data (figure 34)

Medical Consultation

The Seattle/Fairbanks transmissions will also include a series of broadcasts for medical consultation These sessions provide service to both patient and physician while educating the observing students The majority of the Fairbanks consultations will be devoted to dermatology

A dermatologist on the UW faculty will examine patients presented to him by Fairbanks physicians with several Alaska WAMI students attending for instructional purposes An important purpose of the experiment is to determine what kind of video equipment and techniques are required to obtain reliable television pictures of skin lesions Accurate representation of color and detail appear essential for accurate diagnosis

Two additional dermatology consultations are scheduled between Omak and Seattle to compare the television pictures obtained by the color cameras and trained technicians available in the ETV studios at Fairbanks with the pictures that can be provided by the simple monochrome camera and nonprofessional operators at Omak Several other sessions are planned between Seattle and Fairbanks for psychiatric consultation to enable comparison with similar consultations to be conducted between Seattle and Omak

CLINICAL PHASE EXPERIMENTS

The experiments between Seattle and the Community Clinical Unit at Omak include student case presentations evaluative and administrative conferences medical consultation and a variety of other programs (grouped under the category multidisciplinary lecture/discussions) to promote continued medical education and a clearer understanding of the differences between health care needs and practices in the rural and urban setting

The participants in the Seattle-Omak transmissions will be the two students enrolled in each successive six week clerkship held at Omak during the academic year the one resident physician there on rotation at any given time, Omak and UW faculty and coordinators, Omak psychologists, nurses and other practitioners from the hospital and Seattle-based administrators and students

Student Case Presentations

Some of the student case presentations will be spontaneous others formal In spontaneous presentations the student is seen in his first encounter with the patient He interviews and examines the patient then reviews his findings and tentative treatment plan for the observing UW and Omak faculty Formal presentations require that the student study the patient s problem and progress over a period of time and document it thoroughly before presentation to the faculty

During satellite-mediated presentations the TV camera at Omak will be trained on student and patient so that the UW Family Medicine faculty can observe them both Conversation between sites will be interactive (via ATS-6 from Omak via ATS 1 from Seattle) In conferences following spontaneous case presentations the physician/faculty at Seattle and Omak will together critique the skill and knowledge the student demonstrates in dealing with the patient and diagnosing his problem (figure 35)

These presentations will enable UW faculty to monitor the progress of students being supervised by private practitioners to see if students at remote sites are achieving the same levels of medical competence as those at the home site and to convey to Omak physicians the standards of performance required of students in the UW program The contacts also keep UW faculty in touch with the reality of practice in nonurban communities and allow them to respond with appropriate changes to their curriculum

During the first six-week clerkship of fall quarter 1974 all evaluations of case presentations will be made by satellite For comparison during the second six week clerkship they will be made by the customary on-site visit

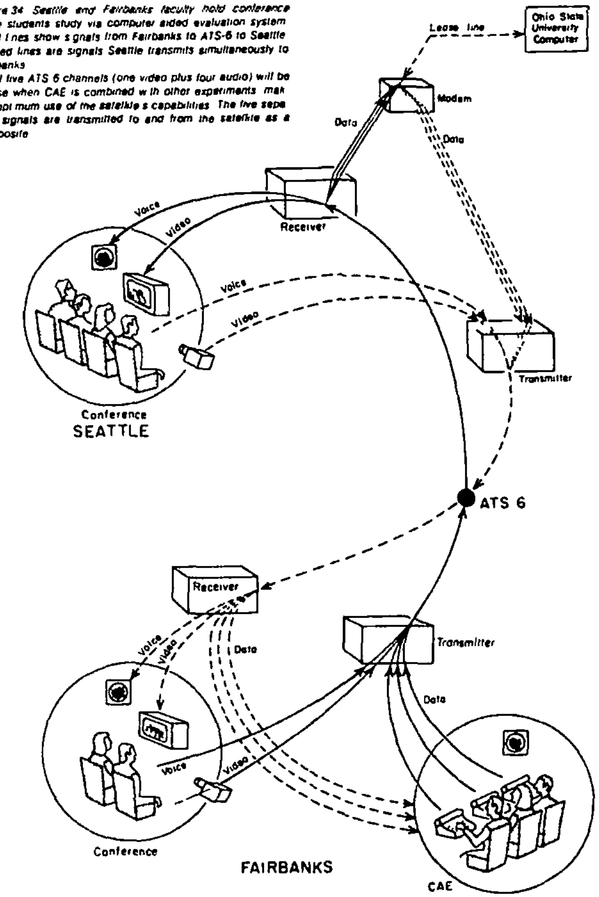

Figure 34 Seattle and Fairbanks faculty hold conference while students study via computer aided evaluation system Solid lines show signals from Fairbanks to ATS-6 to Seattle dashed lines are signals Seattle transmits simultaneously to Fairbanks

All five ATS 6 channels (one video plus four audio) will be in use when CAE is combined with other experiments making optimum use of the satellite s capabilities The five separate signals are transmitted to and from the satellite as a composite

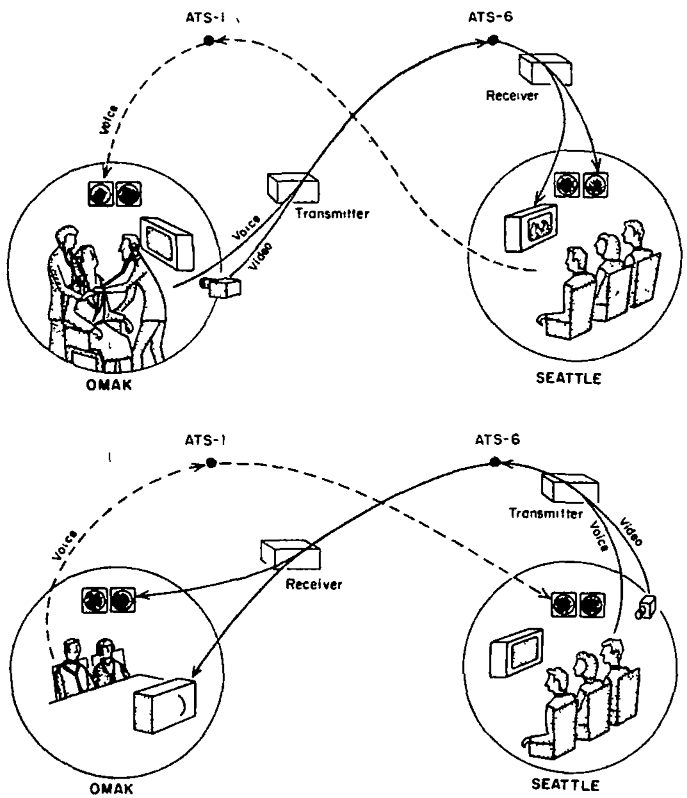

Figure 35 Above University of Washington medical school faculty from the Department of Family Practice observe student presenting pat ent at Omak to assess his clinical skills Omak transmits video and voice via ATS-6 faculty at the UW respond by voice via ATS 1 Below Seattle may switch over to ATS-6 transm ssion for the evaluation discussion following

Administrative Conferences

The administrative conferences are also scheduled mainly for the period of the first six week clerkship During these interactions Omak and UW faculty will make summary evaluations of student progress, adjust individual or overall curricular programming, and discuss administrative matters or other concerns

Medical Consultation

In addition to student case presentations private practitioners (the CCU physician faculty) at the Family Medicine Center will choose patients under their regular care who have problems on which they wish consultation They will present them by satellite to specialists on the faculty in Seattle along with data from their preliminary work-up WAMI students sitting in on these consultations will learn a little more about techniques of case presentation and about the medical problems involved. These experiments will resemble the teleconsultations to be conducted by the Indian Health Service in Alaska

A more lengthy series of patient consultations are scheduled between psychologists from the Okanogan Community Mental Health Clinic and psychiatrists and psychiatric residents at the University of Washington These sessions will provide some consultative backup for a group of practitioners working in considerable isolation In many cases the psychiatric expertise UW faculty can extend may make it possible for the psychologists to treat their patients at home instead of sending them to some larger city for psychiatric care Two similar psychiatric consultation experiments scheduled between Fairbanks and Seattle will permit comparison of interactions in which psychiatrist and patient can see each other simultaneously in color with those between Seattle and Omak in which video can be transmitted in only one direction at a time in black and white

These consultations will broaden the medical services available to Omak patients and provide Omak practitioners with specialized opinions on diagnosis and treatment while giving them valuable experiences in continued medical education Omak nurses and other health care providers attending the sessions will also receive significant educational benefits

Multidisciplinary Lecture/Demonstration/Discussions

The multidisciplinary broadcasts will be highly varied in format and content They are intended to give Omak practitioners the opportunity to participate in continuing education activities ordinarily accessible only to people living in the vicinity of the University of Washington Most of the programs are designed to be of interest to allied health professionals (nurses, lab technicians physical therapists) as well as physicians and WAMI students in Omak

The lecture/interactive discussions will deal with such topics as psychiatric crisis intervention, and emergency medical services in a rural setting Slides, films, and x rays will as for other broadcasts, supplement the spoken material

Other transmissions will take the form of dialogues. Omak nurses and other paraprofessionals define for their student and faculty counterparts in Seattle, their responsibilities and educational needs in the rural setting In a later session the Seattle group responds to issues identified by the Omak practitioners and discuss their own roles and educational programs in the metropolitan environment Omak clinical pathology technicians pose questions about laboratory tests or other problems to clinical pathologists at the UW The CCU faculty and Mental Health Clinic psychologists confer on mental health needs in the rural setting. Faculty students, and residents discuss the problems and advantages of education in rural areas.

Several transmissions to Omak will be devoted to grand rounds in which patient problems of interest are presented by residents and discussed by faculty This time-honored method of continuing education has always drawn large audiences of private physicians to teaching hospitals Grand rounds will be videotaped and rebroadcast for satellite with the original UW participants present in the studio for questions and discussion.

EXPERIMENT SCHEDULE

The WAMI experiments are scheduled for Tuesday and Thursday of every week for the nine-month duration of the HET Experiment

Broadcasts are scheduled to begin at 10·15 a.m in Washington (equivalent to 8 15 a.m in the Alaska time zone) and end at 11 30 (9 30 in Alaska) ATS-1 is available whenever ATS-6 is available and for an additional 15 minutes after use of ATS-6 is concluded. This will allow any unfinished interaction to be concluded by voice and provide for some immediate critique between sites of the experiment broadcast just completed.

Seventy transmission time slots are alloted to the WAMI experiments. Tuesday transmissions will be between Seattle and Omak Thursday s between Seattle and Fairbanks Many of the 75-minute time periods will be used for two separate experiments—for example 25-minute administrative or faculty conferences will frequently follow the 50-minute classroom sessions (CAE will generally be operating simultaneously)

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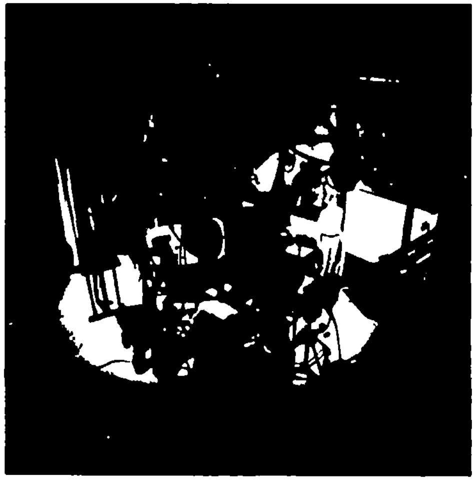

Figure 36 Equipment set up for a lecture/discussion in the Closed Circuit Television studio of the University of Washington Health Sciences Center

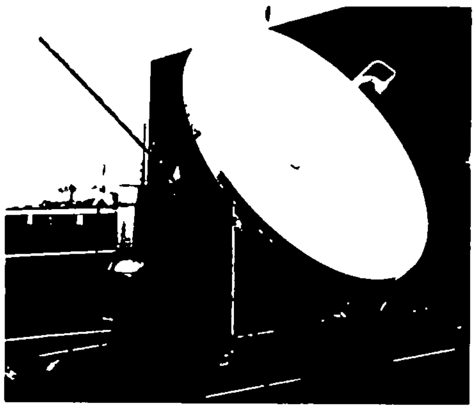

Figure 37 ATS 1 and ATS 6 antennas atop a wing of the University of Washington Health Sciences Center Building

EQUIPMENT INSTALLATIONS

University of Washington Seattle

In Seattle broadcasts will originate in the main studio of the Closed Circuit Television facility of the University of Washington Health Sciences Center (figure 36) This studio is only minutes away from the offices of medical faculty and specialized equipment or research animals can conveniently be brought to the studio for on air demonstrations

The studio has normal broadcast capability in full color Its equipment consists of three live cameras a film chain two quad videotape recorders a special effects generator and very adequate support in the areas of audio and monitoring

The material originated in the studio is processed in the CCTV master control room From here it is sent some 800 feet over interconnecting cables to an equipment room on the eighth floor of the Center where the transmitter receiver and some of the monitoring equipment is installed The ATS 6 and ATS 1 antennas (figure 37) are on a rooftop adjacent to the mechanical room some 125 feet distant from the transmitter and receiver This ATS-6 antenna unlike those for the other HET sites is designed for both transmission and reception

The digital transmissions received on ATS 6 audio from the CAE computer terminals in Alaska are routed through a data modem to land lines leased from the Tymeshare Corporation for transmission to the CAE computer at Ohio State University in Columbus Ohio Return signals from Ohio follow the same route

Figure 38 The KUAC Educational Television classroom/studio at the University of Alaska Alaska WAMI students view the [illegible] lecture from Seattle

University of Alaska Fairbanks

The broadcasting facilities at the University of Alaska in Fairbanks are similar to those at the University of Washington The WAMI Program has contracted with the University of Alaska's on-campus Educational Television Station KUAC TV to provide the equipment and technicians services required for setup production and on air periods of the WAMI experiment

The ATS-6 experiment conferences lectures and consultations will all be conducted from the KUAC studio/classroom facility (figure 38) The station's full color broadcast facilities consist of two cameras a film chain videotape recorders and associated audio and monitoring equipment

Materials originating in the KUAC TV studios are fed by interconnecting cable to the ATS 6 transmitter which is located in the Gruening Building both on the University of Alaska campus Transmit and receive antennas are located on the roof of the building

In addition KUAC TV has provided three interconnecting telephone lines to the Arctic Health Research Center building which serves as WAMI headquarters at the University of Alaska Three teletypewriter computer terminals have been installed in the building for students using the computer aided evaluation program The terminals are connected by ground line to the ATS-6 transmitter where they combine with the video and audio input originating concurrently at KUAC for transmission as a composite signal to Seattle The three audio channels carrying the CAE data are then routed to the CAE computer at Ohio State University by the Seattle access

KUAC personnel will also provide the operational support required to coordinate and configure the ATS-6 and ATS 1 equipment for the various experimental modes The ATS 1 equipment installation is described under the IHS experiment which shares the same terminal equipment for both satellites

Figure 39 *Mid Valley Hospital Omak Washington*

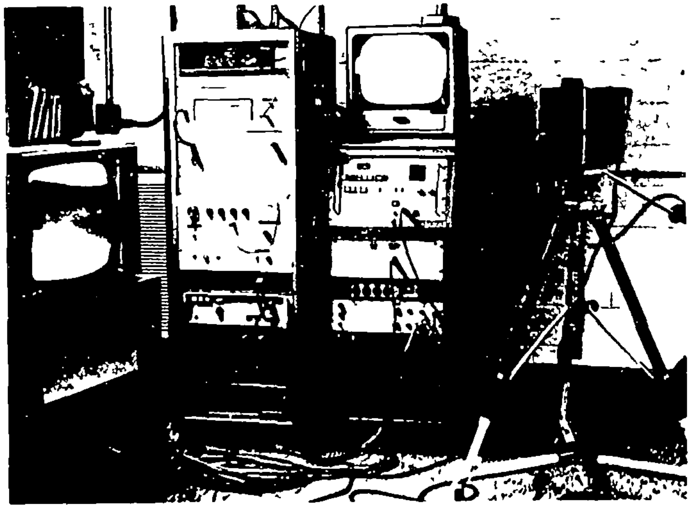

Figure 40 *Equipment for the ATS 6 experiments at Mid Valley Hospital in Omak*

Mid Valley Hospital Omak

There was not adequate space for the installation of equipment or conduct of experiments in the Family Medical Center at Omak where student *training* actually takes place The Omak broadcasts will be made from a room in the basement of the Mid Valley Hospital (figure 39) which is normally used for staff training purposes

All of the equipment required for TV broadcasts as well as the transmitter and receiver for ATS-6 and the transceiver for ATS 1 are installed in this room (figure 40) *Approximately 125 feet of cabling connects the equipment* to the antennas which are mounted on the ground in a large grassy area behind the hospital

OPERATIONAL STATUS OF THE WAMI SYSTEM

Installation of terminal equipment for the three WAMI sites was performed over a period of months as the components were received Equipment delivery was less than optimal Delays and shipping damage impacted the installation and training plans significantly Particularly affected were Omak and Seattle where much planned training did not take place and where relatively expensive retrofit of temporary equipment will be required

Although delayed about three weeks the Seattle Fairbanks portion of the experiments were modified to compensate for the time loss *and no serious consequences* are anticipated Omak installation was delayed by two months and this factor will have to be taken into account in evaluating the experiment A strong effort will be made early in the operational phase of the program to correct deficiencies in equipment and training

Operational testing was held to a minimum in order to reduce time loss on the satellite

EVALUATION AND IMPLICATIONS FOR THE FUTURE

The primary objective of the WAMI experiments with ATS-6 is to determine whether telecommunication is a workable substitute for bringing people together face to face in the same room Specifically WAMI wants to know if satellite mediated communications are

1) *Effective and acceptable?* Can students keep their attention on a lecturer who talks to them out of a television receiver? Do they ask questions as readily as if he were there?

Will this kind of contact relieve their sense of isolation from their Seattle-based classmates? Will UW faculty feel they can accurately assess the clinical skills of students making case presentations from Omak without the customary on-site visit? Do problems really get ironed out during administrative conferences—do the participants really interact? Do students faculty and the other participants in the experiment *like* televised interactions?

2) *Technically feasible?* How reliably does the terminal equipment function and how much adjustment or *maintenance is required to set it right?* Does this interfere with scheduled transmission? Can the nonprofessional operators at Omak operate the equipment without difficulty and obtain good pictures?

3) *Less costly than alternative means?* How much money is saved by reduction in travel and telephone costs and the time faculty spend in travel? How does this compare with the cost of the satellite communication equipment the peripheral equipment and the time required for equipment operation and maintenance? Is it less expensive than hiring additional faculty for permanent location at the decentralized sites?

Evaluation

The WAMI experiments are being evaluated by the Office of Research in Medical Education at the University of Washington School of Medicine under direct contract to Lister Hill

The data upon which the evaluation is based must be collected during the course of the experiments and all of the faculty and student participants and TV studio technicians will contribute

Pre-experiment interviews and questionnaires are being used to obtain information on the present attitudes of the prospective participants—students faculty and others—toward satellite mediated telecommunication Evaluative data will then be obtained following each satellite transmission The instruments used will be pri*marily those* that assess *the* opinions of the participants as to the effectiveness of the satellite interactions from their point of view For some experiments apprehension levels will also be documented The evaluators will also personally observe each transmission

Technical feasibility will be evaluated largely by the TV production staff The staff members will complete forms following each transmission that ask them to rate camera work audio and visual quality and other production parameters—including their impressions of the participants reactions to technical activities within the studio environment

Additional logs will be kept to compare travel time and the volume of telephone communications between the experiment sites before and during the ATS 6 experiment

To determine whether their attitudes about telecommunications were changed by the experience when the nine-month experiment is completed questionnaires and interviews will again be administered to the participants to obtain their overall reactions to the program

Implications for the Future

The WAMI Experiment in Regionalized Medical Education has greatly expanded the capacity of its parent school to provide opportunities in medical education for students in three neighboring states and at a cost far less than that required for the development of new institutions The WAMI experiments with ATS-6 will help to determine whether the use of satellite telecommunications to link the decentralized education and clinical training sites with the parent school can decrease the costs still further

The experience WAMI and Lister Hill will gain from these experiments with the use of satellite communication in medical education will be applied to the design of future satellites satellite equipment and communication techniques bringing the possibility of permanent working systems nearer to reality

If new satellites are developed with this application in mind and become available to the northwest region they could be used to interconnect the entire WAMI system These and perhaps additional links with isolated communities would have the added effect of improving medical service and providing increased incentive for physicians to practice in such areas With further extensions broadcasts of continuing education programs such as lectures, grand rounds etc from the University of Washington could be transmitted to professional audiences throughout the northwest

A4-97

Paper Presented by Dr R S Cooper

at

The Bicentennial Space Symposium

Jointly Sponsored by the AAS/AIAA

in cooperation with the Smithsonian

Air and Space Museum

Washington, D C

6-8 October 1976

A4-98

SATELLITE COMMUNICATION FOR PUBLIC SERVICES

Robert S Cooper and William N Redisch*

Satellite communications can be applied to public services, that is, those services provided by local, state and federal organizations on a non-profit basis These applications would involve fixed, portable and mobile terminals The fixed service applications include health and education and are mainly for the thinly populated remote regions where public services are not economically or readily available The mobile service applications include emergency medical, safety, disaster, and law enforcement communications requiring very low cost user equipment Experiments with NASA's ATS-6 and CTS satellites have started the development of these new satellite services However, the present apparent non-profitable nature of each individual service, the inherent political and institutional obstacles, and the need for satellite/ground terminal technology development prevent making these services affordable A federally sponsored program demonstrating the utility of high powered geostationary multibeam switchable satellites accommodating large numbers of small terminals is needed to overcome these problems The goal is to aggregate the diverse potential market such that commercial satellite operations could expand with minimal financial risk to profitably serve the public service sector The quality and efficiency of communications in remote regions would be realized, leading to communications satellites of the future

* Dr R Cooper is the Director of NASA's Goddard Space Flight Center, and Dr W Redisch is the Chief of its Communications & Navigation Division

INTRODUCTION

Satellite-delivered communication services can be utilized in public service applications, where public services may be defined as those services provided by local, State, and Federal organizations on a non-profit basis These applications involve permanent, portable, or mobile communications terminals Fixed direct reception service applications include health information, education, library and other public services, mainly for thinly populated remote regions where conventional means of delivering these services may not be available or economically feasible The portable and mobile service applications include emergency medical, safety, disaster, and law enforcement communications requiring coverage over large geographic areas with very low cost user equipment (Fig 1)

A Public Services Communications Satellite System could alleviate some of the problems of inadequate service presently available to citizens who reside in remote regions These are people without access to normal communications services such as telephone and television There are also a growing number of people in rural areas who lack the access

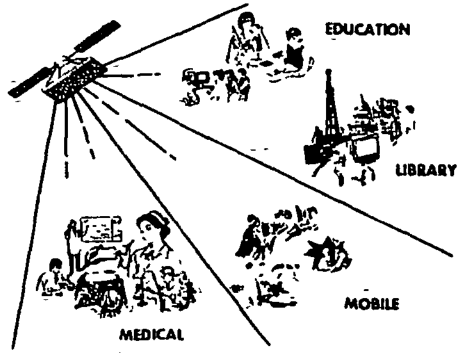

Fig 1 Satellite Communications System for Public Services

to medical professionals enjoyed by urban residents, and it is becoming increasingly difficult in the United States to keep medical professionals practicing in remote areas rather than in urban centers In addition to other reasons, Continuing Medical Education (CME), required by practitioners to retain professional licenses, is difficult to obtain in remote areas, especially when physicians are simultaneously providing primary health care A vast number of people in remote areas receive inferior general educational services because they cannot afford to avail themselves of the wealth of information existing elsewhere

NASA's Applications Technology Satellite (ATS-6) is an experimental system designed to test such public service uses Recently it began a Health and Education Telecommunications (HET) experiment to demonstrate the potential value of interactive television in Alaska, the Rocky Mountain States and Appalachia [1] (Fig 2) A one-year ATS-6 Satellite Instructional Television Experiment (SITE) was just recently concluded in India, where adults and children gathered around community direct-reception (one thousand dollar category) television terminals in 2400

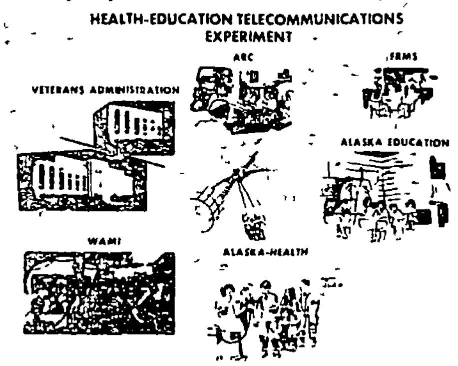

Fig 2 ATS-6 HET Experiments

widely scattered villages History may prove this experiment to be a major milestone in the progress of developing nations [2] (Fig 3) The joint NASA/Canadian Communications Technology Satellite (CTS) is conducting further experiments with these services in the satellite broadcast 12 GHz band [3] (Fig 4) A federally sponsored Public Services Communications Satellite System could build upon this experience, and could lead to an economically viable, commercially offered communication system that would improve the quality and efficiency of fixed direct reception of public services in remote regions

Communications capability for mobile applications does not exist to any significant degree at present For moving vehicles traversing large geographical areas, satellite communication systems offer the most cost-effective communication channels For ships in the Atlantic and Pacific a commercial MARISAT service is now available By the end of this decade, aircraft over the oceans should be able to communicate via Aerosat Past experiments on NASA's ATS satellites gave strong impetus toward developing and demonstrating this technology, and present ATS experimentation is aimed at land mobile and "personal" pocket-sized communications

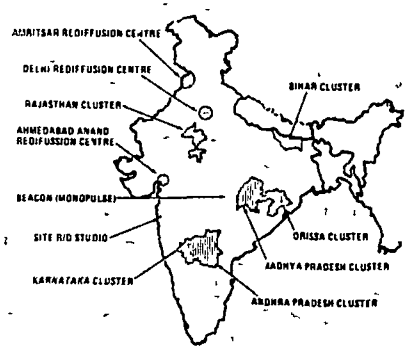

Fig 3 ATS-6 SITE Experiment

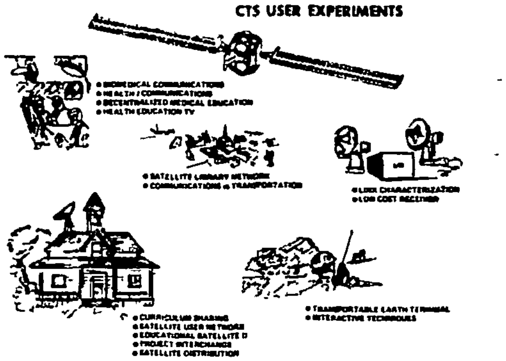

Fig 4 CTS Experiments

Mobile applications such as tying data and voice between ambulances and hospitals, interconnecting emergency vehicles with medical and resource coordination centers, allowing law enforcement vehicles to communicate over vast geographical areas and across jurisdictional boundaries, public safety communications that enable coordination of many organizations, reliable communications during disasters via both mobile and portable terminals set up after a disaster strikes an area, and multi-organization rescue forces able to communicate with each other are feasible with proper application of current technology All these and many more services could be of great benefit to the public sector once made economically affordable Just as the commercial telephone system today serves the public sector so effectively and economically via its paid utilization by non-profit public service organizations, so may these augmented mobile services be extended in many important areas

The U S terrestrial telephone system has evolved over the past hundred years resulting in an enormous investment for an existing effective fixed communications system For these new satellite-aided public

services to come into being, and augment the existing system, very large additional front-end capital investments are needed Since any new non-profit public service is subject to inherent political, institutional and budgetary obstacles, the risk to the private sector of obtaining a reasonable payoff in a reasonable time is too great to warrant such large investments This situation prevents existing technology from becoming affordable and new technology from being developed by the private sector, thereby bringing mobile and personal communications to a practical reality

A government-sponsored program for satellite-delivered communications for public service applications could provide a low-cost dedicated pilot program leading to reasonable risk/investment commercial operational systems Use of the already developed technology for low-cost fixed terminals would be possible to aggregate the very dispersed health and educational communities for their own evaluation of the economic advantages of a satellite delivered service The enormous potential of small mobile transceivers would be demonstrated by developing the space and mobile terminal technology necessary to spark the marketplace with equipment affordable by local rescue squads, police departments, and the like The satellite delivery of communications for these public services suggests geostationary satellites using large solar arrays, high power transmitters, large multibeam antennas, and multiple access with on-board switchboarding techniques to accommodate large numbers of users with efficient spectrum conservation The users would have very economical small terminals, allowing permanent direct reception in the 12 GHz frequency band and/or mobile ones in the new 900 MHz land mobile band, each with low radiated power (EIRP) and small G/T ratios (Fig 5) The economic/technical requirements would drive the overall design of such a communications system, and the effort must be tightly coordinated with the commercial communications interests to assure eventual transition from government sponsorship to profitable commercial operation

BACKGROUND

When the space age was opened by the launch of Sputnik I in 1957, it was already obvious that communications via satellite had great potential,

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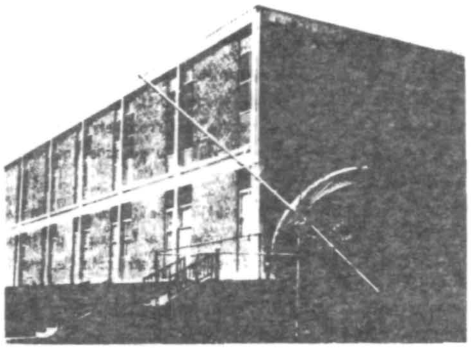

Fig. 5 Small Terminal for ATS-6

because satellites could be simultaneously in view over very large geographic areas. Arthur C. Clarke in 1945 was first to describe the possibilities.[4] In 1958, the launch of the United States Army SCORE, an experimental short-lived, store and forward repeater satellite, successfully tested the feasibility of relaying narrow-band voice and teletype from low orbiting satellites. The NASA Goddard Space Flight Center's early programs to exploit this great new potential included the 1960 Delta launching of the first ECHO satellite, a 30-meter diameter balloon-shaped passive reflector, and the 1962 launching of RELAY I demonstrating the feasibility of actively relaying real-time wideband communications signals, such as television between ground stations and low orbiting satellites.[5] But it wasn't until the first SYNCOMS were launched in 1963 and 1964 that the advantages of geostationary communications satellites were realized. A spin-stabilized communications satellite was first proposed by the Hughes Aircraft Company in the autumn of 1959, and Project Syncom was initiated as a joint NASA/Department of Defense effort to develop the launch capability for earth-synchronous orbits and

to demonstrate the utility of these orbits for satellite communications. These objectives were met and the fantastic growth of communications satellites started, with a billion dollar industry growing up in a decade.

The U.S. Congress established the ComSat Corporation in 1963 to transfer the government-developed technology into the private sector, with Intelsat being established in 1964. Intelsat is today one of the few healthy profit making international organizations. While this explosion of commercial satellite communications was happening, NASA was implementing its Applications Technology Satellite series with a multitude of experiments and demonstrations to advance communications satellite technology. The Dpartment of Defense launched TACSAT in 1969 with a dual-spin stabilization technology innovation of great importance. By 1970 Intelsat was providing fixed private service over the Atlantic and Pacific, and by 1972 DOMSAT (ANIK) was providing service for Canada and the U.S. as a direct outgrowth of the technology and experience obtained from the NASA and DOD satellites. Applications for the first U.S. domestic communications satellite were made to the FCC in 1969. The actual launchings were delayed until 1974 when the FCC policy decision on open skies was made. Today, both domestic and international fixed point-to-point service satellites are a rapidly increasing reality.

TODAY'S EFFORTS

As satellite and launch technology progressed, it became apparent that greatly expanded usage of communication satellites could be obtained by putting more complexity and power in the spacecraft to simplify and economize the ground terminal equipment. A great advancement toward more sophisticated spacecraft occurred with the launch of ATS-6 in mid-1974. This spacecraft was NASA's first 3-axis stabilized synchronous satellite and featured a 9.1-meter pointable antenna with sufficient radiated power to work with low-cost, direct-reception small terminals. The multiple mission concept plus experimentation with advanced satellite communications technology opened the era of direct-reception satellite utilization. Dozens of experiments were successfully performed with ATS-6. Among them were the L-band experiments to communicate with airplanes and ships and to position-locate them, demonstrating the feasibility of maritime and aeronautical communications satellite technology Today, commercial L-band service is available over both the Atlantic and Pacific Oceans via MARISAT By the end of the decade aeronautical communication services should be available via AEROSAT

ATS-6 Experiments

The ATS-6 Health and Education Telecommunications (HET) experiments[6] introduced delivery of direct reception services to remote areas in the U S The education experiments were planned for the Rocky Mountain region, the Appalachian States, and the states of Washington and Alaska (Fig 6) Each area had a slightly different configuration and different utilizations The Educational Satellite project in Appalachia was developed out of the Appalachian Regional Development Act of 1964 which was established to coordinate Federal, State, and local attempts to improve the total economic development (roads, health service, education) in Appalachia In 1971, the Commission surveyed 32,000 public school teachers in Appalachia and discovered that in-service training, particularly in the

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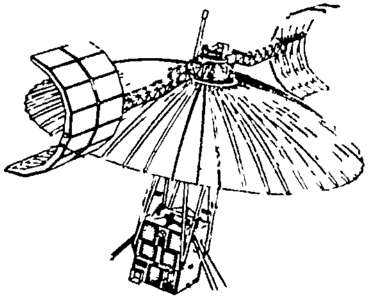

Fig 6 ATS-6 Satellite

teaching of reading and career education, was needed Twelve hundred teachers participated in the reading curriculum and 300 teachers were actually certified through the career education courses delivered by ATS-6 For the Rocky Mountain States, the video signals originated at the main Health, Education, and Welfare facility at Denver This transmit/receive facility was connected by a microwave link to the Federation of the Rocky Mountain States at Diamond Hill in Denver

Typical uses of the ATS-6 in the area of health care may be illustrated from the following summary excerpted from a medical case history

> Using ATS-6 link in Anchorage, a one-year old child in a remote village was observed sitting listlessly in her mother's lap The child was apathetic, showed no interest in her surroundings, and did not appear to be in acute distress A chest x-ray, advised during the satellite consultation, showed a splotchy infiltrate on her left lung Completion of the diagnosis showed active tuberculosis which has been successfully treated

It was noted during the experiment that the observation of motion via the video link provided the means for recognition of helpful diagnostic clues Village hospitals have x-ray capability and the images on the x-ray films were transmitted quite well over the ATS-6 The ability of a nurse in Fort Yukon, a physician at Tanana, and a specialist in Anchorage to hold a conference, examining the x-ray simultaneously, expedited decision-making and definitive care

Another major ATS-6 direct reception public services experiment was the Satellite Instructional Television Experiment (SITE)[7] which was operational during the second year of satellite operation ATS-6 received video signals from Ahmedabad and Delhi, India, and retransmitted the video with two audio channels for different dialects to 6 clusters of 400 direct-receive stations for a total of 2400 direct-receive stations (Fig 3) Morning programs of 1 5 hours per day were designed for classroom use, and evening programs of 2 5 hours duration were designed for village adult education All the direct reception terminals, television sets, and antennas were completely Indian built

India's needs for nationwide educational broadcasting are apparent Its great size, vast population, high birthrate, rural economy, poverty, and illiteracy dictate the need for the most widespread and rapid educational technology available

It comes as no surprise, then, that India desires to provide instructional television through the most modern delivery system available, the broadcasting satellite

The ATS-6 has now returned from its position over India and is commencing its third year of public service demonstrations and experiments

CTS Experiments

Last January the Communication Technology Satellite (CTS) was launched CTS was a joint international effort between NASA and Canada's Department of Communications The CTS was designed to transmit television to small, user-operated terminals in the 12 GHz satellite broadcast band Where ATS-6 achieved its high effective radiated power by use of the 9-meter antenna, the CTS program developed high power (200 watt) transmitters fed by large solar arrays (1 4 KW D C) (Fig 7) The CTS radiates power levels 10 to 20 times higher than the present commercial communications satellites Some of the U S experiments and demonstrations that are being performed on the CTS follow[8]

Fig 7 CTS Satellite

An education curriculum sharing experiment enabling the students in one university to take courses in another, thousands of miles away, is being conducted between Stanford University in California and Carleton University in Ottawa

A COMSAT experiment is demonstrating how a highly transportable terminal can quickly establish reliable communications via CTS between the site of a disaster and relief agencies COMSAT has developed a small lightweight terminal that can be transported to the disaster area by a small van, helicopter or even a small boat The terminal, set up by two people, can be operational in less than an hour providing emergency communications

A Biomedical Communications Experiment sponsored by several agencies of the Department of Health, Education and Welfare is exploring the potential of satellite communications to solve immediate and future communications needs of the health community The general objectives are to evaluate the video and voice communications as an aid to decentralized medical education, as a way to reduce the limitations of remote geographic location, as a way of providing continuing education to health professionals, and as a medium for more effective transfer of new knowledge generated by biomedical research

A Library Services Experiment for a Satellite Library Information Network (SALINET) by the University of Denver is offering service training programs for community libraries in small towns in the Rocky Mountain Area, to provide more effective service and to develop a video program to inform both government and private sector personnel of library resources with the potential to serve as a conduit for bibliographic data requests

A4-104

TODAY'S PROBLEMS

These and other ATS-6 and CTS experiments have demonstrated what today's space communications technology is capable of providing Then why have these services not blossomed as the fixed point-to-point services have over the last decade? What are the obstacles?

There are many By the nature of public services, they are provided by non-profit local, state and federal organizations, both government and non-government Those that are government agencies must depend upon appropriated budgets, and better or increased public service at the cost of increasing these budgets is not, and it could be argued, should not be easily attained Non-government public service institutions depend heavily upon donations and subsidies and more for more money is not enough Everyone is for better public services, the question is Who will pay? Just as non-profit organizations today include funds in their budgets to pay utility bills to profit-making entities,so must they be able to afford satellite services tomorrow This requires the development of extremely low cost ground terminal technology, which in turn depends upon large demand, which of course in turn, depends upon low cost One cannot expect private enterprise to make enormous new capital investment to get to the low cost/high demand stage In their view, the risk of new technology is too high and the potential near-term payoff from the public service sector is too uncertain It is uncertain because one cannot expect local school systems, or small town fire departments, or county sheriffs, or most local public service organizations to worry about subscribing to a possible system ready sometime in the future when they have continuing budget crises today It is generally agreed that if the U S Federal government had not underwritten the risk and spent Research and Development funds to open the satellite communications era, then the price of overseas telephone calls would not have dropped as they have by more than a factor of two, and a solid profit-making satellite communications industry would not have evolved and paid back the U S via tax dollars

There are other major problems and issues to be faced before development of a satellite communications system in support of public services

can occur Even when satellite services may be more cost-effective than existing terrestrial services, one cannot ignore the past investment and present profit aspects of institutions that have been providing these terrestrial services since their inception There are always political-economical-institutional barriers toward implementing new technology which brings competitive changes Different factions must be convinced that change is good and cost-beneficial to them

In addition, when dealing with many local organizations, there are complex political issues that vary from area to area and involve a great many conflicting viewpoints Issues that are real in some areas don't exist in others The public services sector, such as local police departments, do not have that least common denominator-profit motivation that exists in the private sector such as in the mobile market for trucking and busing

Hence, in addition to the technical and operational problems for which the experiments and demonstrations of ATS-6 and CTS were developed, there are these much broader problems and issues which must involve federal, state and local policy decisions The chicken or egg risk/new investment problems, the obsoleting of previous terrestrial system investments/profits problem, thorny political problems associated with direct broadcasting, institutional issues of who does what for whom, and who pays, the hard potential market analyses and benefit/cost studies that are needed, the roles of government and industry in this public field of communications, all will shape the course of any communications satellite system utilized for public services

TOMORROW'S POTENTIAL

A basic recognized role of federal government is to satisfy national needs Some of the basic national needs are to have a strong economy, to have a stable social structure, and to provide adequate resources and a healthy environment A focused Public Service Communication Satellite System can play a significant role in meeting these needs if the services can be made affordable to the public sector and economically viable to the private sector A stable social structure requires public services in the fields of health, education, recreation and public safety which satellite delivered communications can enhance, contributing to a better quality of life

In addition the strength of the economy in terms of a positive balance of trade can be assisted if the United States retains its leadership role in new space technology applications

Health Services

Only medical experts can determine how health care, education or information should be delivered The most a communications engineer can do is to determine how such services might be developed, pointing out the advantages and the disadvantages, and to focus effort toward the goal of delivering more and better health services for more people at lower costs ATS-6 and CTS have been the most significant development in public services communications technology Their technology demonstrates that sophisticated satellites can be built that have enough radiated power to allow direct reception of video signals by small low-cost terminals With enough terminals sufficiently low in cost, it is feasible for every hospital, clinic, medical school, nursing home and perhaps even doctor's office to be tied together in a network possessing tremendous information capacity [9]

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The general areas of medical applications that are suggested are instruction of health professionals, telemedicine, public health education, and overall emergency medical services

In the area of teaching health professionals, the production of formal courses for use in the curriculum (medical school, university, nursing school, pre-med college, etc) has a potential for significant cost savings It allows the use of high quality, highly effective audio-visual presentation of materials suited to such presentations, and it can free the teacher from routine lectures for more creative and interactive work Courses not primarily applicable to audio-visual delivery, may be supplemented by occasional enrichment programming which could represent an improvement in education more than a cost savings

Continuing education might make more extensive use of the satellite because in this usage the prime advantage would be in the delivery of the material to the health worker The advantages in time, expense, and travel saved are obvious In this case, in addition to ideally suited

material not outstandingly suited to audio-visual presentation would be programmed, not to improve the quality of education but to make the process less costly and to make quality continuing education more available to all health workers

A further use for satellites in the health area would be the possibility of presenting current medical research in a "Video Medical Journal " New surgical techniques might be demonstrated in such offerings

Telemedicine is a direct health care delivery use for satellites. Such a service would be valuable in remote diagnosis, consultation, and advice to health workers and patients in isolated regions An "isolated region" could be on the Alaskan North Slope or could be Indianapolis if the specialist needed happened to be in San Francisco and the need were immediate The main advantage in telemedicine is the availability of the very best talent for any difficult case anywhere else in the country Time and travel could be greatly reduced and at the same time better care would be made available using specialist time more efficiently The exchange of data in almost any form - medical records, X-rays, EKG's could be quickly achieved Access to central files of data or libraries could also be arranged along with the necessary privacy and confidentiality

Public health education is conceptually quite different from telemedicine or instruction for professionals since in this utilization the user or viewer is the public In cases where the job of the health worker is to "educate," "train," or instill or modify some behavior in the patient, programming could be used by the health worker in the clinic, hospital, doctor's office, etc to serve in place of lectures or booklets Such programming might include proper sanitary, nutritional, and exercise practices, advisories concerning drug, alcohol and food abuse, instructions for self-diagnosis of "warning signs", regimens for outpatients, and certain materials useful in psychotherapy and mental health treatment. As many people become more visually literate and less reading-literate, such approaches may prove more effective than printed information and may save the health worker a great deal of time and patience.

The Emergency Medical Services (EMS) Systems Act of 1973 provides assistance and encouragement for the development of comprehensive area emergency medical services systems (Public Law 93-154)[10] If the full potential of the EMS Systems Act is realized, a great step will have been taken toward the elimination of needless loss of life and limb due to catastrophic sudden illness, medical emergencies associated with the accidents, and trauma associated with disaster [11]

Studies by the Committee on the Interplay of Engineering with Biology and Medicine have focused on many problems which plague the provision of emergency medical care in this country These and other studies have emphasized the key role of communications in linking the multiple elements involved in emergency medical services systems There is a need for an integrated coordinated communications network that brings together all of the components of the emergency medical system to provide care using well-established principles of modern emergency medicine

The physicians who treat emergencies believe that the outcome of sudden illness or medical emergencies is predicated not so much on obvious symptoms or trauma as it is on a whole gamut of information on which very early decisions can be based

The communications satellite capability offers the potential for the input of advice from a remote specialist to the emergency medical technici (EMT) at the scene for real-time decision making capability between EMT and physician specialist as to the most appropriate medical facility for treatment and the method of transport based on telemetered data Many states, such as Maryland, are in the process of developing EMS radio communication systems which serve major cities and surrounding counties These facilities interconnect emergency vehicles with medical and resource coordination centers and will undoubtedly prove highly beneficial as they are brought to fruition and used on a continuing basis Modern satellite communication technology can aid significantly in realizing the full potential of the EMS Systems Act Through the use of satellite facilities, uniform coverage of the U S is available for a nationally interconnecting system This is particularly significant for rural areas outside the limits of ground radio systems Through this technology, rapid high

quality communications for voice, video, and medical telemetry could be achieved operationally in the 1980's

EDUCATION SERVICES

Productivity losses exist at all levels of education, as studies indicate fewer students, more teachers, increased pay for school personnel and no compatible increase in student test scores Telecommunications has the potential of providing large gains in educational productivity, increasing teaching effectiveness, and broadening the spectrum of educational opportunities

Despite the institutional problems, the use of telecommunications to relay educational programs at all levels (primary, secondary, university, continuing and cultural) is increasing One report forecasts a need for eighty educational television stations by 1985 for instructional television, video tape distribution and the Public Broadcast System.[12] NASA has been assisting Federal and local educators in exploring the use of satellite communications using the ATS-6 and CTS satellites There is a need to continue to work with these users until the technology is effectively transferred

The Southern Educational Communication Association's (SECA) present project is an example of distributing television programming to member stations in the southeastern United States The program material is oriented for instructional use in elementary and secondary schools or for evening distribution to the adult audience Secondary useage exchanges program material over widely scattered regions of the United States and distributes quality multichannel audio and radio material throughout the same region

All receiving equipments are located at the individual SECA stations and are owned by the member stations Future plans would place uplink equipment at several different locations within the SECA region with the origination of the network at various points and with live interconnection between the member stations

PUBLIC SAFETY

The public safety community consists of the law enforcement organizations (including the courts), fire prevention and control units, rescue services, and civil defense organizations Similar to the communications goals of the Medical and Educational Services, the objective of satellite communications services for the public safety community is to provide the service with cost or major performance benefit to the existing services or in areas where services do not presently exist However, unique to public safety, is the requirement of providing communications services under disaster conditions such as earthquakes, floods, riots, and storms especially when existing facilities may be incapacitated Many services are handled today adequately on a local basis by mobile radio, microwave phone and even cable Satellite communications are amenable for coverage over large and remote areas Higher data rates, video signals and great flexibility under abnormal conditions are easily attainable The Law Enforcement Assistance Administration (LEAA) and the State Planning Agencies (SPA) were established by Congress to provide impetus to bring new technology into use in the Criminal Justice Area ATS-1 experiments, using facsimile were sponsored by LEAA to experiment with fingerprint transmission. The FBI is developing techniques for digital fingerprint classifications and automatic identification by computer Using these techniques combined with satellite communications, states could, in the future, interrogate the FBI files directly rather than wait for the mail LEAA and the States are very interested in mobile terminal experiments because in this area, public safety and law enforcement require many vehicles coordinating efforts with each other The development of small, low-cost terminals, as well as the demonstrations to illustrate the functional and cost-effectiveness of satellite communications services, will lead to more effective and cost-efficient operations

For small vehicles, especially land mobile vehicles, the cost of equipment to work with a satellite must be in the thousand-dollar category in order to be a reasonably small portion of the vehicle's cost It is easy to see how the present Citizens' Band low priced radios have led to a craze that has exploded in the U S — people can now communicate directly,

for pleasure and for business It is easy to envision that this will lead to a demand for more telephone-like quality of land mobile communications

In today's world one can pick up a telephone in almost any fixed location in the U S and direct dial almost any other location at a very reasonable cost It has come about because of the highly developed terrestrial communications network that has grown over the years Space links are supplementing the terrestrial links more and more, especially for long distance communications, but it is the vast investment in wiring individual phones through extensive switching techniques that has led to our modern-day communications

The mobile situation is far from having attained the same level of sophistication and economy that exists for fixed telephone service However, with satellite communications a new era could be opened up, that is, the same way that one can communicate from almost any location via telephones in fixed locations, one should be able to communicate from any mobile location to any other location with the same ease and economy as in the fixed service

Going even a step further into the area which is commonly known as personal communications, once one envisions mobile telephony in the above described manner, one can also envision the step after that rather than the mounting of mobile stations mounted in automobiles, ships, planes, trucks, each individual would actually carry with him his own extremely light, small, economical telephone-like terminal, i e , the so-called "Dick Tracy" wrist radio concept

The public sector mobile market, including personal communications, will become indistinguishable from the private sector, except by frequency allocation, within the land mobile bands Today, land mobile communications are needed by trucking companies, busing companies, oil drills, geological exploration teams, and many others An FCC staff report predicts a conservative estimate of 7 3 million land mobile transmitters in the U S by 1980 Several petitions for increased spectrum allocation have been filed before the FCC in Docket 18262 Considerable information has been developed already on land mobile requirements and the equipment market

Off-shore drilling requires quick and reliable communications between the oil rigs or platforms and company headquarters Further, communications are needed for service and supply ships and aircraft For instance, the British North Sea oil operations have established criteria for an elaborate cable and radio network to meet projected needs Geophysical exploratory teams require similar quick and reliable communications with their central facilities

Besides the Health, Education and Public Safety Services, many other public services have been identified The NASA Task Team Report on Satellite Communications[12] identified and discussed some 24 potential applications of satellite delivered communication services These included search and rescue, environmental monitoring, hazard warning, electronic mail, individual data collection, data management and financial data management to name a few in addition to the examples given above

There are various technological areas within which the state-of-the-art should be advanced to produce developments that would optimize the operation and reduce the overall costs of a Public Services Communications Satellite System For example, from the overall systems viewpoint, technological advances are required in areas such as multiple access and modulation (digital communications, coding techniques, etc) With respect to spacecraft technology, multi-beam antennas, high power transmitters, and microprocessors for on-board channel switching should be developed Ground terminal (fixed, portable, or mobile) technological advances should be aimed at high production level, low unit cost terminals that are easy and inexpensive to operate and maintain NASA has already undertaken certain of these developments under other programs and is presently planning the additional long-range development programs that should be undertaken in the remaining areas not being covered by the private sector

CONCLUSIONS

There are public needs for better health, education, safety, law enforcement, disaster, rescue and emergency services in remote, large geographic, and disaster-hit areas These can be most economically met by high-powered communications satellites, working directly to small affordable fixed, portable and mobile ground terminals Although these service needs have been recognized for years, satellites have not yet been utilized The major obstacle to date is not the lack of available technology, but the absence of well-developed and consolidated institutional arrangements to overcome the many special/political problems There is a lack of appreciation of the services that can be provided by satellites and their potential for both cost-effectiveness and for increasing the quality of life Federally sponsored public service satellite communications can aggregate the dispersed market and make commercial services economically viable Providing the space capability has proven thus far too costly and too risky to the private sector to undertake However the past history of communications satellites and associated technology indicates that, once started down the proper development/demonstration path, the rapid expansion of using satellites for communications will encompass the public services, and lead to new commercial communications satellites delivering more effective public services in the future

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UNITED STATES OF AMERICA

Draft New REPORT

USER FUNCTIONAL REQUIREMENTS FOR BROADCASTING-AND FIXED-SATELLITE SERVICES

1. Introduction

The purpose of this Report is to identify some of the potential functional user requirements for domestic satellite services in the United States of America. These requirements may be satisfied within the Broadcasting-Satellite Service, the Fixed-Satellite Service, or both. The frequency bands within which these requirements might be satisfied will depend in part on operational requirements such as service availability and signal quality.

The scope of this Report is limited to identification and description of the functional user requirements. It is not intended to categorize each requirement by Service, or to identify specific frequency bands. However, frequency band requirements can be inferred in some cases from bandwidth and PFD requirements.

The characteristics of some of the systems which may be required to satisfy these diverse requirements are not presently included in Report 215-3. Therefore, a discussion of user requirements may be useful to the CCIR in considering additional system examples, sharing criteria, and spectrum utilization.

The bibliography includes articles on innovative requirements for telecommunications for social services, and other discretionary services, even though satellites may not be identified therein as a potential transmission medium.

A summary of recent U. S. and US-Canadian satellite user experiments having possible applicability to future developments in either the Broadcasting or Fixed-Satellite Service is included as Annex I.

2. Description of potential user requirements

This section of the report describes possible satellite uses based on a particular need, extent of geographical service area, and whether the service is primarily suited for individual, group, or institutional use, as well as whether the service requirements include two-way (interactive) communications

Ten major categories of potential satellite users are discussed.

a) Education

b) Health and medical

c) Electronic mail

d) Law enforcement

e) General computer networks

f) Emergency communication and disaster warning advisories

g) Broadcasting

h) Securities and commodity exchange

i) Electronic publishing

j) Public telephone and telegraph

The paragraphs which follow describe briefly the functional user requirements for each of these services.

2.1 Educational services

Of the two divisions of educational services, public schools (primary and secondary), and higher education, the latter involves a larger use base which extends beyond the institution and includes continuing education. Utilization by public schools may consist of national, state and local distribution of educational program material to classrooms, and dissemination of program material for teacher improvement seminars. Depending on specific need, both can occur on a one-way or two-way basis.

Higher education user requirements may include national and regional distribution of educational program material between institutions, transmissions to individual receivers in the home or in a community learning center, two-way inter-university seminars, teacher improvement seminars, and program distribution to specialized institutions (e.g., vocational schools).

Table I portrays one investigator's prediction[1] of the total satellite channel capacity which may be needed to satisfy the above requirements on a time zone basis.

2.2 Health and medical services

Satellite communication systems have been proposed as a means of satisfying several classes of user needs related to public health and medicine. These uses include the following:

a) Telemedicine: A two-way service primarily for use in sparsely populated areas, in which a distant physician examines, diagnoses, and prescribes for patients in the care of local paramedical personnel. The typical system would involve a one-way color video channel, plus two-way data and voice circuits;

b) Medical teleconferencing: A two-way service permitting specialists to consult each other and exchange information. Typical circuit requirements include two-way audio and visual interconnection;

TABLE I

Estimated number of channels needed for education for each of five time zones

	Dedicated Networks	Video	Voice Feed-Back	15 kHz, Voice, 50 kBps Data Slow Scan
		1975-1985		
1.	Elementary and secondary school net	3	400	400
2.	Higher education net	5	15	50
3.	Public ETV net	1	3	3
4.	Library net (excluding video tape)	-	2	2
	Total per time zone	9	420	455

c) Retrieval and update of medical histories: A centralized data bank on a national, regional, or state level permits rapid access to a patient's complete history by a physician unfamiliar with the case. This requires both data and facsimile circuits to retrieve information in the data base, as well as to add new information related to the present observation. This service could also be used for accessing general disease descriptions, and pharmaceutical products and their use;

d) Continuous remote monitoring of patient biomedical data either by direct observation or by computer analysis. The circuit capacity requirement is a data circuit from the patient to the monitoring center, and an emergency channel in the reverse direction for the purpose of alerting and instructing local personnel.

The total channel capacity which may be required for biomedical needs is summarized in Table II.

2.3 Electronic mail

Electronic mail involves the automated transmission and routing to the destination of written material now customarily handled by surface and air transport.

TABLE II

Biomedical requirements

	Time Zone					
	Hawaii	Alaska	Pacific	Mountain	Central	Eastern
Video channels	7	50	50	100	100	25
Data channels	20	100	200	400	500	200
Population (in millions)	8.0	0.3	25.0	8.0	46.0	122.0
Video channel/ million population	7.0	150.0	2.0	12.0	2.0	0.2

A system for hardcopy materials would typically involve encoding these materials by use of either a facsimile scanner or optical character reader, and transmitting the result to the destination mail handling center by satellite. The principal advantage of such a system is that it would result in faster delivery than is possible with presently available means.

Initial plans for the United States envision the implementation of an electronic mail system encompassing the 81 largest mail originating centers, some of which will serve clusters of cities. It is anticipated that 100 million pieces of mail per day could be processed by the system

Bandwidth requirements are sensitive to a number of factors including:

a) Length of transmission period (twelve hours vs. full period);

b) Non-uniform volume requirements; it is anticipated that volume demands imposed on the system will vary by geographical region and, additionally will be subject to daily and seasonal fluctuations;

c) Variations in the length of a single mail piece;

d) Differing bit error rates acceptable for different types of service.

Present estimates indicate that each of the 81 postal centers would be served by 1000 two-way 50 Kbit digital circuits.

2.4 Law enforcement

Law enforcement communications needs include:

a) Remote data insertion and retrieval from a centralized data base,

b) Interconnection of federal, state, and local law enforcement agencies for video, voice and alpha-numeric communication;

c) Transmission of fingerprints, photographs, and "voice prints" to facilitate criminal identification.

The U. S. network presently planned to satisfy the above requirements is the National Law Enforcement Telecommunication System (NALECOM). Classes of circuits needed for the NALECOM system include video, facsimile, audio and digital channels.. The estimated channel capacity required is summarized in Table III.

2.5 General computer communication networks

General computer communication needs can be classed in the following categories:

TABLE III
Summary of NALECOM traffic projection for 1983*
(best estimate)

Item	State-to-State: Message Volume-10^6/Year	State-to-State: Average Characters/Message	State-to-State: Average BPS	National: Message Volume 10^6/Year	National: Average Characters/Message	National: Average BPS	Total BPS (Averaged)
1. Current Projected (Includes MDT)							
Inquiries MDT	35.3	184	1,013	529.6	20	6,412	23 092
Responses MDT	39.3	377	3,670	520.8	85	11,240	[illegible]
Messages from non-MDT Terminals	7.7	225	557				
2. Criminal Histories (Case Hist...)							
CH - Inquiries	0	N/A		11.2	70	199	5 389
CH - "Hit" Responses	N/A	N/A		9.1	1 725	3,987	(16.1%)
CS - Inquiries	2.1	130	69	7.5	70	133	
CS - "Hit" Responses	2.1	650	340	3.4	390	337	
"No-Hit" Responses	N/A***	N/A		4.1	70	33	
Updates	N/A	N/A		3.9	216	616	
"Pointer Hit" Responses	N/A	N/A		2.1	70	37	
3. Fingerprints							
Booked Offenders				2.915	50 000 Bits	4,624	4 664
Latent Fingerprints				0.083	15 000 Bits	40	(13.4%)
4. Criminal Justice Planners							
CAIIS - Inquiries				0.060	70	1.06	63
- Responses				0.060	1 725	25.16	(0.2%)
NCJISDB - Inquiries				0.156	50	1.94	
- Responses				0.156	103	19.76	
NCJRS - Inquiries				0.052	50	0.68	
- Responses				0.052	1,000	13.16	
5. Criminal Intelligence Information							
Administration				0.165	200	8.4	11
Inquiries				0.074	60	0.4	(0.1%)
Responses				0.074	342	2.1	
Updates				0.01	1 000	0.1	
6. Crime Laboratories							
Facsimile	0.0075	300,000	595	0.0075	300 000	595	1 310
Bibliographic Data:							
Inquiries				0.1095	60	1.7	(3.8%)
Responses				0.1095	1 500	69.5	
Firearms Identifications							
Inquiries				0.1095	60	1.7	
Responses				0.1095	100	13.9	
Spectrographic Data:							
Inquiries				0.021	100	0.5	
Responses				0.021	730	3.6	
Administrative Response				0.3107	432	39.7	
Total BPS (Averaged)			6 144 (17.7%)			28 585 (82.3%)	34 729

*Uses for Courts, Prosecution and Corrections have been accounted for under the estimates for Computerized Criminal Histories, Criminal Justice [illegible] and Current Uses [illegible]
** See National [illegible] plus multistate offenders (Note: H refers to Criminal History and CS to Criminal Summary.)
***Applies [illegible]

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a) Time Sharing Networks, requiring two-way, real-time, non-dedicated, low-data-rate channels;

b) Remote job entry systems requiring two-way non-real-time non-dedicated low-data-rate channels;

c) Reservation and ticket service for airlines, ~~railroads,~~ hotels, etc., requiring two-way dedicated real-time low-data-rate channels;

d) Remote access to centralized credit bureau information (two-way dedicated real-time low-data-rate channels);

Time sharing networks in the United States are presently accessed primarily by means of switched telephone lines to local data centers, which are in turn connected to the computer center by dedicated terrestrial circuits. As the need for this service increases, more local centers will be established, and increased circuit requirements would make satellite service practicable. While an individual user channel is typically 4 KBits/sec or less, it is the usual practice to multiplex the signals at the local centers into a few high data rate channels between the local center and the main computer, the data rate and number of channels being proportional to the design volume of a particular center.

Channels used for remote job entry may be scheduled in one direction for data transmission to the center, and reversed in a subsequent period for transmission from the center.

Reservation and ticket service uses require continuously available low data rate channels between user facilities and a "concentrator" terminal. At the concentrator terminal signals would be multiplexed for transmission on a higher rate channel. Operation of the high data rate channels would be on a dedicated two-way basis.

The requirement for credit bureau information transfer is virtually identical to the above. A system satisfying U. S. needs would have sufficient capacity to handle 2000 50 KBits/sec circuits, and 100 10 MBits/sec circuits for higher rate users.

2.6 Emergency communications and disaster warning advisories

Emergency communications and disaster warning advisory by satellite communication was proposed in WARC 1971 Recommendation Spa 2-13. This Recommendation suggests that space radiocommunications systems could provide a more survivable method of achieving disaster and emergency communications than terrestrial systems

Emergency communications are envisioned to include:

a) Transmissions to emergency agencies (police, fire departments, Red Cross, Civil Defense, etc., and/or the general public) of weather forecasts and warnings of floods, tidal waves, and other calamities both natural and man-made;

b) Interconnection of disaster relief agencies.

Satellite transponders for emergency communications and disaster warning proposed for use in the United States would be designed to provide communications to fixed and mobile terrestrial units beyond the range of terrestrial transmission equipment. The need for such communication is generally local or regional in extent, the principal jurisdiction concerned being state governments. Thus a system configured for the United States would make use of multiple antenna beams designed to serve relatively small areas. It has been suggested that 27 one degree beams or alternatively 50 3/4 degree beams be employed to cover the 48 contiguous states.

The average state would employ two major earth stations, one hundred small fixed stations, and perhaps 1,000 mobile stations. Each major earth station would need about 10 audio and 10 data channels The portable fixed and mobile units would be single channel devices capable of selecting the frequency in use for the particular emergency.

2.7 Broadcasting services

Broadcasting service user needs which may be satisfied by satellite include the following:

a) Direct broadcasting of commercial and/or non-commercial TV and sound signals to home terminals and low power terrestrial redistribution devices;

b) Transmission of news information directly to home or community terminals;

c) Networking of terrestrial facilities associated with the above services.

Requirements for and characteristics of systems for this type of service are discussed in detail in other Reports of Study Groups 4, 10 and 11.

2.8 Securities and commodities exchange

In the United States there are two principal national stock exchanges, and regional exchanges are located in several major cities. In addition there is an increasing over-the-counter market handled by the broker members of the National Association of Securities Dealers (NASD).

In the agricultural sphere, the major commodities exchange is located in Chicago, Illinois. Other commodities exchanges are located in major cities where agricultural and meat processing facilities are located.

There is also a commodities market in metals and other mineral materials, with exchanges located in several major cities.

Users needs indicate requirements for one-way as well as two-way interactive service. The former would be concerned primarily with distribution of price information on near real time basis during the trading day. Additionally, continuous transmission of closing quotes during evening hours may be desirable.

The interactive service would be designed to permit both retrieval of latest quote, and the actual placing of orders on the exchange. This service would involve communication through regional transmission facilities. Subscribers would be interconnected to these facilities by terrestrial means. Each major transmission facility would be equipped with 100 transmit and receive channels each having 50 KBit/sec capacity.

2.9 Electronic publishing

The concept of electronic publishing includes:

a) Direct transmission of non-news publications to user facilities, including schools, community centers, libraries, etc., and ultimately individual users;

b) Remote operation of typesetting and printing equipment from central composing facilities.

Direct dissemination of non-news publications would typically involve an interactive form of operation in which the user places an order or subscription electronically and receives the publication either immediately or on a delayed basis. Service to regular subscribers would probably not be interactive. It is anticipated that the service would involve transmissions to subscribers from facilities serving a large region. Digital channels having rates lying between 50 kB/sec and 1 MBit/sec would be used.

For remote operation of printing equipment, material would originate in national or regional composing centers and be relayed in the form of digital signals to local printing equipment. The data rates required would be between 50 kBits/sec and 1 MBit/sec.

2.10 Common carrier and specialized common carrier

Public telephone, data and video service by satellite is already in operation in the United States, augmenting the terrestrial service. Three major types of user needs are being or will be served:

a) A two-way point-to-point service, augmenting the capacity of medium and long distance microwave service;

b) A two-way service to provide individual or community subscriber connection to the telephone system in regions where there is presently no service, and no economically feasible way of providing such service by terrestrial means (e.g., Alaska);

c) Data and video service on both a dedicated and switched basis.

These common carrier facilities may also be applicable to some of the requirements discussed in this Report but, as noted in the Introduction, categorization of the requirements by type of Service is beyond the scope of the Report.

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3. Summary

This Report has identified some major potential functional user requirements for satellite services in the United States of America. These requirements may be satisfied within the Broadcasting-Satellite Service, the Fixed-Satellite Service, or both.

The number of terrestrial terminal facilities which might be required on a time zone basis for the user needs described in this Report are summarized in Table IV (adapted from (1))

In this Table three types of earth terminal facilities are considered:

Type I - Central stations for transmitting audio, video and digital material,

Type II - Terminals which are primarily receiving in nature but are equipped with limited transmitting capabilities;

Type III - Receive only terminals.

TABLE IV. Terrestrial facility requirement

		HAWAII AND PACIFIC OCEAN			ALASKA			PACIFIC ZONE			MOUNTAIN ZONE			CENTRAL ZONE			E. ZONE		
	COVERAGE	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
ELEMENTARY & SECONDARY SCHOOLS	NATIONAL, STATE	1	20	-	1	300	-	5	700	1400	6	1500	-	16	4000	8000	23	1500	4000
HIGHER EDUCATION	NATIONAL, REGIONAL	4	-	-	4	10	-	275	-	-	100	100	-	1925	—	-	1000	-	-
HEALTH & MEDICAL	NATIONAL, REGIONAL	4	-	1	18	300	-	7	300	-	5	300	-	30	200	-	21	50	-
ELECTRONIC MAIL	NATIONAL	1	-	-	3	-	-	10	-	-	10	-	-	25	—	-	30	-	-
LAW ENFORCEMENT	NATIONAL	1	20	-	3	300	-	13	2000	-	20	2000	-	26	2000	-	33	2000	-
CENTRAL COMPUTER NETWORKS	NATIONAL	1	10	-	1	3	-	1	9	-	1	10	-	4	21	-	3	25	-
EMERGENCIES & DISASTER WARNING	NATIONAL	1	20	-	5	300	-	13	2000	-	20	3	-	26	2000	-	33	2000	-
COMMERCIAL BROADCASTING	NATIONAL, REGIONAL	-	1	8	4	6	100	8	4	30	5	8	30	8	12	30	6	23	43
PUBLIC BROADCASTING	NATIONAL, REGIONAL	-	1	8	1	1	300	1	1	100	1	-	3000	1	5	400	1	2000	400
EARTH FILES & DATA EXCHANGE	NATIONAL	1	-	-	1	-	-	10	-	-	10	-	-	23	-	-	30	6	-
ELECTRONIC PUBLISHING	NATIONAL	1	-	3	3	-	300	2	-	100	6	-	3000	2	-	400	2	3	400
PUBLIC TELEPHONE & TELEGRAPH	NATIONAL	1	6	-	-	100	-	3	-	-	8	30	-	9	-	-	13	-	-

Tables V, VI and VII contain a summary of the channel capacity requirements for Types I, II and III earth terminals respectively.

The frequency bands within which these requirements might be satisfied will depend on operational considerations such as service availability, signal quality, required bandwidth, and the impact of PFD limits.

TABLE V. Channel requirements - Type I stations (central organization facilities)

		VIDEO			AUDIO			DIGITAL			
EDUCATIONAL SERVICES	COVERAGE	NO TRANS	NO RCV	S/N	NO TR	NO RCV	S/N	NO TR	NO RCV	BIT RATE	S/N RATIO
ELEMENTARY & SECONDARY SCHOOLS	NATIONAL STATE	4	4	50	10	1200	50	30	2	300K	60
HIGHER EDUCATION	NATIONAL REGIONAL	3	10	50	30	30	50 15K	3	3	[illegible]	60
HEALTH & MEDICAL SERVICES	NATIONAL REGIONAL	5	15	50	—	—	—	10	15	10K	30
ELECTRONIC MAIL	NATIONAL	—	—	—	—	—	—	1K	1K	50K	30
LAW ENFORCEMENT	NATIONAL	4	4	50	10	10	50	10	10	60K	30
GENERAL COMPUTER NETWORKS	NATIONAL	—	—	—	—	—	—	2K 300	2K 300	50K 10M	60 60
EMERGENCY & DISASTER WARNING	NATIONAL	—	—	—	10	10	50	10	10	60K	30
COMMERCIAL BROADCASTING	NATIONAL REGIONAL	10	40	60	30	30	50	—	—	—	—
PUBLIC BROADCASTING	NATIONAL REGIONAL	5	10	60	30	30	50	1	1	10K	30
SECURITIES & COMMODITIES EXCHANGE	NATIONAL	—	—	—	—	—	—	100	100	[illegible]	30
ELECTRONIC PUBLISHING	NATIONAL	—	—	—	—	—	—	1	1	100K 1M	30
PUBLIC TELEPHONE & TELEGRAPH	NATIONAL	30	30	60	10K	10K	50	40	40	6M	30

TABLE VI. Channel requirements - Type II stations (interactive facilities)

EDUCATIONAL SERVICES	COVERAGE	VIDEO NC TRANS	VIDEO NC RCV	VIDEO S/N	AUDIO NC TR	AUDIO NC RCV	AUDIO S/N	DIGITAL NC TR	DIGITAL NC RCV	DIGITAL BIT RATE	DIGITAL S/N RATIO
ELEMENTARY & SECONDARY SCHOOLS	NATIONAL, STATE	—	4	50	2	—	50	—	1	300K	40
HIGHER EDUCATION	NATIONAL, REGIONAL	—	10	50	2	30	50	—	1	300K	40
HEALTH & MEDICAL SERVICES	NATIONAL, REGIONAL	1	5	50	—	—	—	1	1	10K	30
ELECTRONIC MAIL	NATIONAL	—	—	—	—	—	—	—	—	—	—
LAW ENFORCEMENT	NATIONAL	1	1	50	3	3	50	2	2	10K	30
GENERAL COMPUTER NETWORKS	NATIONAL	—	—	—	—	—	—	100	100	60K	35
EMERGENCY & DISASTER WARNING	NATIONAL	—	—	—	1	1	40	1	1	2K	35
COMMERCIAL BROADCASTING	NATIONAL, REGIONAL	2	40	60	2	30	50	—	—	—	—
PUBLIC BROADCASTING	NATIONAL, REGIONAL	1	10	60	2	20	50	1	1	10K	30
SECURITIES & COMMODITIES EXCHANGE	NATIONAL	—	—	—	—	—	—	—	—	—	—
ELECTRONIC PUBLISHING	NATIONAL	—	—	—	—	—	—	1	1	2K	40
PUBLIC TELEPHONE & TELEGRAPH	NATIONAL	3	20	50	100	100	50	100	100	30K	50

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TABLE VII. Channel requirements - Type III stations (receive only)

EDUCATIONAL SERVICES	COVERAGE	VIDEO NC RCV	VIDEO S/N	AUDIO NC RCV	AUDIO S/N	DIGITAL NC RCV	DIGITAL BIT RATE	DIGITAL S/N
ELEMENTARY & SECONDARY SCHOOLS	NATIONAL, STATE	4	50	4	50	1	300K	40
HIGHER EDUCATION	NATIONAL, REGIONAL	—	—	—	—	—	—	—
HEALTH & MEDICAL SERVICES	NATIONAL, REGIONAL	—	—	—	—	—	—	—
ELECTRONIC MAIL	NATIONAL	—	—	—	—	—	—	—
LAW ENFORCEMENT	NATIONAL	—	—	—	—	—	—	—
GENERAL COMPUTER NETWORKS	NATIONAL	—	—	—	—	—	—	—
COMMERCIAL BROADCASTING	NATIONAL, REGIONAL	40	40	30	50	—	—	—
PUBLIC BROADCASTING	NATIONAL, REGIONAL	10	50	30	50	1	10K	30K
SECURITIES & COMMODITIES EXCHANGE	NATIONAL	—	—	—	—	—	—	—
ELECTRONIC PUBLISHING	NATIONAL	—	—	—	—	—	—	—
PUBLIC TELEPHONE & TELEGRAPH	NATIONAL	—	—	—	—	—	—	—
EMERGENCY & DISASTER WARNING	NATIONAL	—	—	—	—	—	—	—

*Possible distribution to homes by cable or public broadcast

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ANNEX I

SATELLITE USER EXPERIMENTS

The following subsections are devoted to a brief discussion of the user oriented experiments presently supported by the ATS-6 spacecraft and those to be supported by the CTS spacecraft planned for launch in early 1976.

Applications Technology Satellites (ATS)-6

The ATS-6 spacecraft is to date the most powerful and versatile communications satellite in orbit. Differing from early space flight philosophy, the ATS-6 reflects a desire to simplify and lower the cost of the earth stations. The communications experiments being flown on ATS-6 are presented in Table I.

Communications Technology Satellite (CTS)

The objective of the CTS is to advance the state-of-the-art in spacecraft and related earth station technology for use in future educational broadcasting systems and remote area transmissions employing high levels of e.i.r.p., the CTS will make possible television reception and two-way voice communication with the use of small, low-cost earth stations.

Experiments in the areas of education, helath care, community and special services, and technology extension will be

TABLE I

APPLICABLE ATS-6 EXPERIMENTS

EXPERIMENT	MAJOR OBJECTIVES
Health, Education, Telecommunications (HET)	To evaluate a system that will permit relay of television programs through the satellite to facilities such as schools, CATV systems, and clinics
Satellite Instruction Television Experiment (SITE)	To demonstrate relay by geosynchronous satellite of CCIR quality television from a high-powered program transmitting station to small modified standard TV receivers located throughout rural India and to urban rebroadcast stations.
Television Relay Using Small Terminals (TRUST)	To advance state-of-the-art in space communications by demonstrating CCIR quality wideband signaling between ATS-6 and inexpensive ground stations.
Millimeter Wave (MMW) (20 & 30 GHz)	Investigation of atmospheric propagation at MMW frequencies. Feasibility of the application of MMW communications.
Propagation (13 and 18 GHz)	Collect data on attenuation due to precipitation. Determine power margins needed in spacecraft communications systems

aboard the CTS. A brief description of each experiment is presented in the following paragraphs:

- College Curriculum Sharing. This experiment is designed to expand the scope of curriculum by sharing classes among universities and countries. It will demonstrate digital video compression techniques for bandwidth and power reduction.

- Appalachian Educational Satellite Project II. The objective of this project is to strengthen the teaching system in Appalachia by improving teaching skills and increasing the information available to the students. The project will also allow for graduate courses and credit for the teachers.

- Health, Education, Television. This experiment is designed to make available both live and pre-taped continuing health education programs for the use of health care facilities, no matter how remote.

- Project Interchange. This project will serve teachers in scattered parts of the country. It will involve the continuing exchange of materials and teaching techniques related to computer aided instruction.

- Satellite User Network (SUN). This experiment will investigate a telecommunications system requiring little human support. It will also provide data on counseling, job preparation, employment, and career development.

Health Care Experiments

- Health Communications. This experiment will conduct biomedical, clinical and continuing medical experiments among the 30 participating hospitals.

- Biomedical Communications. The purpose of this experiment is to promote the distribution of information between research institutions and the medical community. The experiment will also evaluate broadband teleconference to support continuing education among health care professionals.

- Communications Support for Decentralized Education. This experiment will define methods to improve techniques for administration and teaching, as well as procedures for decentralized medical education.

Community and Special Services

- Satellite Library Information Network (SALINET). The objective of this experiment is to improve the capabilities of both individuals and organizations to assess and disseminate information.

- American Forces Radio and Television Wideband Direct User. This project will develop techniques for the transmission of worldwide special services programs. It will also experiment in converting analog information to digital for wideband transmission of time-compressed audio at video format speeds.

  Communications in Lieu of Transportation. The purpose of this experiment is to establish whether or not an organization, dispersed over a large area, can substitute audio and video communication for travel.

- Communication Link Characterization. The objective of the experiment is to measure and characterize the radio frequency links of the SHF transponder on the CTS with respect to natural and man-made components, for example, rain and interference. The experiment will also evaluate signal attenuation and degradation due to the absorption and scattering caused by precipitation.

- Highly Transportable Emergency Earth Terminal Demonstration. This experiment will benefit local fire department, civil defense units and rescue squads. A highly portable, self-contained earth terminal would be used to demonstrate quick reaction emergency communications via satellite to and from areas isolated by disaster.

Rev. 1

DRAFT

Report of Task Force B
Broadcasting Service Group on Satellite Broadcasting (BSG/SAT)
"Functional User Requirements"

April 23, 1976

DRAFT

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Report of Task Force B
Broadcasting Service Group on Satellite Broadcasting (BSG/SAT)
"Functional User Requirements"

Introduction

This report has been developed to present existing and projected user requirements for the general time frame 1979-2000 in the Broadcasting Satellite Service (BSS) as developed by TFB Task Force B, chaired by Frank W Norwood JCET/PSSC was established October 21, 1975; membership is listed in appendix A. The task force has met four times. Dates of the meetings are listed in appendix B. The principal objective of this report is to present estimates of functional user requirements and logical projections there from in the context of existing allocations and proposed new allocations.

Section A - Scope

This report is principally directed at US requirements. Estimated requirements are based largely on published requirement studies and experiment reports. There has been no attempt to generate an independent requirements assessment except that in Section B substantial demographic evidence is produced to indicate that in one-half of the states, substantial populations live in geographical configurations which are likely to benefit from use of BSS. At least two market surveys are in process; however no results of comprehensive market surveys as they pertain to BSS are known to exist. This report will provide information on the status of the two known market surveys and will incorporate as addenda any specific results which emerge before final submission. Requirements considered fall largely into the Community Reception mode of BSS for specialized audiences. Since the US has a fully developed general broadcasting system,* requirements for this type of BSS are considered only peripherally, particularly as they pertain to the Public Broadcasting Service and National Public Radio Special purpose direct-to-home satellite transmissions are considered a probable future development, but quantitative needs

*Entertainment, news, etc.

are not assessable at this time. Lastly, while this report is principally directed at US requirements, the orbit-spectrum capacity for all of Region 2 is important in determining ability to meet the projected requirements expressed requirements projections of non-US Region 2 countries known to exist are as a consequence, incorporated in this report

It should be understood that this report presents a class of requirements generally related to the use of communications satellites for delivery of health care, assistance in primary, secondary and adult education and other related social services It is considered that all, or some important elements of these requirements fall within the BSS However, no effort has been made to determine that all the requirements discussed uniquely meet all service definitions of BSS; emphasis is on the requirement not the allocations.

Section B - General Population & Resources

The fundamental assumption of this report is that, in the US, certain communication satellite services are more applicable to thinly populated areas because

- -- Concentrations of services develop in densely populated areas.
- -- Concentrations of communications accompany the concentrations of services.
- -- Large scale demand is the driving force in development of such concentrations
- -- Satisfaction of the demand is economically practicable by terrestrial means where large scale demand exists in concentrated form
- -- Thinly populated areas do not normally develop large scale demand
- -- Concentrations of services and associated communications do not normally occur in thinly populated areas
- -- Substitutes may be required in thinly populated areas for services which are readily available in urbanized areas

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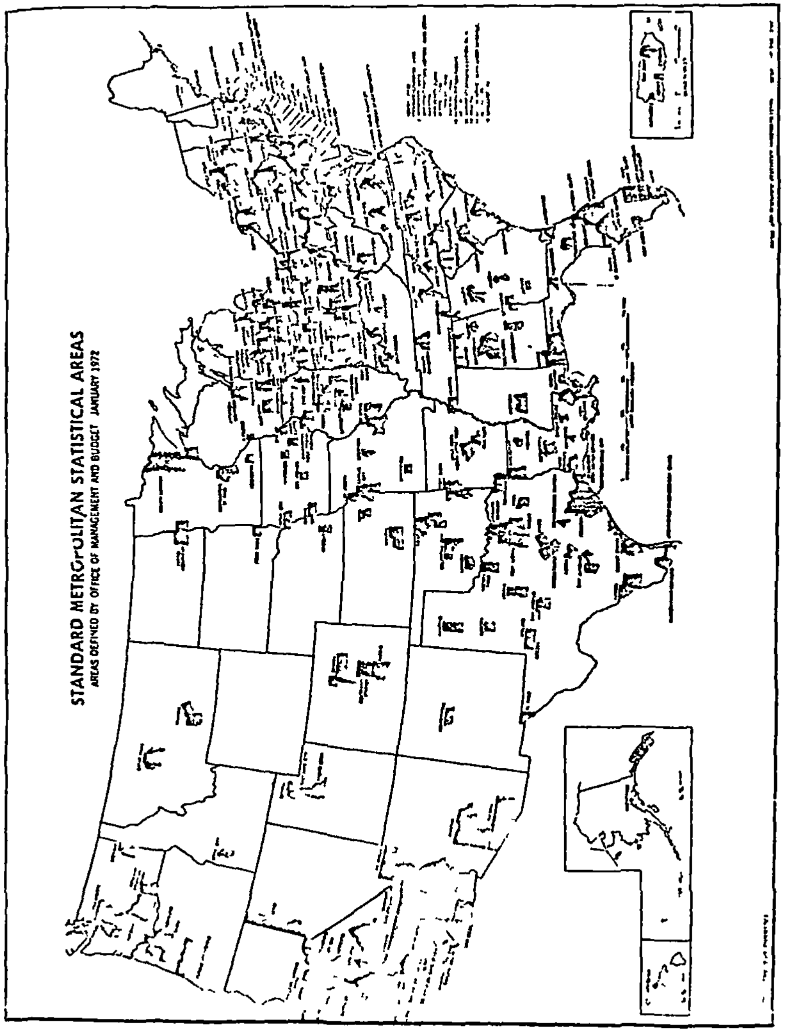

Figure 1

-- Communications satellites are particularly effective in delivering services to a large area, whereas terrestrial techniques are more effective in delivery services to points or small areas
-- Communications satellites are likely to be more effective in delivery of services to large, thinly populated areas than are terrestrial techniques, they may be able to supplement terrestrial techniques in densely populated areas, by providing in them more services already being provided to thinly populated areas

US Thinly Populated Areas

The criterion used in this report in identifying thinly populated areas in the US is to determine the area in each state per Standard Metropolitan Statistical Area (SMSA) Figure 1 shows the SMSA's in the US For example, Oregon has an area of 96,000 square miles, has three SMSA's and, therefore has 32,000 square miles per SMSA Table 1 following lists the fifty states with Area/SMSA based on 1974 Census Bureau estimates The table also shows

Number of SMSA's
Order among states in Area/SMSA
Population outside SMSA's
Percentage of total population outside SMSA's
Land area outside of SMSA's
Percentage of total land area outside SMSA's

Table 1

State	No of SMSA's	Area per SMSA's	Order	Population Outside SMSA	% *	Area Outside	%
Alabama	8	6,451	35	1,456,000	47.7	41,412	80 2
Alaska	1	586,412	3	205,000	62 5	585,485	99 84
Arizona	2	56,904	9	738,700	62 5	95,414	83 8
Arkansas	4	13,277	23	1,340,100	69 1	46,405	87 4
California	16	9,816	26	2,172,000	7 3	88,406	55 7
Colorado	3	34,749	14	842,300	28 3	96,025	92 1
Connecticut	9	889	50	705,400	17 4	3,247	64 8
Delaware	1	2,057	46	76,507	29.6	892	43 4
Florida	12	4,880	42	2,937,400	31 4	44,648	76 2
Georgia	6	9,812	27	2,643 500	50 3	53,231	90 4
Hawaii	1	6,450	36	207,820	18 1	5,851	90 7

State	No of SMSA's	Area per SMSA's	Order	Population Outside SMSA	%	Area Outside	%
Idaho	1	83,557	5	657,770	84 2	82,514	98.7
Illinois	7	8,057	30	3,079,300	19 9	46,446	82.4
Indiana	7	5,613	38	2,332,100	38 1	27,681	76.3
Iowa	6	9,381	28	1,725,000	65 4	50,985	90.6
Kansas	2	41,100	12	1,809,000	57 7	79,270	96.36
Kentucky	3	13,465	22	2,128,400	60.0	38,745	95.91
Louisiana	7	6,931	34	1,505,700	45 2	41,005	84.5
Maine	2	16,600	19	785,450	78.4	32,855	98.9
Maryland	2	5,288	41	799,330	15.7	7,137	67.47
Massachusetts	7	1,179	48	1,499,400	15.3	5,650	68 4
Michigan	11	5,292	40	1,814,000	23 3	47,309	81.3
Minnesota	3	28,022	16	1,713,200	43.1	80,704	95 9
Mississippi	2	23,858	17	1,862,200	82 3	45,480	95 3
Missouri	5	13,937	20	727,600	35 9	61,215	87.8
Montana	2	73,569	7	551,830	75.6	141,830	96.4
Nebraska	2	38,638	13	833,890	57 2	74,895	96 9
Nevada	2	55,270	10	153,650	19.3	96 300	97 1
New Hampshire	2	4,652	43	572,210	73.0	9,104	97.8
New Jersey	8	979	49	2,593,330	23.1	4,577	58.4
New Mexico	1	121,666	4	772,740	68.9	120,490	99.0
New York	9	5,508	39	1,269,000	13 5	32,537	65.6
North Carolina	7	7,512	32	2,996,500	62 7	44,876	85.3
North Dakota	1	70,665	8	519,760	88.1	67,871	96 0
Ohio	14	2,944	45	1,865,800	22.3	27,084	65.7
Oklahoma	3	23,306	18	1,363,200	49.9	62,930	90.0
Oregon	3	32,327	15	715,900	38 8	86,874	89.6
Pennsylvania	12	3,777	44	1,336,000	20 6	27,109	59.8
Rhode Island	1	1,214	47	67,442	15 3	534	43.9
South Carolina	3	10,351	25	1,593,800	60 7	26,257	84.5
South Dakota	1	77,047	6	590,000	85.7	76,234	98.9
Tennessee	6	7,040	33	1,453,400	51.1	34,532	81.7
Texas	22	12,151	24	3,517,800	26.5	229,010	85.7
Utah	2	42,458	11	313,680	22.4	81,841	96 4
Vermont	--	∞(9,609)	2	464,000	100 0	9,609	100.0
Virginia	5	8,163	29	2,381,000	38.8	36,357	89 1
Washington	5	13,638	21	1,070,300	34.0	55,002	80.7
West Virginia	4	6,045	37	919,090	68.7	19,918	82 4
Wisconsin	7	8,022	31	2,070,700	42 4	50,512	89.9
Wyoming	--	∞(97,914)	1	353,000	100 0	97,914	100.0
				52,172,000	24.95**		

*70 Census value
**74 US Census Bureau estimates

Data in Table 1 is developed from World Almanack and book of facts 1975

Almost exactly one fourth of the total population of the states lies outside of any SMSA. However, a substantial portion of this population is located in states which are highly urbanized, and in which it is likely that no area will be far from a SMSA. For this reason a somewhat arbitrary criterion is established in making a determination as to states which should be considered as "thinly populated." This criterion is that the Area/SMSA should exceed 10,000 square miles. In a perfectly regular square distribution elements of the area outside of the SMSA would be as far as seventy miles away from the center of the SMSA and fifty miles away from the edge and the average element about thirty-five miles from the center and fifteen from the edge. These are line-of-sight distances; associated road distances could be expected to be as much as 1.4 times greater. It is assumed that these distances are too great to be negotiated as a daily routine and represent potential problem areas in delivery of emergency services. These are twenty-five states with areas of 10,000 or more for each SMSA, and it is from among these states that it is necessary to look for most of the thinly populated areas. These states are listed in Table 2.

Table 2

Region	State	No. of SMSA's	Area/SMSA	Population Outside of SMSA's	Total Population
M 1.	Wyoming	0	∞(97,914)	353,000	353,000
NE 2	Vermont	0	∞(9,609)	464,000	464,000
P 3	Alaska	1	586,412	205,500	330,000
M 4	New Mexico	1	121,666	772,740	1,106,000
M 5.	Idaho	1	83,557	657,770	770,000
WNC 6	South Dakota	1	77,047	590,000	685,000
M 7.	Montana	2	73,569	551,830	721,000
WNC 8	North Dakota	1	70,665	519,760	640,000
M 9	Arizona	2	56,904	738,700	2,058,000
M 10	Nevada	2	55,270	153 650	548,000
M 11	Utah	2	42,458	313,680	1,157,000
WNC 12	Kansas	2	41,100	1,809,000	2,279,000
WNC 13	Nebraska	2	38,638	833,890	1,542,000
M 14	Colorado	3	34,749	842,300	2,437,000
P 15	Oregon	3	32,327	715,900	2,225,000
WNC 16	Minnesota	3	28,022	1,713 200	3,8[illegible]7,000
ESC 17	Mississippi	2	23,850	1,862 200	2,28[illegible],000
[illegible] 18	Oklahoma	3	[illegible]3,306	1,363 200	2,6[illegible]3,000

Region	State	No of SMSA's	Area/SMSA	Population Outside of SMSA's	Total Population
NE 19.	Maine	2	16,600	785,450	1,028,000
WNC 20	Missouri	5	13,937	727,600	4,757,000
P 21	Washington	5	13,638	1,070,300	3,429,000
ESC 22	Kentucky	3	13,465	2,128,400	3,342,000
WSC 23	Arkansas	4	13,277	1,340,100	2,037,000
WSC 24	Texas	22	12,151	3,517,800	11,794,000
SA 25	South Carolina	3	10,351	1,593,800	2,726,000
			Total	25,623,000	55,269,000

Reviewing the totals, it can be seen that the twenty-five states with Area/SMSA equal to 10,000 square miles or more contain slightly more than one-fourth of the total US population. A little less than one-half of the population of these states (and, therefore about one-eighth of the national population) lives outside of SMSA's. This represents one-half the total population living outside of SMSA's. However, the total area (outside of SMSA's) for the selected states is 2,471,100 square miles out of a total of 3,222,100 square miles; the average population density outside of SMSA's in the selected states is one-third of that in the other twenty-five.

The grouping by regions is interesting. All of the mountain states fall into the selected twenty-five, as do all of the Pacific states except California (which at 9816 square miles/SMSA misses only slightly the 10,000 criterion). All of the West North Central states qualify except Iowa, which is close to qualifying at 9,381 square miles per SMSA. All of the West South Central states are included except Louisiana. The two least populous New England states qualify, two out of four East South Central states, and a single South Atlantic state (although Georgia, North Carolina and Virginia are close to qualifying). No state in the Middle Atlantic and East North Central groups (the most densely populated) fall under the criterion. Thus it appears that the twenty-five states selected are in fact representative of the "thinly populated" section of the US and are the most appropriate for concentrated study in identifying potential requirements for broadcasting satellites. Total personal income in the selected states is $313 billion per year (extrapolated from 1973 data). While this is below the per capita average for the nation as a whole, it indicates that substantial income exists in the states most likely to benefit from satellite broadcasting, and that as benefits are identified resources exist to develop them.

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Table 3 shows the distribution of doctors, hospitals and hospital beds in the selected twenty-five Also shown are the percentages of the fifty state total It is interesting to note that almost one-half of the federal hospitals and almost one-third of the federal doctors are located in the selected twenty-five states While almost one-third of the non-federal hospitals are located in the selected states, they have less than one-fourth of the doctors and hospital beds indicating that hospitals are smaller on the average, than in the other twenty-five, and that doctors and hospital beds are proportionately less available. The proportionately large number of hospitals likely reflects an attempt to increase the geographical density of hospitals at the cost of potentially inefficiently small installations Table 4 shows the distribution within the selected twenty-five states of hospitals and beds within and outside of SMSA and a comparison to the total US While the number of hospitals within SMSA's in the selected twenty-five is 24%, proportional to the ratio of the total population, more than 50% of the hospitals outside SMSA's are located in the selected twenty-five states The density for non-federal hospitals in square miles/hospital is 1004 for the selected twenty-five while the density in the other twenty-five is 175 or a factor of six larger Further, it is obvious that in the selected twenty-five states hospitals are smaller within and outside SMSA's than the US average Density in square miles per non-federal doctor is 40 in the selected twenty-five and 3.3 in the other twenty-five, a factor of 12 larger In the individual states densities may be even less, in Alaska, for example, the number of square miles per non-federal doctor is 1855 7

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Table 3

	State	Active Doctors* Fed	Active Doctors* Non-Fed	Hospitals** Fed.	Hospitals** Non-Fed	Beds in Hospitals** Fed	Beds in Hospitals** Non-Fed
1	Wyoming	37	316	3	28	611	2,174
2	Vermont	34	770	1	20	200	4,020
3	Alaska	127	226	10	16	761	917
4	New Mexico	255	1,130	12	46	1,133	5,343
5	Idaho	54	655	2	50	212	3,579
6	South Dakota	94	504	10	53	1,314	4,816
7	Montana	65	713	6	60	391	3,932
8.	North Dakota	78	557	5	57	421	5,356
9	Arizona	455	2,440	18	60	1,725	8,913
10.	Nevada	51	527	4	20	269	2,984

	State	Active Doctors* Fed	Active Doctors* Non-Fed	Hospitals** Fed	Hospitals** Non-Fed	Beds in Hospitals** Fed	Beds in Hospitals** Non-Fed
11	Utah	121	1,479	3	35	618	4,210
12	Kansas	304	2,484	8	155	2,297	16,548
13	Nebraska	138	1,642	5	101	1,048	10,413
14.	Colorado	562	3,729	6	91	2,305	12,269
15	Oregon	139	2,941	2	84	961	11,202
16	Minnesota	410	5,540	5	188	1,998	31,234
17	Mississippi	242	1,744	5	107	1,810	15,211
18	Oklahoma	308	2,478	12	133	1,460	16,329
19	Maine	83	1,050	2	50	889	7,155
20	Missouri	362	5,839	8	149	3,439	33,545
21	Washington	619	4,763	11	118	3,154	14,326
22	Kentucky	301	3,205	6	126	2,730	17,662
23	Arkansas	180	1,698	4	91	2,054	9,081
24	Texas	2,015	12,768	28	538	8,673	68,729
25	South Carolina	358	2,312	7	85	2,059	17,579
	*1971 Total	7,030	61,510	183	2,461	42,542	327,460
	**1973	31 5%	21 2%	46 5%	36 6%	29.9%	23.5%

Table 4

No of Hospitals, Beds Source: AHA Hospital Stat 1974

	SMSA Hospitals	SMSA Beds	Non SMSA Hospitals	Non SMSA Beds
Wyoming	0	0	27	1,674
Vermont	0	0	17	2,225
Alaska	7	2,190	8	1,443
New Mexico	6	1,264	33	2,195
Idaho	3	479	44	2,677
South Dakota	3	617	48	2,836
Montana	4	946	55	2,816
North Dakota	3	652	51	3,470
Arizona	29	6,162	28	1,602
Nevada	10	1,934	9	466
Utah	14	2,916	18	714
Kansas	16	4,584	125	7,590
Nebraska	15	4,510	80	4,390

	SMSA		Non SMSA	
	Hospitals	Beds	Hospitals	Beds
Colorado	25	6,967	52	2,769
Oregon	27	5,259	47	3,330
Minnesota	57	14,959	117	2,876
Mississippi	10	1,895	91	7,848
Oklahoma	39	5,978	80	5,222
Maine	5	1,208	40	3,152
Missouri	61	17,194	71	6,198
Washington	54	8,328	52	3,177
Kentucky	32	7,461	77	6,452
Arkansas	23	3,945	67	4,582
Texas	242	39,167	251	12,561
South Carolina	25	4,727	48	5,546
Total	682	143,340	1,536	102,810
Total US	2,850	656,115	2,939	241,715
%	23.9%	21.8%	52.3%	42.5%

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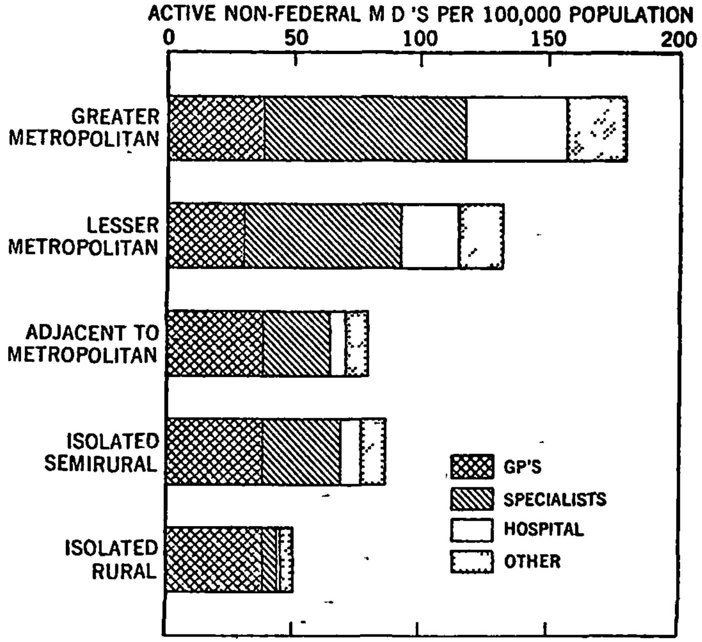
While somewhat outdated, figure 2 shows that the number of GP's is approximately constant as a percentage of the total population regardless of geographical location (although the density factors previously referred to would obviously apply). It also shows that specialists accumulate in SMSA's, therefore the geographical density of specialists is greatly reduced in states where there are large areas per SMSA.

Community hospitals make up more than 70% of all hospitals in the US. Figure 3 shows the distribution by size of all community hospitals. Figure 4 shows the distribution of selected facilities and services at community hospitals. The reduction in facilities with smaller hospital size is obvious Since there is a disproportionately large number of small hospitals in the selected twenty-five states, they provide an obvious area of study for technological means--such as communications --to substitute for certain missing facilities.

If the effects of reduced density of medical service availability is to reduce the quality, which appears to be the case, the then alternative means of improving medical service and health care need to be considered An obvious one is to use improved communications (in place of travel or residence) to provide improved specialist consultation, Doctor-patient consultation, and in-service training These techniques have been proposed and experiments

Figure Urban-rural[1] differences in physician supply, 1962



[1] Counties within standard metropolitan statistical areas, as defined by the Bureau of the Budget, are here classified as greater metropolitan (if they are part of a SMSA of 1 million or more population) or lesser metropolitan (SMSA population of 50,000 to 1 million) Adjacent counties are counties that are not themselves metropolitan but are contiguous to metropolitan counties All other counties are classified as isolated, semirural counties contain an incorporated place of 2,5000 or more population, rural counties do not

Source Health Manpower Source Book, Section 18 U S Department of Health, Education, and Welfare Public Health Service, Washington D C

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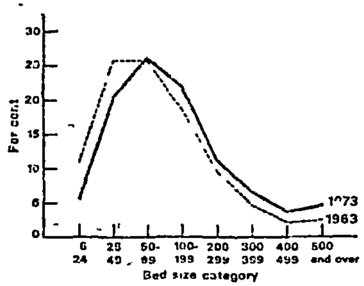

Figure 2—Percentage Distribution of Community Hospitals by Bed-Size Category, 1963 and 1973

Figure 3

Figure 3—Per Cent of Community Hospitals with Selected Facilities and Services 1948 1963, and 1973

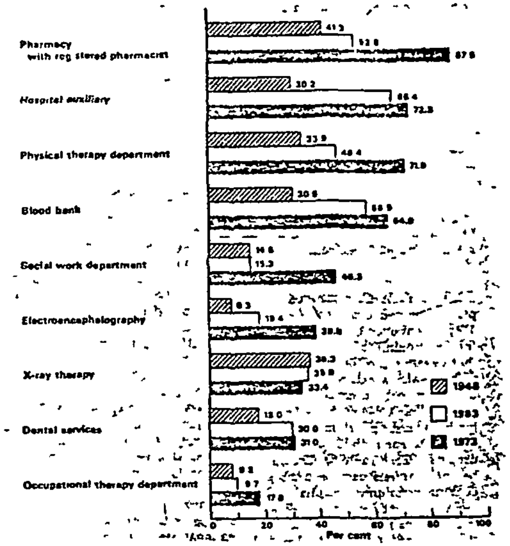

Figure 4—Per Cent of Community Hospitals Reporting Selected Facilities and Services, by Bed Size Category, 1973

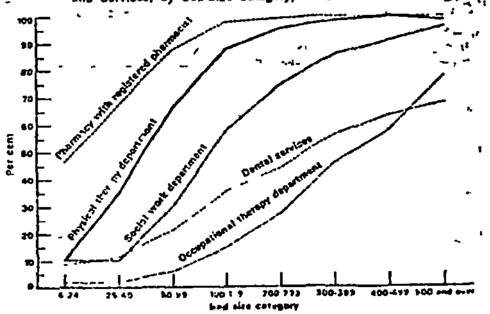

Figure 4

	State	No. of Systems	>25000	(25000>10000	(10000>5000	(5000>2500	(2500>1000	(1000>600	(600>300	(300
1.	Wyoming	60	0	2	0	7	15	6	12	18
2.	Vermont	245	0	0	1	5	21	22	46	150
3.	Alaska	32	1	1	1	3	3	2	6	15
4.	New Mexico	88	1	4	6	16	13	15	12	21
5.	Idaho	115	0	2	7	11	23	22	20	30
6.	South Dakota	220	0	2	1	8	22	35	65	87
7.	Montana	650	0	2	2	9	15	18	51	553
8.	North Dakota	336	0	2	2	4	9	25	65	229
9.	Arizona	276	3	8	13	16	49	34	45	108
10.	Nevada	17	2	0	1	3	5	3	0	3
11.	Utah	40	4	4	5	8	8	5	4	2
12.	Kansas	309	3	1	7	20	58	84	86	50
13.	Nebraska	1,281	2	1	5	9	25	39	111	1,089
14.	Colorado	181	4	10	6	14	34	19	36	58
15.	Oregon	338	1	4	14	28	46	35	43	167
16.	Minnesota	438	4	11	23	33	108	96	121	42
17.	Mississippi	150	1	4	17	57	63	7	1	0
18.	Oklahoma	637	2	4	8	20	58	84	86	50
19.	Maine	230	0	1	4	16	67	14	31	97
20.	Missouri	576	3	14	21	30	110	97	119	182
21.	Washington	314	5	12	23	32	51	45	50	96
22.	Kentucky	188	3	3	24	55	69	16	15	3
23.	Arkansas	383	1	3	11	20	68	68	115	97
24.	Texas	1,120	16	34	41	94	207	153	227	348
25.	South Carolina	93	3	13	21	20	31	3	2	0
	Total*	8,229	59	142	264	538	1,170	878	1,369	3,495
	US Total*	16,338	186	562	1,146	2,025	3,482	1,898	2,316	4,723
	% of US Total	50.3	31.7	25.3	23.0	26.6	33.6	46.3	59 1	74.0
	Total $ **		2.72B							
	US Total $ **		12.5B							
	% of US Total		21.7							

Table 6

No. of School Systems

Source: US Census Bureau 1972 Census of Government

State	Inside SMSA	Outside SMSA (1972)
Wyoming	0	70
Vermont	0	272
Alaska	1	28
New Mexico	1	88
Idaho	3	114
South Dakota	7	221
Montana	34	518
North Dakota	18	369
Arizona	74	167
Nevada	2	15
Utah	10	30
Kansas	40	291
Nebraska	45	1,158*
Colorado	36	151
Oregon	118	235
Minnesota	70	377
Mississippi	10	152
Oklahoma	129	528
Maine	12	269
Missouri	128	508
Washington	65	48
Kentucky	26	165
Arkansas	42	346
Texas	384	792
South Carolina	74	228
	1,189	6,784
National Total	5,284	11,757
% of Total	22.5%	56%

* 53 districts operate consolidated schools with other districts and 3 have no students; 826 represent one-room schools.

conducted leading to the view that in fact improved communications can help make up for deficiencies due to reduced density of medical service These are described in a later section of the report.

Review of the public school system indicates a situation similar to that in medicine. The school system tends to be small in the selected twenty-five states. Table 5 shows the number of school systems in each state of the selected twenty-five, the distribution by size, and the percentage of the national total by size.

It is particularly noticeable that although the selected twenty-five states have only 25% of the total US population. They have almost 50% of the school systems with between 1,000 and 2,500 students, 60% of the school systems with less than 300 to 600 students and 74% of the school systems with less than 300 students. Figure 5 shows the US distribution of school systems and school enrollment by size. The small percentage of the total enrollment in the smaller systems is very apparent. The large incidence of these small systems in the selected twenty-five states is a clear indication of the thinly populated character of these states.

Distribution within the selected twenty-five states within and outside of SMSA's is shown in Table 6 As is the case with hospitals, the schools in the SMSA's within the selected twenty-five states represent a percentage of the US total which is roughly the same as the percentage of the population to the total US population. Outside of the SMSA's the percentage is approximately 50% indicating that in areas outside SMSA's the states in the selected twenty-five have about the same number of schools as the states in the other twenty-five; however, since the selected twenty-five states have approximately three times the area of the other twenty-five, density is proportionately reduced.

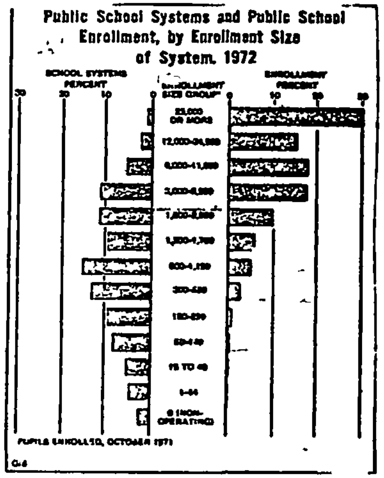

Figure 5

Section C - Presentation of Requirement
Study & Experiment Results

There have been numerous studies of potential requirements of BSS and reports of the results of these studies have been issued. Experiments in use of BSS have been conducted using the ATS-6 satellite and reports of results have been published Experiments on use of BSS are in process using the CTS satellite and reports have been published describing each experiment A partial listing of these reports is included in the references Since projections of the likely technology of BSS (particularly earth station sensitivity) have changed somewhat in the last four or five years, the requirements studies which are specifically considered here are limited to those published in 1970 and later

BSS requirements studies have produced two types of output. In the most common type, specific applications of BSS are examined and their usefulness assessed in subjective terms but without numerical projections as to number of subscribers, total operating hours per day, channel requirements, and geographical distribution of channels; further ~~Other~~ studies have resulted in specific numerical projections Frequently, results specifying numerical projections are based on assessment of and consolidation of subjective evaluations These kinds of reports will be presented separately Frequently, reports stemming from BSS requirements studies have been published together in proceedings of seminars, conferences and the like It is important to observe the distinction (pointed out in Howard Hupe's paper of October 1974 in Educational Technology) between the distribution system and the learning system (or health care, or information system) of which it is a part, the ability of telecommunications to improve these systems can be studied separately and apart from the specific distribution system The characteristics of the distribution system (particularly cost and coverage) will establish practical configurations of telecommunications within the learning (or health care etc) system Characteristics of the distribution system will be established by the characteristics of the learning (etc) system and by the characteristics of the environment which are likely to be the principal factors influencing choice of a particular type of system As stated in Section B, half of the states of the US have characteristics which are favorable for the use of BSS

In addition to the studies of BSS requirements, there have been extensive studies of the benefits of telecommunications dependent techniques in learning (etc) systems which are independent of the specific type of distribution system Some of these reports are also discussed in this paper An important group of studies of the value of the application of telecommuni-

cations techniques for social purposes is contained in Reference 1. Studies of particular importance are

Rockoff, Maxine L , "The Social Implications of Health Care Communications Systems" which shows that although some caution must be exercised, the most practical way to provide vitally needed expansion in our health care system is through improving the distribution of existing resources, and that wide band telecommunications can play an important or dominant role in this.

Hudson, Heather E. and Edwin B. Parker, "Telecommunication Planning for Rural Development". The advantages of satellites for providing telecommunication services to rural settlements are presented (with some emphasis on the value of satellite broadcasting).

Another important group of study papers was presented at the First Annual International Communications Conference held at the University of Wisconsin in June 1975 (Reference 2). Papers of particular importance are

Dreyfus, Lee Sherman, "Satellite and Cable" indicates the importance of satellites in improving educational performance.

Hupe, Howard, "Economic Realities of Satellite Use", indicates the importance of high power BSS satellites for educational programming in schools and universities, continued education of teachers, doctors and paramedics in remote locations, medical diagnosis with particular emphasis on poorly served remote or rural areas

During the summer of 1974 a Summer Study (Ref 3) was conducted by the National Academy of Engineering, on the Practical Application of Space Systems (~~Reference 3~~). Sections of particular value are. "Needs in Education" page 13 which strongly supports requirements for BSS in education for alleviation of adult illiteracy, supplementing high school, community college and four-year college course material and continuing professional education, and identifies potential revenue sources, "Needs in Health Care" page 15 indicate the necessity for wide band communications in health care--with satellite distribution as a basis pointing out that telemedicine systems have greatest applicability in rural regions where conventional terrestrial communications are inadequate or unreliable, and where satellites may be the cheapest alternative for providing health care; "Rural TV and Teleculture" page 20. Rural satellite TV service in addition to Broadcast TV service could enable rural areas and communities to share in the cultural ~~and entertainment~~ activities now available in metropolitan centers. ?

An important group of papers on ATS-6 experiment results is contained in Reference 4. While these papers are principally on the technical performance of the experiment, a paper by Boor, John L.; Braumstein, Jean, Janky, J M.; Ogden, D.; Potter, J.G.; Harper, L.; Volkmer, E.; Whalen, A A.; Hendersen, E. and Hupe, H.H., includes a preliminary evaluation of the HET experiment which indicates that the health and education communities have reacted through the formation of the PSSC to accomodate the new techniques and education, health care and other social services demonstrated in the experiment.

Three important papers by Howard Hupe are References 5, 6 and 7 which establish that markets exist in areas such as health, education and library service, that substantial public funding exists in these areas, and that satellite systems capable of providing a basis of improving dissemination are well within these funding levels.

Results of an important study on a particular aspect of health care delivery via satellite (limited to Alaska where distribution problems are very severe) are contained in Reference 8, the final report in the Alaska Health Segment of the HET experiment. Findings included

Satellite communications using small ground terminals can reliably provide services of sufficient quality to be useful in the health care system in rural Alaska

Useful consultations for practically any medical problem can be conducted using satellite video channels.

Satellite video consultations can be successfully carried out by health care providers at all levels of training

Reference 9 is the report of JI/GC Working Group D which studied requirement potential for BSS in the 11.7-12.2 GHz

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region Although directed principally toward WARC 77 and the 11 7-12 2 GHz region it contains a valuable summary of terrestrial broadcasting facilities and use factors and extensive statement of potential special audience use of BSS/CR

Numerous studies cited in the references and particularly those summarized above have supported the potential utility of satellites as an optimum means to expand our national capability in health service delivery, education and other social areas to meet increasing needs and particularly to improve the quality of life in the "rural" or less densely populated areas by providing services equivalent to those in metropolitan areas. It is clear from Section B that there is a very substantial population in such areas--at least one-eighth and possibly as much as one-quarter of the total US population. This means from twenty-five to fifty million Americans who could, potentially benefit from BSS. However, expansion of this "potential" to hard channel projections is difficult, and has to be based on many factors which are only now coming into existence such as an organization to react with the user community (a role which PSSC has started to fill) to assess what needs exist, which ones can be best filled by satellite, realistically estimate costs, and assess customer resources. Based on something less than perfection in market research, two channel projections have been made by Washington University (Reference 10) and by CCIR study group 10/11B (Reference 11) The Washington University report was developed in 1975 after more than four years of study and analysis of the overall field of communications as an aid to education, with particular emphasis on application of satellites; references 14-31 report on some of this background work. The USSG-BC/838 is totally based on review of background reference material.

Requirements developed in USSG-BC/838 are summarized below:

<u>Average Number of Channels per ~~Time Zone~~</u>
(TV Channel Equivalent)

		Video		15 KHz, Voice, 50 KBps Data	
Education		9		1-1/4	7
Biomedical		55	?	3/4	4
	Total	64		2	11
		?17			

ground segment
~~Terrestrial Facilities~~ - Small Terminals

Education		
Elementary & Secondary	21,720	~~8,165~~ ?
Higher	2413	~~2,500~~
Health & Medical	1450	1,000 ?
Public Broadcasting	6415	5,917 ?
Total	31,999	~~17,632~~

The requirements developed by Washington University for education are summarized below

Average Number of Channels per Time Zone
(TV Channel equivalent)
22-25

Terrestrial Facilities

Receive-transmit	91
Limited two-way	40,000-50,000
Receive only	12,500-17,500
	52,500-67,500

Section D - Market Surveys and Status

Market surveys are critical to establishing dependable requirement projections. However, since they represent a substantial cost and effort and need to be directed toward a specific set of objectives, they are not likely to develop spontaneously or as institutional research projects but to be conducted by organizations interested in "getting into the business " In the BSS area in the US such an organization is the Public Service Satellite Consortium (PSSC) representing a wide spectrum of potential users in the non-profit social service area. Membership in the PSSC is listed in appendix C The PSSC was founded in February 1975 after a series of meetings in late 1974 between interested parties. An important factor in the establishment of the PSSC was a response to a survey questionnaire from which a projected requirement for seven TV channels was developed For the last four months PSSC has been engaged in a detailed market survey in which evaluation teams have been visiting with individual PSSC member organizations for

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indepth discussions of potential requirements and resources, and what promise satellite technology may hold for economical satisfaction of the requirements This visiting, data gathering process is planned for completion by the end of April 1976. It is expected that analysis of the data and development of meaningful requirements projections will take several months; however, to the extent possible preliminary results of this survey which have been developed by June 1976 will be incorporated into this by addendum

A second market survey is being conducted by the Public Interest Satellite Association (PISA). PISA was formed in the Fall of 1975 to explore ways the newer satellite technologies intended for use in the higher bands can be adapted to meet the long-distance communications needs of non-profit groups. These include non-commercial broadcasters, community and social action organizations, and related public interest organizations. A questionnaire (Appendix D) designed to gather information about these groups' communications needs, uses, costs, and future plans has been sent to more than 2,500 organizations, including the entire universe of non-profit organizations with 10,000 or more members. PISA has hired a private communications research firm (Melvin A Goldberg, Inc.) with extensive research experience in both the broadcast and communications satellite fields to conduct the study, which represents the first attempt ever undertaken to broadly assess the communications requirements of the non-profit sector An important aspect of this assessment will be the non-profit community's anticipated use of satellites for broadcast purposes Replies to PISA's questionnaire are currently being tabulated and analyzed by computer. A final report is scheduled to be released by May 15, 1976. Its results also will be incorporated by addendum

Section E - Consolidation of requirements

The requirements developed in the Washington University and CCIR Study Group 10/11B reports are compared in tabular form below

Channels

	CCIR		Washington University
	TV (per time zone)	15 KHz, Voice, data (per time zone)	TV (total)
Education	9	1 1/4	~~3-4~~ us page 16
Biomedical	55	3/4	~~3-4~~
	64	2	22-25

How derived? 368 ~~420~~ (using Washington University educational requirements)
388 ~~462~~ (using CCIR educational requirements)
Total ground terminals 60,000-70,000

Section F - Projection of Requirements

Neither study predicates a specific "time now' for the requirements Based on technology and economic factors it is projected that complete satisfaction of the indicated requirements could not occur until 1980-1985, which is considered to represent the "time now" for the requirements Using a factor of ~~3-1~~ for 8.6% US video growth from 1985 to 2000 (projected from data in Reference 12) the projected US end of the millenium requirement will be in equivalent BC television channels.

conv. to annual

1240-1307
~~1302-1432~~

During informal discussions with non-US governments in Region 2 statements were made that as many as 225 TV channels (BI) could be expected to be in operation by the year 2000 Based on the final report of WGB JI/GC Sharing Principles and Practices", the average number of DC channels equivalent to a single BI channel is 5.76 As a consequence, the non-US BC channel equivalent is 1296 and the total year 2000 requirement in Region 2 is, in BC type TV channels, 2598 to 2728

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Section G - Orbit Spectrum Capacity

Description of Existing Allocations

Existing Region 2 allocations for the BSS are as follows:

620-790 MHz - In the international allocation table, Footnote 332A authorizes assignments in this band to television stations using frequency modulation subject to a power flux density limitation to protect terrestrial services in the band and to agreement between administrations concerned and affected. In Region 2, the band is otherwise allocated to the Broadcasting Service only and in the U S the footnote allocation to the Broadcasting Satellite Service has been suppressed.

2500-2690 MHz - Shared with the Fixed Satellite Service (FSS) (Space to Earth) at 2500-2535 MHz and (Earth to Space) at 2655-2690 MHz and with the Fixed and Mobile (except Aeronautical Mobile) Services over the entire band Use is limited to domestic and regional systems for community reception. Power flux density limitations to protect the terrestrial services are imposed on the space services This is the allocated band which is best for near-term use It is the band in which the US ATS-6 health and education experiments have been conducted and in which the most-developed technology exists It has the most favorable propagational characteristics However, it has rather limited orbit-spectrum capacity due to its somewhat limited bandwidth and satellite separation angles which are proportionately larger than those of the higher frequency bands

11 7-12.2 GHz - In the international allocation table for Region 2, this band is shared with the FSS (Space to Earth), Fixed, Mobile (except Aeronautical Mobile), and Broadcasting Services However, in the national allocation tables of the US and Canada, the allocations to the Fixed and Broadcasting Services have been suppressed and that for the Mobile Service reduced to secondary status Use in limited to domestic systems and there are no power flux density limitations on satellite systems Orbit-spectrum capacity is considerably greater than that of the 2600 MHz band However, required rain margins impose system constraints exceeding those of the 2500-2690 MHz band.

This is the band in which the CTS health and educational experiments are being conducted, technology is in a well-developed stage, although equipment may be somewhat more costly than for the lower frequency bands

41-43 GHz - In the international table, this band is allocated on an exclusive world wide basis to the Broadcasting Satellite Service, although a recently adopted FCC Report and Order (Docket 19973) modifies the US national table to include sharing with the Fixed and Mobile Services. This is a band where equipment technology and knowledge of environmental conditions are not well developed. It may be applicable to services which do not require very high circuit reliability or alternatively, where diversity reception is possible. The utility of this band will probably increase toward the end of the century with expected improvements in technology.

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84-86 GHz - The comments about the 41-43 GHz band also apply here.

Capacity of Existing Allocations

The capacity of the broadcasting-satellite bands of most immediate interest (at 2500 MHz and 12 GHz) have been estimated for the baseline Fixed Satellite and Broadcasting Satellite Systems described in Rand Report R-1463-NASA using methods described in that report. In making these estimates, the total arc of the geostationary orbit usable within Region 2 is taken to be 150 degrees.

The capacity estimate for the band 11 7-12.2 GHz is taken from Table 3 (Reference 13) for the following conditions·

- Copolarizatior
- Cochannel
- Community Reception
- Sharing ratio with FSS 25 75 (what)
- Large FSS Earth Station
- Orbit division
- Paring of service areas in Northern and Southern hemisphere

and is 648 BC equivalent TV channels Based on linear frequency scaling from the 12 GHz capacity the 2500 MHz capacity is

?

$$\frac{190}{500} \times \frac{2.5}{12} \times 648 = 52.5$$

BC equivalent TV channels, however, since there is no sharing ratio with FSS total capacity would be 210 BC equivalent TV channels or assuming that 1 TV channel equals 1,000 one-way voice channels, the total capacity would be equivalent to 858,000 one-way voice channels. If techniques discussed in Rand R-1463-NASA including cross-polarization, frequency interleaving and crossed-path geometry are used these capacities might be doubled. As previously noted, the orbit-spectrum capacity for BI TV channels will be about 0.175 times the maximum BC capacity.

Section H - Adequacy of Existing Allocations

The table below shows in consolidated form the requirements and the capacity estimated in previous sections.

Requirements

Time	US	other Region 2	Total
1980-85	420-462		
2000	1302-1432	1296	2598-2728

Capacity

	2500 MHz	12 GHz	Total
Basic	210	648	858
Improved sharing techniques	420	1296	1716

It can be seen that the 1980-85 US requirement cannot be met within the basic orbit-spectrum capacity of the 2500 MHz band and that even with the use of improved sharing techniques, at some point between 1985 and 2000 the combined capacity of the 2500 MHz and the 12 GHz bands may not be adequate for the projected Region 2 requirement So, retain existing alloc

Section I - Recommendations for New Broadcast Satellite Allocations

Considering that the existing allocations may not be adequate to meet projected Region 2 requirements, and that unforeseen requirements for BSS beyond those described developing through the end of the century, allocation of spectrum to the BSS in addition to the existing allocated bands is recommended. In all cases these recommended additions involve sharing with other services and are conditional on development of mutual acceptable sharing criteria. Basically the recommended additions fall in two broad regions of the frequency spectrum and will be described below on that basis.

1. Below 4 GHz. The region between 2 and 4 GHz is the most suitable for all kinds of satellite communications and is the region where the technology and environmental knowledge is best developed and essentially no margin for atmospheric phenomena is required. It represents the most practical region for early BSS development.

a. 420-450 MHz Selected channels not to exceed 6 MHz total (35 FM channels) Although the desirability for FM aural broadcast for special purposes such as education and medicine is well established, frequency bands allocated to BSS while suitable for TV are not well adapted to aural broadcast because of ground station cost Equipment from the nearby Land Mobile band could be used to provide moderate cost stations This recommended extension would involve sharing with RADIOLOCATION which is now allocated on a primary basis and Amateur and Amateur Satellite which are allocated on a secondary basis

b. 2300-2500 GHz This recommended expansion at the lower end of the existing 2500-2690 band would involve sharing with FIXED and RADIOLOCATION which are now allocated on a primary basis and with Amateur, Mobile and Fixed which are now allocated on a secondary basis

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Sharing between RADIOLOCATION and FSS downlink has been determined to be feasible (see reference). This action would double the orbital-spectrum capacity for early types of BSS

c. 3400-3700 MHz. This recommended expansion is already allocated to FSS in Regions 2 and 3, and would involve sharing with FIXED-SATELLITE, FIXED, MOBILE and RADIOLOCATION Sharing between RADIOLOCATION and the FSS has been determined to be feasible (see reference 33). This band is technically at least as desirable as the 2500 MHz band for BSS and represents an orbit-spectrum capability exceeding that of the existing 2500 MHz band.

2. Above 4 GHz BSS allocations above 4 GHz start at 11 7 GHz, and up to 86 GHz. While the 12 GHz region is technically suitable for BSS, rain attenuation imposes system penalties which may have economic consequences. The next BSS allocations are in the 40 and 80 GHz regions which also have severe rain attenuation, and depend for usefulness on growth of the technology and can only be considered in long term planning.

a. 12 2 to 12.5 GHz. This recommended expansion on the upper end of the 11.7-12.2 GHz band would make Regions 2 and 3 consistent with Region 1. It would involve sharing with FIXED, MOBILE except Aeronautical Mobile, and BROADCASTING; these are already shared regionally in the 11.7-12.2 existing allocation. This action would provide a 40% increase in orbit-spectrum capacity in the 12 GHz region.

b 19.7-21 2 GHz This band is currently allocated to FSS (Space-to-Earth) on an exclusive basis. Sharing between BSS and FSS on the same basis as in the 11 7-12 2 band is recommended; projected technology improvements should render this spectral region useful for second generation systems, while orbit-spectrum capacity would be expected to be very great. Propagation characteristics are not as good as at the lower frequencies and the band might initially be most applicable to service not requiring very high circuit reliability. It is not now known whether orbit sharing with FSS is possible but considering the general increase in antenna directivity with frequency, sharing should be at least as feasible as on the 11 7-12.2 GHz band. Further, there are no terrestrial allocations in this band which require power flux density limits, thus permitting use of higher satellite power to overcome atmospheric attenuation.

Recommendations for Uplinks for BSS Allocations

The uplinks for the BSS are part of the FSS. Since there is not a one-for-one correspondence between the bandwidth allocated for FSS (uplink) and the ~~same~~ sum of the bandwidths allocated for FSS (downlink) and BSS, there appears to be a potential problem in providing sufficient uplink connections for BSS, particularly in applications where interaction is vital (such as doctor-patient consultation). It is recommended that proposals for FSS (uplink) allocations provide for adequate capability for BSS uplink connection.

Glossary

BSS	-	Broadcasting Satellite Service
BC	-	Community reception in the BSS
BI	-	Individual reception in the BSS
CCIR	-	International Radio Consultative Committee
FSS	-	Fixed Satellite Service
JI/GC	-	Joint Industry-Government Committee for WARC '77
WGD	-	Working Group D "Functional Requirements"
WGB	-	Working Group B "Sharing Principles"
SMSA	-	Standard Metropolitan Statistical Area
WARC	-	World Administrative Radio Conference

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WARC 1979

BROADCAST BUREAU SERVICE GROUP ON SATELLITE BROADCASTING (BSG/SAT)

Chairman

Edward E. Reinhart
Mail Station 161228
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, CA 91103
213-354-6929

Co-Vice Chairmen:

A. James Ebel
Cornhusker TV Corp
40th and West Sts.
Lincoln, NE 68503
402-467-4321
P.O Box 30350

Howard H. Hupe
Office of Telecommunications Policy
Dept. of Health, Education and Welfare
330 Independence Ave., SW
Washington, D.C. 20201
202-245-1891

Task Force B--Requirements

Chairman
Frank W. Norwood
Joint Council on Educational Telecommunications
1126 16th St , N W
Washington, D C 20036
202-659-9740

James Ebel (see above)

Andrew Horowitz
Public Interest Satellite Assoc
55 West 44th Street
New York, New York 10036
212-866-4153

Howard H Hupe (see above)

John Kelleher
National Scientific Laboratories
Westgate Research Park
McLean, VA 22101
703-893-4420

James D Parker
CBS, Inc.
51 West 52nd Street
New York, New York 10019
212-765-4321 x3795

Richard O. Pullen, Esq.
Common Carrier Bureau
FCC
1919 M St., N W (Rm. 538)
Washington, D C. 20036
202-632-6440

John Serafin
American Broadcasting Co.
7 West 66 Street
New York, New York 10023
212-581-7777 x7175

Martin H. Meaney, Jr.
National Broadcasting Co.
30 Rockefeller Plaza
New York, New York 10020
212-247-8300 x3354

Dr. Richard B Marsten
Dean, School of Engineering
City University of New York
140 St. and Convent Ave.
New York, New York 10031
212-690-5439

(Continued)

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Appendix A-2

Carlos Roberts
Office of Policy and Plans
Federal Communications Commission
1919 M St.
Washington, D.C. 20554
202-632-6312

Raymond Simonds
RCA Frequency Bureau
1800 K Street
Suite 810
Washington, D.C. 20006
202-659-3320

Appendix B

Meetings of Task Force B BSG/SAT

1st	January 23, 1976
2nd	February 5, 1976
3rd	February 27, 1976
4th	April 16, 1976

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Appendix C

Public Service Satellite Consortium

MEMBERS

Alabama ETV Commission
State of Alaska
Aloha System Project
American Academy of Orthopaedic Surgeons
American College of Physicians
American Library Association
Aspen Institute
Bilingual Children's Television, Inc
Brigham Young University
California Instructional Television Consortium
Catholic Television Network
Coast Community College District
Committee on Institutional Cooperation
Communications Satellite Planning Center-Stanford University
Community Television of Southern California-KCET
Corporation for Public Broadcasting
Federation of Rocky Mountain States
Indiana Higher Education Telecommunication System
Indiana University School of Medicine, Medical Educational Resources Program
Joint Council on Educational Telecommunications
Kansas Public Television Commission
Maryland Center for Public Broadcasting
Medical University of South Carolina
Miami-Dade Community College District
Mississippi Authority for ETV
Mountain States Health Corporation
National Education Association
National Public Radio
North Dakota Educational Broadcast Council
Oregon State System of Higher Education
Public Broadcasting Service
Public Interest Satellite Association
SALINET (Satellite Library Information Network)
San Diego County, Department of Education
San Diego State University
South Carolina Educational Television Network
Southern California Consortium for Community College Television
Southern Educational Communications Association
United Methodist Board of Discipleship
United States Catholic Conference
University of California
Univ of Calif., San Francisco-Dept. of Public Programs & Continuing Education
University of Hawaii
University of Mid-America
University of Southern California
University of Wisconsin-Stevens Point
Virginia Public Telecommunications Council
Western Interstate Commission for Higher Education
University of Alabama in Birmingham

Appendix D-1

PUBLIC INTEREST SATELLITE ASSOCIATION
55 West 44th Street
New York, N Y 10036
(212) 661-2540

The objective of this questionnaire is to obtain information on your communications uses and needs Even if you can't complete all of the questions asked, please return the questionnaire with the information you can answer <u>All replies will be kept confidential</u>

1 Would you please indicate (in the appropriate space in column 1), which communications techniques are used by your organization to communicate with its members or chapters, with other organizations and with the general public Place an X in the space in Column 1 next to that communications technique

2 For each communications technique used by your organization (and marked in column 1) fill in the appropriate spaces in columns 4, 5 and 6 to indicate the following

a) The number of times yearly the specific communications facility is used (column 4) (Example If there are two mailings per year to members, the number 2 would be written next to mailings in column 4)

b) The number of units (items) (pieces) distributed each time (column 5) (Example If there are 10,000 members to which the mailing is sent, the number 10,000 would be written in column 5)

c) The yearly cost for the communications service used (col 6).

(1) Commun Used	(2) Communications Technique	(3) Type of Service	(4) (Annual Usage) Frequency	(5) No of Items	(6) Annual Cost
____	Mail	Mailings (General)	____	____	____
____	Mail	Newsletters	____	____	____
____	Mail	Magazines	____	____	____
____	Mail	Promotions	____	____	____
____	Mail	Surveys	____	____	____
____	Mail	Ballots	____	____	____
____	Mail	Renewals	____	____	____

Appendix D-2

Public Interest Satellite Association

(1) Commun Used	(2) Communications Technique	(3) Type of Service	(4) (Annual Usage) Frequency	(5) No of Items	(6) Annual Cost
____	Telephone	Long Distance	____	____	____
____	Telephone	WATS Lines	____	____	____
____	Telephone	Tie Lines	____	____	____
____	Telephone	Leased Lines	____	____	____
____	Telephone	Foreign Exch Lines	____	____	____
____	Telex	Telex	____	____	____
____	Telecopier/ Facsimile	Telecopier	____	____	____
____	Mailgrams	Mailgrams	____	____	____
____	Telegrams	Telegrams	____	____	____
____	Radio	Tapes	____	____	____
____	Radio- Closed Circuit	Closed Circuit	____	____	____
____	Television	Spots	____	____	____
____	TV-Closed Circuit	Closed Circuit	____	____	____
____	TV-Slow Scan	Slow Scan	____	____	____
____	Pvt Micro Wave	Micro Wave	____	____	____
____	Data Transmission	Data	____	____	____
____	Meetings/Conferences	Conferences	____	____	____
____	National or Regional Meetings/Conferences	Training	____	____	____
	Other (Please list)				
____	____	____	____	____	____
____	____	____	____	____	____
____	____	____	____	____	____

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Appendix D-3

Public Interest Satellite Association

3 If Satellite Service dedicated to non-profit organizations were made available, for which kinds of services would you give first priorities? Please [illegible] the Top 5 (1 is highest)

Long Distance Telephone ____	Mailgrams ____
Telex ____	Telecopier/Facsimile ____
Data Transmission ____	Radio ____
Television ____	Closed Circuit Radio ____
Closed Circuit TV ____	Slow Scan Television ____
Telegrams ____	National/Regional Meetings ____

4 To what other uses, if any, would you put the satellite service, if it were made available to your organization?

____

____

____

Name of Organization ____________

Address ____________

City and State ____________ Zip Code ____________

Telephone (   ) ____________

Number of Chapters ____________

Number of Members ____________

Purpose of Organization ____________

____

____

____

Name of Person Filling Out This Form ____________

____

Title of Person Filling Out Form ____________

Date ____________

APPENDIX 5

PANEL PRESENTATIONS

The following pages contain the results of the panel deliberations and their presentations of user requirements for public service communications satellite system.

PANEL II
COMMERCIAL SERVICES

DON JANSKY, CHAIRMAN
JOSEPH SIVO, SECRETARY

COMMON CARRIERS / DOMSAT
SPACECRAFT / EQUIPMENT MANUFACTURERS
REGULATORY AGENCIES

PURPOSE:

DETERMINE THE RELATIONSHIP BETWEEN INDUSTRY AND A GOVERNMENT-SPONSORED PUBLIC SERVICES SATELLITE COMMUNICATIONS SYSTEM

APPROACH:

- USER NEEDS SHOPPING LIST
- AGGREGATE NEEDS - DEFINE SYSTEM REQUIREMENTS
- DESIGN SYSTEM
- JOINT GOVERNMENT / COMMERCIAL / USER
- DEMONSTRATE QUASI-OPERATIONAL SYSTEM
- FULL COMMERCIAL SYSTEM

GROUND RULES:

- APPLICATIONS WHICH CAN BE SATISFIED BY EXISTING COMMERCIAL SATELLITE SYSTEMS SHOULD NOT BE CONSIDERED FOR THE PSSCS
- CRITERIA SHOULD BE
  - NEW SPACECRAFT SYSTEM IS REQUIRED FOR APPLICATION (EXTENSION OF CURRENT OPERATIONAL TECHNOLOGY)

  OR

  - COST OF USER EQUIPMENT NOT ECONOMICALLY FEASIBLE REQUIRING NEW SYSTEM DESIGN

THE PSSCS

- RELATIVE TO COMMERCIAL SERVICES
  - THE PROGRAM IS IN ESSENCE A MARKET VALIDATION
  - THE MARKET WILL BE ESTABLISHED THROUGH A DEMONSTRATION APPROACH
  - SYSTEM SHOULD BE QUASI-OPERATIONAL WITH HIGH RELIABILITY
    - NASA SHOULD CONSIDER THE TOTAL USER SYSTEM (END-TO-END) AND PROVIDE THE REQUIRED ASSISTANCE, I.E., TRAINING, OPERATIONS AND PROGRAM DEVELOPMENT
    - NASA SHOULD INVOLVE INDUSTRY TO ESTABLISH THE PROPER CROSSOVER TO A FULL COMMERCIAL SYSTEM

- 5 -

: THE PSSCS SHOULD BE AS CLOSE TO ITS OPERATIONAL CONFIGURATION AS IS POSSIBLE

: STABILITY OF SYSTEM PARAMETERS IS OF MAJOR IMPORTANCE (REGULATORY AGENCIES)

: DIFFERENT ALTERNATIVES SHOULD BE EXAMINED IN ESTABLISHING SYSTEM

- USE EXISTING COMMUNICATIONS SYSTEMS CAPABILITIES
- PROVIDE INCENTIVES FOR INDUSTRY TO DEVELOP THE SERVICES
- GOVERNMENT DEVELOPED SYSTEM IN COOPERATION WITH COMMERCIAL SERVICES

- 6 -

THE USER

- SHOULD MAKE SOME FINANCIAL COMMITMENT TO THE SYSTEM
- THE USER SHOULD BE MADE AWARE OF THE ULTIMATE OPERATIONAL COSTS
- FOR SOME USERS A GRADUAL INCREASE IN FINANCIAL COMMITMENT SHOULD BE ESTABLISHED TO EASE THE TRANSITION TO A COMMERCIAL SYSTEM

PSSMP

PUBLIC SERVICES SATELLITE

MASSAGE PARLOR

REQUIREMENTS

DATA RATES (bits/sec)

		average	peak
1.	SENSORS	0.1	100
2.	DATA TERMINALS (INTERACTIVE)	10	10^4
3.	COMPUTER FILE TRANSFER	1000	10^6

REQUIREMENTS

TRANSACTIONS (bits)

1.	DATA INQUIRY (Library, medical record, sensor data, ...)	200
2.	RESPONSE	2000
3.	ELECTRONIC MAIL (single page)	20,000
4	HIGH RESOLUTION IMAGE	10^7

Example: ATS-6 transponder, small earth terminal 5×10^6

USER COMMONALITY REQUIREMENT

$$\left.\begin{array}{l} \text{MEDICAL SENSORS} \\ \text{WEATHER SENSORS} \\ \text{DIGITIZED VOICE} \\ \text{BULK DATA TRANSFER} \\ \text{INQUIRY SYSTEM} \\ \text{INTERACTIVE DATA PROCESSING} \\ \text{ELECTRONIC MAIL} \end{array}\right\} \text{PACKETS}$$

DIRECT DELIVERY TO USER

1. Programmable Hand Calculator
2. Citizens Band
3. Digital Citizens Band

USER CONNECTIVITY

1. HUMAN COMMUNICATION
2. RECONFIGURATION AND GROWTH
3. MODULARITY
   (a) START-UP COSTS
   (b) COMPATABILITY

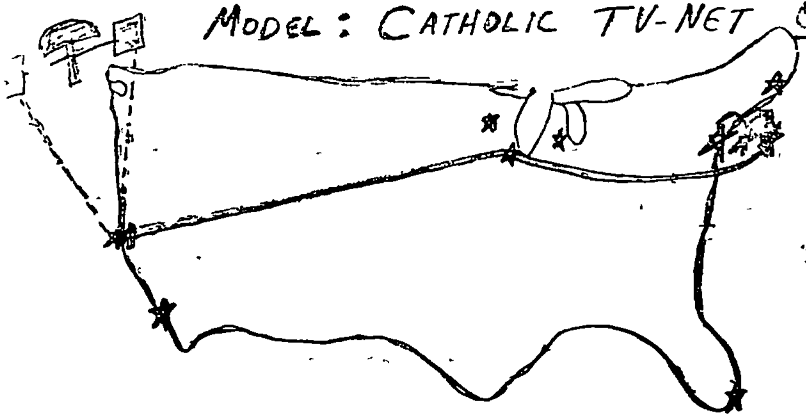
PACKET BROADCASTING

POINT-TO-POINT ALTERNATIVE

100,000 node network requires

$$\frac{100{,}000 \times 99{,}999}{2} \approx 5 \times 10^9 \text{ links}$$

MODEL: CATHOLIC TV-NET



OBJECTIVE

TO MEET INSTRUCTIONAL NEEDS OF ELEMENTARY & SECONDARY STUDENTS AND THEIR TEACHERS

SAMPLE APPLICATIONS

- ACCESS TO EDUCATIONAL DIAGNOSTIC SPECIALISTS
- OBTAIN REMOTELY STORED INSTRUCTIONAL MATERIALS AND RESOURCES
- SUPPLEMENT TEACHING STAFF
- INDIVIDUALIZE INSTRUCTION
- PROVIDE INSTRUCTION FOR HOMEBOUND STUDENTS
- PROVIDE COMPUTER ASSISTED INSTRUCTION
- FACILITATE ENRICHMENT ACTIVITIES
- MEET UNIQUE NEEDS OF HANDICAPPED LEARNERS

SCHOOL USERS [EST.]

600,000 Students (K-12)
25,000 Teachers
1,300 SCHOOLS

13,000 "Terminals" (TV Sets)

CTN also Serves:

HOSPITALS
Community Colleges
Adult Education

TERMINAL CONFIGURATION REQUIREMENTS

- TWO-WAY AUDIO
- TWO-WAY VIDEO
- COMPUTER TERMINAL
- FACSIMILE RECEIVER
- VIDEO TAPE RECORDER
- AUDIO TAPE RECORDER
- MULTI-CHANNEL CAPABILITY
- REMOTE CALL-UP CAPABILITY
- TELECONFERENCE CAPABILITY

NUMBER

- MINIMUM OF ONE PER SCHOOL (65,000+)
- 1,000 MOBILE TERMINALS (20/STATE)

VOLUME

- OPERATIONAL 7 HRS/DAY 5 DAYS/WEEK
- EASTERN THRU HAWAIIN TIME ZONES

OBJECTIVE

TO PROVIDE ACCESS TO INFORMATION NEEDED BY TEACHERS TO TEACH ELEMENTARY & SECONDARY TEACHERS

TEACHER NEEDS

- STUDENT DATA
- PROGRAMS OF STUDY
- INSTRUCTIONAL OBJECTIVES
- LEARNING ACTIVITIES
- LEARNING MODES
- MEDIA RESOURCES
- MEASUREMENT DEVICES
- DIAGNOSTIC/REMEDIAL ACTIVITIES
- MANAGEMENT INFORMATION

ASSUMPTIONS

- INFORMATION IS "RAW MATERIAL" OF INSTRUCTION
- USER SHOULD DICTATE FORM, TIME, PLACE OF NEEDED INFORMATION

SATELLITE APPLICATION TO Elementary & Secondary Education

- CHEAPER TO MOVE INFORMATION ELECTRONICALLY
- MOST INFORMATION CAN BE STORED, UPDATED RETRIEVED ELECTRONICALLY
- ALL ELECTRONICALLY STORED INFO CAN BE DISTRIBUTED TO LARGE NUMBER OF USERS
- STORED INFO CAN BE GIVEN TO USER IN ANY ELECTRONIC FORM.

TEACHER NEEDS

FUNCTION	MODE	LOCATION
STORAGE	PRINT FILM VIDEO TAPE AUDIO TAPE DATA	HOME CLASS SCHOOL REGION NATIONAL
DISTRIBUTION	MAIL UHF/VHF CABLE TV TELEPHONE ITFS SATELLITE	HOME JOB SITE SCHOOL HOSPITAL COLLEGE
UTILIZATION	BOOK FACSIMILE CRT DISPLAY CAI PRINTOUT	SAME

A5-10

PANEL FOUR

1

Presently served 25 to 40 million adults

Fastest growing segment of education

Part-time enrollments now exceed full time enrollments

Envision an enrollment potential of 60 million in the 80's

Yet higher education has failed to take advantage of communications technology.

How motivate the use?

Need for entrepreneurs;

Need for federal policy and resources

2

Populations to be served:

1) occupational training
2) cont. professional education
3) military training
4) institutional uses - in service training
5) education in sparsely populated areas
6) immobilized persons - handicapped or incarcerated
7) mass distribution of content of meetings of professional societies

Panel [illegible] 3 [illegible] 4

Need for further study, but can recognize:

1) re licensure laws
2) state and federal regs
3) degree requirements for graduation
4) requirements to protect privacy
5) liability concerns

1) Market aggregation - distant independent
2) Equality of access
3) Timeliness of information
4) Pooling and sharing of resources
5) Catalytic effect of achieving change
6) Responsiveness - potential two-way communication
7) Economic advantage

General - Satellite which can access all modes

Depending upon situation -

telecopying
Computer systems
2 way audio
2 way color video

Quality may be variable
Color not always necessary
Nor is two way video
Interactive mode may require only digital response, or voice, or voice and video

Continuous use of available time —

daytime - schools, military institutions and industry

evening - continuing education programs for adults

night - taping programs for storage and future use

One present system - Appalachia plans use of 20 hrs/wk.

We forsee as much use as facilities development will allow.

We see problems of access. Who will decide? Commercial? Public Service?

7

Presently primarily local, state and regional

ITFS
Appalachia
Alaska
Navy Marisat Atlantic/Pacific
PSat Pan Pacific Basin
CTS networks
Public Broadcasting System
State Networks (ie So. Carolina)

We foresee a need for inter-connecting existing facilities both locally, regionally, nationally and internationally
Ideally each site would have a receiver/transmitter

8

Privacy
Copyright
Legislative action
licensure and re licensure
Segmentation of curriculum among jurisdictions
Engineering and Technical
NASA and FCC requirements
Picture quality
Frequency spectrum problems
Accreditation and awarding of credit
Availability of funding
Jurisdiction within institution or consortium

9

RECOMMENDATIONS: (not concurred in by all in panel)

(1) NASA should undertake an active study of applications of satellite systems and make recommendations for benefit of government and potential users.

(2) There should be a detailed study of the continuing education needs of the professions which could be served by satellites.

(3) There is a need for a clearinghouse to provide information exchange about the present availability and potential of satellite systems.

(4) There is need for a means to inform potential users about possibilities of satellite systems.

(5) Government should convene a meeting of all federal agencies involved with satellites to establish policies for the federal government role in development of satellite systems.

(6) NASA should continue its efforts to develop high powered satellites so that necessary earth terminals can be obtained inexpensively and used widely in the many applications appropriate to continuing education.

(7) NASA should encourage further research in the higher frequency spectrum so as to increase the frequency spectrum available for public service transmission.

(8) So that the learnings from this workshop are not lost, a similar workshop should be convened periodically to update and extend the information and recommendations of an informed group.

MEDICAL EDUCATION - PANEL 7

Introduction:

The Medical Education Panel Report is a statement of the future (next decade) needs of health care professionals for health science education which will be most effectively met by information transfer systems via a communications satellite. The Panel recognizes the magnitude of ~~medical~~ health education needs of both the patient and the general public but did not include that aspect in the discussion upon which this report is based.

1.0 Objectives

1.1 Discipline Objectives - The objectives of medical education are to maintain and improve professional services through the education and training of physicians and other health professionals and through biomedical and health services research. The major educational phases for the health professions are undergraduate, graduate and continuing education with different emphases on these phases in each specific discipline (medicine, dentistry, nursing, allied health professions, pharmacy, etc.).

1.2 Statutory Requirements - There are no federal statutory requirements for the practice of health professions. Each state regulates the practice of these professions and, particularly of medicine through its medical practice act.[1] Some states have introduced a statutory requirement of continuing medical education as a prerequisite for relicensure of physicians and other health professionals. All other requirements for educational or professional standards in medicine are established by voluntary organizations.[2]

1.3 The Objective to which Satellite/Telecommunications can make a Contribution is to provide a wider distribution to regional geographic areas for interconnection to terrestrial systems in order to more efficiently reach a wider specialized audience. It would also enable a national ~~control~~ coordinating facility to more efficiently provide the programming input to such a system via a multiple capability uplink.

[1] FLEX, NBME, e.g. The most common provisions for medicine are: 1) that the individual has to have graduated from an accredited U.S. or Canadian medical school (undergraduate education), 2) that the applicant must have one or two years of house-staff training (graduate medical education), and 3) that the individual must have received a passing score on the examination.

[2] CCME, LCME, LCGME, LCCME, specialty boards, etc.

2 DISCIPLINE COMMUNICATIONS NEEDS

2 1

Purposes	Type of Communication
- Telediagnosis and selected mass information transfer as in medical school classroom, multiple branches of a school or multiple schools, etc	Audio-video-color 2 way (option - may be used with teleprocessing)
Computer Data Banks Examples - data for purpose of determining prognosis in chronic diseases	High Data Rate (Digital) - audio - combination
Business/Educational * (See footnote) Requirements of hospitals, clinics, groups (Eventually may be practical for individuals)	Audio-video color 2-way Practical to meet some of this need - expansion of use probably necessary
Health Education for the Patients- Type I - Health Education For the general public, believed to be a public health function	Audio-video use practical, now, program content very critical
Type II - Physician to patient about specific condition, a health system function - completely confidential requiring physician input	Audio - 2-way, video is helpful, if available

2 2 -Volume of Communications

- At present, very low volume, experimental in nature and regional
- During the next ten years, volume will increase in direct response to development of programs and availability of funds both of which are outside the scope of this report
- No assessment of longterm volume was made by the panel

To appendix 4

2 3 Communications Networks

- At present needs can be identified through recently conducted experiments
- The use needs of a dedicated broadband network for health has not been determined

3 0 CONSTRAINTS AND PROBLEM AREAS

3 1 Constraints - statutory restraints are state and not Federal ~~...~~ at this time and they can be unique to a given state

3 2 Regulatory Constraints - None now, but disclosure regulations regarding drugs under auspices of FDA have been recognized

3 2 Institutions are not funded to develop or distribute continuing medical education programs utilizing broad band or any other distribution modality

3 3, A PROBLEM AREA RELATED TO CONFIDENTIALITY OF DATA

4 0 POTENTIAL BENEFITS

Overcomes restraints of geographic separation and thereby facilitates sharing of human and physical resources

5 0 CONSENSUS

Federal government should consider providing funds for subsidizing the dissemination of educational programs

PUBLIC SAFETY

CHR: SMILEY ASHTON
LEAA

1 - 2

PUBLIC SAFETY
GENERAL

CONSTRAINTS

- NO COMMUNICATIONS LINKS TO BE PROVIDED TO FURTHER COMPUTER LINKAGE (FEDNET TYPE)
- COMPUTERIZED CRIMINAL HISTORY AND OTHER CRIMINAL JUSTICE RECORDS REQUIRE SPECIAL HANDLING.
- PRIVACY OF INFORMATION RELATED TO SPECIFIC INDIVIDUALS TO BE RESPECTED (NO LINKAGE OF INDIVIDUALS BY NAME TO STATISTICAL ANALYSIS).

FEATURES

- PRIVACY AND/OR ENCRYPTION OF LINKS IS REQUIRED IN SOME INSTANCES TO ENSURE PROTECTION OF SENSITIVE INFORMATION.
- PUBLIC SAFETY COMMUNICATIONS LINKS SHOULD STRIVE FOR MAXIMUM RELIABILITY ~~AND AF~~FORD 100% AVAILABILITY SINCE EMERGENCIES ~~CANNOT BE ANTICIPATED~~ AND EFFECTIVE SERVICE IS OFTEN A MATTER OF LIFE OR DEATH.

10-3

PUBLIC SAFETY REQUIREMENTS ANALYSIS

VOICE	3KHZ CHANNEL
ONE-WAY RADIO (NATIONWIDE COVERAGE)	
DISASTER ALERTING NETWORK	6
OTHER PUBLIC SAFETY REQUIREMENTS	1
TWO-WAY RADIO	
MOBILE/MOBILE, BASE/MOBILE AND MOBILE/BASE (95% WITHIN 200 MILE RANGE, 5% NATIONWIDE 100% RELIABILITY, 100% AVAILABILITY, 1% AVERAGE USAGE FOR 250,000 STATIONS)	2500
NATIONAL EMERGENCY COORDINATION CHANNEL	
(100% RELIABILITY, 100% AVAILABILITY, 5% AVERAGE USAGE NATIONWIDE, COORDINATES ALL ELEMENTS OF DISASTER - POLICE, FIRE, SEARCH AND RESCUE, RED CROSS, EMERGENCY MEDICAL SERVICES ENVIRONMENT PROTECTION, CIVIL DEFENSE AND OTHER SPECIALIZED SERVICES)	3

NOTE: DOES NOT INCLUDE ADMINISTRATIVE/OPERATIONAL TELEPHONE SERVICE NOT PECULIAR TO PUBLIC SAFETY OPERATION; THESE ARE INCLUDED IN GENERAL ADMINISTRATIVE SERVICE AT FEDERAL, STATE AND LOCAL LEVELS.

10-4

PUBLIC SAFETY REQUIREMENTS ANALYSIS

RECORD TRAFFIC: 69 KBPS

ESTIMATED CRIMINAL JUSTICE SYSTEM REQUIREMENTS FOR INTERSTATE TRAFFIC IN 1983 (INCLUDES OPERATIONAL TRAFFIC, COMPUTERIZED CRIMINAL HISTORY RECORDS, CRIMINAL JUSTICE PLANNING, INTELLIGENCE INFORMATION, CRIMINALISTICS LABORATORY REQUESTS AND RESPONSES. AVERAGE MESSAGE LENGTH 377 CHARACTERS PER MESSAGE.)

LETTER TRAFFIC:

APPLICANT FINGERPRINTS (8x8 CARDS) FROM STATES TO NATIONAL (FBI) 20,000/DAY.

OTHER NORMAL ADMINISTRATIVE REQUIREMENTS NOT UNIQUE TO PUBLIC SAFETY ARE NOT INCLUDED IN THESE LETTER TRAFFIC REQUIREMENTS.

PUBLIC SAFETY REQUIREMENTS ANALYSIS
VIDEO - 6MHZ CHANNELS

	ONE WAY (NATIONWIDE AUDIENCE)	INTERACTIVE WITH AUDIO ONLY	INTERACTIVE WITH VIDEO
FEDERAL LAW ENFORCEMENT AGENCIES			
DEA, FBI, CUSTOMS, INS, ETC.	4		
EDUCATION			
PUBLIC SAFETY			
SEARCH AND RESCUE	1	1	1
RED CROSS			
DISASTER			
FIRE, POLICE, SEARCH AND RESCUE, CIVIL DEFENSE, ETC.	4		
TOTALS	9	11	1

PUBLIC SAFETY REQUIREMENTS ANALYSIS
FACSIMILE

	VOICE GRADE CHANNELS
TRANSMISSION OF ARREST FINGERPRINTS FROM STATE TO NATIONAL AND INTRASTATE (4800 BPS USING DATA COMPRESSION TECHNIQUES)	200
DISSEMINATION OF MUG SHOTS AND IDENTIFICATION PICTURES	3
INTER- AND INTRASTATE TRANSFER OF MAPS, FOOTPRINTS, SHOE IMAGES AND OTHER IDENTIFICATION DATA TO FACILITATE SEARCH AND RESCUE.	10

PUBLIC SAFETY REQUIREMENTS ANALYSIS

TELECONFERENCING

AUDIO	3 KHZ CHANNEL
EMERGENCY LOCATION TRANSMITTERS RECEPTION/LOCATION	1 FULL TIME
INTERAGENCY COORDINATION OF PUBLIC SAFETY AGENCIES	1 PART TIME

AUDIO AND VIDEO

REQUIREMENTS IN THIS AREA FOR PUBLIC SAFETY WILL BE SATISFIED BY COMMON USER LINKS PROVIDED FOR GENERAL ADMINISTRATIVE USAGE.

10 - o

PUBLIC SAFETY

REQUIREMENTS ANALYSIS

DATA TRANSFER

	VOICE GRADE CHANNELS
DIGITAL COMMUNICATIONS MOBILE/MOBILE, MOBILE/BASE, AND BASE/MOBILE	250
VEHICLE TRACKING AND LOCATION	100
ANALOG COMMUNICATIONS MOBILE/MOBILE, MOBILE/BASE, AND BASE/MOBILE (LOW SPEED TELEMETRY AND VOICE ASSOCIATED WITH POLICE-OPERATED EMERGENCY MEDICAL SERVICE).	5

PUBLIC SAFETY COMMUNICATIONS
SYSTEMS OPERATION AND MAINTENANCE COST

	ANNUAL COST	PROPOSED ADDITIONAL EXPENDITURES NEW/ AUGMENTED SERVICES
CRIMINAL JUSTICE		
STATE AND LOCAL LEVEL	$100,000,000	$60,000,000
FEDERAL LEVEL	$ 20,000,000	20,000,000
SEARCH AND RESCUE (ALL)	1,000,000	600,000
EMERGENCY MEDICAL SERVICE (POLICE ONLY)	*	*
ENVIRONMENTAL PROTECTION	25,000,000	25,000,000

*THIS FIGURE UNAVAILABLE IN THIS PANEL

REPORT - GROUP II

RELIGIOUS APPLICATIONS

1. IN-SERVICE TRAINING FOR PASTORS, CHAPLAINS (MILITARY AND INSTITUTIONAL) AND OTHER CHURCH PROFESSIONALS, AND TEACHERS - SECTARIAN AND NON-SECTARIAN.
2. DATA TRANSFER: COMPUTER, VIDEO AND AUDIO SOFTWARE.
3. TELECONFERENCING, INTERNAL COMMUNICATION; NATIONAL AND INTERNATIONAL; REGIONAL - INCLUDING PROGRAMMING.
4. INTERCONNECTION OF DENOMINATIONAL SEMINARIES, UNIVERSITIES AND PAROCHIAL SCHOOLS, INCLUDING LIBRARY SERVICES.
5. TV AND RADIO PROGRAM DISTRIBUTION (OFF AIR).
6. NEWSFEED TO DENOMINATIONAL AND SECULAR PRESS, RADIO AND TV.
7. INTERNATIONAL DISASTER RELIEF COORDINATION AND INFORMATION.
8. MISSIONARY COMMUNICATIONS.
9. DIRECT BROADCAST - DOMESTIC (AUDIO/VIDEO) AND INTERNATIONAL.
10. HEALTH.

PLANNING NEEDS

NATIONAL
↕
STATE
↕
LOCAL

INTEREST GROUPS

- INCREASING SERVICE DEMANDS
- FUNDING LIMITATIONS
- GRASS ROOTS INPUT

SERVICES NOT AVAILABLE BECAUSE:

- NEEDS NOT AGGREGATED
- TECHNOLOGY NOT DEMONSTRATED
- ECONOMIC FEASIBILITY UNPROVED

∴ ACCELERATED EVOLUTION IS NEEDED

- GOV'T UNDERWRITING OF SATELLITE DEVELOPMENT
- PSSC-TYPE MARKET DEVELOPMENT

MARKET AGGREGATION

PUBLIC SERVICE

- COMBINE SIMILAR USERS
- COMBINE CLASSES OF USERS

PRIVATE SECTOR

DESIGN SYSTEM TO MEET ALL COMMON NEEDS

SYSTEM OPERATION

- MUST BE SELF-SUPPORTING
- REVENUE SOURCES
  - USERS
  - OTHERS (SUBSIDIES)
- SUBSIDIZED OPERATION
  - INDIRECT - GOVERNMENT OPERATION
  - DIRECT - TO SYSTEM
    - TO USER

SOFTWARE PRODUCTION

LOW-COST DISTRIBUTION

MANY USERS

ADEQUATE REVENUES

QUALITY PROGRAMMING

(TEXTBOOK ANALOGY)

APPENDIX 6

APPENDIX TO ELEMENTARY AND SECONDARY EDUCATION REPORT

Appendix A

ASSUMPTIONS about the Electronic Transfer of Information

1 "information" = "raw material" of instruction/learning

2. "User" should dictate Form /Time/ Place of needed information

3. It is cheaper to move information (to user) then to move users (to information sources)

4 It is cheaper to move information electronically than any other way

5. Most information can be/ Stored Updated Retrieved /Electronically

6. All electronically stored information can be electronically distributed to large numbers of remote users

7 Electronically stored and transmitted information can be given to the user in any electronically related form
   - CRT ~~usage~~ image (still, motion)
   - full audiovisual
   - computer printout
   - facsimile

1.

PANEL 3

Appendix #B

MODEL

"CATHOLIC TELEVISION NETWORK" - hypothetical system

Current "network" description

10 ITFS systems (2 - 4 channels) = NY, Brooklyn, Rockville Centre
Boston, Miami
Detroit, Chicago, Milwaukee
LA, San Francisco

Interconnection

- with cable TV: SF, Chicago, R Centre
- with other ITFS: NY-Brooklyn-R Centre
- with satellite (CTS): SF

(estimated) (exact numbers can be provided)

SCHOOL USERS

600,000 students (elementary + secondary)
25,000 teachers
1,300 schools
13,000 "terminals" (=TV sets)

(NB) Current school users = approximately ½ of potential users in Catholic schools of the 10 systems

In addition to schools, one or more CTN station is serving
- hospitals
- community colleges
- adult education centers

"CATHOLIC TELEVISION NETWORK"

1. Objectives

1.1 discipline objectives:
-- to support teachers in all instructional tasks
(see) list of "teacher information needs"

1.2 No statutory requirements apply here

1.3 Satellite contribution to 1.1 _____
make INFORMATION available to teachers
-- larger quantity
-- better quality
-- greater variety
-- multiple forms
-- faster access
-- lower unit cost

by

remote-access to shared electronic information systems
(computer storage, update, retrieval)

"CATHOLIC TELEVISION NETWORK"

2. Communications Needs

2.1 Types (prioritized)

A (-- library/info retrieval (image + alphanumeric)
(-- CMI (computer managed instruction)

B -- live teleconferencing (two way audio)

C (-- live teleconferencing (one way video, 2 way audio)
(-- CAI (comp ter assisted instruction)
(-- TV program distribution (NON real-time)

D -- TV program distribution (real time)

2.2 Volume of communications

Present: approx. 30-40 channel hours per day
of 1-way TV program distribution in
most CNT stations

occasional teleconferencing
(one way video, two way audio)

experimental - facsimile transmission
- data transmission

NO QUANTITATIVE ESTIMATES POSSIBLE

"CATHOLIC TELEVISION NETWORK"

2.3 Networks

Present ((see Page 1, current description,
(interconnection.

Short- (interconnection of CTN stations NOT with each other
Long (but with shared library and information sources
Term ((e.g. central computer for CMI/CAI)

3.0 Constraints

3.1 statutory: current legislation does not authorize adequate $ support of research, development, and experimentation commensurate with $ investment in electronic hardware.

3.2 regulatory: minimal -- though there are threats to integrity of dedicated spectrum for public service (e.g., ITFS vs MDS)

3.3 institutional: educational management fractionated among autonomous systems -- will not aggregate needs or funds without decisive Federal initiativeand support.

"CATHOLIC TELEVISION NETWORK"

4.0 Potential benefits

(see) 1.3 on page 2 of Appendix B

greater individualization and personalization of instruction made possible of the information/communication system relieves teachers of "information" tasks.

Public Service Communications User Requirements

Additional Observations on Utilization (by a Panel 3 member who had to leave the conference early)

Appendix C

UTILIZATION ~~Dixon~~

PANEL 3

~~#2~~ Teacher Control

Teachers are charged with development of instructional programs. They must be concerned about requirements, content, relevancy and schedules. If they use television as part of their classroom instruction the programs must fit.

Systems must be developed and implemented which will provide in-put from teachers to assure that they will get what is needed and wanted.

It's recognized that all of the needs of individuals can't be met. However, within the available time frames, efforts should be made to provide programs which will meet the needs of the majority as far as such needs can be determined.

Use of a VTR will assist the teacher with scheduling. While it's true not all teachers have access to VTR equipment there exists a limited number which is bound to increase.

~~#5~~ Observed Interactions

Interactions through use of television and the telephone is an effective process. Some reject the possibilities because of the limitations imposed. Only a few can get in the act.

Because of the time limitations its recessing to program the interactions so that specific persons are involved. For instance in a district composed of numerous schools, one classroom of students could be designated for the interaction. The rest of the students would be observers. Participation has greater value than observing yet the probability that the students in the classroom designated to ask questions will raise most of the questions which might be ask from any of the total number of students is great. Observed interaction is valuable and should be used regularly in connection with use of instructional television.

~~#25~~ User Involvement

User developed programs one usually used. They are relevant and reflect the desires of the user. Prescribed programs may be valuable but it's for more difficult to relate the subject matter to the specific plans of the user.

A system should be developed to assure user involvement in program development and evaluation.

UTILIZATION ~~Dixon~~

PANEL 3

~~#37~~ More Program Choice

Instructional television has been in use for a number of years. Video-tapes have provided a means of duplication at a much less cost than reproduction of films.

Systems should be developed and information disseminated as to choices available. Users need to plan ahead. Thus, advance material is essential if programs are to be used.

Computer capability for identification and processing will add a great deal to the efficiency of the selection and utilization process. Present capabilities will allow more program choice. Efforts should be made to assure the opportunities.

APPENDIX 7

APPENDIX TO MEDICAL EDUCATION REPORT

Appt

2) B/C
3) Members of Educational Committees

Done

ADI + 410, 425

AMERICAN MEDICAL ASSOCIATION

535 NORTH DEARBORN STREET • CHICAGO ILLINOIS 60610 • PHONE (312) 751-6000 • TWX 910 221-0300

September 30, 1976

ORIG to MARTY

DIVISION OF EDUCATIONAL POLICY AND DEVELOPMENT

JACKSON W RIDDLE, M.D., PhD
Director
(312) 751-6357

(+) - Mandatory

AAOS
CVH

CONTINUING MEDICAL EDUCATION FACT SHEET

1 State medical associations who have made a policy decision to require continuing medical education (CME) as a condition of membership, but not all of whom have been able to implement this decision as of the above date

Alabama	Kansas	Minnesota	New York	Pennsylvania
Arizona	Maine	Montana	North Carolina	Vermont
Florida	Massachusetts	New Jersey	Oregon	

2 Medical specialty societies who have made a policy decision to require CME as a condition of membership, but not all of whom have been able to implement this decision as of the above date

- American Academy of Family Physicians
- American Association of Neurological Surgeons
- American College of Emergency Physicians
- American College of Radiology
- American Psychiatric Association
- American Society of Abdominal Surgeons
- American Society of Plastic & Reconstructive Surgeons, Inc

3 All 22 medical specialty boards have established a policy to provide recertification, 13 of these have established dates on which recertification will begin

American Board of Allergy & Immunology	1977
American Board of Colon & Rectal Surgery	1985+
American Board of Family Practice	10/30-31/76+
American Board of Internal Medicine	10/26/74
American Board of Ob-Gyn	1977
American Board of Otolaryngology	1978
American Board of Pediatrics	1977
American Board of Physical Medicine & Rehabilitation	1977
American Board of Plastic Surgery	1978
American Board of Radiology	1978
American Board of Surgery	1985+
American Board of Thoracic Surgery	1986+
American Board of Urology	1980

4 Medical practice acts in fifteen states give the State Board of Medical Examiners authority to require evidence of CME as a condition for re-registration of the license to practice medicine These, with effective dates where possible, are

Alaska + 1/1/77	Illinois + 11/19/75	Minnesota 1/1/77	Utah 2/10/76
Arizona +	Kansas + 7/1/78	Nebraska	Washington + 7/1/76
California + 1/1/77	Kentucky 9/1/72	New Mexico 3/24/71	Wisconsin * 1/1/77
Colorado + 3/1/77	Michigan + 1/1/77	Ohio + 1/1/77	

A7-2

The Board of Medical Examiners in New Mexico has implemented its program and accepts the PRA as meeting its requirements The law in Ohio states, "Every doctor of medicine licensed to practice medicine or surgery within this state shall, on or before the first day of January of EVERY THIRD YEAR AFTER THE 1977 REGISTRATION, apply to the state medical board for a certificate of TRIENNIAL registration with the board upon an application which shall be furnished by the board <u>THE APPLICANT SHALL INCLUDE SATISFACTORY EVIDENCE TO THE BOARD THAT IN THE PRECEDING THREE YEARS THE PRACTITIONER HAD COMPLETED 150 HOURS OF CME CERTIFIED BY THE OHIO STATE MEDICAL ASSOCIATION AND APPROVED BY THE BOARD</u>

* The state of Wisconsin has enacted malpractice legislation requiring 15 hours of annual CME credit for relicensure, starting in 1977, as a requirement for licensure

5 The Physician's Recognition Award (PRA) provides a mean for documenting CME for all physicians in any field of medicine Programs for certifying CME are in operation in the states of Arizona, California, Oregon and Pennsylvania Criteria for certification adopted by the New Jersey Medical Society and the Pennsylvania Medical Society are identical to those of the PRA The AMA assists the state associations of Arizona and Pennsylvania, the American Society of Clinical Pathologists and the College of American Pathologists in review and evaluation of the applications from their membership for their certificate in CME The PRA program endorses the CME programs for the following organizations

- American Academy of Family Physicians
- American College of Obstetricians and Gynecologists
- American Society of Clinical Pathologists
- College of American Pathologists
- Arizona Medical Association, Inc
- California Medical Association
- Ohio State Medical Association
- Oregon Medical Association
- Pennsylvania Medical Society

This means that any physician qualifying for these programs is also considered qualified for the PRA In the states of Pennsylvania and Arizona, the PRA certificate is issued, as well as the state certificate, for CME For the other organizations, a simple statement by the physician on his application for the PRA and the application fee is all that is needed He need not complete the details of the application form

6

CRITERIA FOR THE PRA	Credit Hour Limit
Category 1 - CME Activities with Accredited Sponsorship (60 hours required)	No limit
Category 2 - CME Activities with Non-accredited Sponsorship	45 hours
Category 3 - Medical Teaching	45 hours
Category 4 - Papers, Publications, Books and Exhibits	40 hours
Category 5 - Non-supervised Individual CME Activities	45 hours
Category 6 - Other Meritorious Learning Experiences	45 hours

A total of 150 credit hours are required over a 3-year period with a minimum of 60 credit hours in Category 1

7 State medical associations which have been approved by the Council on Medical Education of the American Medical Association for survey, review and evaluation of organizations or institutions sponsoring intra-state continuing medical education programs are.

1 Medical Association of the State of Alabama
2 Alaska State Medical Association
3 Arizona Medical Association, Inc
4 Arkansas Medical Society
5 California Medical Association
6 Medical Association of the Isthmian Canal Zone
7 Colorado Medical Society
8 Connecticut State Medical Society
9 Medical Society of the District of Columbia
10 Florida Medical Association, Inc
11 Medical Association of Georgia
12 Hawaii Medical Association
13 Idaho Medical Association
14 Illinois State Medical Society
15 Indiana State Medical Association
16 Iowa Medical Society
17 Kansas Medical Society
18 Kentucky Medical Association
19 Louisiana State Medical Society
20 Maine Medical Association
21 Medical & Chirurgical Faculty of Maryland
22 Massachusetts Medical Society
23 Michigan State Medical Society
24 Minnesota State Medical Association
25 Mississippi State Medical Association
26 Missouri State Medical Association
27 Nebraska Medical Association
28 Nevada State Medical Association
29 New Hampshire Medical Society
30 Medical Society of New Jersey
31 New Mexico Medical Society
32 Medical Society of the State of New
33 North Carolina Medical Society
34 North Dakota Medical Society
35 Ohio State Medical Association
36 Pennsylvania Medical Society
37 Puerto Rico Medical Association
38 Rhode Island Medical Society
39 South Carolina Medical Association
40 South Dakota State Medical Associati
41 Tennessee Medical Association
42 Texas Medical Association
43 Utah State Medical Association
44 Vermont State Medical Society
45. Medical Society of Virginia
46 Virgin Islands Medical Society
47 Washington State Medical Association
48 West Virginia State Medical Associat
49 State Medical Society of Wisconsin
50 Wyoming State Medical Society

8 Organizations which sponsor Self-Assessment Programs

Allergy Foundation of America
American Academy of Dermatology
American Academy of Ophthalmology and Otolaryngology
American Academy of Orthopaedic Surgeons
American Academy of Pediatrics
American Academy of Physical Medicine and Rehabilitation
American Association of Neurological Surgeons
American Board of Thoracic Surgery
American College of Cardiology
American College of Chest Physicians
American College of Emergency Physicians
American College of Obstetricians and Gynecologists
American College of Physicians
American College of Radiology
American College of Surgeons
American Neurological Association and
American Academy of Neurology
American Psychiatric Association
American Society of Anesthesiologists
American Society of Clinical Pathologists
American Society of Colon and Rectal Surgeons
Connecticut & Ohio Academies of Family Practice
Philadelphia County Medical Society
University of Wisconsin Department of Continuing Medical Education

9 Continuing medical education requirements for state Osteopathic Associations, as of October 1975

1	Arizona +	2-day course approved by AOA
2	Florida +	25 hours per year
3	Illinois +	Minimum of 50 hours per year, to coincide with AOA requirements
4	Kentucky	150 hours in 3-year period
5	Maine +	50 hours per year, 40% must be Osteopathic
6	Maryland +	New regulations being formulated
7	Michigan +	25 hours per year, will be increased in 1976 to 50 hours per year
8	Nebraska	150 hours in 3-year period
9	Nevada +	10 hours over a 2-day period
10	New Mexico +	150 hours in 3-year period, or 50 hours per year
11	Ohio +	150 hours every 3 years for 3-year relicensure, 50% must be obtained in programs where majority of speakers are DOs
12	Oklahoma +	2 days each year
13	Pennsylvania	150 hours in 3-year period
14	Rhode Island	20 hours per year
15	Tennessee +	2 days each calendar year
16	Vermont +	2 days each calendar year
17	West Virginia +	2 days, requirement expected to be increased to 25-50 hours
18	Wisconsin	50 hours per year, 150 hours in 3-year period for AOA

REGIONALIZATION OF ACADEMIC MEDICINE TO INCLUDE CONTINUING EDUCATION

The Regionalization of Academic Medicine: The Metamorphosis of a Concept

Edmund D Pellegrino, M D

Metamorphosis a normal process in the life history of an organism which results in radical alterations in its structure within a relatively short period of time.

—William C. Grant Jr. (1)

Our academic health centers are young educational organisms whose metamorphosis is incomplete and whose ultimate adult form is still to be determined The transformation from medical school to multischool academic center is scarcely more than a decade old Yet, we are already compelled to contemplate the next developmental stage the transition to multi institutional, regionalized health sciences consortia more specifically designed to meet defined societal needs.

The entire process of metamorphosis is being telescoped by external forces whose thrust is to engage the nation's academic health centers more directly in the planning and delivery of health care and in providing manpower better adapted to meet perceived public needs. The configuration of our academic health centers in the next decade is sure to be determined by how they respond to a variety of significant factors diminished support for building and financing university hospitals, diversion of "teaching" patients to community hospitals, the need to provide a wider spectrum of teaching experiences for a wider variety of health professionals, the trend to research in health care rather than biomedical research. In this matrix, federal programs like CHP RMP, and more lately HMO AHEC and CHES become catalytic forces whose fiscal potency provides leverage for a necessary re-examination of the form and function of health sciences centers in contemporary society

Some universities have already begun to respond. Indiana Illinois, and Michigan State are conducting significant experiments in educating medical students in community hospitals and other educational settings outside the academic health center But the necessary reconceptualization of the fundamental purpose structure, and organization of the academic health center is just beginning in most universities, while it is being resisted in still others.

I propose to analyze briefly the necessities, opportunities, obstacles, and requirements that the next stage of our evolution places before us. The current thrust toward regionalization, represented by the recommendations in the Carnegie Commission report to establish area health education centers (2), will serve as a convenient frame for my more fundamental query into the nature of the academic health center I do not propose to provide a universal model but merely to examine the elements in any regional approach to health professions education

Selection of Wise Ends

The final test of our system of education for health professionals is the degree to which its graduates satisfy the needs of the people they serve This means that the numbers kinds, and attitudes of health workers must be sufficient to make available to every citizen the fullest measure of health which we are capable of providing.

We are far from meeting this test today, despite the employment of some 4 million health workers. Major categories of health care are neglected other categories are inequitably distributed, excessively costly or inefficiently delivered Some types of health workers are scarce, while others are overabundant. All categories are poorly distributed among rural and poor populations. Clearly, there is a disjunction between the purposes of health manpower as seen by the public and the purposes seen by the professions The resultant communications gap, as Anne Somers (3) has called it, is of serious proportions and is growing.

Our academic health centers have a major responsibility for repairing this disjunction Public expectations are that the enormous potential of our academic centers will be harnessed more directly to adjust manpower production more explicitly to needs. This expectation underlies much of the recent and pending state and federal legislation in health. Academic health centers must consciously and explicitly accept this responsibility and bring pedagogic aims and academic organization into closer conformity with public expectations.

Congruence between educational and societal ends in health is the paradigm of how universities can meet their responsibilities to put their resources at the disposal of the communities they serve. A responsive, intelligent and substantial exhibition of academic statesmanship is thus demanded. As John Buchan (4) reminded us in his life of James Montrose, "Statesmanship requires two gifts the conception of wise ends and the perception of adequate means." Up to now, we have been fascinated with means but lacked precision and boldness in the conception of ends.

The ends of social and public needs must be given prior emphasis as we begin to design the next steps in the metamorphosis of our academic health centers. Lacking this, the surfeit of means now being thrust upon us will again lead to another ride on the roller coaster of expectation and disappointment to which John Gardner (5) has referred This has too often been characteristic of recent attempts to engage universities and their health centers in more directly improving the health of our people.

Educational, Pedagogic Necessities

The Carnegie Commission clearly sensed many of these issues when it suggested the establishment of 126 area health education centers (AHECs) as part of its recommendation to improve education in the health professions (2) These centers are to be developed, according to the Carnegie formulation, in moderately sized communities at some distance from existing academic centers but under their academic supervision. The intent is twofold to expand the national capacity for the education of more and different kinds of health workers and to bring to more communities the benefits of house staff and continuing education programs.

This paper is based on an address delivered at the November 4, 1972, plenary session of the 83rd AAMC Annual Meeting in Miami Beach, Florida.

Dr Pellegrino is vice president for the health sciences and director of the Health Sciences Center State University of New York at Stony Brook.

Added to this are the more subtle improvements in health care that accrue from well designed educational activities. The hospitals in larger communities, acting as AHECs, would establish their own satellites in smaller communities and thereby link them also to the university centers.

The Carnegie Commission report defined the area health education center only in general terms. The idea is being currently analyzed and its degree of dependence upon academic health centers debated (6). In this discussion, I shall favor the view that, however designed, *these area centers should be integrally related to existing academic health centers.* Indeed, the latter must become regionalized multi institutional networks if they are to meet their service, research, and educational responsibilities. This is, in fact, the next stage in metamorphosis that must unfold over the next decade.

Even before the Carnegie Commission recommendations, it was obvious that academic health centers, as currently conceived, could not provide the varieties of experience required to train professional health workers for effective health care delivery. The university hospital, that mainstay of quality clinical education in the last several decades, is facing some serious problems and a need to redefine its role (7).

Third party payments are diverting *many former teaching patients to community hospitals,* leaving university hospitals with a bimodal distribution of tertiary complex, and esoteric problems or chronic low turnover illnesses, both in very low income patients. In poverty areas, some university hospitals are already facing serious occupancy problems that threaten their fiscal survival.

In addition, the drying up of federal support for building university hospitals is forcing newer schools to seek innovative arrangements with existing hospitals. Older schools, seeking to enlarge their classes, cannot expect federal assistance for expansion of their existing plants and must also look elsewhere for more teaching beds.

Most important, university hospitals simply do not afford opportunities for extensive clinical training in some of the most important and neglected areas of health care. They have become as Flexner (8) appropriately recommended, centers for the training of academicians for clinical investigation, and optimal instru*ments for treating the 10 to 15 percent of* problems of human illness that require highly specialized care. They do not—and probably should not—provide settings for teaching secondary care and the much neglected family care, primary and first-contact care, long term care, and health maintenance.

Yet, these latter comprise the largest bulk of health needs in our country. They are precisely the ones that are not being met and the ones for which we should specifically train the bulk of students in all the health professions. Education for these neglected dimensions of health is most sensibly provided in settings where such care is delivered now and is certain to be delivered in the future in community hospitals, ambulatory clinics, group practices, physicians' offices, *and emergency rooms. Only in these* settings can the student encounter practitioners who can teach such care without a credibility gap.

Some of these settings are used now, but with reluctance and fear of exposing the student to questionable models of practice and thought. Instead, these experiences must become integral and organized segments of the clinical education of many more students, used not begrudg-

ingly but deliberately because they provide certain essential experiences. This will mean much closer planning for, and supervision of, such experiences by the academic health center and, thus, an infusion of the spirit of inquiry and constructive criticism necessary for a true teaching environment.

To attain these ends, the academic health centers—and each of the schools that comprise them—must reach out to community hospitals and other settings and incorporate them into a cooperating network. This, in turn, will require extending faculty appointments to practitioners who teach in these settings, incorporating them into the committee and governance structures of the academic centers.

The new multitrack curricula will make extramural clinical experiences a pedagogic necessity. Students who wish to specialize in family and first-contact medicine, community and social medicine, and health maintenance will differentiate earlier and follow curricula differing from those headed for the major clinical specialties or for academic medicine. The major portion of their educational experiences will be gained, not in the university hospital, but in clinical campuses and community settings. They will follow patients into the university hospital only when their care requires its use. Area health centers, far from being auxiliary means of expanding student enrollment, will become the proper training ground for the education of family and primary care physicians and nurses and *all health professionals* interested in community medicine, preventive care, and long term care. It is becoming unmistakably clear that we must somehow induce a majority of graduates in the immediate future to elect these careers if we are to fulfill our responsibilities to match manpower with unmet and urgent needs.

Education in settings outside the university hospital by faculty members skilled in ambulant, preventive, and long-term care is the only realistic way to assure the authenticity our students so rightly demand. Such settings also provide the only genuine way a student can experience the demands and the life-style of certain branches of medicine. A student must, in the long run, determine his own suitability for these branches of practice—the advantages as well as the disadvantages. By developing new models for the delivery of primary and family medicine, the university consortium might obviate the sense of isolation and of overwhelming demands primary care now imposes on so many practitioners.

There is no question that a major problem before us is how best to deploy and utilize existing health manpower. This means experimentation in role realignments among health professionals so as better to match the needs of patients and communities. Extramural community settings, when part of a network linked to the academic health centers, offer the best opportunity for such experimentation in team care. Students of every health profession should receive some of their clinical education in multiprofessional teams. The university hospitals can provide examples of a limited number of teams. The most important models—from the point of view of current need—can be experimented with and used as clinical experiences only in the community settings.

We would be naive, however, if we interpreted the current public mood of disaffection with some forms of research to mean that the public will forego the accrued benefits of scientific medicine. What it seeks, rather, is a better balance

between the effort dedicated to research and the training of specialists and that devoted to training manpower for the larger volume of ordinary human illness. We must not forget the dismal state of clinical education in Flexner's time which impelled him to dedicate a large section of his report to the need for university and faculty control of teaching beds (7). It is unwise to risk the return of such conditions by neglecting the university hospitals or forcing them to undertake care and education for which they are not suited. They provide the specialized technologic back up and specialized workers who complete the full spectrum of care that should be available to every community. They remain the places to train subspecialists, academic clinicians and clinical investigators.

Rather, what the true consortium requires is a conscious deployment of care and educational functions among its institutional members in such a way that each institution does that portion of teaching and service for which it is best suited. We gain little by homogenizing hospitals and institutions. Their differences are their contributions to the consortium. We must find ways to institutionalize the differences for the benefit of each region and for the training of each student in whatever track he chooses in the total spectrum of opportunities the academic health center must offer.

The majority of academic clinicians in health sciences centers are not suited by training, temperament, or motivation to teaching all the new roles required for an adequate health care system. Their education, interests and motivations do not suit them for teaching the missing dimensions of care. Rather than hope for their miraculous conversion, at best a transitory and limited phenomenon, we must assign their responsibilities to separate departments of family medicine and community medicine in university and community hospitals and provide them with faculties clinically competent in caring for and preventing ordinary illnesses and capable of academic surveillance of the clinical faculties providing such care outside the centers. These departments need counterparts in the area health education centers tied in by faculty appointments. Academic standards will remain the purview of the university departments, but these must be departments themselves skilled in the type of care they will supervise. This is not the interest of traditional academic departments, even the broader based departments of medicine or pediatrics (9).

AHECs are also essential for viable programs of continuing education for all health professionals. Mandatory or self imposed requirements for continuing education and recertification of all health professionals can be expected as part of the public interest in accountability of professionals. Unprecedented demands for this type of education can be anticipated therefore. These demands cannot be met without each health sciences center's taking responsibility for the continuing education of all health professionals in its region. Further, the most effective form of such education is that which is integrated into the practitioner's daily practice and built around the care of his own students, whenever possible. This is best achieved by extending continuing education into area health education centers and, through them, to their satellites so that, in some way, every health care institution can become a teaching institution. Development of a core staff of full-time teaching clinicians in the larger community hospitals and the training of additional in situ faculty for smaller institutions will be required—all

under the leadership of the university health sciences centers (10). Courses, fellowships, and seminars at the center are, at best, only supplemental to the ongoing continuing education conducted in the region's hospitals. Clearly, without a regional approach that uses all available facilities, continuing education cannot be adequately supplied for all health professionals by today's health sciences centers.

Another neglected dimension of health professions education for which the regionalized approach is essential is teaching of the process of health care delivery as well as its content. All health professionals need a better perception of the efficacy, efficiency, productivity, and costs of delivering health care to a variety of populations through a variety of organizational patterns. The university center, with its hospital and clinics, can teach one form of the process of delivery. The other forms can only be taught in community health agencies. Academic health centers need these agencies to study the process of care and, with their cooperation, to establish newer models designed to meet specific community needs.

Yet another important advantage of the regionalized health sciences consortium is its potential for speedily and economically expanding a university's capacity for health manpower production. Existing clinical facilities under university supervision can be prepared to take students after a relatively short lag period. A smaller number of university supported faculty will be needed, and large capital outlays can be avoided. Limitations on class size imposed by the bed capacity of the university hospital can be transcended. If clinical campuses can be coupled with a series of basic science campuses, the educational capacity of most university health sciences centers can be enlarged materially. If this is to occur without loss of quality of education, then the academic health center must take the leadership role to organize and supervise each of its clinical and basic sciences extensions. It is essential, however, that an academic health sciences center and its university hospital be at the center of such a complex. Current experiments that seek to ameliorate capital and operating costs by establishing new schools through uniting community hospitals with general campuses without incorporation of the academic health sciences centers seem dubious enterprises. They will ultimately either have to develop into health sciences centers or suff[illegible] evaluation of educational quality. The illusion needs to be dispelled that any willing community hospital and any willing college with science departments can become a medical school.

It is academically and fiscally much sounder to make more optimal use of the large investments represented by existing academic health centers. By extending their educational capacities to include a network of other institutions, manpower needs can be better met than by replicating any number of free standing medical schools, attractive though this prospect may be for the local community. Each state must first assign responsibility for a subregion to its existing centers so that each serves a prescribed population and a prescribed set of institutions.

Even though indirect and at a distance, the intellectual stimulus of an academic clinical faculty and the basic sciences are essential if clinical pedagogy is to remain up to date. In our haste to increase manpower and to make it serve the more common illnesses, we must not forget the essentiality of science for the growth of every branch of clinical medicine.

A major problem in many a state is the

retention of medical graduates. In some instances there is up to a 70 percent loss of recent graduates. Place of residency training is a more important determinant for the location of a man's practice than is place of graduation One of the first results of establishing clinical campuses in community hospitals is to improve the number and quality of residency programs within a state This, in turn attracts more recent graduates who will settle in significant numbers where they took their residencies When this is coupled with expanded efforts in continuing education an additional attraction is added that will keep more graduates in any community The network arrangement is also the necessary vehicle through which the academic health center can take its formal role in graduate education—a development recommended in 1966 by the Millis Commission and still to be implemented formally by academic health centers (11)

A regional consortium for the health sciences must extend beyond medical and health oriented institutions it should seek to encompass all levels of education for the health professions. In this way a unified continuum of educational experiences can be fashioned, comprising community colleges four year colleges, and general university campuses These institutions will in the next decade become more than ever deeply committed to preparation of students for health careers Cooperative curricular planning among all types of institutions is an urgent necessity if academic equivalency, admission to advanced standing, and long term programs for redressing the educational handicaps of minority students are to be accomplished on a regional basis Such arrangements are absolutely requisite if upward and lateral mobility is to become a realistic probability for the majority of students in the health professions.

No single institution can—or should try to—encompass every level of education in the health professions. By joining two-year and four year colleges with universities and university health centers in a true regional consortium each can make its special contribution to a synergistic educational effort that provides the student with alternatives and the possibilities of progression from first entry into health sciences to the highest levels of educational sophistication Educational ladders and lattices' will continue to be mirages until these multi-institutional arrangements are effected

These are a few examples of the pedagogic necessities and potentialities inherent in the development of regional health sciences consortia In fact without such developments the academic health sciences centers manifestly cannot meet the full range of even their current responsibilities The federal area health center program will certainly accelerate such developments but even in its absence the centrifugal evolution of health sciences centers would have to be encouraged

Regionalism, Research, and Service

In addition to their expanded educational responsibilities, academic health sciences centers have an obligation to influence the quality of health care in their regions While this is a standard part of their rhetoric, there are practical problems in its realization. One of the unresolved questions is the extent to which an academic institution should involve itself in health care delivery Providing direct care can compromise academic responsibilities not providing a certain amount of such care is irresponsible We have yet to find the correct balance between re-

sponsible involvement and careless over immersion in service obligations.

One thing is certain When a university attempts to influence the quality of health care it should do so in a manner consistent with the university tradition—in a disciplined way freed of self-interest, and committed to high performance standards Using the regional approach the university can have a considerable influence *over a larger number of institutions and practitioners than is now the case.* This influence is exerted through extending the presence of its students faculty and teaching attitudes. The quality of certain aspects of care rises in any institution when a critical and inquiring attitude is introduced and the best teaching provides this spirit.

University centers can also be more directly involved in delivering health care through their associated institutions, through HMOs run collaboratively with them and by operating other types of experimental models of health care for prescribed populations. The consortium offers some viable alternatives to the academic centers' undertaking massive programs of health care delivery Yet it infuses the university influence into the health care delivered in a larger number of institutions than would otherwise be possible. *Inducing changes indirectly* is more effective for an academic center than trying to meet the enormous demand of large populations for health care directly This puts education and public service into competition and ultimately education must take second place.

Area health education centers and their satellite institutions and clinics are natural and needed laboratories for departments of family and community medicine. Studies in the delivery of primary and preventive care and their management and in the design and testing of new team models and investigations into ecology and epidemiology and into a variety of other dimensions of health and disease are best pursued in the regional area centers. University hospitals will do best to concentrate on investigations of disease mechanisms per se and are unsuited for investigation into processes of delivery, except in tertiary care.

What the regionalization of the academic health center offers, then is the *possibility for a coordinated community* effort in research in health care delivery, as well as improvement in delivery itself It does so by a conscious assignment of functions among institutions. The university per se can design new models, evaluate them rigorously and thus advance our knowledge of the delivery process, just as it does in the laboratory and at the bedside. It does not, however, attempt to supplant existing hospitals and health care institutions or to undertake massive programs of delivery by itself This division of functions and effort among many institutions assures a total community effort to improve the delivery of health care. The university is a partner and contributes its expertise in research, but all health providers have an investment in the result

As in the case of its pedagogic obligations, *the regionalization of academic* health centers offers research and service opportunities impossible to achieve by other means. Indeed it is most promising in just those areas of manpower production and health care delivery where we are most criticized

The Stony Brook Consortium

Many of the principles of regionalization are being developed in the educational networks now in operation by the University of Illinois and Indiana University as well as in some of the pilot AHEC

programs just recently funded. I shall exemplify some of these principles further by a brief description of the consortium now being organized on Long Island under the aegis of the new Health Sciences Center of the State University of New York. Details must of necessity be scanty and are provided more extensively elsewhere (12 13)

The Health Sciences Center at Stony Brook is a new six school academic health center comprising Medicine Dental Medicine Nursing, Allied Health Professions, Social Welfare and Basic Health Sciences. It was designed from the outset in 1966 to be part of a multi institutional network providing basic clinical graduate and continuing education for some 3000 full time students under a unified academic plan The region encompassed by the center and its member institutions includes all of Nassau and Suffolk counties and part of Queens with a combined population of 3 5 million

Such a population might reasonably justify at least two medical schools or health sciences centers Instead, one center, located midway on Long Island at Stony Brook, can develop educational programs for some 3000 full time students by establishing a cooperative network with a variety of hospitals and other institutions.

The University Hospital at Stony Brook is being designed consciously with a limited bed capacity to perform specific roles in the educational process but not to fill the total educational needs of the students enrolled in the center Four clinical campuses are already in operation Together with the University Hospital, they will provide the major portion of the in hospital clinical experiences for students of all six schools. These are the Nassau County Medical Center, the Long Island Jewish Hillside Medical Center/Queens Hospital Center, the Veterans Administration Hospital at Northport, and the Medical Department of Brookhaven National Laboratory The location of these centers is shown in Figure 1 and additional data are noted in Table 1

The clinical campus function is reserved for hospitals of sufficient size to provide a wide variety of clinical experiences for students in all the major health professions. All the chiefs of service and full time staffs are by contractual agreement, appointed to the faculty of the medical school and must be mutually acceptable All patients are teaching patients. Whenever possible, clinical campuses carry responsibility for students from all six schools of the center as well as conducting graduate and continuing education programs.

Students receive clinical instruction from the first year onward at the clinical campuses. This consists of early introduction to health care systems and clinical concentrations of basic science teaching. During the second year integrated systems teaching, mini-clerkships and introductory physical examination and history taking are conducted at these sites.

Current plans call for those students who choose clinical educational "tracks" to spend the major portion of their clinical education at one or several of the clinical campuses. These tracks would include the usual clinical specialties, community medicine and family medicine After completion of several modules, basic sciences, integrated systems, and introduction to clinical medicine the student may elect to spend the remainder of his clinical education at a clinical campus. This will take him through the M D degree and, if he chooses to do so, through his graduate education to the point of competency in a specialized field

The period spent at the clinical campus

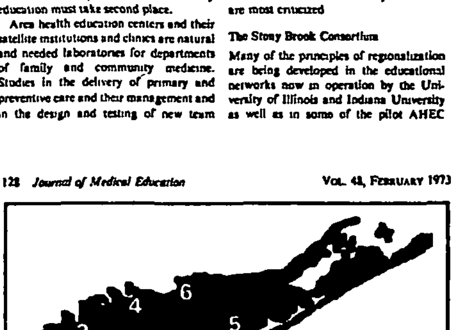


FIGURE 1

Location of clinical campuses in the Stony Brook Long Island Health Sciences Consortium. (For key to numbers, see Table 1.)

will vary, depending upon the area of major study chosen The four years *ordinarily devoted to internship and resi*dency and the last two years ordinarily assigned to medical school are telescoped into one four year module which the student may spend almost entirely at a clinical campus. In this plan he will receive only specialized parts of his education at the University Hospital in disciplines and settings not available at clinical campuses—those which the University Hospital is best suited to provide Each clinical campus already has its own character and mission and it is expected to develop an educational emphasis of its own, which it contributes to completing the spectrum of special experiences available to all participants in the consortium

Each clinical campus has its own full time dean who is responsible for coordinating all academic programs in all professions at his campus. He is appointed by *a joint selection committee of the Health* Sciences Center at Stony Brook and the hospital concerned He is expected to effect liaison with the dean of each school on the university campus or with the vice president's office on matters that transcend *the concerns of individual schools.* Academic programs, clinical curricula appointments, student services, scheduling and all the many details of operation that usually beset any dean's office are coordinated through the Office of the Dean of the Clinical Campus.

Participation by clinical campus faculty in the governance of the schools of the Health Sciences Center is accomplished by service on all school committees, joint planning of curricula, and liaison between departmental chairmen at all campuses. The director of the Health Sciences Center at Stony Brook meets regularly with clinical deans, deans of the Stony Brook schools, and directors of the four hospitals to discuss policy matters and operational problems.

The clinical campus arrangement is one of five ways in which hospitals may become part of the Stony Brook Long Island Consortium. A mode of affiliation is provided that can fit the needs and capacities of almost every hospital in the

TABLE 1

CLINICAL CAMPUSES IN THE STONY BROOK LONG ISLAND HEALTH SCIENCES CONSORTIUM

	Clinical Campus	Beds	Full-time Staff	House Staff	Outpatient Visits per Year
1	Nassau County Medical Center	639	80	184	147 198
2	Long Island Jewish-Hillside Medical Center†	659	83	230	40 000
3	Queens Hospital Center†				
4	Veterans Administration Hospital, Northport	1 110	35	8	408 000
5	Brookhaven National Laboratory Medical Dept	32	33	0	2 306
6	Stony Brook	600	270	300	130 000

Numbers refer to locations on map in Figure 1

† LIJ HMC and QHC are affiliated institutions comprising one clinical campus

region Each hospital can to the extent its facilities and goals permit choose one of these modes of affiliation Currently a dozen additional hospitals are participating members in the network by departmental affiliation *for special programs* by providing clinical experience for nursing programs, or for purposes of continuing education Eventually it is hoped each of the 40 or more hospitals in the region will become participants by choosing the mode of affiliation most suited to its needs and aspirations

In addition to hospitals other elements related to the developing network include health agencies health departments neighborhood clinics regional medical programs and four year and community colleges. The aim is to relate the network to all institutions concerned with health sciences education Out of these interrelationships we seek *to devise a continuum* of educational experiences from the beginning to the most sophisticated levels and with sufficient academic equivalency to permit the largest set of educational options possible for the student

The network is new still only partially developed and facing the frustrations and problems in communication and governance to be expected of such a complex organizational structure It is too soon to evaluate its utility effectiveness, and productivity My purpose is merely to sketch *the outlines of the way a new academic* health sciences center must accelerate its own metamorphosis to meet current challenges to integrate manpower production health care delivery and research in health care under one institutional aegis

Attitudes and Concepts

Any genuine or lasting alterations in the structure of academic health centers as outlined here must be preceded by more fundamental alterations in their attitudes and in their concepts of the purposes they serve The imminent reality of an extensive federal program of AHECs now focuses these redefinitions very sharply The challenges to the way academic health centers view themselves and organize to carry out their perceived missions are profound and immediate.

Academic health centers first must consciously and explicitly accept their inevitable responsibilities as instruments of defined social purposes—purposes that

now arise increasingly outside of their institutional preoccupations. We are victims of our own success. Health has a liberating influence on the life of man as person and as community All men hope for health and now realize that we have the capability and the resources to move closer than ever to its realization. For society the justification for the support of *academic health centers must rest on the* degree to which they and their graduates can serve these ends. The growing incongruity between the public s affirmation of what it wants *from us and* what we are willing to provide must be eliminated, or the public will fashion its own alternatives outside existing institutional frameworks.

The multischool academic health sciences centers are still very young academic organisms They have still to meet the major challenges of the Coggeshall report (14) Yet even before they reach maturity they must seek an identity in new terms. A simple arithmetic extrapolation of their current educational missions will only aggravate the health care crisis More professionals must be educated specifically to meet those very large neglected segments of health care that are generating the current health care crisis.

Having accepted this social imperative the academic health centers are compelled to scrutinize the assumptions that have gone into their present self identity In this scrutiny one of the oldest and firmest assumptions in need of revision is that the academic health sciences center is a place and that all health professionals must be educated largely in that place Instead we must see that academic health sciences center as an organizing principle by which a network of institutions of great variety can be organized each carrying out that part of the total educational task for which it is best suited It is the totality, then, that constitutes the academic health sciences center and not just the energizing core which is the academic center and its university hospital By embracing a large variety of institutions, the academic health center can have a much more pervasive influence than is now possible on the quality of care to its region and can more closely match manpower production to regional needs.

Academic health sciences centers as they begin to accept federal funds for area health education center programs, must appreciate the necessity of this prior *metamorphosis*. AHEC *programs* are simply the latest expression of the public desire to engage the academic health sciences centers more intimately in meeting perceived needs. RMP CHP, and HMOs were all drafted with the same hope One need not be a thorough philistine to observe that that hope has too often been diluted by concerns more congenial to the traditional purposes of academic institutions. As T S Eliot s Archbishop remarked "Those who serve the greater cause/May make the cause serve them." (15) It is not too early to suppose that another quenching of expectations will invoke an alternative system of care and education born of public frustrations and legislative pique

All of this means that the academic health center must be willing to reexamine its traditional concept of "excellence " Heretofore excellence has been confined to scholarly activities and rigorous performance standards within prescribed disciplines and within the confines of the university Now excellence must of necessity extend to an equally rigorous examination of all aspects of providing health care. The academic health center will fail if it is attracted exclusively to either pole of the dichotomy It can forsake neither its traditional role as a locus for creative inquiry nor its new role

in confronting some of the more immediate problems of health care in the community Faculty members cannot reasonably be expected to span these extremes as individuals but the academic health center—expanded as a regional organism—can unite these polarities by extending its traditional scholarly influence into the practical realm of health care problems.

Many practical issues need to be addressed *even when the conceptual and* attitudinal metamorphoses are set in motion. For example

1 Each academic health center must explicitly define its region in collaboration with neighboring centers providing for coverage of every community by an academic health center its area health education centers, and their satellites.

2. Each institution health agency, and participating professional must be assigned and must accept a specific contribution *role consistent with its capabilities* and thus become part of a totally integrated plan for education and care.

3 Faculty appointments will have to be accorded to many more professionals and practitioners than is now the case. They must be made part of the organizational life of the new species of academic health center Given the jealousy with which academics regard faculty titles, this may be a very formidable obstacle.

4. To fulfill all its responsibilities and to expand its potential for manpower *production the clinical network herein* described must be joined to a basic sciences network organized along similar lines. The sciences departments of the regional colleges and universities, with expanded faculties for this purpose, could become peripheral components of the basic sciences departments of the academic health centers. In this way students could begin their education in the health sciences at one of several basic sciences campuses and complete it by transfer to one of several clinical campuses—all under the same academic umbrella With out a basic sciences component, the fullest potentialities of the regionalization of health sciences education cannot be realized

There are many additional problems in implementing these complex programs, such as the governance of the network, its *financing, mechanisms for accountability*, consumer input, the location of various levels of responsibility for operation and decision making. and the preservation of institutional identity within such a large institutional frame.

The new regionalized academic health centers described here will make unprecedented demands upon the leadership of our health professions. Individuals must be found who can design develop, and administer these multi institutional entities. *Today's academic health centers* already easily qualify among the most complex of our social and political organisms. But the emerging regionalized centers will require even more extraordinary managerial and executive skills. It is certainly not yet clear what training grounds are most suitable for preparing these leaders.

Finally, as we have already learned in our own experiment a communications network is absolutely essential as the nervous system, without which these new *academic organisms will fail to act co*hesively The geographic impediments to information transfer, interpersonal communication among key personnel in the participating institutions, committee participation and governance, and sharing of teaching and library resources must be obviated. A well functioning communications network is an essential first step. It will also be the first point of dysfunction

when the system of interrelationships begins to deteriorate The technical and organizational requirements for effective educational networks are considerable, but workable plans and programs are beginning to appear (16)

These problems bespeak an organizational complexity from which it is tempting to retreat. The tendency to revert to type is particularly strong in the academic community when faced with such fundamental changes. This is especially the case when the benefits to be gained are seemingly so remote from traditional disciplinary interests. After all," it will be said, "our academic health centers are the finest instruments yet created for both research and education of health professionals they are already overwhelmed with responsibilities, we will surely destroy them if we dilute their efforts and lower their standards in the romantic *pursuit of social polymathism.*"

To this, we would reply with the closing sentence of Lewis Mumford's book *The Transformations of Man* (17) "Every goal man reaches provides a new starting point and the sum of man's days is just a beginning. The sum of the accomplishments of today s academic health centers is, indeed just a beginning. The thrust toward regionalization and outward expansion is simply the next perceivable goal. Even before it is realized, a new one will assuredly appear

The potential social utility of academic health centers is too great to be confined only to currently existing organizational concepts. The high hopes society places in us will demand a continuing conceptual redefinition of mission and organization every time we attain some new success. This is an infallible sign of our vitality and our usefulness to those we serve.

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13. PELLEGRINO, E D Planning the Health Sciences Within a University Context The Health Sciences Center at Stony

A Supplement

Survey and Evaluation of Approaches To Physician Performance Measurement

Arlene R Barro, Ph.D

From Journal of Medical Education Vol 48 - No 11 Nov 1973

ASSOCIATION OF AMERICAN MEDICAL COLLEGES

PHYSICIAN PERFORMANCE MEASUREMENT

– PPM

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PPM

Preface

This survey and evaluation of approaches to performance measurement was undertaken by Dr Arlene R Barro as research associate for the Association of American Medical Colleges Longitudinal Study Project. (Dr Barro is now educational evaluator Office of the Dean, School of Medicine, State University of New York at Stony Brook.) This project was supported by the National Center for Health Services Research and Development, Health Services and Mental Health Administration, Department of Health Education, and Welfare, under contract number 110-72 96. The purpose of the survey is to provide background information for the selection of performance measurement instruments to be used in connection with the projected follow-up of the longitudinal study of medical students of the class of 1960.

The preliminary version of this monograph was prepared for a workshop entitled "Following Up the Performance of Physicians in the AAMC Longitudinal Study," which was held June 1972. This final version incorporates some comments and suggestions received from the workshop consultants and from the review done by the National Center for Health Services Research and Development.

Additional comments and inquiries will be welcomed by Dr Barro at SUNY Stony Brook and by the Division of Educational Measurement and Research of the Association of American Medical Colleges.

AYRES G D'COSTA, PH D.
Associate Director
Division of Educational Measurement and Research
Principal Investigator of the AAMC Longitudinal Project

Introduction

Raising the quality of medical care is a major concern in our country today "Efforts to evaluate the quality of medical care are becoming more explicit and more intensive" (1) The performance of the individual physician is of particular interest because he is the major figure in the health care team thereby assuming the primary responsibility for delivering quality care Thus, if the quality of the individual physician s performance is raised the general level of medical care should improve

A strong desire to improve the quality of physicians is evident. Efforts to develop better physicians are reflected in changes in selection and admission procedures to medical schools, in changes in content and presentation of medical school curriculum and in new approaches to evaluation of medical students performance Interest in maintaining a high level of performance in practicing physicians is reflected in physician participation in self-assessment programs, in continuing medical education programs, and in the development of explicit criteria by which their performance can be evaluated

Scope of the Study

The purpose of this study is to investigate the dimensions of physician performance and how these dimensions have been measured A variety of approaches that have been used to assess physician performance are reviewed and evaluated Suitability and applicability of approaches with respect to specific assessment purposes are also discussed.

The focus is on (*a*) the individual physician and his patient not on *medical* care systems, and (*b*) the qualitative aspects of individual physician performance, not output or productivity Thus, a number of topics are outside the scope of this study including the role of the physician in the health care system the effects of staff physical facilities, and formal organization on physician performance, and the physician's contributions to society which focus on effectiveness, productivity and distribution The exclusion of these topics should not be interpreted as a lack of recognition of their importance.

Dimensions of Performance

PROCESS AND OUTCOME

Two major approaches to the evaluation of performance are the assessment of process and the assessment of outcome As defined by Donabedian (2) 'assessment of process is the evaluation of the activities of physicians and other health professionals in the management of patients, assessment of outcome is the evaluation of end results in terms of health and satisfaction " An examination of the evaluation literature shows that there has been a tendency to focus on either process or outcome but not to tie them together Donabedian refers to this tendency as the "polarization" effect. The focus on either process or outcome suggests that they are independent of each other when, in fact they are intimately related. It is possible for example to perform a particular process well but to have a poor outcome In the 1700s bloodletting may have been well performed, but the patient often died It is, therefore mandatory to determine the extent to which a particular

9 [handwritten initials]

process affects outcome or outcomes. As Sanazaro and Williamson (1) have explained

> The validity of any criteria of clinical performance is determined by the extent to which such performance is causally related to patient outcomes. For example the causal relationship between a penicillin injection given to a penicillin-sensitive patient and a subsequent anaphylactic reaction is very clear and renders valid the criterion that presence or absence of penicillin sensitivity should be determined prior to administering this drug. On the other hand reports on the use of anticoagulants for patients with symptoms of acute myocardial infarction do not equally clearly establish a relationship to beneficial patient effects, and consequently do not provide as valid a clinical criterion of care

Considerably more research has been done to assess process than outcome One reason for this is that it is difficult to factor out either the physician behaviors that directly contribute to outcome or the degree to which outcome depends on physician behavior Simon (3) has suggested that process *and outcome* should be viewed as a continuous chain of events composed of many links—each link represents an outcome Each of these links is an intermediate outcome that can be evaluated Correctness of diagnosis, correctness of treatment, and compliance of patient are intermediate outcomes In the discussion on outcome both intermediate and final outcomes are included.

TECHNICAL AND INTERPERSONAL PROCESS

The process approach to physician performance measurement involves assessment of the array of skills that the physician applies to patient care. It is convenient to distinguish between the physician's technical skills and interpersonal skills. The *technical category* includes a wide variety of skills ranging from those which are psychomotor such as giving an injection or closing a wound to cognitive abilities required in data gathering data interpretation, and problem solving "Interpersonal skills" means primarily the physician s ability to conduct the necessary verbal and nonverbal communication with his patient. The bulk of the physician performance literature focuses on the technical as opposed to the interpersonal processes. Moreover within the technical domain there tends to be heavy emphasis on the cognitive aspects of performance

The quality of the physician's interpersonal skills specifically his ability to communicate with his patient has received considerably less attention than his technical skills. Yet there are two important reasons for assigning a more important role to the physician s interpersonal skills in an evaluation model of performance—(*a*) interpersonal skills contribute along with technical skills to diagnosing disease problems, and (*b*) interpersonal skills are needed in the treatment of nondisease problems.

Jason (4) discusses the relationship between technical and interpersonal skills in diagnosing a problem He explains that a variety of competencies are subsumed in the process of formulating a diagnosis, including the skills of interviewing, diagnosing, and problem solving. Jason maintains that the quality of the interview defined by the accuracy and completeness of the history depends on the physician's capacity to establish an atmosphere of openness and trust If this type of atmosphere does not exist the patient will not respond to the physician's questions honestly On the basis of what Jason has said even a technically competent physician may not diagnose the patient s problems accurately Thus, an accurate diagnosis requires the use of both technical and interpersonal skills.

Studies have shown that the physician contends with many problems that are not in the disease category An examination of the makeup of the physician's practice shows a broader view of the physician's domain in terms of range of problems and kinds of behaviors required in handling the problems. In a study of general practice in Massachusetts, Brown (5) found *that nonsickness* accounted for almost 25 percent of the diagnoses made on 12,835 patients. More than 20 percent of these nonsickness problems were due to environmental stress such as financial family school or job problems Last and White (6) in an analytic study of the content of general practice comment on the narrow range of diagnostic categories contained in the International Classification of Diseases. They maintain that this conventional classification scheme needs to be expanded to include such conditions' as socioeconomic stress " "marital upset ' and teenage tantrums", if it is to be a realistic reflection of what goes on in general or primary practice. In England, Mace (7) has reported that Balint estimated that *from* 25 to 50 percent of all patients who go to doctors are not suffering from any pathological entity or nosological syndrome More generally Donabedian (2) has assessed the nature of a physician's domain as one which includes aspects of preventive, rehabilitative, social and psychological management skills.

To summarize, an evaluation model of physician performance is incomplete unless it includes an assessment of technical and interpersonal skills. In diagnosing a patient's problem, both types of skills interact, which in turn can affect the diagnosis. The domain of a physician's practice is such that it includes a wide range of problems requiring competencies in a variety of interpersonal skills.

Measurement Methods

Two types of evidence, direct and indirect, are used to obtain information on physician process. Sources of direct evidence are those that reflect physician behavior in actual practice *Direct* observation, patient records, record abstracts, hospital charts, and tape recordings are direct evidence of physician process. Sources of indirect evidence are those that are used to simulate the physician patient encounter Patient management problems, actors card decks, and computers have been used to provide indirect evidence of physician process.

A major problem in using indirect evidence is that of establishing to what degree a physician's performance in a simulated situation reflects his performance in a live situation with a patient The question of validity of simulated approaches is discussed in Chapter 3.

A measurement method that does not fall under process or *outcome* has been developed by Price and his associates (8) at the University of Utah. They ask, "What are the qualities of a superior physician?" By questioning a large heterogeneous group of people including both providers and recipients of medical care, they arrived at a set of qualities which are believed to characterize a "good" physician Scales have been devised to rate these qualities. This method is described more fully in Chapter 4.

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...ical Process Approaches

variety of approaches and source materials have been used to evaluate the activities of the physician They include direct observation patient records, record abstracts, and hospital charts. Definitions of performance and styles of measurement procedures vary among these approaches. Evidence of reliability and validity varies in both quantity and quality To assess the state of the art of process measurement for the individual physician each approach is described and evaluated.

Direct Observation

Direct observation has been used primarily in studies of general practice Usually a physician-observer spends a day or more observing the physician's interaction with his patients during the course of a normal work day The observation procedures that have been used are primarily aimed at assessing the physician's handling of new patients patients with new illnesses, patients requesting a check up, or patients whose complaint, history appearance, or attitude would indicate the need for careful history and examination.

MAJOR STUDIES

Taylor (9) a British practitioner was among the first to apply the direct observation method in a study of physician performance. Taylor's approach, that of a descriptive social researcher, contains no statistical methodology One observer visited each of 94 physicians for one or more days. Taylor comments that the observer's approach to assessment was similar to that of a doctor approaching a long clinical case Its history has been studied, its present condition examined the performance and personality of its members assessed, their interrelations drawn out, and a final over all picture built up. This type of study provides avenues for further inquiry but does not provide a method that can be replicated.

Peterson and his colleagues (10) refined Taylor's approach in a study of general practice in North Carolina They outlined specific performance dimensions that should be assessed and assigned weights accordingly Two physician-observers shared the responsibility of visiting 88 general practitioners. One physician-observer rated each physician on the specified dimensions. In order of importance Peterson defined six dimensions and weighted them as follows clinical history 30, physical examination 34 use of laboratory aids 26 therapy 9, preventive medicine 6 and clinical records, 2. Each dimension except for history taking was further defined. For example, under physical examination the observer was supposed to rate the physician on specific items, which primarily deal with parts of the body Given the item neck " the physician receives zero points if the neck is not examined, one point when examination is limited to submaxillary nodes, and two points when examination includes such aspects as thyroid and mobility of neck when the need for such examination is indicated. Under history-taking, on the other hand, there were no specific items to be rated, only statements as to what generally comprises a poor fair or very good history The ratings of a series of dimensions for each physician provided the information for an overall qualitative assessment of performance

In Canada, Clute (11) applied Peterson's methodology to a study of general practice in which two physicians shared the responsibility of observing 85 practitioners for three days. Clute however modified Peterson's approach in two respects. First he altered the weighting scheme giving equal weight to history taking and physical examination (each received 30 points) laboratory work received significantly less weight 6 percent compared with Peterson s 26 percent. Second Clute divided history taking into a number of categories, such as functional inquiry and family history In both Peterson s and Clute s studies weights of categories were subjectively determined

In Australia Jungfer and Last (12) applied Peterson's methodology to 108 general practitioners, using Clute's definition of history taking. Unlike Peterson and Clute Jungfer gave history taking double weight on the grounds that it is the most important skill of the general practitioner

EVALUATION

In setting up judgmental performance rating schemes like those described above the following issues must be faced explicitly or implicitly (a) what dimensions of performance to include (b) how to define good and bad performance along each dimension and (c) what weight to assign each performance category These three aspects will largely determine the validity and usefulness of the measurement method.

Regarding the question of what dimensions to include, the important considerations are completeness and relevance. Are there categories of physician behavior that are not included in the definition that should be? Conversely, are there categories of behavior that are included that should not be? Examining the definition for omissions shows that the area of interpersonal skills was neglected in the studies described above Both Peterson and Clute however, mentioned that this type of competence needs to be assessed. In the realm of technical competence, specifically in the therapy dimension the ability to handle psychomotor tasks such as setting bones and giving inoculations, was omitted. *One would expect that this* is an important skill for a primary physician. Also, one questions why "obesity" was singled out under "therapy"

In some cases attempts have been made to establish either normative or empirical standards Normative standards are derived from the opinions of health professionals empirical standards are derived from the actual practice of professionals. As Donabedian points out in an excellent discussion of standards, the validity of almost all standards, whether normative or empirical, must ultimately be derived from their demonstrated relationship to outcome "Standards vary greatly in the degree to which this condition has been met (2)* In these three studies of general practice no attempt was made to validate the standards.

The degree of importance of specific weights were also subjectively determined. Pellegrino (13) comments on the overall subjective nature of quality studies

> the moment one attempts to define quality it turns out to be one's own personal brand of practice. What studies of quality usually find out is whether or not the investigator's notion of quality is being practiced. This may not be significant. A definition of quality is required which has some objective validity

* Donabedian also presents a detailed description of nine aspects of these standards, source validity consensus, stability transferability configuration, level of stringency explicitness, and content

There are two ways in which the direct observation approach could be more effective and objective. The critical incident technique (1, 14) provides an objective means for determining dimensions and "good" and "bad" performance As for obtaining objective weights, the National Center for Health Services Research and Development has used a task analysis approach to determine the frequency and duration of tasks specific to a particular job. It is noteworthy that the National Center has applied the task analysis approach to primary care

There is little evidence for reliability and validity for the direct observation approach Peterson reports correlation coefficients of 72 and 78 on history taking and physical examination for two observer-physicians on a small subsample of the physicians. In Clute s study only five practices were revisited by a different observer six to 12 months after the initial visit Clute reports that the difference between the two scores was less than 12 percent. Jungfer reports that "agreement is quite close" between two raters on overall quality of 44 physicians. Commenting on the validity of the observations, Peterson and his associates (10) state that

> A physician was not informed that assessment of the level of his performance was one of the objectives of this study Although some physicians grasped this purpose, it seems very improbable that physicians significantly altered their habits greatly during the period of observations however it is impossible to gauge the extent of the possible bias.

Considerably more evidence is needed to decide whether the direct observation approach is a reliable and valid measure of physician performance In particular, the direct observation approach needs to be validated against outcomes.

Review of Records

Three types of recorded information have been used to retrospectively assess physician process patient records, record abstracts, and hospital charts. Each of these is described and evaluated.

PATIENT RECORDS

Patient records are generally used to evaluate quality of care in hospitals. They could, however, be used to assess private care. A number of problems are associated with the use of clinical records for performance assessment. First, the information on the records is not standardized, which makes comparisons among physicians difficult. Second, the recorded information is frequently incomplete and inadequate. Peterson, Clute, and Jungfer report this situation in their studies of general practice. Kroeger and his colleagues (15), in a study to determine the feasibility of evaluating quality of care in the office practice of internists, found that only two-thirds of a random sample of 91 internists kept sufficient material in their records to allow nonphysicians to abstract *information* Gonnella and his associates (16) in an evaluation study of delivering care to patients with urinary tract infection found that the information on medical records was incomplete compared with that obtained in a structured interview Third, there is the question of accuracy of recorded statements. Donabedian (2) maintains that there may be inaccuracies in the recording of events that transpire during the course of care and there may be errors in the data which the physician uses to arrive at a diagnosis and a plan of

treatment Fourth the records do not generally contain information on the management of psychological and social problems. Also a problem that is common to patient records and to the direct observation approach is that there is a need to decide on the specific elements that should be assessed and their appropriate weights. Without some systematic way of deciding, there is the danger of arbitrariness and omissions.

Finally some people have tried to argue that quality of recording is associated with quality of care If this were the case the quality of care rendered by a physician could be determined by the completeness and accuracy of his records. At present the evidence is inconclusive Clute however observed that incomplete records are not incompatible with good quality of care Unfortunately Clute Peterson, and Jungfer did not address themselves to the problem of correlating quality of records with actual performance Rosenfeld (17) attempted to cope with this issue in an unusual way He differentiated between two types of recording errors those that might reflect inadequacies in record keeping alone and those that are omissions of essential diagnostic or therapeutic procedures He found that physicians who make one type of error usually make the other Rosenfeld concluded *that his findings "would seem to give additional support to the thesis that hospital records provide a valid picture of the quality of care"*

A number of these problems mentioned here would not exist if the form and style of clinical records were improved Weed (18) has devised the problem oriented record which appears potentially more useful for assessment purposes than the traditional clinical record * This approach calls for a systematic account of the collection of data the formulation of problems based on the data the development of plans and treatment for each problem, and numbered and titled progress notes for each problem. The types of problems other than medical that the physician should identify include those that are social psychiatric and demographic If records were structured according to Weed's plan, one could more clearly observe physician process and assess intermediate outcomes, such as correct identification of problems and quality of treatment plans. The extensive documentation and specificity in this type of record and the sequencing of medical action provides the basis for examining the physicians' actions and decisions. For purposes of assessing physician process, the clinical record is potentially useful.

RECORD ABSTRACTS

Abstracts of hospital records have been extensively used for statistical display and analysis in hospital utilization studies. Specific types of information are abstracted from hospital records to make up the record abstract The Commission on Professional Hospital Activities (CPHA) and the Hospital Utilization Project (HUP) are the major agencies which process display and summarize hospital data The abstract used by the CPHA contains information on patient management and length of stay (20), the HUP abstract emphasizes length of stay (21)

Record abstracts to assess individual physician performance are infrequently used Kroeger and his associates in their study of internists asked 10 physicians to review 21 abstracts and rate (on a scale from 1 = excellent" to 4 = very poor) the performance which the grader thought the internist had rendered No attempt was made to measure specific dimensions of performance The reliability of the

* *Weed addresses himself to the use of the problem-oriented record in the hospital.* Bjorn and Cross (19) explain its use in private practice.

ratings was surprisingly good—over half of the judges were in perfect agreement on the grades that were given on 13 of the 21 abstracts. More recently, Payne and Lyons (22) used record abstracts to assess individual physician performance. They devised a measure, Physician Performance Indices (PPI) to evaluate individual performance in certain diagnostic categories. Panels of physicians decided on dimensions and weights for each diagnostic category Prior to this study Payne (23–25) following Lembcke (26–28), did extensive work in developing standards for a large number of diagnoses. Until recently he focused primarily on hospital *utilization without provision for measuring* individual performance The development of the PPI is a significant advancement in performance measurement because it provides an objective basis for evaluating individual physician performance in specific diagnostic categories.

Payne and Lyons have explained the derivation of the PPI in the following words

> A PPI is a weighted percentage of hospital service criteria items observed The hospital service criteria are specific items recommended for optimal care and include the history physical examination laboratory and roentgenology special procedures and or therapy components in the process of optimal care The criteria panels applied weights of importance to each specific item. Any PPI for a case in a given diagnostic category is the sum of the observed item weights divided by the sum of the maximum possible weights for that case, i e
>
> $$PPI = \frac{\Sigma(\text{Observed Item Weight})}{\Sigma(\text{Criteria Item Weight})}$$
>
> or the weighted percent of criteria items observed

Attempts were made to relate process of care measures to end results. It is noteworthy that "overall the trends in positive correlation between high physician performance indices and good outcomes were more often in the right direction than not but they were seldom statistically significant" (22). It was suggested that both diagnostic and management process criteria needed improvement.

In appraising the worth of the record abstract as a source of information for evaluation two aspects need consideration Is the abstracting process reliable and valid? Is there agreement on evaluations based on the abstract versus those based on the entire record? Regarding the reliability of the recording, Payne and Lyons (22) report inter rater reliabilities in the nineties. Kroeger and his colleagues *(15) also report high inter rater* reliabilities. To provide information on the other issues more research is needed.

HOSPITAL CHARTS

Hospital charts have been used extensively to evaluate quality of care. For the most part they are used as a basis for retrospectively assessing outcomes either intermediate or final As in the case of record abstracts, charts are infrequently used to assess individual physician performance

A method devised by Williamson (29) to measure individual physician performance on simulated patient problems was adopted by Helfer (30) to assess intern performance as reflected in charts. Williamson s method combines both process and outcome assessment, yielding three types of scores

> An Efficiency Index (EI), estimating quality of process, defined as the percentage of the physician's selections that were helpful, and a Proficiency Index (PI), estimating quality of product, inferred from the agreement with the criterion group in selecting beneficial and avoiding harmful interventions.
>
> After the two components of competence are thus estimated, these scores can be combined, in a manner emphasizing

proficiency to yield a Competence Index (CI) indicating percentage of overall agreement with criterion judgment.

The purpose of Helfer's study was to *determine whether intern performance* improved as a result of chart review sessions. Williamson's method was used to measure change in performance as reflected in the charts. According to Helfer changes in intern performance occurred, *but the charts did not reflect these* changes. Accounting for the changes in actual performance Helfer said that "merely making the intern aware of what is expected of him significantly improves patient care, measured by these criteria."

The use of chart review to assess quality of care has many limitations which are common to all types of records. A major limitation is that the written information on the chart does not necessarily reflect what actually occurs. Perhaps this helps to explain Fessel and Van Brunt's (31) finding that "neither quantity nor quality of recorded data (charts) was related to outcomes of either acute appendicitis or *myocardial infarct*. It is conceivable however that the documentation of physician process could be improved. Brown, formerly the director of medical education at Chestnut Hill Hospital in Philadelphia has instituted problem oriented charts (32). Brook and Stevenson (33) and Brook and other associates (34) used charts in conjunction with patient interviews to assess process and outcome.

To summarize retrospective assessment of physician process using patient records has many limitations. Probably the most important one is that the recorded information does not necessarily reflect what occurred between the patient and the physician.

Chapter 2

Interpersonal Process Approaches

Many writers have discussed the interaction between the doctor and his patient. Although certain theories have been advanced about what kind of relationship is good in obtaining desired results, few empirical efforts have been made to clarify the picture particularly from the viewpoint of the practicing physician (35). In this discussion a brief review of the contributions of sociologists and psychiatrists to the understanding of the doctor patient relationship is followed by a discussion of what types of physician behaviors or skills are relevant in this relationship and how they have been measured.

Sociological Formulations

Much of the sociological theory can be traced to Henderson's description of the doctor patient (D-P) relationship as a social system (36). The sociological formulations stemming directly from his *contributions have been done* by Parsons (37), Fox (38) and Bloom (39). Following Henderson, Parsons defines the social roles of physician and patient. Parsons specifies the key qualities of a physician's role and the rights and duties of the patient derived *from his concept of the* sick role. The most important attitude of the physician toward the patient is "affective neutrality" whereby he is supposed to refrain from too much sympathy, to be neutral in judgment and to maintain self-control. Fox *applies Parson's* formulations to interpreting relationships of physicians and patients in an experimental ward of a university hospital. On the basis of her study of doctors and patients under stress, she modifies Parson's concept of neutrality emphasizing the importance of physician authority. Bloom expands the doctor patient relationship to take into account cultural and psychosocial factors of both the doctor and the patient. In other words he expects that these external factors will affect the D P relationship.

Psychiatric Formulations

Psychiatric interpretations of the doctor patient relationship date back to Freud and his interest in the nature of the therapeutic process. He emphasized the power of *transferance* whereby the patient redirects toward the physician his feelings toward his parents or other significant people (35). Szasz and Hollender (40) postulate another psychoanalytic approach to the D P relationship in which they *conceptualize three interaction* models. The application of the model depends on the clinical situation. In the first model activity passivity the physician takes charge and the patient is passive as would be the case if the patient *were in a coma. In the second model,* guidance-cooperation the doctor guides the patient when he is able to follow directions, as in infectious disorders. In the mutual participation model physician and patient carry out the treatment *together, for example, in the management* of chronic illness. Ford and his colleagues (35) note that Alby focuses on the D P

relationship when the patient's problem is *chronic illness*.

> As Alby sees it, the doctor-patient relationship is established on two planes: first the objective plane of care and treatment and second, a deeper one, the subjective plane where the patient balances within himself what he seeks from the doctor against what he is receiving.

It is noteworthy that Ford and his colleagues conducted a study to verify some of the constructs from the psychological and sociological interpretations. They *modeled their approach after that of Price* and his associates (41).

Implicit in the sociological and psychiatric formulations of the doctor patient relationship is the premise that a relationship exists between the roles that a physician assumes and his effectiveness. The physician's communication skills hold the key to playing these roles.

Oral Communication Skills

Bird (42) has commented

> Of all the technical aids which increase the doctor's power of observation, none come even close in value to the skillful use of spoken words -the words of the doctor and the words of the patient.

A common denominator in all formulations of the doctor patient relationship is communication. In addition to healer, the doctor plays a variety of roles such as sympathetic listener, director and guidance counselor. How well he plays these parts depends on his capacity to communicate. The same of course is true of the patient. Many types of communication including facial expressions, gestures and words, affect the quality of his performances. Because oral communication is the *primary* mode the physician uses in his interaction with the patient, the effectiveness of communication has a strong bearing on the physician's overall performance.

Mace (7) outlines three purposes of communication between the doctor and the patient.

First, the physician must secure data for the diagnosis. He takes the patient's history, which requires considerable skill in interviewing. Stevenson (43), in a book *on medical history taking*, states that "if the physician has not acquired comfort and dexterity in his history-taking and interviewing by the time he graduates from medical school, he will practice medicine with incomplete data for which no other skill can compensate him or his patients."

Second, physicians enlist patient cooperation in the therapeutic process. In this situation we are concerned with whether the physician explains and discusses the patient's illness and instructions for treatment so that the patient understands what the physician has said. Has the physician used nontechnical language? Has he explained what he means by "Drink plenty of fluid" or "Pull down your weight"? Has the patient been encouraged to ask questions?

A third purpose of communication is to provide counsel. Mace distinguishes between counseling and psychotherapy as differing in degree and kind. Even though he alludes to the physician as a counselor, one who helps people with emotional problems, he seems to be more concerned with skills which would facilitate the physician's securing more accurate data, making the patient comfortable, and gaining his confidence and cooperation.

One would expect that physicians' communication skills vary greatly depending on their personalities and medical school *training. People are becoming* aware of the importance of communication skills, as these skills contribute to diagnostic outcomes, patient compliance, and patient satisfaction. A discussion of

the relationship between communication skills and outcome follows later. At this point the recognition that the quality of physician communication affects outcome is crucial to understanding the significance of measuring the physician's ability to communicate. The next line of inquiry focuses on what has been learned from studying physician patient communication, what aspects of communication have been measured, and how they have been measured.

A number of investigators (44-47) have studied aspects of the doctor patient communication process. Generally speaking, the state of the art of assessing quality of physician communication is not highly developed. Until rather recently, information on communication skills was derived from studies on patient compliance and, to a lesser degree from studies on patient satisfaction. The finding that noncompliance and patient dissatisfaction are correlated with quality of communication seems to have provoked researchers to investigate certain facets and factors that affect communication in these areas.

FAILURES IN COMMUNICATION

One conclusion that emerges from these studies is that a physician's ability to make himself understood is an important dimension of performance. Collins (44) did a study to determine whether antepartum patients understood the language that was used to give nutrition advice. *One hundred patients attending* public health clinics were individually asked to define orally 20 words commonly used to advise antepartum patients about dietary intake (for example, "nutrition," "diet," and "vitamins"). Any reasonable definition was accepted. It was *found* that only 62 patients understood one half or more of the words. This finding suggests that there are probably many patients of similar backgrounds who are going to the physician for treatment and do not understand the physician's vocabulary.

Skipper and his colleagues (45) provided evidence to show that physicians use technical language that the patients do not understand. Eighty-six hospital patients who had either cardiovascular or gastrointestinal problems were given a semi-structured interview to determine important barriers to effective communication between patients and hospital functionaries. All the interviews were recorded. The findings indicate that the physician speaks "in such fancy language that it leaves a lot to the imagination" or "he talks to you in a way you don't understand and then he goes out again."

Korsch and her associates (46) report similar findings from their study of 800 mothers who visited a pediatric clinic. They report that "an outstanding barrier in more than half the recorded cases is the pediatrician's use of difficult technical language" and that "words like 'workup,' 'follow,' and 'history' are as obscure to the patient as fancy technical terms, and they are used ceaselessly by the medical staff often in crucial contexts."

Pratt and her colleagues (47) were concerned with determining the physicians' attitudes and beliefs about *patient knowledge* and its effects on communication. Specifically, they wanted to determine (*a*) the level of knowledge that clinic patients had on etiology, symptoms, and treatment of 10 common diseases, (*b*) the *physician's view of patient knowledge in* these areas, and (*c*) the amount and type of information that physicians gave their patients. They found that the patients were poorly informed about the 10 diseases. The physicians, however, thought that the patients were even less informed than they were. In cases where the physicians seriously underestimated patient knowledge, they were less likely to discuss the illness with the patient. In general, most of the patients received little information on such things as etiology, prognosis, or purpose of their tests.

The studies that have been cited indicated that the quality of communication between patient and physician is affected by the physician's use of technical language or vocabulary and by his failure to educate the patient about his problem. There is an indication that doctors are unaware of patients' level of medical knowledge and that this adversely affects their communication. Lack of communication between the physician and his patient could adversely affect outcomes.

MEASURING QUALITY OF COMMUNICATION

A number of researchers have attempted to characterize verbal communication between patient and physician primarily with the idea of relating it to outcomes such as patient compliance and patient satisfaction. All the approaches are based on Bales (48) Interaction Process Analysis.

One phase of a study reported by Gozzi and her colleagues (49) was concerned with classifying and categorizing the communication between the physician and his patient. The transcripts from the taped doctor patient interactions provided the basis for "facilitations and blocks in communication." Statements that were relevant to the topic were called "facilitations"; statements that were not related to the preceding statements were "blocks." Gozzi classified 10 types of doctor blocks, for example: doctor interrupts, mother and doctor both talk at same time, doctor makes vague inappropriate argumentative comments, doctor ignores mother's comments, and doctor switches subject abruptly and uses jargon (49). A rating method was devised to assess doctor blocks which was computed as follows:

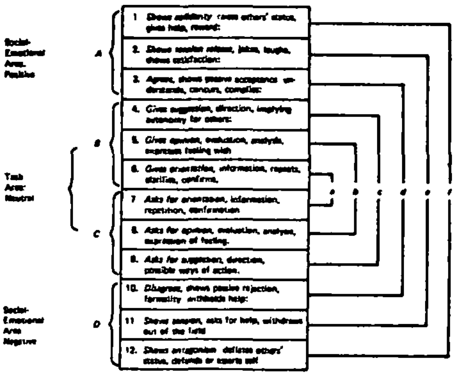
$$\frac{\text{No. of doctor blocks} \times 100}{\text{His blocks} + \text{His facilitators}} = \text{Percentage of blocks per visit}$$

The median for the sample was 13.5 percent doctor blocks per patient visit. Visits scoring above the median were designated as "high-block visits," and those scoring below as "low block visits." This approach seems potentially useful for analyzing and assessing the physician's communication process. Korsch and her colleagues (46) report that the inter rater reliability for all their coded material was 95.2 percent. The fact that "blocking" correlated with patient satisfaction and patient "compliance" provides evidence of validity.

Davis (50) has proposed a more elaborate method for categorizing the doctor patient interaction process. His method is an adaption of Bales' Interaction Process Analysis, "which permits the collection and analysis of material according to sheer volume of participation by the doctor and the patient, separates their acts into twelve categories and indexes based on combinations of the categories." Figure 1, based on a chart developed by Bales (48) illustrates the categories and their relationships. Davis expanded Bales' coding system to permit collection of additional data including information about diagnosis and prescription.

Davis reports that more than 200 doctor patient interactions in a clinic were recorded, transcribed and coded. Two "crucial" periods of interaction were handled in this manner: the doctor's presentation of the medical regimen and diagnosis during the first visit, and the entire interaction between the doctor and the patient at the first revisit.

Reliability of coding averaged 85 percent. As for validity, Davis reports "significant associations" between communication and patient compliance.



KEY
a. Problems of Communication
b. Problems of Evaluation
c. Problems of Control
d. Problems of Decision
e. Problems of Tension Reduction
f. Problems of Reintegration

A. Positive Reactions
B. Attempted Answers
C. Questions
D. Negative Reactions

FIGURE 1
The system of categories used in observation and their major relations.
Figure reprinted with permission of R. F. Bales (48).

Adler and Enelow (51) have developed a Psychotherapy Interaction Scale (PIA) for the measurement of verbal and nonverbal interaction between the physician and the patient during the diagnostic interview. The scale is modeled after Bales' Interaction Process Analysis and contains elements commonly found in Korsch's blocks and Davis' scale. Because of the similarity between the PIA and the others, it will not be described. It is noted that Adler, Ware, and Enelow (52) report "high inter-rater reliability" for their codes and indices.

IMPLICATIONS

A need exists to differentiate communication for different groups of patients. The preceding studies, in which all the subject patients are from the lower socio-economic classes indicate that the subject-patients had a poor understanding of vocabulary and technical terms. In the middle and upper classes, one would not expect to find this low level of comprehension.

Zborowski (53) has concluded the following: "Behavioral responses to pain present identifiable regularities patterned along cultural models common to groups of people of a similar origin." He studied Jews, Italians, Irish and Anglo-Saxons at a Veterans Administration hospital to determine their responses to pain. He found that to a considerable degree pain is an emotional response. The Jews and Italians were quite dramatic in their description of symptoms, whereas the Anglo-Saxons tended to minimize the pain; the Jews wanted to know their diagnosis and its future significance, and the Italians were primarily interested in relief of pain.

How do class and cultural differences affect communication between the doctor and his patient? This question needs to be answered. It is highly conceivable that this type of knowledge could be used to improve health and satisfaction outcomes.

Chapter 3

Simulated Process Approaches

A number of devices have been used to simulate the physician-patient encounter in order to assess, investigate, or teach technical skills. They include patient management problems (PMP), computers, card decks, and actors. The PMP approach is more widely used and developed than the others.

Patient Management Problems

A patient management problem contains a brief clinical description of a patient and his problems. The physician is supposed to study the available information and make diagnostic, therapeutic and management decisions. As much as possible the problems attempt to simulate the physician patient encounter. The National Board of Medical Examiners first introduced the PMP approach "to test aspects of clinical competence dealing with the ability to identify, to resolve and to manage patient problems" (54). The board had tried a variety of methods, including motion pictures, television, and lantern slide projection. Dissatisfaction with these methods led the board to develop the patient management problems.

Prior to the development of the patient management problems, the board, with the assistance of the American Institutes of Research, used the critical incident technique developed by Flanagan (55) "to obtain a definition of clinical competence and skill at the level of the internship, as the young physician with his M.D. degree begins to assume independent responsibility for the care of patients" (54). Thirty three hundred incidents of "good" and "poor" practice were collected, grouped, and classified into the following nine areas: (*a*) history, (*b*) physical examination, (*c*) tests and procedures, (*d*) diagnostic acumen, (*e*) treatment, (*f*) judgment and skill in implementing care, (*g*) continuing care, (*h*) physician patient relationship, and (*i*) responsibilities as a physician. Each major area was subdivided. For example, "physician-patient relationship" included "establishing rapport with the patient, relieving tensions, and improving patient cooperation." The nine areas and their subdivisions became the National Board's definition of clinical competence and "constituted a well-documented answer to the question of what to test" (54). Then, the PMP problems were developed to assess these areas of competence.

The following is an example of how the National Board states a patient simulation problem (54):

Patient A

General Information

A 45 year-old man is admitted to the hospital because of pain in his right hip and pelvis, especially when walking. He had lost 30 pounds in weight in the past year during which time he did not feel strong or well enough to work. Three months prior to admission he developed an acute upper respiratory infection and noted an increase in his symptoms with generalized "pain in my bones and stiffness of my joints." At that time he also noted generalized numbness with tingling and stiffness of his hands he had difficulty talking because his jaws and lips became stiff making it difficult to form words

Twenty years earlier he had had similar symptoms which he described as "pain all over" At that time, he was studied at a hospital for bone and joint disease where he was told he had "osteoporosis During the intervening years, he has been relatively well.

Physical Examination

Temperature is 37 0 C (98 6 F) pulse rate is 80 per minute and regular blood pressure is 120 80 mm Hg. The patient is well developed and appears well nourished The lungs are clear to percussion and auscultation. The heart is normal in size there are no murmurs The abdomen is protuberant but no masses or organs are palpable There is pain in the right groin on palpation but no mass can be felt There is 2 + edema of the legs but the extremities are otherwise normal Neurological examination shows no abnormalities Walking causes severe pain in the right hip and pelvis as well as pain in the feet

Initial Laboratory Studies

Hemoglobin	10 0 gm 100 ml
Hematocrit	35 percent
Leukocyte count	6,800/cu mm polymorphonuclear neutrophils 60 lymphocytes 34 monocytes 5, eosinophils 1
Erythrocyte count	4 000 000 cu mm
Urine	Specific gravity 1 015 pH 5 5 protein 1 + sugar and acetone negative microscopic examination 3-4WBC, 1 2 RBC per high power field no bacteria, casts or crystals
Roentgenogram of the chest	Lung fields clear

As one can see the student starts with a lot of 'given' information

The following method is used to score the PMP test All the courses of action offered in the test are classified in one of three categories (*a*) it must be done for the well being of the patient (*b*) it should definitely not be done and, if done would be a serious error in judgment that might be harmful to the patient and (*c*) it is *relatively unimportant* that is, a procedure that might or might not be done depending upon local conditions and custom The total score is the number of correct decisions he has made (the number of indicated procedures he has selected plus the number of incorrect procedures be has avoided) The choices in the equivocal middle ground receive no score (54) No attempt is made to weight the responses

In order to clarify specific aspects of the PMP exam the author spoke with Dr Charles Schumacher then associate director the *National Board of Medical* Examiners With respect to the relationship between the patient management problems and the nine areas of clinical competence Dr Schumacher explained that the test emphasizes diagnostic skills, management of patient and laboratory skills and that it is balanced from the point of view of covering clinical areas of medicine On the basis of the author's conversation with Dr Schumacher it was clear that no attempt has been made to equally or proportionately represent the nine areas of clinical competence

The National Board provides some evidence of reliability and validity for the PMP exam Regarding reliability (stability of scores) Hubbard reports that it is generally at the level of .80 to .85 which "compares favorably" with the sections of equal length in Parts I or II The validity of the test (Does the test actually measure performance of practicing physicians?) has not yet been studied Thus, the validity of the PMP approach has not been assessed against the "ultimate criteria" of directly measured physician performance

Attempts have been made however to evaluate the PMP tests against intermediate criteria " One such approach consists of identifying groups of students at different educational levels who could reasonably be expected to differ in terms of knowledge and clinical skills and then to compare the test performance of such groups to see whether corresponding differences in scores occur" (56) The results of a cross sectional and a longitudinal study show that interns did substantially better than third-year students. The fact that the interns performed better on the test indicates that some type of learning must have occurred between the third year in medical school and the internship The assumption is that the test is measuring something that is occurring in direct clinical training and—more important—that the thing *learned* is relevant to actual practice

Another indication of validity is the degree to which scores on the PMP section of Part III and those on Part II (knowledge of clinical sciences) correlate. If the correlation is low that would indicate that the PMP section measures something different from what is measured by Part II Schumacher (56) *reports* correlations ranging from 34 to 48 and concludes that the *PMP* section is measuring something other than knowledge of clinical sciences. The unanswered question is whether the additional abilities being measured correlate with actual physician performance. This still needs to be empirically determined.

A major independent effort to develop patient management problems has been carried on at the University of Illinois by Christine McGuire and her associates. The PMP approach has been used both to test clinical competence (57) and to teach clinical competence (58)

The University of Illinois' version of PMP differs in at least four important respects from the National Board's version

First in the statement of the patient's problem much less information is in the given." This can be seen by comparing the following example of an Illinois *PMP* problem statement (58) with the National Board example given previously

> You are called to the emergency room at 1 30 A.M. to see a sixty six year-old saleslady brought there by a cab driver because of her acute shortness of breath. She is moderately obese, cyanotic and sitting on the edge of the bed with markedly labored respirations. Coarse *bubbling rales are easily audible without* a stethoscope The patient is so acutely ill you have difficulty obtaining the history

All other information must be obtained by the examinee

Second, branching is used so that the subject can explore a varie y of pathways to the correct solution of the problem. McCarthy and Gonnella (57) point out that the branching allows the subject to act as he would in an actual situation without the test format constraining his actions. The National Board exam con*tains no branching.*

Third, the feedback feature of branching allows the subject to receive information about a patient's response to his intervention and possible complications resulting from the subject's decisions. The National Board exam only provides "yes" or "no" responses.

Fourth the method of scoring is different As explained by the test designers (59)

> The scoring procedure provides a more discrete classification of responses (referred to as coding) which are then weighted Each option in a problem is placed into one of five categories according to how it relates to the patient and the stage in the workup The categories are (a) choices indicated and important in the care of the patient (b) clearly indicated but of more routine nature (c) optional in the sense that it will probably not be helpful (d) not indicated *though not harmful*, (*e*) contraindicated, definitely harmful After each option of a problem is coded, it is assigned a positive or negative weight that reflects its relative help or harm in the management of the patient described From the array of choices two scores are calculated an efficiency score and a proficiency score The efficiency score is reported as the percent of the examinee's choices that are helpful to the patient *Proficiency is reported as the percent* agreement with the criterion group in selecting procedures they regard as clearly indicated and avoiding those they classify as contra-indicated.

In contrast the National Board's scoring approach has no provision for weighting.

It should be noted that the National Board and the University of Illinois have similar approaches to selecting what to test Both try to select a wide variety of cases. Both have made use of the critical incident approach to determine specific dimensions of performance *

The University of Illinois' and the National Board's patient management problems differ substantially in format and scoring Christine McGuire asserts that the use of branching and feedback provide the opportunity for assessing clinical judgment If this is the case, then one would expect the Illinois patient management problems test to correlate better with actual physician performance than the National Board's test. This hypothesis should be tested.

The Illinois Evaluation Unit provides evidence of reliability and validity Regarding reliability the Evaluation Unit at the Center for Educational Development (60) reports a slightly higher score .85 to 90 than the National Board's. In an interesting attempt to obtain evidence of validity Williamson compared the performance of physicians on a PMP test dealing with hypertension with their performance on actual patients suffering from hypertension Performance with real *patients was determined from an objec*tive chart audit (60)

Williamson found that the physicians recorded significantly less information on the charts than they requested on the patient management problem test thus casting doubt on the fidelity with which PMP simulates actual practice

It was hypothesized however that the differences might be attributed primarily to recording behavior To determine whether this was the case six critical items that were recorded on the chart and requested on the test were compared. In this *instance*, *performance* on the chart and performance on the PMP were almost identical

The question of the realism of PMP simulations therefore remains open. To decide on the validity of PMP as a performance measure however the relevant question is not whether PMP simulates real life but whether PMP scores correlate *with more direct performance measures.*

* The University of Illinois has used the findings of Blum and Fitzpatrick (61) a critical incident study of orthopedic surgery as a guide for performance dimensions.

Additional research remains to be done in this area.

Recently, specialty medical societies (62) have started to use patient management problems in their self assessment programs It is hoped that they will do research on the technical aspects of their PMP problems.

Computer-Based System (CBX)

Another simulation device for assessing clinical competence is now being developed under the auspices of the National Board of Medical Examiners. The Computer Based System (CBX) is supposed to simulate a patient The examinee is given a booklet containing questions that the patient-computer is programmed to answer—on history physical findings, laboratory tests and diagnostic procedures. By interacting with the computer the examinee is able to gather sufficient information to formulate a differential diagnosis order diagnostic studies, and make a final diagnosis.

Because the CBX is in the process of development, the scoring procedures, reliability validity and practicality of the system have not yet been established.

Hubbard (54) points out

> assuming that the validity and reliability of a computer-based examination can be fully established, examining a single physician at a single computer terminal is quite different from examining 500 or 5,000 examinees at the same time in many locations across the country The problem then becomes that of establishing a nationwide network of computer facilities with multiple terminals at designated centers, all operating simultaneously

Due to the technical complexities of setting up the CBX it will probably take a number of years before this measurement device is available and has been evaluated.

The Test of Diagnostic Skills

Rimoldi (63) developed the Test of Diagnostic Skills to appraise clinical diagnostic ability of medical students through an analysis of simulated process. The test aims at analyzing the types and sequence of questions that a physician asks when he is trying to solve a clinical problem. Even though the relationship between diagnostic problem solving ability and performance has not yet been determined, it is plausible that they correlate. Thus, this test *presents an approach to assessing* an important dimension of performance.

The subject is given specific information about a case, for example data upon admission and chief complaint. Additional information is provided on request. Removable cards contained in flat pockets which partially overlap are evenly arranged on a display folder A question is written on the top edge of each numbered card and the answer is written on the reverse side. For a question like "Have you been feverish?" the answer might be 'Yes, yesterday afternoon had a tem*perature of 38°C" (64) Three types of* questions are asked those pertaining to interview and history of the patient those related to physical examination and those concerned with laboratory procedures. The questions are scored according to (*a*) the number of questions asked and usefulness of these questions in terms of the final diagnosis and (*b*) the order of the questions asked

The author does not know to what extent reliability and validity of the test have been established.

The Inquiry Method

Elstein and his colleagues (65) developed an approach to investigate the medical inquiry process of physicians. Specifically, they wanted to study the process that physicians use to reach a diagnosis. Actors are used to simulate patients.*

The simulations are set as follows A physician subject enters a room in which cameras will videotape his actions. An actor patient enters and presents his chief complaint he is prepared to answer questions on history of illness and review of systems. When the physician wishes to begin the physical exam another actor patient enters and acts as a data bank giving only factual information For the third case an actor patient confronts the physician with emotional problems. In all three cases the physician subject can ask any questions in whatever order he wants

According to Elstein these simulations provide the opportunity to observe the data gathering and reasoning processes of physicians in moderately controlled circumstances so that differences and similarities in the problem solving techniques of the physician-subjects can be identified and studied. If it is true that physicians differ in terms of factors such as the amount of information that they need to solve the problem and the number of questions needed to solve the problem it is conceivable that a relationship exists between these characteristics and quality of performance If this were the case then this method could be used to assess physician performance.

The reliability and validity of the method have not yet been established

*See Barrows (66) for a discussion of the use of actors in medical teaching.

Chapter 4

Approaches for Measuring Outcome

In the last analysis, whether a physician is good or effective depends on how close he comes to producing the best possible results for his patients. Process measures like those discussed in the preceding sections are valid only to the extent that so-called good process correlates with desired outcome Recognizing this, a number of researchers have attempted despite the formidable conceptual and practical difficulties, to carry out direct outcome based measurement of physician performance

Definitions of Outcome

Different writers conceptions of outcome vary with respect to (*a*) emphasis on final (end results) as opposed to intermediate consequences of medical intervention, (*b*) long run versus short run orientation, and (*c*) generality versus specific attention to particular diseases or problems. At the general final result end of the spectrum, we find the following definitions of outcome and outcome based assessment Donabedian (67) maintains that the assessment of outcome is the evaluation of end results in terms of health and satisfaction Shapiro (68) says that the term end result refers to some measurable aspect of health status which is influenced by a particular element or array of those elements of medical care " Sanazaro (69) defines end results as "the effectiveness of a treatment or program as determined by the consequences for the individual patient or population, including expressed views of patients and potential patients toward the availability and acceptability of medical care." More specifically, Sanazaro (70) quotes Elinson as saying that the generally accepted targets of patient care are death, disease, disability discomfort, and dissatisfaction (the five D s) " Williamson (14) proposed a sixth D social disruption.

Moving toward somewhat greater specificity, Siegal * in a discussion of monitoring quality of care in health maintenance organizations, proposed several indicators of outcome which could be investigated through long range prospective study infant mortality, perinatal mortality and morbidity, death rates for specific diseases, and hospitalization rates. He further commented that At present we do not have standards for many of these outcome measurements, and it will take years to develop them " Shapiro (68), working with a more detailed classification of effects on patients, identifies a spectrum of outcome categories which take into account physical structure, physiological function of the person, and psychological and social performance For example, evaluation of functional capacity would include meas-

* Segal, B., and Goldberg, G "Monitoring the Quality of Medical Care in Health Maintenance Organizations." Washington, D C Community Health Service, National Center for Health Services Research and Development 1971 (Mimeographed.)

ures of occupational function (work time loss, work modification, job change, job loss), social function (household and family composition changes, daily activity changes), and personal function (degree of self-care, sleep and rest patterns, personal hygiene habits, recreational activity) As an example of a definition aimed at one specific situation, Shapiro identifies outcomes of maternal care as "birth weight with various gradients of immaturity, and the Apgar score at five minutes to classify the infant as essentially normal, moderately distressed, and severely distressed."

Donabedian (67) presents an elaborate definition of outcome dimensions, including both general and specific and both long run and short-run categories in the areas of health and satisfaction. In addition to mortality, morbidity, and disability rates, he includes longevity the occurrence of certain complications of, or failures in, therapy such as incomplete control of diabetes the occurrence of specified complications during the course of care of following surgery such as post operative infection the restoration of physical function following certain traumatic or neurological diseases, such as recovery after fractures, and social restoration following mental illness, for example ability to find and maintain employment. In the area of satisfaction, Donabedian identifies patient satisfaction and satisfaction of health professionals. He points out that the latter is infrequently mentioned but thinks that it is important from the point of view that it affects performance.

All the above categories of outcome were arrived at nonempirically Until 1968, no systematic, comprehensive classification of medical care outcomes had been devised At that time Sanazaro and Williamson (14) described the results of a study in which a modified form of the critical incident technique was used to identify end results of patient care as reported by internists. On the basis of their reports, 12 categories of outcomes were derived, with 42 subcategories. The major categories were divided into two types of outcomes, patient end results and process outcomes. Patient end results "refer specifically to changes in the patient as a person or in the attributes of the disease or condition." Six types of patient end results were identified changes in longevity, physical abnormalities, psychological abnormalities, physical symptoms, psychological symptoms, and function.

None of these categories is uniquely dependent upon medical intervention." (14) Process outcomes, on the other hand, occur only when the patient receives medical care. Six types of process outcomes were identified attitudes toward the physician and the episode of care, attitudes toward and understanding of the condition, compliance, incurring or avoiding unnecessary risks in medical care, hospitalization, and costs of care. Physician acts, beneficial and detrimental, were described for each major category In 1970 Sanazaro and Williamson obtained more information on end results of patient care by applying the critical incident technique on reports by internists, surgeons, pediatricians, and obstetricians.

Measuring Intermediate Outcomes

Unquestionably the major obstacle to an outcome based system of performance is that outcomes are only partly attributable to the actions of the physician or, in fact, to medical care as a whole. The more general or long-run the concept of outcome, the less clear cut is the relationship between the physician's performance and the results obtained with a particular patient Because of this, efforts to develop

outcome-based assessment methods have often focused on intermediate, problem-specific outcomes, such as correctness of diagnoses and patient compliance.

DIAGNOSTIC OUTCOMES

Williamson and Miller (71) define diagnostic outcomes as follows

> Diagnostic outcomes represent the data required to determine the need for care, specific therapy and prognosis. It could be a simple diagnosis derived from a single symptom or laboratory test ("cough" or "hyperuricemia") or a complex diagnosis with major treatment and prognostic implications (lobar pneumonia due to pneumococcus in a noncompliant patient allergic to penicillin)

Williamson and his colleagues have devised two approaches to assess diagnostic outcomes for specific problems such as heart failure and urinary tract infection. One approach (contained in an unpublished report, *A Retrospective Study of Heart Failure in Acute Coronary Suspects Admitted to the Coronary Care Unit from the Emergency Room*) uses retrospective chart review and the other (described in *A Study of Heart Failure in Emergency Room Hypertensive Patients*, unpublished) direct verification.

In the retrospective chart review approach to assessing diagnostic outcomes for heart failure in acute coronary suspects, 40 specific items of clinical information (such as pulmonary rates and enlarged heart) considered essential for determining whether a patient requires management for heart failure were tabulated The items were primarily derived from the New York Heart Association's diagnostic criteria. Williamson and his colleagues, in their work which uses the retrospective chart review approach, classified the diagnoses as follows:

> If specific symptoms and/or signs were recorded and the diagnosis "heart failure" written or implied by therapy, a "true positive" diagnosis was tabulated. If recorded physical findings were negative but the diagnosis recorded as "heart failure," a "false positive" or "misdiagnosis" was tabulated. If the chart contained sufficient evidence to indicate heart failure but such a diagnosis was not stated nor therapy instituted, a false negative' or "missed diagnosis" was tabulated. Finally, when the chart contained negative findings and heart failure was neither recorded nor treated, a "true negative" diagnosis was recorded.
>
> Criteria for assessing measured diagnostic outcome were established by the hospital staff advisory group using formal estimation methods.

It should be noted that this approach is limited by the quality of the records.

In the direct verification approach, Williamson and his associates applied the same "quality assessment strategy" that they had used in the previous study The major and significant difference is that a study team of physicians was used to verify the diagnoses. This method was applied in an assessment of heart failure in hypertensive ambulatory patients, who were admitted to an emergency room. If a patient's diastolic pressure was 110 mm. Hg. or greater the study team, after the patient was discharged from the emergency room, made its own diagnosis. A cardiovascular history, physical examination, electrocardiogram and chest X-ray provided the basis for the diagnosis. After each member of the study team made his diagnosis, it was compared with that of the emergency room staff to identify missed" heart failures and mis-diagnoses." Of the 100 patients that were studied in this manner, three were ' missed."

Williamson and his colleagues did not address themselves to the problem of comparing the chart review and direct verification methods for assessing diagnostic outcomes. However, because the direct verification approach avoids the problems of incomplete data and bias associated with chart review methods, it appears to be a much more promising method.

The two methods that have been described have not been used to measure individual physician performance. The emphasis is on evaluating and improving the performance of a staff of physicians at a hospital in specific diagnostic categories. These methods could, however be used to assess individual physician performance.

PATIENT COMPLIANCE

Patient compliance is defined as the degree to which patients follow the medical regime that the physician has prescribed. Subjective reports and objective physical measurements have provided the basis for measuring compliance. Approaches have been devised, however, to verify the subjective patient reports.

Francis and her colleagues have described an approach for measuring patient compliance that was used in an 800 patient pediatric clinic study (72). The information from the follow up interview of the mothers was the basis for compliance ratings. In order to increase the reliability of the information obtained from the interview, the questions were supposed to be open ended, nonthreatening, and nonjudgmental. Prior to the major study a pilot study was conducted to determine whether patients could understand the questions and were willing to admit failures to comply. Typical questions were "How long did you feel Johnny needed the medicine?" or "Parents often find it hard to remember about medicine. What happened when you forgot?" Responses to compliance were tabulated and compared with the doctor's notations in the chart and to the tape recorded verbal instructions given to the patient. Patients were given such classifications as "high compliant" and "moderate compliant." Those who followed all the doctor's instructions were considered highly compliant, those who carried out few or none were noncompliant.

Davis (50) has outlined a more precise approach to measuring compliance. He has devised an index of compliance which is composed of "patients' perceptions of their compliant behavior, doctors' perception of the patients' compliant behavior, and an independent review of patients' medical records." Charts and patient interviews provided the information on the specific recommendations that the doctor had made. The patient was asked to state how closely he followed the doctor's advice. His responses were coded to indicate how often he followed each regime that the doctor had suggested. The physician was asked how closely the patient followed his advice. His responses were also coded. When the physician and patient responses did not agree, an average of the two was made. Medical records were used to indicate follow through involving the use of a hospital. On the basis of this procedure, a composite index of compliance was obtained, which is "a weighted average of a patient's follow through with various pieces of advice ordered by the doctor."

Charney and his colleagues (73) have described a physical measurement approach to compliance. In order to determine whether children were taking oral penicillin, urine specimens were obtained. The relationship between "take rates" and methods for obtaining the urine were investigated. No significant difference in the "take rates" was found between bringing the specimen from home or giving one in the physician's office.

A major difficulty in measuring compliance is that of verification. Francis, Davis, and Charney have all attempted to provide answers to this problem. Clearly, some difficulties inherent in measurement are related to the type of compliance that one wants to measure.

Measuring Final Outcome

Williamson and others suggest approaches to assessing results related to a specific physical condition. More generally, some researchers have focused on a patient's level of physical function, irrespective of the diagnostic problem. Psychiatrists and those concerned with measuring the effects of psychotherapy assess the social function of the individual. An overall evaluation of a patient's interaction with the physician is reflected in a nonhealth outcome, patient satisfaction.

PHYSICAL CONDITION

Different approaches have been used to assess the physical condition of the patient after treatment for a specific disease or condition. The sources of information on which these approaches are based include retrospective examinations of patient records or derivatives thereof and direct follow up of the patient.

Williamson and his colleagues in their studies of heart failure report a number of sources of follow up information used to assess therapeutic outcomes. They include charts, personal contact, telephone, home visit, and questionnaire. If a patient died, information was derived from death certificates, charts, physicians, and/or family contacts. Each patient was classified as asymptomatic (but with measurable impairment of hypertension), symptomatic (but active in major life activity such as work, school, retirement), not working (not active in major life activity, but caring for himself and ambulatory), bedridden (dependent upon others for self care), or dead. Even though these outcomes were applied to patients who have heart failure, they could also be applied to other diagnostic conditions.

In Payne and Lyons' study (22) a panel of physicians agreed on outcomes for 16 diagnostic categories. The specificity of outcomes ranged from such observations as "freedom from pain" and "cessation of transient ischemic attacks" to "return to activity" and "death." Some of the diagnostic categories had more explicit outcomes than others.

In the discussion of process measures, it was pointed out that retrospective data are incomplete and unreliable. Thus, in measuring outcomes it is essential not to use retrospective information solely.

PHYSICAL FUNCTION

A person's level of physical functioning can be used as an indication of the effects of medical treatment. Katz and his colleagues (74) have developed an Index of Independence in Activities of Daily Living to study results of treatment and prognosis in the elderly and chronically ill. The index was developed from observations of a large number of activities performed by a group of patients with fracture of the hip. The index allows rating of individuals from more to less independent according to adequacy of performance. Adequacy is expressed as a grade which summarizes overall performance in six functions: bathing, dressing, going to toilet, transferring, continence, and feeding. The summary grade indicates to what degree the person is independent or dependent. A description of rankings is as follows: A—independent in feeding, continence, transferring, going to toilet, dressing, and bathing; B—independent in all but one of these functions; C—independent in all but bathing and one additional function; D—independent in all but bathing, dressing, and one additional

function; E—independent in all but bathing, dressing, going to toilet, and one additional function; F—independent in all but bathing, dressing, going to toilet, transferring, and one additional function; G—dependent in all six functions. Other—dependent in at least two functions, but not classifiable as C, D, E or F.

In order to arrive at an overall ranking, the observing physicians, nurses, or sociologists check off on an evaluation form the descriptive statements for each of the six functions that apply to the patient. For example under "feeding," the following three entries might be found: (a) feeding self without assistance (without supervision); (b) feeds self except for getting assistance in cutting meat or buttering bread; (c) receives assistance in feeding or is fed partly or completely by using tubes or intravenous fluids. Data that have been recorded on the form are then converted to an overall grade as defined above.

The order of the rankings has been verified by observing more than 1,000 people who had a wide variety of diagnoses, including multiple sclerosis, malignancy, Parkinson's disease, asthma, and alcoholism. It was also found that those who were recovering from a disabling illness showed an ordered sequence of improvement. Katz and his colleagues (74) suggest that the index could be used "as a measure for comparing treatment and control groups in studies of the efficacy of treatment." As for reliability, the difference between observers occurred once in 20 evaluations or less frequently.

SOCIAL FUNCTION

Scales have been developed to evaluate the effects of psychotherapy. In some instances attempts are made to show a relationship between patient improvement and the type of therapy that the physician used.

Luborsky (75), affiliated with a psychotherapy research project at the Menninger Foundation, reports the development of the Health Sickness Rating Scale to record patient improvement. Each patient is rated on seven dimensions: (a) ability to function autonomously, (b) seriousness of symptoms, (c) degree of discomfort, (d) effect upon the environment, (e) utilization of abilities, (f) quality of interpersonal relationships, and (g) breadth and depth of interests. Thirty four sample cases are used to anchor the points of the scale.

In six reliability studies of observer agreement, correlation coefficients ranging from the seventies to the nineties are reported. As for evidence of validity, 11 variables thought to correlate with treatment prognosis correlate between 0.54 and 0.85.

Rice and his associates (76), in an attempt to devise a method for appraising the effectiveness of public psychiatric hospitals, developed as part of their approach a questionnaire to assess patient adjustment to the community before and after treatment. The questionnaire is supposed to assess four areas of social adjustment: social and family relations, social productivity (areas such as work and school), self management (personal care and conduct), and antisocial behavior. The questionnaires are sent to community informants at the time the patient enters the hospital and then again three months after he is discharged. The questions are structured to elicit objective information such as whether the patient has been engaged in work and to what extent. Other questions are structured in terms of comparison of the patient's behavior with the behavior of his peers in the community; still others ask the informant to indicate the patient's behavior by means of simple scales. Ideally the same person rates the person before and after treatment. No information was provided as to the reliability of the ratings and the validity of the instrument. No provision in the total assessment program provided for examining the different types of psychotherapy that were used and relating it to patient improvement.

Rosenbaum and his colleagues (77) have proposed an approach to evaluate psychotherapy which was tried on a group of outpatients from a psychiatric clinic. Unlike Rice, Rosenbaum attempted to relate patient improvement to the type of therapy that the physician administered.

Psychiatric residents were asked to complete an evaluation form for each patient that they had seen during a 12 month period. The resident was to respond to the questions on a form with either "yes" or "no" or with a number or symbol. Definitions accompanied the instructions so that specific standards were given to explain what constitutes "good," "fair" or "poor" childhood environment. The standards were derived from the research literature and devised by the authors. The residents evaluated each patient on (a) his illness including the clinical diagnosis, dynamics and genetics, description of symptoms, goals in treatment and initial prognosis; (b) his adjustment before therapy and the changes that occurred with therapy which involved evaluating factors such as marital adjustment, work adjustment, financial status, social status, and interpersonal relations; and (c) his therapy including frequency, length, and duration of therapeutic interview, attendance, motivation and other factors. They also reported the type of therapy that they had used on their patients. The 210 patients who were evaluated by this method were grouped according to their improvement. The criteria for improvement developed by Miles and his colleagues (78) were used:

> *Apparently recovered*—Recovery from symptoms (except possibly for one or two minor complaints) and marked improvement in social adjustment, with no return of the emotional disorder even under severe stress. This implied a complete and stable recovery from the emotional disorder.
>
> *Much improved*—Recovery from symptoms except for a few minor complaints. Marked improvement in social adjustment. Under severe stress a transient exacerbation of the illness might occur.
>
> *Improved*—Definite improvement in symptoms and in one or more areas of social adjustment. Some symptoms persist and patient's total adjustment is still not as good as it had been before the illness began.
>
> *Slightly improved*—Slight or variable improvement in symptoms and/or social adjustment.
>
> *Unimproved*—Self-explanatory
>
> *Worse*—Self-explanatory

The "much improved" group (which also contained the apparently recovered), the "improved" and the "slightly improved" were compared to determine whether a relationship existed between the type of therapy used and level of improvement. The findings indicate that "there was a significant association ($p < .01$) between the more intensive types of psychotherapy and improvement" (77). They also found that patients more often dropped out of therapy with less experienced residents. If the patient continued in therapy, however, he was as likely to improve with a less experienced resident as with one who was more experienced.

Evidence of reliability could not be obtained because of the single ratings. Aside from this, one questions whether the person who administers the therapy can provide an objective rating. No evidence of validity was provided.

PATIENT SATISFACTION

The primary objective in measuring patient satisfaction is to ascertain those aspects of the physician-patient encounter which the patient finds satisfying or dissatisfying. This type of feedback provides the basis for improving and evaluating physician performance In Chapter 2 it was mentioned that a relationship exists between patient satisfaction and patient compliance If this is the case, then the measurement of patient satisfaction becomes even more important.

Interviewing is a common method used to elicit information on patient satisfaction Korsch (46) Alpert (79) and Mindlin (80) have all used some type of structured interview to ask mothers from low and middle class families to express satisfactions and dissatisfactions with their physicians.

One problem with these studies is that they do not provide information on individual physician performance In order to do this, sizable samples of each physician's patients would have to be studied A second problem with these studies and others like them, whether interviews or written questionnaires are used, is that of reliability and validity To the author's knowledge, no one has validated a patient satisfaction instrument

Chapter 5

Qualities Approach

Price and his associates at the University of Utah have developed an approach to measure physician performance which focuses on discovering the qualities or attributes of a "good" physician. Price (81) explains that many different categories of qualities are associated with a superior physician, including "intellectual, social, some related to personality and character, some having to do with training or with motivation, others reflecting achievement, opinions of other people or actual performance"

In order to ascertain the qualities of a superior physician, several studies were done Initially, about 200 measures of subjective and objective information were obtained for nearly 800 physicians (41) Then factor analysis was used to reduce the mass of measures to 80 criteria

In the second study (8) different weighting methods were used to determine the importance and variability of the 80 criteria This approach provided the basis for ranking the qualities.

In the third study (8) more than 350 physicians were asked to respond to the question, "With regard to your field or specialty what do you consider to be the basic factors of success?" The list of qualities accumulated from the physicians was given to a large group of heterogeneous people to modify

The purpose of the fourth study (8) was to determine to what degree the "qualities" from the previous study were measurable Rating scales were devised to measure these traits. Eight groups of raters used these scales to rate the performance of 10 physicians. The eight groups included the physicians themselves, physician-observers, peers, expert judges, house officers, nurses, hospital administrators, and patients. Only the physician-observers directly observed each physician's performance The other groups, who worked at the same hospital in which the physicians practiced, completed mail questionnaires.

With respect to reliability Price (8) in a so-called feasibility study reports that the physician-observers varied little or not at all in their ratings of negative qualities. On the rating of 34 positive qualities, a Pearson of 9 and a rho of .6 were obtained as indices of inter rater reliability They also report that the judges displayed a considerable degree of consistency with one another With respect to construct validity it was pointed out that more research needed to be done However, "on a whole the construct validity analyses did provide an indication that most of the concepts being rated were fairly well defined"

The validity of the Qualities Approach has not been established There is, however, reason to believe that the line of inquiry is worthwhile Similar types of qualities have been found to be related to professional performance in other fields. For

example, the Institute of Personality Assessment and Research at Berkeley has shown that cognitive and noncognitive traits provide a basis for differentiating between more creative and less creative architects (82) mathematicians (83), and writers (83–85) Whether the qualities approach is validated remains to be seen.

Chapter 6

Conclusions

The following general impressions of the state of the art of physician performance measurement emerged from this survey

First, at the present time there exists no system for measuring the overall performance of individual physicians that has been validated in the sense that physicians who measure higher have been shown to produce better patient outcomes. In other words, no system of measurement now available allows us to determine objectively who are the high- and low-performing physicians. Lack of validation in terms of patient outcomes is the primary shortcoming of many of the approaches currently being used or developed, and efforts to establish such validity should be the focus of future endeavors in this field

Regarding dimensions of performance, there has been a marked tendency to concentrate on the technical aspects of performance and to neglect the interpersonal Within the technical realm moreover there has been a heavy emphasis—possibly disproportionate—on so called intellectual problem-solving abilities (primarily related to diagnosis) relative to the skills needed for treatment and patient management There have been few attempts to define performance categories and to assign weights based on empirical analysis of the composition of actual practice More effort in this direction would contribute to greater content validity of performance measurement instruments.

Outcome and Process Dimensions

OUTCOME

The ideal performance measure would be a measure of the individual physician's contribution to outcome. But to obtain such a measure, it would be necessary to understand and take account of all the nonphysician factors affecting medical results. Since no such capacity exists, most attempts at outcome measurement have focused more narrowly on results of treating specific problems or conditions in relatively homogeneous settings. Thus, there are well developed techniques for assessing quality of care for specific disease categories in a hospital setting. Whether these methods can be extended to multiple problem categories and applied to individual practices remains to be determined.

TECHNICAL PROCESS

Assessment of technical process can proceed in a relatively straightforward manner through various direct and indirect methods of peer review once process dimensions and their relative importance have been determined. As noted above, selection of dimensions and weights has tended to be arbitrary and subjective, but this can probably be remedied by means of empirical analysis of the content of actual practice A more fundamental issue is the paucity of efforts to validate process measures against outcome criteria

Without such validation, the value and meaningfulness of process measures remains open to question.

INTERPERSONAL PROCESS

Although some work has been done to develop instruments for measuring interpersonal process, primarily in the physician patient communication area, a full set of process dimensions has not been worked out Also, since the work has been separated from other efforts to measure performance, important interactions between technical and interpersonal process have been neglected Little is known for example, about how technical management and the physician-patient relationship jointly affect physical and psychological outcomes. Even less seems to be known about performance in the large segment of practice devoted to "nondisease" problems of patients, where the role of interpersonal processes is particularly great. The major need, therefore, is to bring interpersonal process within the mainstream of physician performance so that future work can be guided by a holistic conception of physician patient interactions.

Specific Measurement Methods

DIRECT OBSERVATION METHODS

The most direct observation methods, in which a physician's peers observe his processes or directly confirm outcomes, probably have the highest potential for accurate, valid measurement. There are relatively few applications of these methods, however, probably because the methods are costly and time consuming. To demonstrate the full potential of direct observation and direct verification methods, it will be necessary to conduct larger, more rigorous, multi-observer studies in which both processes and outcomes are assessed

RECORD-BASED METHODS

Records, record abstracts, and hospital charts are frequently relied on for both outcome and process measurement. Their use is attractive, especially in hospital studies, because of the ease and relatively low cost of data collection The quality of results suffers severely, however, from incompleteness, inaccuracy and nonstandardization of data—especially when attempts are made to use records from private practice Greater use of problem-oriented records may help considerably to improve the quality of data But a fundamental problem of bias—that is, the physician-subject is also the data recorder—remains as a permanent threat to the validity of record based methods.

SIMULATION METHODS

These are easy to standardize and use on a large scale and are also relatively economical They have been used primarily to examine problem solving aspects of the physician's role but may be extensible (for example through computer simulation and the use of live actors) to other dimensions of patient management and to interpersonal relations. The main problem again is one of validity It remains to be demonstrated that physicians' scores on simulation tests correlate with their performance in the real world.

QUALITIES-OF A PHYSICIAN APPROACH

In this case also, the crucial question is one of validity Do the physician characteristics that various observers feel to be important actually correlate with performance on actual patients? What is needed here is a direct comparison between the qualities-of-a-physician approach and results obtained on a more direct study of physician process or patient outcomes.

QUALITY AND COST

There appears to be a definite inverse relationship between the quality of a measurement method and the ease and economy of applying it. The methods that inspire most confidence—direct observation and direct verification of outcomes—are very expensive and time consuming. Methods that are most practical to use on a large scale, such as simulations and the qualities of a physician approach (when rating scales are used without direct observation), have serious validity problems at the present time. Record based methods, which fall in between in practicality and economy suffer from the aforementioned inaccuracy and bias problems. Anyone selecting a method for use today must confront this difficult cost quality trade off

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Journal of Medical Education Vol 48 No 11 Nov 1973

Individual Physician Profile

Individual Physician Profile Continuing Education Related to Medical Practice

Sigurd E. Sivertson, M.D., Thomas C. Meyer, M.D., Richard Hansen, and Adeline Schoenenberger

Abstract—Planning for continuing medical education of physicians involves many variables. The Individual Physician Profile is one method bringing these variables into focus. Problems patients bring to a physician are codified, the physician is tested on those problems, and, with additional personal information, consultation leads to a tailor made educational program. To expedite this method it was necessary to develop computerized techniques for storage and retrieval of practice data, relevant test questions, and learning resources. The Individual Physician Profile permits better investment of a busy physician's time and energy for education to meet the needs of his practice. It points to the need for a new arena in continuing medical education, an educational consulting service (or consultant) for the physician.

A major problem for a physician is to relate his continuing medical education accurately to the knowledge and skills necessary to meet the needs of his patients and community. The faculty of the University of Wisconsin Department of Postgraduate Medical Education identified the following factors as being significant in dealing with this dilemma: problems patients bring to their physician, organization of the practice community setting, and the physician's personal likes and dislikes relating to his practice and his apparent interest in continuing medical education. All are determinants of the *type of practice he builds and the quality* of care he delivers. It was out of the need to describe these variables for any physician that the Individual Physician Profile (IPP) was created. (This method has a long-range orientation and is continuously evolving as experience dictates the need for change.) It is the authors' intent here to describe the basic techniques.

The research reported here was supported by National Institutes of Health contracts number 70-4029 and 70-4030 and by the W. K. Kellogg Foundation, Battle Creek, Michigan.

Dr. Sivertson is assistant dean for continuing medical education, Dr. Meyer is associate dean for education, Mr. Hansen is director of postgraduate medical education, and Mrs. Schoenenberger is project specialist, Department of Postgraduate Medical Education. All are at the University of Wisconsin Medical School.

Procedure

The Individual Physician Profile is a three step process: practice profile, examination, and educational consultation and design of a continuing medical education program.

Practice profile—The profile is obtained by issuing the physician a small tape recorder on which he records, one different day each week for four weeks, the age and sex of every patient encountered in the office, in a hospital, on the telephone, and at home, presenting symptoms, significant findings, major diagnosis (patient problem), contributing diagnoses (other patient problems), tests ordered, and disposition. The tape is then returned to the University of Wisconsin's Department of Postgraduate Medical Education where it is transcribed and the diagnoses codified in the categories of the *International Classification of Diseases, Adapted* (ICDA). This classification contains 17 categories and a supplementary classification called "Special Conditions and Examinations without Sickness" which was arbitrarily called category 18.

The numbers of diagnoses in the categories form a practice profile, that is, a histogram such as that shown in Figure 1 which is a "typical" profile of a family practitioner in Wisconsin. That practice profiles vary is shown in Figure 2, which reflects an atypical family practice.

Examination—The physician is tested with 125 questions obtained from a large number of questions stored in the computer; these questions have been cross-indexed in the ICDA. For example, if he sees a large number of diabetic problems, he will receive a greater number of questions on diabetes; the complexity of the questions also increases with the number of questions. The test takes approximately two hours to complete.

Consultation—In order to design an appropriate educational program, an educational consultant who is a member of the medical school faculty meets with the physician, and together they study the practice profile and the test results and other information elicited by asking the participant questions of a general and personal nature. The general questions relate to his age, years in practice, number of physicians and ancillary personnel in his practice setting, previous education, hospital affiliations, special facilities available in the hospital, current educational programs available and used, and amount of time he can leave his practice for continuing medical education. The personal questions relate to how he learns best, characterization of the people and community he serves, delegation of tasks to supporting personnel, education of his patient population, patient problems and practice problems causing him personal distress, and the part of his practice he most enjoys.

Resources necessary for implementation of this method were a computerized test bank and a computerized educational resource index. Computerization techniques were necessary to permit storage of a large number of questions and educational programs, rapid retrieval of specific questions, and identification of the relevant current educational programs which could be *recommended* for each participant.

TEST BANK

In the initial stages of the program, a large number of questions were obtained from a variety of sources, including departmental files in the medical school, the Ohio Academy of General Practice and the Connecticut academy, various self assessment tests, and the Professional Examining Service of New York City. Initially it was suspected that practicing physicians would doubt the appropriate relationship of many questions to their practice. This was soon confirmed by asking the initial 14 participating physicians to state whether, in their opinion, each question in his examination was relevant or nonrelevant to his practice. The result was that an average of 35 percent of the questions in each examination were judged to be unacceptable. It was neces-

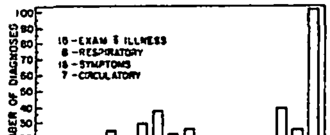

Figure 1
Profile of a typical family practitioner

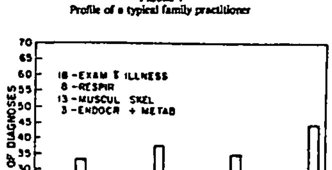

Figure 2
Profile of an atypical family practitioner

tory then to review these questions and either revise or reject them. Therefore, a process was established for "cycling" questions before entering them into the test bank. (This reduced the proportion of unacceptable questions to an average of 11 6 percent which the authors found to be low enough for their purposes.) Each question is first reviewed by a staff member Initially this was a physician but experimentation and experience soon indicated that a non-M D staff person (such as a graduate student or English major) could screen each question to meet the following criteria, questions must be of the multiple-choice type with no less than four answer options possess apparent relationship to clinical practice and be grammatically correct

Questions surviving this review are as-

signed identification numbers and sent to practicing physicians who are asked to review and return them. To assist them in judging questions, the authors developed a rating scale that permits a semiquantitative assessment of both the item and answers as well as an overall assessment.* (If the defects identified in a question by the practitioner cannot be corrected, it is rejected) If a question survives this part of the cycle, it is subjected to a scrutiny for scientific accuracy by a subject matter expert on the medical school faculty His review process is facilitated by a similar rating scale * Identified defects are corrected if possible and the question moves to the coding process.

Coding involves (*a*) assignment of the question to one or more categories of the ICDA (*b*) designation as to its appropriateness for general practitioners, internists, obstetricians pediatricians, and surgeons and (*c*) assignment at one of three levels of sophistication (a gross attempt to relate the question to the circumstance and environment of the patient contact) The levels are as follows Level I—an "on the spot" decision (the common clinical situation) Level II—a decision requiring manipulation of information derived from commonly available diagnostic tests and procedures and Level III—a problem or technique requiring specialized training or diagnostic tests to manipulate the information

An attempt is made to attach a reference citation to each question The intent is to make the test a learning situation so that the physician who fails to answer a question correctly has a specific reference to study It also gives the clinician an opportunity to confirm the scientific accuracy or inaccuracy of the question if he challenges it Brief experiments were conducted with third year medical students to determine the most efficient and effective method of obtaining references. They found this generally to be current medical texts because searching current journals was too time-consuming Due to restricted funds, references have not been found for all questions in the test bank.

A total of 2,020 questions have passed through this cycling process and have been entered into the computer test bank. Since many of these could be appropriately placed in more than one ICDA category the capacity of the bank was expanded to 3 755 questions. In composing a test, however, safeguards have been established in the computer program to assure that the same question is not assigned twice under different categories.

*The rating scale is available from the first author on request.

EDUCATIONAL RESOURCE INDEX

Early in the study it was quickly recognized that it would be necessary to develop a listing of educational programs that was accurate, comprehensive current, and expeditious for the educational consultant to use The first step in this project was to send a letter of inquiry to all major organizations and associations in the country that sponsor continuing education for physicians asking to be placed on their mailing lists for upcoming events and available materials. The continuing education issue of the *Journal of the American Medical Association* has proved to be an invaluable comprehensive source of conferences and more recently audiovisual material

As educational listings are obtained, each is coded into the ICDA and entered into the computer in a two-branching system one of which is related to home study and includes audiovisual materials, programmed instruction and texts and journals (1) and the other to away from home study including conferences and apprenticeships.

For nearly three years apprenticeships ("on the job training") were available at only a few medical centers. Recently however, they have become more plentiful and can be codified in adequate numbers within the index. The index is updated every two months so that new entries become readily available and obsolete ones are deleted.

Discussion

The development of the procedures and resources has taken place over a three-year period and is still continuing. During the first 18 months, 37 physicians participated and assisted in resolving some major problems which arose In the next 18 months, 76 physicians participated. The result was a procedure which apparently is useful in identifying individual educational needs for practicing physicians.

PRACTICE PROFILE

Collection of patient data was initially done by a medical secretary who followed the physician and recorded information about each patient contact for a week Later to reduce cost tape recorders took the place of the secretary and made it possible to spread the sample over a month's time even though the volume of data was not increased.

The four-day sample of the physician's practice is still considered a weakness in the procedure However it is a reasonable compromise with expense and demands on the physician's time Comparison of the two methods of data collection a medical secretary on site as opposed to a tape recorder indicated close correlation of data, although some physicians forgot to record all telephone contacts

EXAMINATION

The testing procedure underwent considerable change during the three years of research The examination was initially administered in the physician's office over a portable teletype which was connected on line to a computer in Madison This proved to be expensive and technically incompatible with the many telephone companies in Wisconsin. The test is now printed out and mailed to the physician, who returns the answer sheet for scoring. The answer sheet found to be most useful is the Action/MARK Paper Response System it is constructed so that the correct answer is given immediately to the examinee when he commits himself to one of the options

A major problem in testing, however, was the quality of the questions. The initial questions were for the most part, written by academicians for use in formal education programs As noted previously, it soon became apparent that many of these questions were not relevant to clinical practice Consequently the initial bank of questions was virtually discarded and the cycling procedure for new questions was developed.

A further weakness of the test bank which has been partially corrected is the overemphasis on the cognitive domain that is, instant recall of factual knowledge which does not probe the analytical process used in solving medical problems (2) Rewriting questions so that they relate to a clinical setting and assess synthesis and application of knowledge is a continuing necessity

Further, the arbitrary limitations of a two-hour 125-question test makes it difficult to explore in depth the physician's knowledge in specific areas of medicine. However, it has been possible to judge the number of questions that should be asked on a given subject to determine educational need on the basis of the participants response during the consultation if a low score brings forth a comment such

as "I really should know that, I see many such patients," it is thought to highlight an area of need. Consequently, the examination is regarded as a screening instrument rather than a definitive diagnostic tool. To be useful, test results must be interpreted in relation to all the information in the IPP in addition, they may lead to further testing in a given area.

CONSULTATION

Perhaps the greatest evolution took place in exploring the role and function of the educational consultant. In the early research phase it was assumed that virtually any medical educator could fill this role, and a variety of faculty members volunteered for the project. The main criterion for selection was that the consultant's specialty be matched to major areas of the physician's practice profile It was found that this type of matching was difficult if not impossible, for several reasons (*a*) the consultant's breadth and depth of knowledge was not applicable to private practice and (*b*) his access to available educational resources was definitely limited.

Currently, one physician has assumed major responsibility for consultation, with assistance from two others They have common qualifications in that their specialties are in the more general areas of internal medicine and pediatrics and each had spent a number of years in private practice before joining the faculty

The result is that there may be a need for a new position in continuing medical education that of educational consultant with specific techniques and procedures to be mastered as a prerequisite for assuming this role, which appears to be defined to the extent that it can be taught and learned

EDUCATIONAL PROGRAM DESIGN

During the first research phase, the procedure ended with the consultation, the participating physician was left to design his own specific educational program. Since the practicing physician's knowledge of available educational resources was limited and as previously indicated the early consultants lacked experience, a source for educational programs was mandatory Consequently, the educational resource index was developed and now the participant can be furnished with a computer printout that designates those materials or events recommended by the consultant. This printout is returned to the participant along with the consultant's personal letter of recommendations and many enclosures containing information about delegation of tasks, management comments, references to the problem oriented record, and composite data from many other practices which are useful for comparing his practice with the "average" practice.

EVALUATION

It has been difficult to assess the true success or failure of the procedure to assist a physician in identifying and meeting his unique educational needs There can be little doubt however, that the method does relate to individual practices.

Initially, it was supposed that retesting after an educational period would provide adequate information on which to base an evaluation of the efficacy of the program This was the case with the limited sample which participated in posttests. However testing assumed a less dominant role in evolution of the process because the ability to show improvement in instant recall of factual knowledge became less acceptable as a method of measurement. Efforts are now being directed to devising a method of patient-care appraisal for the purpose of detecting change in the delivery of health care attributable to the procedure.

THE CONTINUUM OF MEDICAL EDUCATION

CME 1

FROM JOURNAL of MED EDU Vol 48 No 1 JAN 1973

The Continuum of Medical Education

Ivan L Bennett, Jr, M D

Many months ago, I agreed to help round out the program for this meeting of our Association and tentative agreement was reached that the subject would be "The Continuum of Medical Education" My acquiescence, I should add, occurred during a transient period of pusillanimous susceptibility engendered by the blandishments of some old and treasured friends who were responsible for the program Once we had parted company my strength of spirit and firmness of mind were restored and I retreated into my spongy sanctuary of freebooting negativism to enter into a period of regret which will terminate about thirty minutes from now

It is not my intention to address the announced topic of a continuum in any systematic, indeed, in any detectable way Rather I would like to take this unsought after but valuable opportunity to give an overview of where we seem to be going in medical education and what I think we should be trying to accomplish in the future.

As an aside, I can say that I think that it is probably a good policy to hear from an occasional dean at these plenary sessions of our Association, and I am glad today to represent the boys who limp in after the cheering has stopped and the crowd has gone home

Most of you will be relieved to know that my remarks will not be comprehensive I will adopt the viewpoint once suggested by A N Whitehead as a guide for intellectual inquiry— to seek simplicity and then distrust it "

In his Presidential Address before the Association of American Physicians in 1971 Dr Ludwig Eichna identified a 'verity" which I believe to be of paramount importance as we look at trends and objectives in medical education He reminded us that medicine, as a profession, is both a science and a service and that we must prepare our students for both He stated his unequivocal opinion (with which I am in complete agreement) that science must take priority over service in medical education since it is science that looks to the future while service looks only to the present

I would like to say just a bit about the general business of looking at the future My own clinical experience as a futurologist has taught me, if nothing else the wisdom of Winston Churchill's remark "It is always wise to look ahead, but difficult to look further than you can see "

To begin with the next 10 to 20 years of an enterprise as complicated as medical education is a relatively safe subject for prediction or forecasting After all, who in this audience really expects a

This paper was prepared for delivery at the November 4, 1972, plenary session of the 83rd AAMC Annual Meeting in Miami Beach Florida

Dr Bennett is dean and director of the New York University Medical Center

At the present time there are no objective measurements of the success or failure of the procedure However, a subjective analysis of educational recommendations for 58 physicians who had completed the procedure by July 1, 1971, was made The *assumption* was that an educational diagnosis *based on the three steps of IPP, that* is, practice profile, testing, and the subjective information obtained during consultation, was effective When all three steps contributed to the end result, the project staff assumed IPP to be highly effective in relating recommendations to a practice When two factors pointed to an educational need, IPP was considered to be effective (This occurred, for example, when the practice profile indicated a high volume of patients in a specific area of medicine and the consultation indicated a need for study but the test results were inconclusive) Where only one step *supported an educational diagnosis,* IPP was considered to be ineffective (This occurred most frequently when only consultation resulted in indication of educational need which was not supported by objective data in the practice profile or test results.)

On the bases of these somewhat crude criteria, it was concluded that 35 (62 percent) of the 58 physicians involved received a highly effectual educational diagnosis 18 (31 percent) received effective program planning, and the results for five (7 percent) were ineffective The five in effective results were attributed to either failure of the procedure or the possibility that these individuals had no identifiable educational needs

Now that IPP has successfully passed through the research phase its maturation is progressing rapidly This is particu*larly true* in the area of family practice to the extent that the program is cosponsored by the Wisconsin Academy of Family Practice Family practitioners may subscribe for a fee of $80 To date a limited number of specialists in pediatrics, internal medicine, and surgery have also participated, the results of their evaluations suggest that the method is also applicable and useful in these specialties but as yet in need of further development.

Although the number of physicians participating from other states and countries is small, the practice data that have been gathered strongly suggest their value in comparing patient problems within regions and between territories

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prediction about 1984 made by me to be truly accurate? If I prove to be wrong after 10 years, who will care? If I prove to be correct, who else will remember? In other words, for a dean, at least, I am on uncommonly safe ground

As that ancient retiree from the Research Department of the British Foreign Office is reputed to have said after serving from 1903 to 1950 Year after year, the worriers and the fretters would come to me with awful predictions of the outbreak of war For 47 years, I denied it each time I was only wrong twice '

Much indeed most of present day future watching suffers from a malady that Hasan Ozbekhan has called the perpetual present" and P L. Polak has referred to as timeless time As Ozbekhan a practicing futurologist and forecaster put it Today the future tends always to be viewed hence methodologically approached as if it were the *mere extension of the past* The future should be viewed as a solution to the present not as an extension of it and desirable ends should never be confused with the means that makes them feasible '

I am convinced that this confusion of ends or objectives and means or trends is a root cause of our difficulties in analyzing and dealing with many complex problems, including those of education medical or other R G H Siu has stated the situation in another way The reason that the present century is fittingly called the machine age is not the abundance of machines, nor is it man s dependency upon them It lies in man s changed attitude Consequences are taking the place of purposes."

Yes consequences are taking the place of purposes, and I submit in medical education as well as in other endeavors, that our task is to try to assure that the consequences of our actions today will coincide to the greatest possible extent with our purposes for the future

Present trends in medical education, as extensions, represent future trends. You can easily compile your own lists, but let me enumerate a few

1 The integration of college and medical school experience culminating in actual combination of college and medical school to provide a single shortened 5 6, or 7 year course of instruction leading to the M D degree

2 Coordinated teaching between basic science and clinical departments with maintenance of strong and independent basic science departments and teaching programs

3 Early contact with patients as a meaningful aid to education of the student as opposed to overemphasis upon early practical experience or the desire of many students to become instant healers.

4 Additional use of teaching machines and computers as adjuncts to the basic learning provided by student teacher and student patient relationships.

5 A strong tendency to shorten the M.D. curriculum in response to external pressures and financial incentives to do so as an effort to economize as a means of achieving goggle eyed publicity for unsung institutions or in true recognition of the fact that clinical medicine is really learned during the internship and residency years

6 A movement toward abandoning the general clinical experience of the so-called freestanding internship preceding postgraduate specialization along with the determination and control of the house officer segment of physician education by medical schools rather than self perpetuating specialty boards

In view of recent experience with participatory democracy" in selection of advisory councils at the National Institutes of Health, however, I wish to make it clear that self perpetuation is not, categorically a bad operational policy in many areas

7 The introduction of greater and more meaningful components of ambulatory care in both hospital and community settings as an integral part of the clinical experience of students and house officers

8 The development of less rigid curricula, allowing greater engagement of the student in his own education under appropriate guidance This includes continuing emphasis upon providing opportunities for original research, intensive clinical experience in a specialty of the student's choice and elective experience in settings outside the medical school and teaching hospital

9 Exploration of the ways in which students can better understand themselves and their patients in terms of ethnicity, social background and economic status, what the human impact of illness is and how to cope with complex ethical problems and moral ambiguities This includes a continuing exploration of the role of humanistic studies in broadening the horizons and perspective of the student, in acquainting him with the role of other professions in society and in assisting him toward what, for want of a better term I will call compassionate behavior

These, then are some but by no means *all of today's major trends in* medical education By extension they will be the trends of the future

No such general listing, of course, can possibly portray the rich variety of form and degree in which these trends exist in various institutions in many different locations. This is truly an exciting time in medical education The reality of this diversity of innovative efforts surely contradicts the entrenched, widely held, and quite erroneous view of the medical curriculum as a cumbersome static, monolith created in 1910 by someone named Flexner held stubbornly immutable for 72 years.

Among the carping critics and naive, mostly well intentioned reformers outside the system who seek more and more to change what they clearly do not understand, one might create an affirmatively bewildering effect by paraphrasing the statement of Secretary of State William Rogers to the Senate Foreign Relations' Committee It would be very useful if you will ask yourself what it is that you would do differently than we are doing keeping in mind that you may not know what we are doing.

These then are some of the major trends for the future in medical education It is safe to say that as the programs represented by these trends continue, they will have certain consequences.

As we look to the future, it seems to me that we must ponder at least three important questions.

1 To what extent will the consequences generated by extension of these trends coincide with our objectives in medical education?

2 Do these trends reflect the best means for achieving our educational objectives or do some of them represent juicy morsels cut out of the living environment of context and process?

3 *And of course this is really the* first question we should ask Just what are our objectives in medical education?

Last April, David Shaw a staff writer for the *Los Angeles Times* published an article in that newspaper entitled M D Reform Will Patients Be the Losers?",

with the subtitle Opponents Fear Proposals Will Shortchange Public with Immature Doctors.' In this article he cited four trends intended to move doctors from the campus into society more quickly" and reviewed the opinions of various medical educators, house officers, and physicians as to the consequences to be expected from these trends, I will quote some of these to emphasize the importance of the question about coincidence of consequences and objectives The four trends cited by Shaw were (*a*) combined six year premedical medical school programs leading to the M D (*b*) shortening of the M D curriculum to three years. (*c*) the elimination of the required internship by several specialty certifying boards. and (*d*) the planned discontinuation of all internships in 1975 except as part of residency programs

Among the opinions about the consequences of these changes which he collected were

From a representative of the American Medical Association "These kinds of changes are the results of several studies and a continuous attempt to improve medical services. They will produce more and better doctors at a faster rate reducing duplication and eliminating some old, anachronistic practices "

From many critics" "The medical revolution will yield a glut of doctors who are narrow specialists—as physicians and as human beings. These doctors will be practicing most where they are needed least

From a professor of medicine "The fourth year of med school is now pretty much what an internship used to be—an opportunity for clinical experience in a variety of hospital wards. That's why they're doing away with the internship, per se But if you do away with the fourth year as well you take away a lot of the young doctor s exposure to general medical problems You make him a narrow specialist and that's bad for him and worse for society

From "advocates "They hope to monitor the new programs to keep the young doctors' options for lateral mobility open and preserve the tradition of the well-rounded physician.

From a practicing physician "In a combined program, the student won't have to concentrate on the non medical, non-scientific courses because he won't need good grades in those classes to be accepted in med school He'll already be there He'll just study the minimum necessary to pass those classes and devote all his energy to the medical classes—the product will be a doctor ignorant of literature sociology fine arts and other liberal arts

From a chief resident who opposes shortening I was the youngest intern in my class and I'm only now beginning to realize that there's something to be said for coming onto the wards as mature as possible You re dealing with human life, and those kinds of decisions just can t be made from textbooks You have to live and see and learn—and that takes time.

So much for this sampling of one set of answers concerning the relationship of trends, consequences and objectives While at this particular time, we all have reason to question the results of the pollsters, it is important to know what the lay press is saying and what a variety of opinion exists. This is a matter that we will do well to keep in mind as we look to the future

Let me return to the vital importance of considering our basic objectives, our goals, in medical education These have often been described in the past mostly in the form of characterizations of the hoped for product of the system, the good physician

For example Alexis Carrel described the physician He needs sound judgment, great physical endurance and ceaseless activity He is set a task very different from that of a man of science The latter can confine himself (almost) entirely to the world of symbols Physicians, on the contrary, have to face

both concrete reality and scientific abstractions. Their mind must simultaneously grasp the phenomena and their symbols, search into organs and consciousness, and enter with each individual a different world They are asked to realize the impossible feat of building up a science of the particular Of course they might use the expedient of indiscriminately applying their scientific knowledge to each patient as, for instance a salesman trying to fit the same ready made coat to people of different sizes But they do not really fulfill their duty unless they discover the peculiarities of each patient Their success depends not only on their knowledge, but also on their ability to grasp the characteristics which make each human an individual

Despite enormous changes in the body of medical science that have occurred in the half-century since Dr Carrel wrote these words his general characterization of the ideal physician requires no substantial modification today

How can such a description of the desired end product of our endeavor be translated into a set of objectives for medical education? The most luminous and insightful analysis that I know was *made in 1941 by Dr Samuel Harvey* the late great professor of surgery at Yale I have borrowed heavily upon his framework to examine the qualities which we would like to see in our graduates and to look at the ways in which these qualities might be influenced by the curriculum or the total educational experience

The quality or attribute which all, or nearly all would place in the first rank is integrity in its usual meaning of honesty as well as the broad implications of its Latin derivation "wholeness and uprightness.' No matter what type of professional activity in medicine is undertaken by a student after graduation this life long quality is peculiarly desirable Of course the desirability of integrity as a quality is by no means limited to the products of medical education What medical education can do in a direct or positive way to assure this quality is all too little The medical student comes to us as an adult (a fact we tend to overlook) especially so in regard to the qualities of behavior and conduct He has been heavily conditioned during the formative years by his family school and college and his basic patterns are set In a negative sense and indirectly a medical school can cull the obviously dishonest during the selection process but, once admitted such changes that occur, for better or for worse, are likely to come from the example set by the faculty and the medical profession outside the faculty This is probably what Sir William Osler had in mind when he wrote This higher education so much needed today is not given in the school is not to be bought in the market place but it has to be wrought out in each one of us for himself it is the silent influence of character on character

A second attribute that is desirable *in a physician of course, is intelligence* or as Dr Harvey put it a *proper intellectual ability* It seems abundantly clear that the curriculum of a medical school will not influence this quality in any direct way Nonetheless many institutions (or at least, their admissions committees) seem to continue to function in the vain hope that intelligence can be increased to a reasonable level by proper teaching This is not true in theory or in practice although learning proper work habits may sometimes bring pre-existing intelligence into action Perhaps it is this occasional happening that keeps alive the false hope that a student whose past experience gives evidence of a mediocre intellectual ability can somehow be regenerated by exposure to the medical school curriculum

A third quality is the capacity for hard work including physical stamina and especially intellectual labor Dr Harvey divided this into two components a faculty for sustained work and, of no less importance a faculty for initiating work These might also be referred to as endurance and work initiative The lack of these in a physician results in professional stasis a chronically static attitude a rut Only the acute pressure of circumstances will occasionally force such an individual out of a routine approach, learned in the past as a finished thing Lack of initiative and the absence of sufficiently demanding intellectual curiosity are probably responsible for more poor medical practice than any other factors

Now in relation to this quality medical education can probably contribute a great deal It is at this point that the theory of discipline in education enters in As you know it is customary in university circles to refer to fields of study as disciplines Underlying this is the concept that a timed enforced performance will instill in students habits of scholarly behavior that will persist for a lifetime From this arose the educational method of enforced attendance at lectures and other exercises the controlled systematic coverage of the material of the discipline frequent check points in the form of oral quizzes and written examinations and the expression of the instructor s evaluation of the student s performance in exact mathematical terms so as to allow for academic competition and rank ordering.

As Dr Harvey epitomized this approach The student puts his tuition in the slot jumps in the hopper and comes out of the spout of the machine a link of sausage even down to the cellophane wrapping of an appropriate degree "

That this "disciplinary" method is effective cannot be seriously questioned but whether the effect is beneficial insofar as the continuing quality of work which the physician will do in the future is quite another matter Work carried out by command and by rote checked rigidly and regularly tends to destroy the work initiative and by association makes intellectual endeavor disagreeable A student s *performance* becomes dependent upon a continuing obligatory supervision which will be conspicuously absent in his future professional career This form of disciplinary instruction of course reaches its extreme in the military where a primary objective is the achievement of unquestioning obedience to an always present command For the purposes of the armed forces this method may be highly desirable but in the absence of authoritative leadership disciplined troops are often bewildered and ineffective The method is so undesirable in other respects however that the English language has been enriched by the word soldiering a type of behavior that is relatively common in disciplinary education

A fourth quality that is highly desirable in the physician is that of common sense horse sense or gumption " When this is based upon superficial empiricism or is obtained *ex cathedra* from the professor this is often so shallow as to be misleading and dangerous When the student derives it from a properly proportioned integration of knowledge and experience it is of great importance. I might give an old example of this quality that may be familiar to some of you

There is a story from the ancient book of Sanskrit tales *The Panchatantra* entitled, ' The Lion Makers " It is the tale of four Brahmin youths, lifelong companions. Three of them studied very hard and, as the story goes reached the farthest shore of the ocean of science The fourth it was said, had no head for science but he had much common sense or gumption The three young scientists decided to set out to make their fortunes at the court of a great king. After some discussion, they decided to allow Gumption the fourth youth to accompany them

In the course of their journey they came across some bones in the forest What have we here? asked the first young scientist as he added flesh to the bones Quickly the second young scientist added blood and hide As the third bent over to give the creature the breath of life Gumption pulled him back and cried Hold on That is a lion you are about to bring to life' Stop'

The other three thrust him back shouting, How dare you stand in the way of science, ignorant one?'

Wait then please said Gumption, "while I climb this tree

The lion brought to life killed the three young scientists and after staring at the frightened young man in the tree turned away and entered the forest

After waiting for several hours, Gumption the young man who had only common sense climbed down and went home alone

And the tale ends with the Goldspinner, teller of the story giving the moral

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> Book learning many rightly cherish
> But gumption s best of all to me
> For without gumption ye shall perish
> Like the lion-makers three.

Common sense is the enzyme that catalyzes the synthesis of judgment from the substrate of experience, individual and collective To return to medicine I would submit that without surgical judgment " a surgeon is likely to be a dangerous man I would further submit that the greater his facility in surgical technique the more dangerous he is likely to be While it may not be so obvious in other fields of medical endeavor the absence of judgment is just as dangerous as it is in surgery Judgment is closely related to integrity, the first quality we desire in the physician and the one with respect to which the student may have been almost irretrievably conditioned by *family* and scholastic environment before reaching the medical school Probably the best that the school can do is to have a faculty that will set an example in its own behavior while having a curriculum that will give the student ample opportunity to exercise his own judgments in situations involving responsibility so that he can learn by his own experience Without real responsibility and without an intrinsic system of reward or penalty for good or bad judgment, such exercises are largely meaningless and ineffective

The last quality which Dr Harvey cited as basic in the properly educated physician is that of a faculty for ascertaining the truth or as close an approximation to it as possible Knowledge which does not correspond with reality is dangerous under any circumstances and peculiarly so in medicine By experience also we know that at its very best, knowledge is of a changing quality The ideal physician is not the one with the greatest content of vintage facts but the one who has the knowledge of the present moment critically evaluated Moreover, his professional life consists of constantly facing problems in the

laboratory or the clinic that are soluble only by application of the scientific method This method is constant, although that with which it deals is changing It makes no difference whether the problem is confronted in basic science or in clinical medicine in the laboratory or in the clinic, in an experimental animal or in a patient, the methodical approach although the nomenclature may vary is the same

This scientific method for solving problems is *actually* the basic motif underlying all learning in medical school and thereafter and about this, the methodology of teaching, the means," "the trends " should be oriented The method simply cannot be taught from books, although books help by lecture although lectures help or even by example although example helps To achieve this end the student needs ample opportunity to solve problems himself for only with repeated use of the method comes the skill that is the objective of our educational effort.

Up until this point, I have assiduously avoided mention of the content of the knowledge necessary for the medical student and the future physician Knowledge is obviously an objective but I feel strongly that present day discussions of curriculum tend to place too much emphasis upon the specifics of the knowledge that a faculty should somehow transmit to its students With the proper educational approach knowledge will be obtained not only during the school and postgraduate experience but also as a continuing process thereafter This is why the objective of medical education is sometimes stated as simply to assure that the graduate will continue to learn as a "perpetual student" throughout his professional life

As I have emphasized, knowledge gained perforce from the teacher under what I have called the disciplinary system has a fixed and dated content tends to be of an authoritative or dogmatic nature which actually inhibits its further development by the student and is likely to result in an acquired chronic revulsion for the continuing acquisition of knowledge

It would be absurd to interpret this as meaning that the content of the medical student s or the physician s knowledge is unimportant I am only saying that an *effective content* of knowledge can better be assured by flank rather than frontal attack I will not labor this knowledge content, but the fact that we must face squarely is that four years or three years in medical school and three years or six years in postgraduate work are not sufficient for acquiring a comprehensive and detailed knowledge of basic science or of clinical medicine This means that emphasis must be placed upon the acquiring of habits of work and skill in the common method for solving problems—the development of a scientific attitude rather than a scholastic one

Clearly, also the student and future physician must be aware of knowledge outside of his own direct experience Means should be employed to see that he undertakes in his own time and on his own initiative surveys of what is known in various fields sufficient to give him a keen awareness of the problems with which he may be faced Were there no medical literature, this would have to be done by lecture, but we tend to forget that the invention of moveable type has made lectures largely superfluous.

It may be asked if the student actually is to be left to his own initiative for the acquisition of an adequate content of

knowledge can one be certain that he will do this?

On this point Dr Harvey was very definite in his treatise It should be clearly understood he said ' by faculty and student alike that this is the student's responsibility The faculty should provide adequate opportunity advise sympathetically and outline the paths along which the student must go but he does the walking It is no function of the *faculty* to provide transportation Tuition is not carfare but an entrance fee which covers only a fraction of the cost of the caravan

It is in the student s interest rather than that of the faculty that he obtain an adequate medical education, and he should be disillusioned immediately if he supposes that by the deposit of a fee he can transfer the weight of the burden to the faculty

These six broad objectives—integrity intellectual ability capacity for work, common sense and judgment, a faculty for ascertaining the truth and the acquisition of knowledge—in my opinion represent most of what medical education should be about

To list them is only a first cut of course in defining or modifying a curriculum to achieve or to nurture them There are many other subobjective and narrower specific goals that should be encompassed in planning the education of physicians. I have labored these major objectives at some length only because I have the inescapable feeling that many current trends in medical education externally and internally generated have come into being in virtual disregard of a set of overall objectives. If we continue to approach the future only in terms of present trends rather than in terms of objectives, the consequence will be a future that is, indeed a mere extension of the present rather than a solution for the present

The late J Robert Oppenheimer once wrote concerning actions today which may influence the future (The means) *of doing* justice to the implicit the imponderable and the unknown is sometimes called *style* It is *style* which makes it possible to act effectively but not absolutely it is *style* which enables us to find harmony between the pursuit of ends essential to us and the regard for the views the sensibilities, the aspirations of those to whom the problem may appear in another light, it is *style* which is the deference that action pays to uncertainty "

What we are seeking, I believe is a style for the education of the physician, a style that will relink humanistic studies, the basic sciences, and the clinical specialities and subspecialities of our profession and others and that will meld premedical, undergraduate and postgraduate experience into a continuum of learning so that medical education is not just an aggregation of puddles dotting the academic landscape but a system in which currents flow merge and again diverge replenishing and enriching one another and the social soil with which they come in contact.

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Toward a Continuum in Medical Education

Thomas C Meyer, M D

Medical education is a continuum beginning with premedical training and ending with retirement or death One portion of this continuum that of continuing medical education is critical, for there lie the problems of ensuring the continuity of flow of scientific information while assisting change in the attitudes of overburdened individuals toward their roles, their responsibilities, and their traditional functions in a demanding and critical society

During the second and third decades of this century, medical schools made a well circumscribed well accepted body of knowledge available to their students, taught them a limited number of skills, and then evaluated their competence The schools could, with pride award them the M D degree and allow them to *practice with fair confidence that these* graduates were scholars enough to keep abreast of the small volume of literature reporting the comparatively slow advances in knowledge The skills changed but little and the hazard of a physician's or surgeon's not acquiring these skills was comparatively unimportant to the patient Continuing education had therefore, the comfortable role of reinforcing, updating, and expanding the scientific base upon which practitioners delivered care to the sick Continuing education programs were based on the intuitive assessment of need by teacher programmer, or student.

Dr Meyer is associate dean, Department of Postgraduate Medical Education, University of Wisconsin

The discoveries of Einthoven, Erhlich, Landsteiner, Banting, Best, Sherrington, Adrian, and Domagk made profound changes in medical school curricula but had little impact on continuing education Changes in clinical practice were relatively uncomplicated even though the results were frequently dramatic The infrequency of their introduction permitted the changes in performance to be gradual

Continuing medical education, therefore was comparatively simple, not because it was effectively planned and implemented but because the task was so limited

Since World War II

There have been profound changes in medical science since World War II Every physician is aware of the exponential increases in scientific papers and numbers of journals of original publications, review journals, and thematic monographs. He also knows that the rate of discovery of significant remedies that should be immediately implemented has not increased so rapidly but the impact on medical education is substantial

The formal years of this continuum have made adjustments for the burgeoning of scientific knowledge The student physician is kept informed of significant

new developments by his peers, journals, the medical faculty, and the medical library By delineation of specialties and subspecialties the structure of medicine has changed so that each physician need not absorb all scientific knowledge available The traditional role of reinforcing, updating, and expanding the scientific base upon which practitioners deliver care has become a much more diverse and demanding one, however Accomplishing this traditional role now brings continuing medical education face to face with the same issues challenging every other branch of education today developing methods of identifying needs, establishing objectives, planning educational methodology and evaluating effectiveness in terms of behavior change

A new "nonscientific" role of change-agent is being thrust on continuing education This new role is seen in the areas of changes required within the practice setting and changes required for the physician to function within the social structure The changes in his practice of medicine, for which continuing education must prepare the physician, include the following

Assessment of the quality of care—In the last eight to 10 years a significant attempt has been made by Beverly Payne, Clement Brown and Robert Evans to measure the quality of hospital care and devise instruments by which it can be compared with established standards. There remains the problem of measuring the quality of ambulatory care

Change from crisis intervention to continuous comprehensive care—The data we have been able to gather on clinical practice indicate that this is extremely difficult without conversion to a team approach to health care

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The team approach—Higher levels of competence of allied health personnel, the increased demand for health care, and the shortage of physicians dictate a need to adopt a team approach to delivery of care, with the physician having a supervisory and consultant role There is little opportunity for the physician to develop the necessary management skills for this during his formal training.

These are difficult adjustments for the physician to make. If he is to receive assistance in making these changes, it must come through continuing education.

The second area in which continuing education may play a nonscientific role as change-agent is at the interface between medical practice and society The public has difficulty understanding the health care systems provided by the health professions and the economic system through which they obtain that care The physician, too, has difficulty responding to newly voiced demands by the public and intervention of third parties in his relationships with his patients. A contribution can be made, however, by educating patients in the proper use of the existing health care system and by assisting practitioners in adjusting to changes.

Wisconsin Study

At the University of Wisconsin, we have taken the first step in developing a method by which the physician can identify and fulfill his individual educational needs related to his health care responsibilities We started with the hypothesis that no two practices are alike because every physician differs from his colleagues in background knowledge experience, and interests. Therefore, it is unreasonable to plan continuing education by intuition alone, each practitioner's educational needs vary as his practice varies.

The practices of approximately 75 Wisconsin physicians were studied and data were collected on all of the patients each physician treated during four separate 24-hour periods in a month From

these data we designed a test related to observed practice The test results became one factor in the design of his personalized educational program. The data show that practices do vary significantly, and we concluded that we are doing the practitioner a disservice if we intuitively plan a course, publicize it, take enrollments determine his "happiness index," and send him home with a feeling of accomplishment His time is too valuable and his patient care responsibilities are too great for that approach

We also attempted to determine the learning behaviors of the physicians. They were asked, "Do you know how you learn best?" A small percentage could answer this directly More frequently, we found out by discussing with them their performance in preclinical and clinical years of medical school and their current use of books and journals as opposed to audio-journals and attendance at conferences. Two-thirds of them were audio-visual learners or felt they did not learn unless they were personally "doing" something. The implications for teaching media and methodology in continuing education are evident, attention must be given to providing educational content in the diverse forms by which individual physicians learn best.

Of the 63 family practitioners involved in the study, one-fifth of the patients were in the category of "Special Conditions and Examinations Without Illness." If physicians make their continuing education choices on the basis of what is interesting or challenging to them, rather than on the needs of their patients, it is unlikely that they would show much enthusiasm for this area of medicine Perhaps the real significance of this data lies in another direction What degree of training and education is necessary for the delivery of some health services now being delivered by the physician, and might the high level of patient contacts in this category reflect inappropriate use of physician manpower? In its expanded role of improvement of health care, continuing education must determine whether the educational task lies in the traditional area of scientific medicine or in the non-scientific area of proper utilization of allied health personnel

Some physicians scored higher on test questions in those areas of medicine where they had few patient contacts, and they did less well in areas which constituted major portions of their practice It raises the question of whether continuing education programs or, for that matter, whether medical schools are not producing physicians who are highly trained in areas where they see few patients but are less well trained for the majority of patient needs.

While highly supportive of the training he received, Dr Keith Hodgkin, in his book, *Toward Earlier Diagnosis* (1), demonstrates that the hospital based training of medical students perhaps leaves the graduate poorly prepared to meet his first private patient.

Not every practitioner can be expected to study his own training and practice as Dr Hodgkin did. But continuing education can assist physicians in analyzing their patients' needs in relation to their medical preparation.

The Wisconsin study also demonstrated that there is wide variation in the volumes of patients seen by individual physicians and in the use of office facilities, telephones, or hospitalization in caring for these patients. The average number of patient contacts per day demonstrates that constraints on a physician's time are universal A number of physicians, when presented with data on the volume of telephone calls, revised their office procedures A nurse now screens the calls and in many cases meets the patients' needs.

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There is a detectable and persistent change in many practices which we have observed for a second time

We hope that this rather disjointed presentation of a minor portion of our data and that of Dr Hodgkin illustrates that continuing medical education must be analyzed The problems facing the practitioner and his patients are not always in scientific medicine nor do they always lend themselves to "educational" solutions in the traditional sense of the word Nor can these solutions always be found in continuing education. Perhaps they relate to earlier stages of the continuum

Medical School Role

What, then, is the role of the medical school in continuing education?

First, it must produce graduates who have the skills and concepts to minister logically to the needs of the unhealthy and promote the health of the population before they become ill This base is essential for an effective program in continuing education

Second, the medical school must prepare its graduates for the learning that must continue for the remaining 30 or 40 years they are in practice

Third the medical school must make its educational resources constantly available to the physicians by whatever means those individuals select.

Fourth, it must assist the physician in constantly redefining his role and in adjusting to changes which he initiates or which are thrust upon him by his patients or the society in which he practices.

Finally, the medical school has a responsibility for the continuing education of the public. The public should have at its disposal the skills of medical faculties in teaching them how to use the health care system logically and systematically In so doing, the practicing physician can be simultaneously protected and motivated to spend his educational time in a way which is appropriate to the population he serves

Continuing education is increasingly necessary where the consumer provider, and educator in the health care system meet To be effective it must influence and be influenced by each segment it serves. Each must be given due service, each must be given due respect, and each must be made to understand the role and function of the other two

Reference

1 Hodgkin, K *Toward Earlier Diagnosis*. Edinburgh and London E. and S. Livingstone, Ltd., 1966.

Continuing Medical Education at Stanford
The Back-to-Medical-School Program

Edward Rubenstein, M D

Abstract—The Stanford University School of Medicine has established an extramural program of continuing education based on a federation of community hospitals in northern California. In one of these hospitals an experiment is being conducted in which a core curriculum is being offered to the community physicians. Evaluation indicates that significant changes in medical practice have taken place in the hospital since the program's inception.

Since July 1970 the Stanford University School of Medicine has conducted a regionalized continuing education program for physicians. The undertaking is based on an informal federation of five hospitals located within the various geographic districts of Area III of the California Regional Medical Program.

The goals of this project are the improvement of health care and the incorporation of the intellectual pursuits of practitioners. In addition, the project has been designed to allow the School of Medicine to investigate the process of the continuing education of physicians. Under study is the analysis of the steps involved in the initiation of such extramural programs, the identification of areas of educational need, and the evaluation of effectiveness of various educational methods as judged by their impact on health care. The program is predicated on a long-term relationship with about 1,000 physicians in northern California.

Because of the marked diversity which characterizes hospital staffs throughout this region the activities vary at each institution. With the exception of the Back to Medical School Program described subsequently educational needs are determined by local committees on continuing medical education. Their decisions have been largely based on what their members perceive as self-evident problems in their respective institutions. These choices are communicated by the committee chairmen who work closely with the Office of Postgraduate Medical Education at Stanford in the design of educational programs. In recent months the Office of Postgraduate Medical Education has encouraged the local committees to evaluate systematically the clinical activities of their staffs in order to identify areas that may need educational support (1). Such problem areas exist in all hospitals, including university medical centers but it has been felt that focusing initially on practitioners' performance levels would be a tactical error which might hamper the establishment of a

The work reported here was supported by a grant from the Carnegie Commonwealth Clinical Scholar Training Program.

Dr. Rubenstein is clinical professor of medicine and associate dean for postgraduate medical education, Stanford University School of Medicine.

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cordial relationship between the school and the community hospitals.

Stanford sends faculty members to each of the hospitals on a regular basis. They deliver lectures, attend rounds and conferences, offer consultative advice and assist with other educational and administrative activities at the community hospitals.

To supplement the extramural activities, the program includes important intramural components at the Stanford campus. Each hospital sends 15 staff members to Stanford for two one week courses during the year. One course deals in depth with the latest revisions of medical and surgical management involved in the treatment of critically ill patients. This subject has been chosen because it relates to the rapidly changing principles and techniques involved in the care of persons with life threatening illnesses whose medical management must almost always be rendered within the local community. The program is an attempt to ensure that the latest information and methods available at the University Medical Center are also available in each of the regions served by the federation.

The other intramural course is a comprehensive review of basic medical science organized to meet the needs of seasoned practitioners whose formal education was completed years before the advent of modern biomedical science. This course consisting of lectures and informal office discussions, is given by some of the most distinguished members of the university's faculty.

In addition, each hospital annually selects one staff member who comes to Stanford for two weeks or longer to work as a clinical fellow within a department or division of the school. This physician participates in the daily clinical and scholarly activities of the unit, refreshing his knowledge and acquiring new information and skills which he can take back to his community.

Program Description

An experiment in continuing education is being conducted at the Mills Memorial Hospital in San Mateo. This project, termed the Back to-Medical School Program, is a study of the feasibility of offering to physicians in their own community the core curriculum as currently taught to medical students at Stanford. The program is divided into two parts, one related to courses in basic medical science and the other dealing with applied clinical subjects. Each course meets weekly for one hour. The curriculum has been specially developed for practitioners. Irrelevant material has been deleted and topics pertinent to patient care have been emphasized. By attending the two sessions each week, staff physicians, most of whom have been in practice for 20 or more years, will over a period of four years have "graduated" a second time updating their knowledge of biomedical science and of the newest concepts of clinical medicine.

Basic science courses offered during the first two years have included biochemistry gross anatomy applied physiology and human genetics. Clinical courses have dealt with intensive care, neonatal emergencies, infectious disease, immunology, fluid and electrolyte problems, and disorders of the urinary tract.

The curricula have been focused on the educational needs of general and family practitioners, internists, and pediatricians. Emphasis is placed on the interdisciplinary aspects of clinical problems in an attempt to involve a maximum number of staff physicians. Stanford faculty members alternate with Mills Memorial Hospital staff members as weekly conference chairmen or lecturers. In this way active par-

ticipation by the hospital staff is encouraged, and the latent teaching skills of practitioners nurtured. Recently the Lane Medical Library at Stanford has made available the computerized services of MEDLINE, which greatly simplify time-consuming literature searches needed by busy physicians who are preparing a teaching session.

Evaluation

Inasmuch as two years of the Back-to-Medical-School Program have been completed, initial evaluation of the project is now possible. The success of the undertaking, as indicated by the enthusiasm and steadily increasing participation of the staff has been gratifying. However more meaningful evaluation has been sought by studying the effect of the program on actual physician performance, especially since the effectiveness of continuing education lecture courses has been widely questioned. Because of the many variables which influence patient care in any institution, it is necessary to examine a number of parameters which, taken together, can provide a significant composite of data.

The evaluation process has been based on measuring the effect of lectures and conferences on a variety of those medical activities which can be quantitated. An attempt has been made to assess the effect of educational programs dealing with (a) the advocacy of well established concepts or methods which may have been underutilized, (b) the condemnation of methods and procedures which have been ingrained durably in daily practice but which have been shown to be outmoded, and (c) the exposition of relatively new concepts or methods.

The method employed for the study of those activities related to laboratory procedures was based on the enumeration of procedures done in the laboratory per month. The data on serum creatinine include all serum creatinine determinations done on all hospital patients except those patients in the artificial kidney unit.

The data on subcutaneous and intravenous heparin are based upon the fact that at Mills Memorial Hospital subcutaneous heparin has been administered in the form of a preparation containing 10 000 units per ml, whereas intravenous heparin has been administered in the form of a preparation containing 1,000 units per ml. Estimation of the use of these two preparations in the hospital has been made on the basis of the replenishment of pharmacy-shelf supplies by weekly reorders from the distributor.

Statistical analyses were based on the student's t test.

Results

As part of the course on intensive care, a lecture was given on March 12, 1971 in which the inappropriate use of whole blood transfusions was condemned, and the administration of packed cells was urged for anemic patients who are not actively bleeding. During the 13 months prior to that lecture, the mean number of whole blood transfusions given per month at Mills Memorial Hospital was 142 (S.D $\pm$ 31.5). During the subsequent 13 months, the average number fell to 111 per month (S.D $\pm$ 25.6), $p < .01$ (Figure 1).

At the same time, the use of packed cells for transfusion increased from an average of 34.0 units per month (S.D $\pm$ 9.5) to 53.2 units per month (S.D $\pm$ 15.4) $p < .001$ (Figure 2).

CLOTTING TEST

During lectures given on January 22 and February 5, 1971 the staff was urged to abandon the use (after many decades)

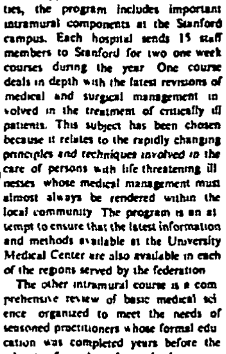

FIGURE 1
Units of whole blood given per month before and after a lecture on the use of blood and its components.

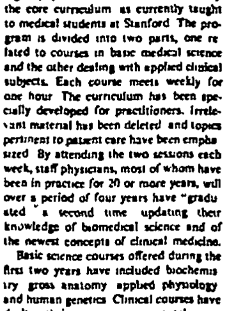

FIGURE 2
Units of packed cells given per month before and after a lecture on the use of blood and its components.

of the outmoded Lee White clotting time and adopt the partial thromboplastin time (available for more than 10 years) as the standard global test of the clotting mechanism. The average number of Lee-White clotting time tests performed in the laboratory during the prior seven months was 143 (S.D $\pm$ 28.4). This number fell to 86 (S.D $\pm$ 20.0) during the subsequent seven months, $p < .001$, after which the laboratory discontinued the test (Figure 3).

The use of the partial thromboplastin time increased from an average number of tests per month of 25.7 (S.D $\pm$ 8.5) for the year prior to the lecture, to 118 (S.D $\pm$ 38.5) during the following 12 months, $p < .001$ (Figure 4).

HEPARIN ADMINISTRATION

During lectures given on September 4 and 11 1970, the administration of heparin by the intravenous route was urged and subcutaneous administration was condemned. Over the 18-month period prior to the lectures, the average number of units of heparin given subcutaneously per three months was 723 $\times 10^4$ units (S.D $\pm$ 148 $\times 10^4$), during the subsequent 18 months, this amount declined to an average of 161 $\times 10^4$ units per three months (S.D $\pm$ 157), $p < .001$ (Figure 5). Simultaneously, there was an increase in the intravenous administration of heparin from 221 $\times 10^4$ units per three months (S.D $\pm$ 117) to 792 $\times 10^4$ units per three months (S.D $\pm$ 334), $p < .001$ (Figure 6).

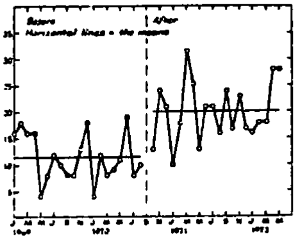

FIGURE 7
umber of lung scans performed per month before and after a lecture which stressed the diagnostic sensitivity of this procedure in the presence of pulmonary emboli

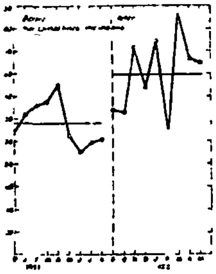

FIGURE 8
umber of serum creatinine determinations ne per month in the hospital laboratory fore and after a lecture which stressed the portance of this measurement as a serial test of renal function.

quent nine months to 159 (S D ± 41.2), $p <$ .01 (Figure 8)

Discussion

These data indicate that a continuing education program based on formalized courses of instruction can influence medical practice Although some of the effects may represent only the accentuation of pre-existing trends taken in the composite the data appear to attest to the fact that well conceived lectures and clinical conferences can be effective learning methods.

The utilization of formalized courses has made it possible to incorporate those educational techniques related to the repetition, correlation, and integration of information The strong motivation of the Mills Memorial Hospital staff and the enthusiasm and the teaching skills of the Stanford faculty undoubtedly have been critical factors in the program's progress.

The Back to Medical School pilot project is nearing completion. During the

coming months, the remaining courses in the core curriculum will be offered, as well as a number of briefer programs concerning newly emerging concepts and techniques. Thereafter, increasing emphasis will be placed on educational needs uncovered by audit procedures.

Continuing evaluation will be made, and eventually the program will be analyzed in order to determine its suitability as a model for use elsewhere in the field of continuing medical education.

References

1 Brown, C. R., Jr., and Uhl, H. S. M., Mandatory Continuing Education Sense or Nonsense J.A.M.A., 213 1660-1668, 1970.
2. Szucs, M. M., Jr. et al. Diagnostic Sensitivity of Laboratory Findings in Acute Pulmonary Embolism. Ann Intern. Med., 74:161-166, 1971

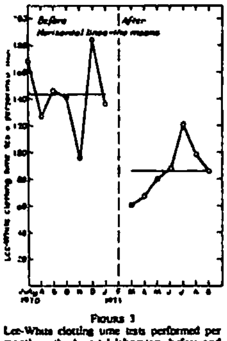

FIGURE 3
Lee-White clotting time tests performed per month in the hospital laboratory before and after a lecture which emphasized the unreliability and insensitivity of this test.

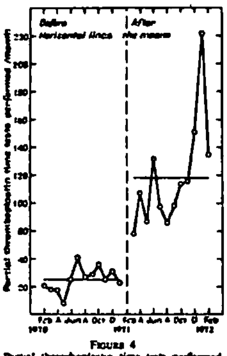

FIGURE 4
Partial thromboplastin time tests performed per month in the hospital laboratory before and after a lecture which stressed the value of this procedure as a screening test for clotting disorders

LUNG SCAN

During lectures given on September 4 and 11 1970, the importance of obtaining a lung scan was emphasized in the diagnostic testing for pulmonary embolism. During the prior 18 months, the average number of lung scans per month was 11 4 (S.D ± 4 52) this number increased during the subsequent 18 months to 20 1 (S.D ± 5 72), $p <$ .001 (Figure 7)

A unique opportunity presented itself in late February 1971 when an article by Szucs and his colleagues (2) appeared in the *Annals of Internal Medicine* pointing out the extreme diagnostic sensitivity of combining the results of lung scan with arterial oxygen tension in excluding the presence of pulmonary embolism. This report made it possible to test the influence of a journal report on clinical practice at Mills Memorial Hospital and also the effect of lectures on the same subject given to a small number of the medical staff From November 1 to 5, 1971, 13 physicians from Mills Memorial Hospital attended a week-long refresher course on the latest modifications of intensive care methodology in which the results of Szuc's paper were emphasized.

During the eight months between the appearance of the article in the literature and the intensive ... refresher course at Stanford, there were only three instances in which patients at Mills Memorial Hospital had a lung scan and arterial oxygen measurement done on the same day

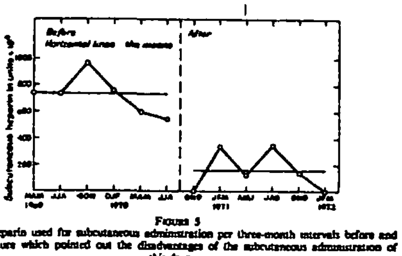

FIGURE 5
Units of heparin used for subcutaneous administration per three-month intervals before and after a lecture which pointed out the disadvantages of the subcutaneous administration of this drug.

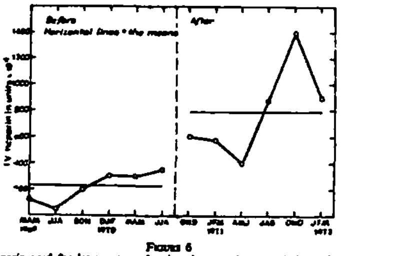

FIGURE 6
Units of heparin used for intravenous administration per three-month intervals before and after a lecture which called attention to the advantages of the intravenous administration of this drug.

During the eight months after the intensive care refresher course, the number of instances rose to 17 ($p <$ .01)

SERUM CREATININE

During the first lecture on disorders of the urinary tract, given on September 15, 1971, the value of serum creatinine determinations as a serial test of renal function was stressed. The average number of serum creatinine determinations done per month, during the nine months prior to this lecture was 116 (S.D ± 19.8). This number increased during the subse-

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A.M.A

Continuing Medical Education

Section IV

Continuing Medical Education

Contributors *Anne E Crowley, PhD, Charlotte Hartman Rutledge W Howard MD, Leo L Leveridge, MD, Clark W Maughan Jr MD*

During the past year, the interest and activities of individual physicians and medical organizations that have been devoted to continuing medical education have continued to increase This has been manifested several ways

1 Increasing numbers of physicians have been applying for the Physician's Recognition Award (PRA)

2 Five additional state associations have passed resolutions that are likely to require physician participation in continuing medical education as a condition for membership

3 Among medical specialty societies, there is a trend to establish committees and provide staff support for planning, administering and evaluating continuing medical education programs

4 Many specialty societies are recognizing the need and desirability of documenting physician participation in continuing medical education programs in their particular specialty

5 Medical specialty societies are continuing to expand the availability and scope of their self assessment programs

6 Medical specialty societies are beginning to comprehend the need for incorporating peer review findings into the process of identifying continuing medical education needs and using these needs as a basis for their continuing medical education programs

7 Medical specialty societies are recognizing also the desirability and the advantages of a centralized system for recording the participation of their members in continuing medical education

Supplementing the 1972 Survey on the Continuing Medical Education Activities of State Medical and Medical Specialty Societies

A summary of the 1972 survey on continuing medical education was reported in last year's EDUCATION NUMBER of *JAMA* Since that report five additional state medical associations have adopted resolutions, the effect of which will be to require evidence of continuing medical education as a condition for membership The state associations that now have adopted these kinds of resolutions are

*Alabama	New Jersey
Arizona	North Carolina
Florida	Oregon
*Kansas	Pennsylvania
*Massachusetts	*Vermont
*Minnesota	

Asterisks indicate state associations that have adopted resolutions since the report of the 1972 survey

Among medical specialty societies, there are now two that have passed resolutions, the anticipated result of which will be to require evidence of participation in continuing medical education as a condition of membership These specialty societies are the American Academy of Family Physicians and American College of Radiology The resolution requiring evidence of continuing medical education for the American College of Radiology was adopted during 1974

During the past year, there has been much discussion among the medical specialty boards as to whether recertification should be required at periodic intervals The American Board of Medical Specialties indicates that all 22 of its organizational members have now accepted the concept of periodic recertification

Four state boards of medical examiners are known to have legislation that authorizes them to require evidence of physician participation in continuing medical education as a requirement for reregistration of the license to practice medicine in their state The four states are Kansas, Kentucky, Maryland, and New Mexico

Progress for the Physician's Recognition Award

The number of physicians applying for the AMA Physician's Recognition Award and the number of physicians qualifying for it have increased The number of physicians qualifying during the last three years for the PRA and the number of physicians holding a valid PRA for each of those years are shown in Table 1

During the year, the criteria for the PRA were modified slightly to give Category 1 credit for the 1974 PRA to medical educators for the time they spend in preparing up-to-date educational material The 1974 PRA booklet also contains an expanded list of organizations accredited for continuing medical education by the Council on Medical Education. The application form has been shortened and simplified.

During the year, an exhibit showing the award and offering assistance to physicians in applying for the PRA was shown at nine medical professional meetings.

An increasing number of physicians and medical educational institutions are requesting information from the AMA about how their continuing medical education programs can be used by physicians to qualify for the PRA. Since physicians applying for the PRA need to have 60 hours of Category 1 credit out of the total of 150 hours of credit required for the PRA, there is particular interest on the part of educational institutions about how their programs can be accepted for credit in Category 1 Category 1 has two general requirements

1 The activity must be a planned program of continuing medical education, which is defined as one that is planned, coordinated, administered, and evaluated in terms of specific educational objectives for a defined group of physicians or an individual physician "

2 The program must be sponsored or co-sponsored by an organization accredited for continuing medical education by the AMA Council on Medical Education

Twenty-eight state medical associations now have programs which have been approved by the AMA Council on Medical Education for the accreditation of institutions sponsoring locally-oriented continuing medical education Institutions accredited for continuing medical education by these state medical associ-

Table 1 — Physicians Qualifying for and Holding PRA

Year	No. Physicians Qualifying for PRA	No. Physicians Holding a Valid PRA During Year
1971	5,450	29 087
1972	11,498	25,770
1973	13,000	29,948

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ations are accepted by the AMA as accredited sponsors of continuing medical education programs. Thus a planned program of continuing medical education that is sponsored by an organization accredited by an approved state association accreditation program is accepted on an hour for hour basis by the AMA-PRA in Category 1

Many fine, planned programs are not sponsored by accredited organizations and, thus, are not accepted in Category 1 If these programs are co-sponsored by an accredited organization acceptance can be arranged Under these circumstances the accredited co-sponsoring organization must be substantially involved in the planning development, administration and evaluation of the program and must accept responsibility for its quality For example many national medical specialty-societies fulfill the obligations of co-sponsors for division or state units of their societies that are conducting planned programs of continuing medical education It is important to recognize that an accredited co-sponsoring organization needs to be involved early in the planning and should not be confronted with a request for rubber stamp co-sponsorship after the program has been developed and commitments made

Because a minimum of 60 credit hours of the 150 that are required for the PRA must be in Category 1, Continuing Education Courses for Physicians" published as a supplement to *JAMA* each August becomes a basic reference for accredited organizations and the planned programs of continuing medical education that they sponsor The criteria for 1974 PRA are given in Table 2

Table 2. — Creditable Continuing Medical Education (CME) Activities July 1 1971 — June 30 1974

	Credit-Hour Limit
Category 1 — CME activities with accredited sponsorship	No limit
Category 2 — CME activities with nonaccredited sponsorship	45 hours
Category 3 — Medical teaching	45 hours
Category 4 — Books, papers publications and exhibits	40 hours
Category 5 — Nonsupervised individual CME activities — subcategories	45 hours
Category 6 — Other meritorious learning	45 hours

A total of 150 credit hours is needed to qualify for the 1974 Award At least 60 credit hours must be in Category 1

A — Self learning B — Consultation C — Patient care review D — Self assessment E — Specialty board preparation	22 credit hour limit for each subcategory not to exceed 45 credit hours total for Category 5

How Programs Are Accepted for Credit Toward the PRA

It is important to recognize that it is institutions that are accredited as sponsors of continuing medical education and not the individual activities of those institutions Educational institutions directors of medical education and individual physicians frequently write to the AMA to ask how a particular program can be used toward qualifying for the AMA-PRA

As described previously, for a program to be accepted in Category 1 it must be a planned program of continuing medical education and have accredited sponsorship or co-sponsorship Activities that do not have accredited sponsorship or co-sponsorship and/or are not a planned program of continuing medical education are accepted on an hour for hour basis in Category 2 (activities with nonaccredited sponsorship)

There are two alternatives available for a nonaccredited institution that is planning activities it would like to have accepted by the AMA in Category 1 for the PRA

1 *Arrange for co-sponsorship by an accredited sponsor* There is a list of accredited sponsors in the information booklet for the 1974 PRA The Physician's Recognition Award– American Medical Association 1974 Since the list is updated three times a year the most recent list of accredited sponsors can be obtained from the AMA Department of Continuing Medical Education If co-sponsorship is sought involvement of the accredited co-sponsoring organization should begin with the planning of the program and follow through with the evaluation of the program

2 *Seek accreditation from the state medical association or the AMA* If the program is locally-oriented and does not regularly attract physicians in substantial numbers from three or more states application should be made to the state medical association If the state association does not have an accreditation program co-sponsorship by an accredited sponsor should be sought as described in item 1 If the program is not locally oriented as described above but does regularly attract physicians from three or more states, application to the AMA for an accreditation survey should be made

Surveys for accreditation are usually planned so that the survey team visits the institution when a continuing medical education activity is in progress. If the institution is accredited as a result of the survey the activity in progress at the time of the survey and all appropriate subsequent activities are accepted in Category 1 for the PRA Programs carried out prior to the survey are accepted in Category 2

How Continuing Medical Education Activities Are Reported

Educational organizations, either accredited or nonaccredited need not report physician participation in their continuing medical education activities to the AMA The statement that the physician signs on his application for the PRA is accepted as certifying the kind and amount of continuing medical education he has completed The only time and place that physicians need to report their continuing medical education activities is on the application for the award when they apply It is neither necessary nor desirable for physicians to report their continuing medical education immediately after they take courses or other programs, nor is it necessary to have any kind of AMA endorsement of the fact that they took the course

How the Use of Audiovisual Materials Can Be Accepted Toward the PRA

Organizations concerned with the production and distribution of audio-visual materials frequently ask how their products can be used by physicians toward qualifying for the PRA If the materials do not constitute a planned program of continuing medical education or are not sponsored or co-sponsored by an accredited organization they would be accepted on an hour for-hour basis in Category 5(A) (non-supervised individual CME activities -self learning) subject to the 22 hour credit limitation in his subcategory Under circumstances where audiovisual materials constitute a planned program of continuing medical education and have accredited sponsorship or co-sponsorship they can be accepted in Category 1 depending upon the circumstances of their use The details are given in the information booklet "The Physician's Recognition Award—American Medical Association—1974"

In announcing programs in which credit toward the PRA is mentioned the following statement is suggested

"This Continuing Medical Education activity is acceptable for ____ credit hours in Category #____ for the Physician's Recognition Award of the American Medical Association" The organization sponsoring the program should fill in the blanks. The category (see Table 2) should be specific, eg 1 2 5(A) or 5(B)

Organizations sponsoring continuing medical education need not report physician participation in their activities to the AMA The signed statement of the physician on his application for the award is accepted concerning the kind and amount of continuing medical education he has completed The information on the application form is audited however against the list of accredited sponsors and occasionally audited for the particular courses, which are listed on the application, to be sure the number of hours, location and dates are correct for the course reported It is important that the physician identify the accredited sponsor or co-sponsor in listing the continuing medical education activity on his application for the PRA.

Physician's Recognition Award Computer Tabulated Information Service (*PRACTIS*)

It is becoming apparent that a nationwide data system to automate the recording and reporting of physician participation in continuing medical education is a needed and useful service to individual physicians and their professional organizations. This is because

1 An increasing number of state medical associations are proposing a continuing medical education requirement for membership.

2 *Added consideration is being given* by medical specialty societies to requiring evidence of continuing medical education for membership

3 The decision has been made by two *state boards of medical examiners to* require evidence of continuing medical education as one of the conditions for reregistration of the license to practice

4 Consideration is being given by *some medical specialty boards to using* evidence of physician participation in continuing medical education as one of the elements of the recertification process.

With this in mind, cooperative programs have been initiated among the AMA, two state medical societies, and two medical specialty societies, whereby the AMA gives consultation and operational support by reviewing the applications for physicians desiring continuing medical education certification by these organizations. For the organizations served *it avoids the expense and administra*tion involved in *the review* of applications and gives their certificates the prestige of having been reviewed by a nationally recognized medical organization For the AMA, this support program increases the number of physicians qualifying for the PRA since each of these programs has requirements that are identical to or exceed the requirements of the PRA Thus, the physician not only receives his state association's or medical specialty society's certificate but also receives the AMA-PRA

Because of the trends mentioned above and the successful operation of the cooperative supportive programs, *experimental programs were* begun to see if information about physician participation in the continuing medical education courses offered at the AMA Annual and Clinical Sessions could be recorded entered into the computer and then reported to the physician This experiment is still in progress, and in its expanded *version it is called* the Physician's Recognition Award Computer Tabulated Information Service, using the acronym PRACTIS

If the experimental and developmental work for PRACTIS is successful, it could be expanded to provide each physician with a plastic imprinted card containing his name *and AMA medical education number* This continuing medical education activity card could then be used by the physician to document his participation in continuing medical education programs offered by organizations accredited for continuing medical education by the AMA Council on Medical Education With such a *system continuing medical education* activities recorded by any accredited sponsor and forwarded to the AMA would be combined and reported directly to the physician The physician might have the following uses for this information

1 Reviewing evaluating and planning his personal continuing medical edu*cation program*

2 Preparing administrative reports, tax records etc

3 Documenting participation in continuing medical education as may be *required of its members by a group prac*tice or partnership practice

4 Maintaining staff privileges at hospitals

5 Maintaining status as a consultant.

6 *Maintaining an academic appoint*ment.

7 Documenting participation in continuing medical education as may be required for recertification

8 Documenting his participation in educational experiences as may be required by a peer review committee or self-assessment program

9 Documenting participation in continuing medical education as may be required for reregistration of the license to practice

10 Documenting participation in continuing medical education as may be recommended or required for membership in local state or medical specialty societies

Confidentiality would be protected by allowing physicians to decide to *whom they might* wish to give detailed information about their continuing medical education accomplishments. Unless permission were refused by the physician, reports would be made to local medical societies, state medical associations, recognized national medical societies, and organizations accredited for continuing *medical education that would* help them plan administer, and evaluate their continuing medical education activities and programs. This information would not be released to government agencies, and the use of the AMA medical education number, instead of the social security number to identify physicians *offers an added protection* against an outside organization obtaining information about the continuing medical education accomplishments of individual physicians.

As peer review activities increase in institutions supplying inpatient medical care, and, for the future, where outpatient and office-based *medical care are subject to peer* review it is important that the profession establish and maintain a system for documenting individual physician needs for continuing medical education This might avoid the possibility of a punitive approach by third party payers.

Combined information about phy*sician participation in continuing* medical education in the United States has an important potential for maintaining and enhancing the leadership for the profession in the field of continuing medical education and for representing the position of the profession before national and state legislative groups in matters that concern *the freedom of the profession*

Growth of Accreditation Program

Voluntary accreditation of continuing medical education programs has shown further growth in the past year The Vollan Report in 1955 reviewed the status of the field of continuing medical education of that period *A Guide Regarding Objectives and Basic Principles of Continuing Medical Education Programs*, developed by an Ad Hoc Committee on Postgraduate Medical Education was approved by the Council on Medical Education in 1957 Revised periodically it offered assistance to planners and producers of programs of continuing medical education In 1970, it provided the framework of the *Essentials of Approved Programs in Continuing Medical Education* approved by the AMA House of Delegates at its annual meeting These *Essentials* are intended to be a guide for institutions seeking accreditation for programs in continuing medical education

The Advisory Committee on Continuing Medical Education, a standing committee of the Council on Medical Education was established in 1961 Under the Committee's direction a pilot study of 20 institutions was carried out to determine the feasibility of an accreditation program and the mechanism for its implementation From that study a formal plan for accreditation proposed by the Committee was approved by the Council and adopted by the AMA House of Delegates in 1964 Under the plan 384 institutions and organizations have been formally accredited by the Council on Medical Education as of June 21, 1974 (See Appendix IV, Table 1)

Although many of these institutions and organizations are medical schools, it should be noted that also included are community hospitals, specialty societies, large private clinics, and federal government facilities.

The fact that these 384 institutions have been formally accredited does not imply that their programs are superior to those of other institutions. It does mean that those that are accredited elected voluntarily to request a survey for accreditation, and that, as a result of the survey, accreditation was granted by the AMA Council on Medical Education The number of accredited institutions can be expected to increase steadily in the future

Current Information

As in past years, analysis of the course listing Continuing Education Courses for Physicians,' provides the principal source of information about the field of continuing medical education The 20th annual listing, for the period Sept 1 1974 through Aug 31 1975 appeared as a supplement to the Aug 12 1974 issue of THE JOURNAL. Individual copies are available from the AMA Department of Continuing Medical Education

The supplement comprised information supplied voluntarily by the interested institutions, on questionnaires provided for this purpose The Council on Medical Education in June 1971 on the recommendation of its Advisory Committee on Continuing Medical Education took action whereby beginning with the 1972 course listing the *only* courses listed are those offered by institutions and organizations that have been surveyed and accredited for their continuing medical education programs. The Council took this action in the belief that all institutions and organizations with national or regional ~~(multistate)~~ interests known to be offering courses in continuing medical education have had an opportunity to seek accreditation

The single annual list has several advantages. It permits the individual physician to plan his personal course of study for an entire year in advance easing his way to plan suitable coverage of his practice It also encourages all institutions that offer continuing education courses to plan ahead and then provide a more comprehensive list for the physician who will use it. There is also the likelihood that the single annual list gives the institutions an overall view of fields that need additional coverage in the year ahead

The analysis of course data presented below is based on courses *scheduled* to be presented not necessarily the courses which are eventually presented

Number and Location of Courses

For the 1974-1975 academic year 3 677 courses were reported to the *Council on Medical Education* and are contained in the annual course listing The 1974-1975 number shows a 50% increase over that of 1973 1974 (Table 3) Course sponsors are listed for 44 states and the District of Columbia The six states for which no course sponsors were reported are Mississippi Montana Nevada, South Dakota, Vermont, and Wyoming

Course Sponsors

The number of courses reported for 1974 1975 increased by 1,236 from that of the previous year and the total number of institutions involved in their presentation increased to 876 Of the total institutions 393 may be classed as "primary sponsors —those institutions assuming major responsibility for the organization and presentation of the programs The remaining institutions serve as co-sponsors or supporting sponsors" of continuing education courses.

For the year 1974-1975 medical schools will continue as sponsors of the greatest number of courses offered The number of medical schools involved is 97 the number of courses offered has increased from 1 061 to 1 516 which is 41% of all courses offered– slightly below the percentage for the previous year (43%)

Other sponsors and co-sponsors are identified in Table 4 Of these the largest group was the nonaffiliated hospitals (including government hospitals) which numbered 389 (compared with 309 in the previous year) and which will offer 652 courses 18% of the total The number has increased from 426 courses, 16% of the

Table 3. — Continuing Medical Education Courses Listed 1961 1962 to 1973-1974

Year	Total Courses Reported	No. of Primary Sponsors	Courses Offered by Medical Schools	Courses Offered by Hospitals
1961 1962	1 105	206		
1962-1963	1 146	208	626—55%	104— 9%
1963 1964	1,246	267	760—60%	163—13%
1964 1965	1 569	251	857—55%	265—16%
1965 1966	1 641	252	863—53%	351—21%
1966-1967	1,608	262	910—57%	338—21%
1967 1968	1,830	263	1,000—54%	224—12%
1968-1969	1,922	300	1,024—53%	370—19%
1969-1970	2 016	323	886—44%	441—22%
1970 1971	2,319	303	813—35%	374—16%
1971 1972	2,354	392	895—38%	601—26%
*1972 1973	2,082	253	957—46%	343—16%
†1973 1974	2 441	287	1,061—43%	426—18%
†1974 1975	3,677	393	1 516—41%	652—18 %

* Includes courses offered by 5 Canadian schools not reported in other years.
† Includes only courses offered by accredited institutions and organizations.

Table 4 — Sponsors Co-Sponsors of Continuing Medical Education Courses 1974 1975

Medical schools	97
Nonschool hospitals	389
City county & state medical societies	31
Specialty medical societies & academies of family physicians (Acad of Gen Prac)	190
Voluntary health agencies	40
Other (schools of public health postgraduate medical schools government agencies, etc)	129
Total	876

total in 1973 1974 Again it should be noted that the programs of medical schools are much more extensive the average number of courses offered by medical schools is 15 whereas that for the community hospitals is less than two per hospital

Course Subjects

Psychiatry showed the largest number of courses offered 718 compared with 213 in the previous year One newly accredited organization alone accounted for more than 300 of the new listings Internal medicine is still the most popular field however, if all of its separate divisions are added together 729 courses are listed under 11 subject headings that might be considered areas of internal medicine General medicine is the next largest category with 437 courses listed

As in past years, the other major fields are surgery, with 165 pediatrics with 160 pathology, with 147 and obstetrics and gynecology with 131 These seven subject headings account for a total of 2 487 courses, or about 68% of the total listing

Types and Duration of Courses

For many years courses have been classified according to their manner of organization and presentation *Continuous* courses are those presented as solid units on consecutive days until they are completed *Intermittent* courses are presented one or two days per week or per month over a period of several weeks or months. *Circuit* courses are those presented at relatively isolated communities by touring faculty groups. *Home study* courses utilize self-instructional techniques, usually via correspondence *Audio or television* courses involve mass communications media and *postgraduate traineeships* are residency-type experiences of varying duration usually arranged on an individual basis Each of these latter groups is classified separately to provide a more accurate picture of the types of educational offerings Postgraduate traineeships are generally considered to be among the most important and valuable experiences in continuing medical education For the current year, 97 postgraduate traineeships are listed It is likely however that many postgraduate traineeships are available which are not indicated in the annual listing Frequently such experiences are arranged on an individual basis at a medical school or hospital without any formal publicity being given in advance The physician who cares to do so can usually work out an individual program of study at almost any medical center if he is willing to adjust his needs and his allocation of time to the regular schedule of the institution

Currently there is widespread discussion and advocacy of plans whereby practicing physicians might return to the medical center to engage in residency type experiences for from one to three months while their practices are carried on by other physicians. Many have advocated the exchange of regular residents with practicing physicians not only to provide the practicing physician with the educational experience in the medical center but also to provide the resident with some experience in the practice of medicine outside the medical center With so many proponents of this philosophy, it seems likely that such arrangements will be worked out in the future

Similarly, it seems likely that self study opportunities and educational programs offered through mass communications media will increase The current listing for television and radio courses is only ten, but that number almost certainly is not really representative of the total activity in this field Interest in the media of two-way radio, radio-television, television-telephone and other similar combinations grows every day Some institutions and individuals have reported discouragement with the high costs and relative inefficiency of television programs but apparently the problem is the result of unsatisfactory planning and technical production.

The use of programmed instruction self teaching devices, and automatic motion picture projectors with single-concept films will likely increase the popularity and effectiveness of home-study courses. For the current year the number of such home-study courses listed is 17 The number offered last year was 21

As in past years, continuous courses are the most common in type and appear to meet most completely the expressed needs of physician-learners. The number of courses offered in this way is 2 121, about 57%. Thirty-four percent of the courses are scheduled intermittently, with the largest number of such courses accounted for by the field of psychiatry Eighty-five percent of the courses offered in psychiatry are given on an intermittent basis, since in that field the necessary development of attitude and concepts is facilitated by presentation of the course intermittently over a long period As noted in last year's listing, this circumstance in part dictates the composition of the student body and determines the nature of the course. It is usually inconvenient for physicians to come from long distances at intermittent intervals over long periods. For a continuous course on the other hand, physicians may travel long distances to spend a concentrated period in formal study Table 5 shows the number and proportion of all continuing education courses by type of course

Nature of Enrollments

Table 6 lists the number and proportion of all courses by type of practice of physicians for whom courses were designed The figures

Table 5 — Number and Proportion of All Continuing Education Courses by Type of Course 1974 1975

Type	Total No	%	General Medicine	%	Psychiatry	%	Total Less General Medicine & Psychiatry	%
Continuous	2 121	57 7	24	51.2	95	11 7	[illegible]	[illegible]
Intermittent	[illegible]	34 8	174	39 8	617	85 9	488	20 5
Postgraduate traineeship	97	2 6	9	2 1	5	.7	83	3.5
Home study	17	.4						–
Circuit course	37	1 0	26	5 9	1	.1	10	.4
TV Radio	7	.3	4	.9				
Not stipulated	119	3.2						
Total	3 677		437		718		[illegible]	

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Table 6 — Number and Proportion of All Courses by Type of Practice of Physicians for Whom Courses Were Designed 1974 1975

Type*	Total No.	Percentage (of 3,372)	Percentage (of 3,677)	Gen Med	Percentage (of 358)	Percentage (of 437)	Psych.	Percentage (of 695)	Percentage (of 718)	Total Less GM & Psych	Percentage (of 2,319)	Percentage (of 2,522)
S	1,204	35 7	32 7	4	1 1	.9	474	68 2	66 0	726	31.3	28.8
G	245	7 3	6 7	64	17 9	14 6	13	1.8	1 8	168	7 2	6 7
B	1,923	57 0	52 3	290	81 0	66.4	208	30 0	29 0	1 425	61 5	56 5
Subtotal	3,372			358			695			2 319		
Not stipulated	305		8.3	79		18 1	23		3.2	203		8.0
Total	3,677			437			718			2 522		

*S Specialists G General practitioners B Both

for 1974 1975 do not show a further trend toward a single class of continuing education courses, at which all physicians, whether specialists or generalists are permitted to attend For 1974 1975, 52% of all courses listed are open to both specialists *and generalists, compared with 64%* in 1973-1974 and the same percent in 1972-1973 63% in 1971-1972 58% in 1970 1971 57% in 1969-1970 59% in 1968 1969 and only 11% in 1956-1957 The percentage is even higher for courses offered by medical schools, with 68% of medical schools' courses designed for both specialists *and physicians in general or part-time specialty practice.*

Exception to this principle must of course be made for the technical courses that require that physician participants already have competence in a specialty to benefit from the course offerings. Only 35% of all courses offered are listed as restricted to specialists and only 20% of courses offered by medical schools are so classified.

The trend noted last year toward smaller class size in continuing education courses is also noted for the courses listed for 1974 1975 Twenty-one percent of the courses offered are listed as having restricted class enrollments of 25 students or less, as compared with 18% in 1973-1974 16% in 1972-1973 18% in 1971 1972 24% in 1970-1971 and 20% in 1969-1970 Enrollment limitation was not stipulated for 45% of the courses, as compared with 41% last year Psychiatry is again the exception *since 52% of the psychiatry* courses are limited in enrollment to 25 students or less whereas 36%, have no enrollment limitation stipulated This is the first year in which more than half of the psychiatry courses were listed as limiting enrollment to 25 students or less (Table 7)

Interestingly courses offered by *medical schools are less likely to have* enrollments limited than are courses of other institutions. Only 4% of medical school courses are restricted to 25 students or less, and 50% have no enrollment limitation stipulated

Review of Continuing Education Activity for 1972-1973

Institutions that provided information for the 1974-1975 course listing were asked at the same time to review their activities for the year 1972 1973 and to provide figures for physician registrations numbers of courses actually presented total hours of instruction offered and number of courses cancelled This information was requested in an attempt to relate the actual performance during the year 1972 1973 to the course offerings that were projected for that year in advance of the annual course listing The results are shown in Table 8 for those institutions that returned the information sheet It will *be noted that medical schools actually* presented 1,787 courses during that academic year although they had actually listed 957 in the annual course listing indicating that this information sheet may not have full validity because of the relatively low number of medical schools reporting (66) Physician registrations for these *courses totaled 116,203*

For the eighth time, some information is available on the relation of registrations in courses to the actual number of physicians who attended Many physicians, of course attend more than one course in a given year, and total registrations consequently are not accurate indicators of the actual *number of physicians* who participated For 1972 1973 the 116 203 registrations were reported as made by 70 432 physicians, for an average of about two registrations per physician When totals for all courses offered by medical schools and other institutions are considered, 301 574 registrations were said to represent 177 600 physicians. It must

Table 7 — Number and Proportion of Courses With Limited Enrollments 1974 1975

Enrollment Limited to	Total No.	Percentage (of 2,001)	Percentage (of 3 677)	Gen Med	Percentage (of 111)	Percentage (of 437)	Psych.	Percentage (of 461)	Percentage (of 718)	Total Less GM & Psych.	Percentage (of 1,419)	Percentage (of 2 002)
1 5	99	5.0	2 7	8	7 2	1.8	16	3 5	2.2	75	5.3	3.8
6-10	149	7 4	4 0	1	1 0	.2	111	24 1	15 4	37	2 6	1 8
11 25	435	21 7	11 8	8	7 2	1.8	265	57 5	37.0	162	11.4	8 1
26-50	254	12 6	7.0	16	14.4	3 6	27	5 8	3 7	211	14 9	10 5
51 100	369	18 4	10.0	35	31 5	8 0	14	3.0	1 9	320	22 5	16.0
100 +	695	34 9	19.0	43	38 7	9 8	28	6 1	3 8	614	43.3	30 7
Subtotal	2,001			111			461			1,419		
Not stipulated	1,676		45.5	326		74 5	257		36.0	583		29 1
Total	3,677			437			718			2,002		

Table 8. — Report of Activity in Continuing Medical Education for the Year 1972 1973

Sponsor	No of Institutions	No. of Courses Actually Presented	No of Courses Reported in 1972-1973 Listing in JAMA	Total Hours of Instruction Offered	No of Physician Registrations for All Courses	No. of Individual Physicians Represented in Total Registration	Courses Cancelled
Medical schools	66	1 787	957	34,888	116,203	70 432	100
Hospitals	105	1 547	343	18,161	59,843	22,830	9
City county & state medical societies	10	183	8	492	11,488	8,029	0
Specialty med societies & academies of general practice	70	1,277	329	9,687	89,663	59,371	40
Voluntary health agencies	14	24	29	209	6 119	4,079	1
Other (schools of public health postgraduate medical schools, government agencies etc.)	34	479	416	50,372	18,298	10,859	14
Total	299	5,247	2,082	113,787	301,374	177,800	164

Table 9 —Registrations for Continuing Education Courses Reported by American Medical Schools 1963 1974

Year	No. Registrations	No. Schools Reporting
1963-64	71 000	43
1964 65	88,845	56
1965-66	118 514	64
1966 67	128 246	65
1967 68	158 017	67
1968-69	152 035	71
1969-70	189 918	69
1970 71	219 660	69
1971 72	205 287	72
1972 73	194 518	66
1973 74	354 569	80

be noted that the accuracy of these figures is open to question, since many institutions do not keep careful records of individual physicians who attend their individual courses.

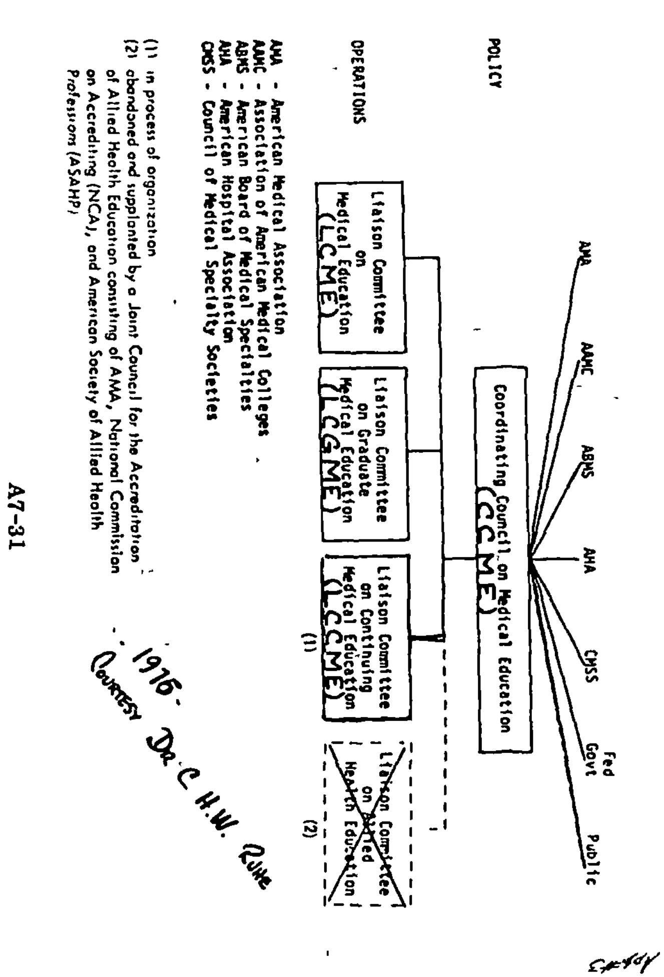
It is rather striking that only 164 of a total of 5,247 reported courses were actually cancelled after original scheduling This is about 3% of the total number offered and represents a low figure when one considers the large number of problems which an institution might face in planning a course at least a year in advance Presumably most cancellations were due to insufficient registrations, although it is possible that other administrative or faculty problems contributed to the cancellations.

There is an increase in the number *of voluntary health agencies report*ing and the total number of courses they sponsored is slightly greater The total number of physician registrations is higher than that reported in 1971-1972. Registrations for the category "other" also increased.

Attendance Figures for 1973-1974

Reports from the medical schools in the annual Liaison Committee Questionnaire show an increase in the attendance figures during 1973-1974 Eighty medical schools reported a total of 354,569 registrations in all continuing education courses for physicians.

It should be noted that the completeness and accuracy of reporting on registrations for continuing education courses has been very uneven through the years. Registrations for radio and television courses are included by some in the total figure, other schools have separated such registrations. In order to present relatively comparable figures the registration for radio and television courses are included in the totals listed for each year as seen in Table 9



ADDENDUM

CCME.

AMA (3) AAMC (3) ABMS (3) AHA (3) CMSS (3) FED GOVT (1) PUBLIC (1)

COORDINATING COUNCIL ON MEDICAL EDUCATION (CCME)

FUNCTIONS

- Develop and Review Policy
- Implement Policy After Adoption by Parent Organizations
- Review and Coordinate Liaison Committees
- Recommend Studies and Improvements

AMA (4) AAMC (4) ABMS (4) AHA (2) CMSS (2) FED GOVT (1) PUBLIC (1)

LIAISON COMMITTEE ON GRADUATE MEDICAL EDUCATION (LCGME)

64

65

FUNCTIONS

- Accredit Graduate Medical Education Programs on Recommendation of Residency Review Committees
- Coordinate Development and Improvement of Residency Review Process
- Recommend Studies and Improvements
- Recommend Policy to CCME

AMA (6) AAMC (6) PUBLIC (2) FED GOVT (1)

LIAISON COMMITTEE ON MEDICAL EDUCATION (LCME)

FUNCTIONS

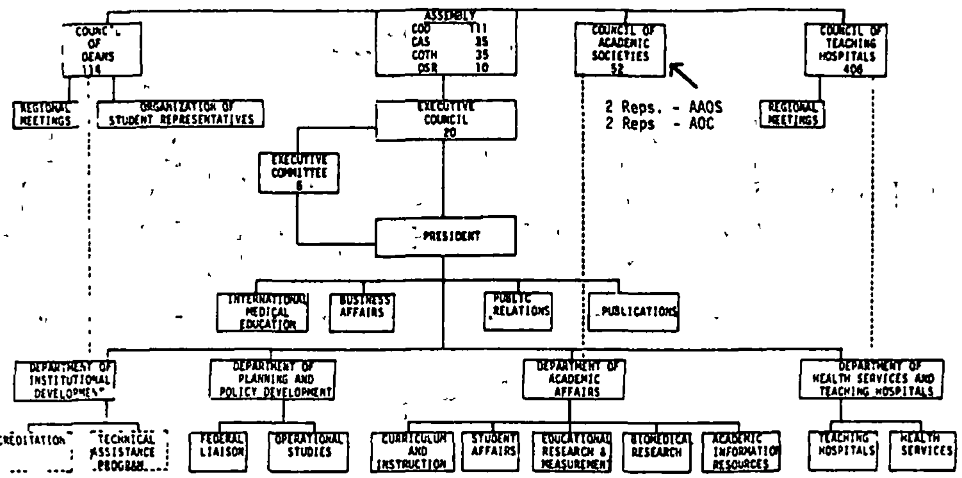
- Accredit Medical Schools
- Assist Development of New Medical Schools
- Recommend Studies and Improvements
- Recommend Policy to CCME

COUNCIL OF MEDICAL SPECIALTY SOCIETIES (CMSS) INTERSPECIALTY COUNCIL - AMA (ISC)

1 - American Academy of Dermatology
2 - American Academy of Family Physicians
3 - American Academy of Neurology
4 - American Academy of Ophthalmology & Otolaryngology
5 - American Academy of Orthopaedic Surgeons
6 - American Academy of Pediatrics
7 - American Academy of Physical Medicine & Rehabilitation
8 - American Association of Neurological Surgeons
9 - American College of Preventive Medicine
10 - American College of Obstetricians & Gynecologists
11 - American College of Physicians
12 - American College of Radiology
13 - American College of Surgeons
14 - American Psychiatric Association
15 - American Society of Anesthesiologists
16 - American Society of Colon & Rectal Surgeons
17 - American Society of Plastic & Reconstructive Surgeons
18 - American Urological Association
19 - College of American Pathologists

CMSS	ISC
20 - Society of Thoracic Surgeons	20 - American Academy of Allergy/American College of Allergists
	21 - American Association of Public Health Physicians
	22 - American Association for Thoracic Surgery
	23 - American College of Cardiology
	24 - American College of Gastroenterology/American Gastroenterological Association
	25 - American Society of Internal Medicine

ASSOCIATION OF AMERICAN MEDICAL COLLEGES



OP
3/8/72

ORGANIZATION OF THE AMERICAN BOARD OF MEDICAL SPECIALITIES

A7-33

EXECUTIVE COMMITTEE
(Elected each year)
President
Vice President
Treasurer
Member-at-Large
Member-at-Large
plus
Immediate Past President

EXECUTIVE DIRECTOR
Full-time staff director
who is appointed by
Executive Committee

AMERICAN BOARD OF MEDICAL SPECIALTIES (ABMS)

MEMBERS (22)
AMERICAN BOARDS OF

- Anesthesiology
- Colon & Rectal Surg
- Dermatology
- Family Practice
- Internal Medicine
- Neurological Surgery
- Obstetrics & Gynecology
- Ophthalmology
- Orthopaedic Surgery
- Otolaryngology
- Pathology
- Pediatrics
- Physical Med. & Rehab
- Plastic Surgery
- Preventive Medicine
- Psychiatry & Neurology
- Radiology
- Surgery
- Thoracic Surgery
- Urology
- Allergy & Immunology
- Nuclear Medicine

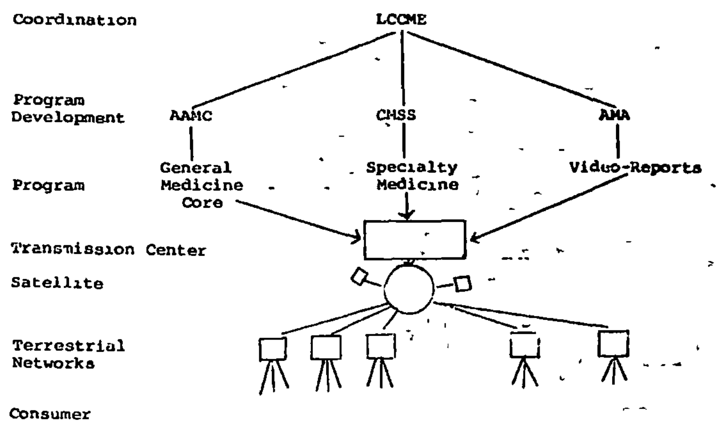
ASSOCIATE MEMBERS (5)

- Association of American Medical Colleges
- American Hospital Assn
- Council of Medical Specialty Societies
- Federation of State Medical Boards
- National Board of Medical Examiners

Appendix 4

A National Continuing Medical Education System

To obtain some estimate of potential need for channel time for one area of medical education, a hypothetical scenario for a continuing medical education system was developed. This scenario assumes that all organizations representing physicians, medical education and hospitals agreed that a unified national system was acceptable and effective The system is described schematically in the following figure and in more detail below No such system is being planned or contemplated in its entirety, while segments are presently in operation.



Objective - To provide continuing medical education to all practicing physicians in the United States.

Requirement - To fulfill requirements for state relicensure and for specialty board recertifications

Target - Approximately 280,000 practicing physicians.

Curriculum - The curricula are offered in three year cycles for all physicians:

1 - General Medicine Core Curriculum
2 - Specialty Medicine Curricula
3 - Multidisciplinary Video-Reports

Curriculum Developers and Program Producers - Three agencies assume responsibilities in the following fashion

1 - GM Core. Assoc of Am. Med Colleges

2 - Specialty M: Council of Medical Specialty Societies

3 - Video Reports: Amer Med. Assoc. and independent producers

Delivery System - National Network interconnect via satellite to existing terrestrial systems, uplink of program material for satellite interconnection to the terrestrial institutional network; downlink located at hospital, medical schools, group or individual practice or physician's home.

Capability - broad band video color
- duplex audio
- data and hard copy service
- teleprocessing
- electronic response

Channel Time - The following estimates are presented:

Program 1 - General Medicine Core: ½ hour broadcast repeated twice each week for 50 weeks. Each program consists of 5 minute pre- and post-tests and 20 minutes instruction

Program 2 - Specialty Medicine For each specialty (22) ½ hour broadcasts repeated twice every week for 50 weeks.

Program 3 - Video Reports 4 hours broadcast every week repeated twice for 50 weeks.

Evaluation and Credit - For performance assessment and for credit registration, data return and land-based computer are required.

Coordination of System - Liaison Committee on Continuing Medical Education.

WAT 21

presents

"GRAND ROUNDS IN SURGERY"

- 12 Noon (Indianapolis time), the first Wednesday of each month
- Live Rounds
- Patient interviews
- Comprehensive discussion of medical indications for surgery
- Color videotape of surgical procedures
- Two-way discussion between presenting physician and viewer-physicians
- Presented by the Medical Television Facility and the Department of Surgery, Indiana University School of Medicine

Thomas V N Ballantine, M D., Assistant Professor of Surgery, is coordinator and program host for "Grand Rounds in Surgery"

May 5, 1976 **CROHN'S DISEASE**
The surgical approach to Crohn's disease will be presented by John E. Jesseph, M D., Professor and Chariman of Surgery

The Indiana University School of Medicine Library will make available to you a packet of articles relevant to the case being presented on Grand Rounds in Surgery Requests for copies should be addressed to Mrs. Gellersen, I U School of Medicine Library, 1100 W Michigan Street, Indianapolis 46202.

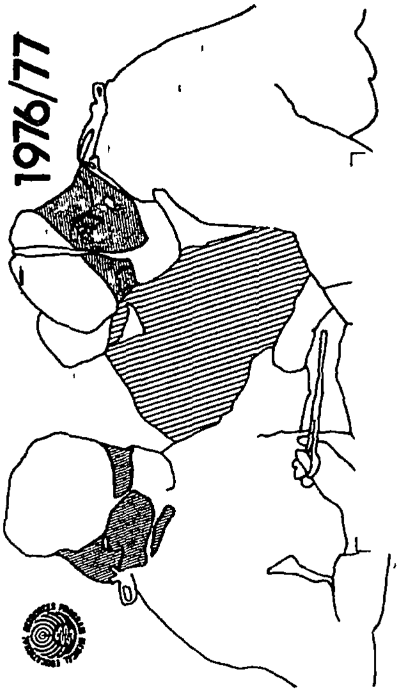
Your comments on Grand Rounds in Surgery are welcomed by Thomas V N Ballantine, M D , Pediatric Surgery Section, Dept. of Surgery, James Whitcomb Riley Hospital for Children, 1100 W Michigan Street, Indianapolis, Indiana 46202

Grand Rounds in Surgery is a television presentation of the Medical Educational Resources Program of the Indiana University School of Medicine.

WAT 21 Medical Television presents

live from I U School of Medicine with telephone talkback/first Wednesday of each month, 12 noon, Indianapolis time

GRAND ROUNDS IN SURGERY 1976/77



PANEL 7 -

WAT 21 MEDICAL TELEVISION
Medical Educational Resources Program
Indiana University School of Medicine
1100 W Michigan St.
Indianapolis, Indiana 46202

WAT 21 MEDICAL TELEVISION
INDIANA UNIVERSITY SCHOOL OF MEDICINE
1100 W. MICHIGAN STREET
INDIANAPOLIS, INDIANA 46202

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PANEL 7 - APPEN. 5

WAT 21 VIEWING AREAS

Arnett Clinic (Lafayette)
Doctors' Lounge

Ball Memorial (Muncie)
Doctors' Dining Room
Bingham Hall – Family Practice Office

Bloomington
1-East Lounge

Community (Indianapolis)
Multi Service 4 (Bldg. 3)
Doctors' Lounge (1st Floor)

Good Samaritan (Vincennes)
Physicians Surgical Lounge
Nurses Surgical Lounge

Home (Lafayette)
Conference Room
Doctors' Lounge
Medical Staff Conf. Room
X-ray Conference Room
Emergency Room Phys.'s Lounge
1PCW & 2 PCW Conf. Rooms

Howard Community (Kokomo)
Staff Library

Indiana U. Student Health Center
Conference Room

Lafayette Center for Medical Education
Purdue Auto-tutorial Lab

Marion County General (Indianapolis)
Myers Bldg. 7th Floor Conference Room

Memorial (South Bend)
Doctors' Dining Room

Methodist (Gary)
Room 230

Methodist (Indianapolis)
Surgeons Lounge
Wile Hall 8-7
Medical Education Conference Room 4A
Media Center
Medical Lecture Room

Northwest Center for Medical Education (Gary)
Medical Education Resources Center
3400 Broadway – Room 13

Osteopathic (South Bend)
Doctors Dining Room

Our Lady of Mercy (Dyer)
Doctors' Lounge

VIEWING AREAS
(Continued)

Porter Memorial (Valparaiso)
Doctors Lounge

Purdue Student Hospital (W. Lafayette)
Medical Library

Riley Hospital for Children (Indianapolis)
Conference Room A204

St. Catherine (East Chicago)
Library
Doctors Lounge
Auditorium
Room 10

St. Elizabeth (Lafayette)
Conference Room
Doctors' Lounge
Emergency Room Phys.'s Lounge

St. Francis (Indianapolis)
Self Study (Medical Education Office)
Conference Room 1
Conference Room 8

St. Joseph (Kokomo)
Doctors' Lounge

St. Joseph (Mishawaka)
Doctors Lounge

St. Joseph (South Bend)
Pauline Room

St. Margaret (Hammond)
Conference Room – Nursing Service Office
Doctors' Lounge (1st Floor)
Doctors' Lounge (4th Floor)

St. Mary Mercy (Gary)
Medical Education Room

St. Vincent (Indianapolis)
Medical Education Conference Room
Surgery Lounge
Doctors Lounge

University (Indianapolis)
Medical Science Bldg. Rm. 119
School of Nursing Bldg. Rm. 114

Veterans Administration (Indianapolis)
Room A237
Room B208

Winona Memorial (Indianapolis)
Conference Room "A"

Wishard Memorial (Indianapolis)
Myers Bldg. 7th Floor Conference Room

1976-1977

12 Noon (Indianapolis time)

In these televised Rounds surgeons take a comprehensive look at the medical indications for surgery — usually with a guest consultant whose specialty is representative of the case under discussion Viewers may assess patients firsthand when Rounds features preoperative history taking/patient examinations on videotape Selected segments of surgical procedures are presented on color videotape and viewers are encouraged to participate in the live discussion periods

• •

September 1, 1976
VOMITING IN INFANCY
Thomas V N Ballantine, M.D
Assistant Professor Pediatric Surgery

October 6, 1976
PANCREATIC SURGERY
Robert Lempke M D
Chief Surgical Service
Veterans Administration Hospital and Professor of Surgery, IU School of Medicine

November 3, 1976
RENAL TRANSPLANT IN INDIANA
Ronald Filo M D
Chief Transplantation Section
Veterans Administration Hospital and Assistant Professor of Surgery, IU School of Medicine

December 1, 1976
THERAPEUTIC APPROACH TO NECK MASS
William Cocke M D
Chief, Plastic Surgery
Wishard Memorial Hospital Indianapolis and Associate Professor Surgery
IU School of Medicine

> *"Our live telecasts follow typical rounds format, but a color television camera in the operating room adds the concept of presenting some aspects of the operative technique."*
> Thomas V. N. Ballantine, M.D.
> Host, Grand Rounds in Surgery
>
> *"We of the School of Medicine have the obligation to serve as a forum for the collection, interpretation and dissemination of new and even controversial scientific information and methods of treatment."*
> John E. Jesseph, M.D.
> Chairman, Department of Surgery
> Indiana University School of Medicine

• •

January 5, 1977
ORTHOPAEDIC PROBLEMS IN CHILDHOOD
Richard Lindseth M D
Head, Pediatric Orthopaedics and Professor of Orthopaedic Surgery
Paul DeRosa M D
Chief Neuromuscular Diseases and Assistant Professor of Orthopaedic Surgery

February 2, 1977
CARCINOMA OF THE BREAST: A COMBINED APPROACH
James A Madura, M D
Associate Professor of Surgery

March 2, 1977
CURRENT STATUS OF CORONARY ARTERY RECONSTRUCTION
Robert King M D
Professor of Surgery

April 6, 1977
ANESTHETIC CONSIDERATIONS OF IMPORTANCE TO THE SURGEON
Robert Stoelting M D
Professor of Pharmacology and Anesthesiology

May 4, 1977
CARCINOMA OF THE COLON
John E Jesseph M D
Professor and Chairman of Surgery

Thomas V N Ballantine, M D, Assistant Professor of Pediatric Surgery Indiana University School of Medicine, is host and coordinator for Grand Rounds in Surgery

Copies of articles relevant to the cases presented on Rounds will be provided at no charge by the Indiana University School of Medicine Library If you are interested in receiving this correlated material indicate which programs you plan to see and send your request to WAT 21 Station Manager, University Hospital A116 IU School of Medicine, 1100 W Michigan St Indianapolis 46202

Grand Rounds in Surgery is a television presentation of the Medical Educational Resources Program of the Indiana University School of Medicine

PANEL 7 – APPENDIX

WAT 21

MEDICAL TELEVISION

PROGRAM SCHEDULE FOR Sept. 13 — Oct. 8 1976

Continuing Medical Education for Indiana's Physicians and Allied Health Professionals

Indiana University School of Medicine

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Postgraduate credit for viewing CME programs	4-5
Program listings	6-13
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Upcoming programs	15
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WAT 21, Indiana University School of Medicine's Instructional Television Fixed Station, is operated by the School's Medical Educational Resources Program.

WAT 21 serves Indiana's physicians and allied health professionals with Continuing Medical Education Programs four hours a day, five days a week.

The daily, four hour schedule is repeated in the evening to all Marion County (Indianapolis) hospitals. Hospitals in other cities receive the evening programming as shown below

Monday	Bloomington from 7-10 p m Vincennes from 8-9 p.m Kokomo Lafayette and Muncie hospitals from 8-10 p m
Tuesday	South Bend Valparaiso and Lake County hospitals complete schedule
Wednesday	Lake County Valparaiso and South Bend hospitals complete schedule Bloomington from 7-10 p m Kokomo Lafayette, Muncie and Vincennes hospitals from 8-10 p m.
Thursday	Lake County Valparaiso South Bend and Kokomo hospitals from 8-10 p m Bloomington Lafayette, Muncie and Vincennes hospitals from 9-10 p m
Friday	All hospitals complete schedule

Programs are subject to change without notice

Direct questions regarding programming to
Sharon C Greene, WAT 21 Station Manager

or

Don Greene, Producer/Director, Television Facility
Medical Educational Resources Program
Indiana University School of Medicine
1100 W Michigan Street

Telephone. (317) 264-4316

Program listings are Indianapolis time

AAFP AND AMA CREDIT FOR CONTINUING MEDICAL EDUCATION OPPORTUNITIES IN VIDEO TAPE REPLAYS AND MEDICAL TELEVISION

The Division of Postgraduate Medical Education of the Indiana University School of Medicine has arranged with the Indiana Academy of Family Physicians to receive elective hours' for all the videotape and television programs of the Statewide Medical Education Network.

1. The participating physician must have the Director of Medical Education or authorized representative of the hospital certify that he did in fact view or participate in the programming.
2. This certification is to be done on the special three-part form distributed to the hospitals in the Network.
3. If more than one program is viewed in a single day they can all be listed on one form
4. The hospital will forward the completed forms to the Division of Postgraduate Medical Education, which will record attendance and forward the information to the Academy
5. Credit will be given for the amount of time viewed, however, viewing hours must be based on complete program.

For further information contact your hospital's Director of Medical Education or the Division of Postgraduate Medical Education, (317) 264-8353.

Programs acceptable for elective hours' credit by the American Academy of Family Physicians on an hour for hour basis.

Programs acceptable for up to 25 hours postgraduate credit per year by the American College of General Practitioners in Osteopathic Medicine and Surgery

Programs acceptable for credit in Category V (a) on an hour for hour basis for the Physician's Recognition Award of the American Medical Association. For circumstances under which programs may be accepted in Category I, please consult the Physician's Recognition Award booklet.

WAT 21

VIEWING AREA

WEEK OF SEPTEMBER 13

MONDAY — WEDNESDAY — FRIDAY

10:00 a.m. 6:00 p.m.	**LEADERS IN AMERICAN MEDICINE. JOSEPH T WEARN M.D (C)**
10:55 a.m. 6:55 p.m.	**BLOOD ADMINISTRATION (C)** This program consists of a review of information about the physiology of human blood followed by a demonstration of the equipment and procedures used in initiating and recording the administration of a unit of blood.
11:38 a.m. 7:38 p.m.	**INTRA-ARTERIAL VASOPRESSIN IN THE TREATMENT OF GASTROINTESTINAL HEMORRHAGE. A CONTROLLED CLINICAL TRIAL (C)** A noted hepatologist presents the final results of the first controlled clinical trial of this new form of therapy for gastrointestinal hemorrhage.
12 Noon 8:00 p.m.	**TOTAL PARENTERAL NUTRITION CURRENT CLINICAL APPLICATIONS (C)** This and the next two programs on total parenteral nutrition were produced under the guidance of Stanley J. Dudrick, M.D. of the University of Texas by the Network for Continuing Medical Education.
12:16 p.m. 8:16 p.m.	**THE DAILY DIET (C)**
12:39 p.m. 8:39 p.m.	**THE INFUSION TECHNIQUE (C)**
12 Noon Wed only	**THE ROLE AND RATIONALE OF A PULMONARY INTENSIVE CARE UNIT (C)** The participants in this program take you to the bedside of patients on the PICU to demonstrate treatment techniques performed on the unit and to illustrate the physical facilities of the unit as contrasted with a regular medical unit. The participation of pulmonary intensive care nurse specialists in this presentation is indicative of the team approach to management employed in the University's comprehensive pulmonary care program on the PICU. Presented by [illegible], M.D., medical director of the PICU; [illegible] R.N. B.S., nursing coordinator of the PICU; and [illegible], R.N. B.S., nursing director of intensive care, University Hospital. (live/talkback)
1:00 p.m. 9:00 p.m.	**NON FUNCTIONAL KNEE. AN ORTHOPAEDIC DECISION (C)**
1:34 p.m. 9:34 p.m.	**DIAGNOSIS IN CHILDREN'S ORTHOPAEDICS THE LEG AND FOOT (C)** The following problems are considered: newborn and congenital, toeing gait, arch problems, toeing in, bowing and knock knees.
1:50 p.m. 9:50 p.m.	**BIRTH CONTROL (ORAL MEDICATION) (Patient Education) (C)**

(C) Color

Continuing Medical Education for Indiana's

MEDICAL TELEVISION

WEEK OF SEPTEMBER 13

TUESDAY — THURSDAY

10:00 a.m. 6:00 p.m.	**LEADERS IN AMERICAN MEDICINE MATTHEW WALKER M D (C)**
10:52 a.m. 6:52 p.m.	**ACUTE EXTREMITY ARTERIAL OCCLUSION WITH DELAYED THROMBOEMBOLECTOMY (C)** A case of successful management after a delay of 72 hours is presented.
11:22 a.m. 7:22 p.m.	**ENIGMA OF PSORIASIS (C)** An estimated 4 million Americans are afflicted with psoriasis. This clinically oriented presentation emphasizes the morphology, natural history, pathobiology and treatment of this physically and emotionally crippling disease. The discussion includes new approaches to therapy which are based on recent advances in our knowledge of the biochemistry of psoriasis. Presented by Warren W. Epinette, M.D., Associate Professor of Dermatology, IU School of Medicine.
12 Noon 8:00 p.m.	**THE RIGHT TO LET DIE (C)** This program was originally broadcast by NBC in cooperation with the Kennedy Institute for the Study of Human Reproduction and Bioethics at Georgetown University. It comes to grips with the ultimate questions of life and death. Can any human agency interfere with the natural process of dying? Does the patient in the agony of dying have the right to ask to be allowed to die? Does a physician have the right to respond to this appeal?
12:30 p.m. 8:30 p.m.	**WHO SHOULD SURVIVE? (C)** The parents of a newborn mongoloid refuse to permit a life saving operation to correct an intestinal block. The surgeon promises the family he will not challenge the decision of the courts. The hospital does not overrule him. The infant cannot be fed, is put aside, and is dead in 15 days. This film recreates this case history with the actual doctors and nurses playing their true life roles. A panel discusses the ethical, legal and scientific issues involved.
1:00 p.m. 9:00 p.m.	**WOMEN WHO HAVE HAD AN ABORTION (C)** This program deals openly and frankly with the subject of abortion with twelve women of all ages and from all walks of life.
1:30 p.m. 9:30 p.m.	**SMALL AIRWAYS DISEASE (C)** Small airways disease presages overt diffuse obstructive pulmonary destruction. Except for maximal expiratory flow rates (FEF) there is no early test for caps. Pulmonary function tests are presented as amplification of these tenets.
1:51 p.m. 9:51 p.m.	**BACKACHE (GENERAL) (Patient Education) (C)**

(C) Color

Physicians and Allied Health Professionals

WAT 21

VIEWING AREA

WEEK OF SEPTEMBER 20

MONDAY — WEDNESDAY — FRIDAY

10:00 a.m. 6:00 p.m.	**LEADERS IN AMERICAN MEDICINE MATTHEW WALKER M D (C)**
10:52 a.m. 6:52 p.m.	**ACUTE EXTREMITY ARTERIAL OCCLUSION WITH DELAYED THROMBOEMBOLECTOMY (C)** A case of successful management after a delay of 72 hours is presented.
11:22 a.m. 7:22 p.m.	**ENIGMA OF PSORIASIS (C)** An estimated 4 million Americans are afflicted with psoriasis. This clinically oriented presentation emphasizes the morphology, natural history, pathobiology and treatment of this physically and emotionally crippling disease. The discussion includes new approaches to therapy which are based on recent advances in our knowledge of the biochemistry of psoriasis. Presented by Warren W. Epinette, M.D., Associate Professor of Dermatology, IU School of Medicine.
12 Noon 8:00 p.m.	**THE RIGHT TO LET DIE (C)** This program was originally broadcast by NBC in cooperation with the Kennedy Institute for the Study of Human Reproduction and Bioethics at Georgetown University. It comes to grips with the ultimate questions of life and death. Can any human agency interfere with the natural process of dying? Does the patient in the agony of dying have the right to ask to be allowed to die? Does a physician have the right to respond to this appeal?
12:30 p.m. 8:30 p.m.	**WHO SHOULD SURVIVE? (C)** The parents of a newborn mongoloid refuse to permit a life saving operation to correct an intestinal block. The surgeon promises the family he will not challenge the decision of the courts. The hospital does not overrule him. The infant cannot be fed, is put aside, and is dead in 15 days. This film recreates this case history with the actual doctors and nurses playing their true life roles. A panel discusses the ethical, legal and scientific issues involved.
1:00 p.m. 9:00 p.m.	**WOMEN WHO HAVE HAD AN ABORTION (C)** This program deals openly and frankly with the subject of abortion with twelve women of all ages and from all walks of life.
1:30 p.m. 9:30 p.m.	**SMALL AIRWAYS DISEASE (C)** Small airways disease presages overt diffuse obstructive pulmonary destruction. Except for maximal expiratory flow rates (FEF) there is no early test for caps. Pulmonary function tests are presented as amplification of these tenets.
1:51 p.m. 9:51 p.m.	**BACKACHE (GENERAL) (Patient Education) (C)**

(C) Color

Continuing Medical Education for Indiana's

MEDICAL TELEVISION

WEEK OF SEPTEMBER 20

TUESDAY — THURSDAY

10:00 a.m. 6:00 p.m.	**LEADERS IN AMERICAN MEDICINE JOSEPH T WEARN M.D (C)**
10:55 a.m. 6:55 p.m.	**BLOOD ADMINISTRATION (C)** This program consists of a review of information about the physiology of human blood followed by a demonstration of the equipment and procedures used in initiating and recording the administration of a unit of blood.
11:38 a.m. 7:38 p.m.	**INTRA-ARTERIAL VASOPRESSIN IN THE TREATMENT OF GASTROINTESTINAL HEMORRHAGE. A CONTROLLED CLINICAL TRIAL (C)** A noted hepatologist presents the final results of the first controlled clinical trial of this new form of therapy for gastrointestinal hemorrhage.
12 Noon 8:00 p.m.	**TOTAL PARENTERAL NUTRITION CURRENT CLINICAL APPLICATIONS (C)** Shows the results of intravenous hyperalimentation in many situations — trauma, gastrointestinal fistula and inflammatory bowel disease, major burns, cancer and infants who fail to thrive or who have congenital GI tract anomalies which interfere with eating.
12:16 p.m. 8:16 p.m.	**THE DAILY DIET (C)** Emphasis is placed on how to avoid metabolic complications during total parenteral feeding.
12:39 p.m. 8:39 p.m.	**THE INFUSION TECHNIQUE (C)** During TPN you must guard against mechanical, septic, and metabolic complications. The guidelines for successful use of this technique — from catheter insertion to solution infusion and maintenance — are demonstrated on this program.
1:00 p.m. 9:00 p.m.	**NONFUNCTIONAL KNEE. AN ORTHOPAEDIC DECISION (C)**
1:34 p.m. 9:34 p.m.	**DIAGNOSIS IN CHILDREN'S ORTHOPAEDICS THE LEG AND FOOT (C)** Minor variations of normal are shown first. Then problems are considered under the following headings: newborn and congenital, toeing gait, arch problems, toeing in, bowing and knock knees.
1:50 p.m. 9:50 p.m.	**BIRTH CONTROL (ORAL MEDICATION) (Patient Education) (C)**

(C) Color

Physicians and Allied Health Professionals

WAT 21

VIEWING AREA.

MEDICAL TELEVISION

WEEK OF SEPTEMBER 27

MONDAY — WEDNESDAY — FRIDAY

10:00 a.m / 6:00 p.m — LEADERS IN AMERICAN MEDICINE. MARTIN M CUMMINGS, M.D

10:48 a.m. / 6 48 p.m — BREAST FEEDING. PRENATAL AND POSTPARTAL PREPARATION (C)
Designed for health professionals who assist expectant and new mothers in learning the preparation and care of their breasts for breast feeding. Coverage includes demonstration of breast support, breast cleansing, nipple conditioning, nipple rolling, breast massage, manual expression.

11 15 a.m. / 7 15 p.m — TECHNIQUES OF ARTERIAL BLOOD SAMPLING IN THE NEWBORN (C)
Richard L. Schreiner M.D., Asst. Professor of Pediatrics and attending neonatologist, Riley Hospital for Children, demonstrates techniques of radial artery blood sampling, capillary (or heel stick) blood sampling, and umbilical artery catheterization in newborn infants. In addition to the demonstrations taped on the newborn unit at Riley Dr. Schreiner discusses the indications, techniques and complications of arterial blood sampling for blood gas analysis.

12 Noon / 8·00 p m — HYPERLIPIDEMIA AND HEART DISEASE. THE DRUG APPROACH (C)

12:25 p.m. / 8.25 p.m. — SCREENING MAMMOGRAPHY A SECOND LOOK (C)

12 36 p.m / 8:36 p m. — MYASTHENIA GRAVIS. NOT A RARE DISEASE (C)
With Joseph E. Tether M.D., private physician and Associate Professor of Neurology Indiana University School of Medicine. This program is a joint production of the Indiana University School of Medicine and The Network for Continuing Medical Education of New York City.

1:00 p m / 9·00 p.m. — FLUID AND ELECTROLYTE BALANCE (C)
This program presents tonicity of prescribed fluids and a knowledgeable assessment of the following: I.V. bottle and chart, patient's respiratory rate and depth, patient's temperature, turgor and moisture of skin and mucous membranes, patient's muscle strength, urinary output and mental status.

1 29 p m / 9·29 p m — HEART (ANGINA) (Patient Education) (C)

1 47 p.m / 9·47 p m — SENILE BRAIN DISEASE (Patient Education) (C)

(C) Color

TUESDAY — THURSDAY

10·00 a.m / 6·00 p.m — *LEADERS IN AMERICAN MEDICINE KARL F MEYER (C)*

10:48 a.m / 6 48 p.m — ACOUSTIC TRAUMA (C)
Both environmental noise-induced hearing loss and unexpected traumatic hearing loss associated with other more obvious injuries are presented.

11·00 a.m / 7·00 p.m — SEROUS OTITIS MEDIA (C)
Presents the subject of serous otitis media in all its major aspects including recognition, cause and treatment.

11 35 a.m / 7 35 p.m. — AUSCULTATION OF THE HEART MITRAL STENOSIS (C)
Employs the heart sound simulator patient demonstrations, and animated illustrations to present the technique of auscultation and its use in the diagnosis of mitral stenosis. With the heart sound simulator oscilloscope, and appropriate animated diagrams, heart sounds are analyzed into their component parts; this permits the viewer both to hear and see the distinguishing features.

12 Noon / 8:00 p.m. — THE ANGINA PATIENT MAINTAINING OPTIMAL FUNCTION (C)
This film is based on the premise that, in a growing number of cases, a carefully monitored medical program may permit exertional activities that previously brought on pain or discomfort.

12 40 p m / 8 40 p m — BERTHA (C)
Bertha is a mentally retarded teenager. Her story deals with two very basic ethical and moral issues involving the individual and society. The first has to do with the way a person like Bertha becomes caught up in a network of social services because of a handicap or disadvantage and the extent to which her essential dignity and freedom as a person are damaged in the very process of helping. The second relates to society's concern with the sexuality and moral standards of teenage boys and girls, especially those who are diagnosed as mentally retarded.

1 20 p.m / 9 20 p.m — DYSPHAGIA (C)
After watching this program the viewer will be able to describe the dysphagia syndrome, identify the abnormal variations in the chew-swallow process of the dysphagic patient, and discuss the rehabilitation techniques used to return function to the dysphagic patient.

1 44 p.m / 9 44 p.m — GALL BLADDER (Patient Education) (C)

1.52 p.m / 9·52 p.m — TOBACCO AND SMOKING (Patient Education) (C)

(C) Color

Continuing Medical Education for Indiana's Physicians and Allied Health Professionals

WAT 21

VIEWING AREA

MEDICAL TELEVISION

WEEK OF OCTOBER 4

MONDAY — WEDNESDAY — FRIDAY

10·00 a.m / 6·00 p m — LEADERS IN AMERICAN MEDICINE KARL F MEYER (C)

10·48 a.m / 6 48 p.m. — ACOUSTIC TRAUMA (C)
Both environmental noise-induced hearing loss and unexpected traumatic hearing loss associated with other more obvious injuries are presented.

11 00 a.m / 7:00 p.m — SEROUS OTITIS MEDIA (C)
Presents the subject of serous otitis media in all its major aspects including recognition, cause and treatment.

11.35 a.m / 7.35 p.m — AUSCULTATION OF THE HEART MITRAL STENOSIS (C)
Employs the heart sound simulator patient demonstrations, and animated illustrations to present the technique of auscultation and its use in the diagnosis of mitral stenosis. With the heart sound simulator oscilloscope, and appropriate animated diagrams, heart sounds are analyzed into their component parts; this permits the viewer both to hear and see the distinguishing features.

12 Noon / 8·00 p.m. / Mon. & Fri. only — THE ANGINA PATIENT MAINTAINING OPTIMAL FUNCTION (C)
This film is based on the premise that, in a growing number of cases, a carefully monitored medical program may permit exertional activities that previously brought on pain or discomfort.

12 Noon / Wed. only — GRAND ROUNDS IN SURGERY PANCREATIC SURGERY (C)
Robert Lumpkin, M.D. Chief, Surgical Service, Veterans Administration Hospital — Indianapolis, and Professor of Surgery, IU School of Medicine, is the surgeon presenting today's program. (Live/talkback)

12.40 p.m. / 8·40 p.m. — BERTHA (C)
Bertha is a mentally retarded teenager. Her story deals with two very basic ethical and moral issues involving the individual and society. The 12:40 p.m. showing will be preempted by Grand Rounds on Wednesday.

1:20 p.m. / 9.20 p.m — DYSPHAGIA (C)
After watching this program, the viewer will be able to describe the dysphagia syndrome, identify the abnormal variations in the chew-swallow process of the dysphagic patient, and discuss the rehabilitation techniques used to return function to the dysphagic patient.

1 44 p m. / 9·44 p.m. — GALL BLADDER (Patient Education) (C)

1.52 p.m / 9:52 p.m. — TOBACCO AND SMOKING (Patient Education) (C)

(C) Color

TUESDAY — THURSDAY

10:00 a.m / 6:00 p.m — LEADERS IN AMERICAN MEDICINE. MARTIN M CUMMINGS, M D

10·48 a.m. / 6.48 p.m. — BREAST FEEDING PRENATAL AND POSTPARTAL PREPARATION (C)
Designed for health professionals who assist expectant and new mothers in learning the preparation and care of their breasts for breast feeding. Coverage includes demonstration of breast support, breast cleansing, nipple conditioning, nipple rolling, breast massage, manual expression.

11 15 a.m. / 7 15 p.m. — TECHNIQUES OF ARTERIAL BLOOD SAMPLING IN THE NEWBORN (C)
Richard L. Schreiner M.D. Asst. Professor of Pediatrics and attending neonatologist, Riley Hospital for Children, demonstrates techniques of radial artery blood sampling, capillary (or heel stick) blood sampling, and umbilical artery catheterization in newborn infants. In addition to the demonstrations taped on the newborn unit at Riley Dr. Schreiner discusses the indications, techniques and complications of arterial blood sampling for blood gas analysis.

12 Noon / 8·00 p.m — HYPERLIPIDEMIA AND HEART DISEASE. THE DRUG APPROACH (C)

12:25 p m. / 8.25 p m — *SCREENING MAMMOGRAPHY A SECOND LOOK (C)*

12:36 p.m. / 8.36 p.m. — MYASTHENIA GRAVIS. NOT A RARE DISEASE (C)
With Joseph E. Tether M.D. private physician and Associate Professor of Neurology Indiana University School of Medicine. This program is a joint production of the Indiana University School of Medicine and The Network for Continuing Medical Education of New York City.

1:00 p.m. / 9:00 p.m. — FLUID AND ELECTROLYTE BALANCE (C)
This program presents tonicity of prescribed fluids and a knowledgeable assessment of the following: I.V. bottle and chart, patient's respiratory rate and depth, patient's temperature, turgor and moisture of skin and mucous membranes, patient's muscle strength, urinary output and mental status.

1.29 p.m. / 9:29 p.m. — HEART (ANGINA) (Patient Education) (C)

1.47 p.m / 9 47 p.m. — SENILE BRAIN DISEASE (Patient Education) (C)

(C) Color

Continuing Medical Education for Indiana's Physicians and Allied Health Professionals

. . . Serving . . .

BEECH GROVE
St Francis

BLOOMINGTON
Bloomington
I U Student Health Center

DYER
Our Lady of Mercy

EAST CHICAGO
St. Catherine

GARY
Methodist
St Mary Medical Center
Northwest Center for Medical Education

HAMMOND
St. Margaret

INDIANAPOLIS
Community
Wishard Memorial
Methodist
Riley
St Vincent's
University
Veterans
Winona

KOKOMO
Howard Community
St Joseph

LAFAYETTE
Home
St Elizabeth
Arnett Clinic

MISHAWAKA
St Joseph

MUNCIE
Ball Memorial

SOUTH BEND
Memorial
Osteopathic
St Joseph

VALPARAISO
Porter Memorial

VINCENNES
Good Samaritan

WEST LAFAYETTE
Purdue Student Hospital
Lafayette Center for Medical Education

UPCOMING PROGRAMS

GRAND ROUNDS IN SURGERY

Grand Rounds, presented by the Department of Surgery I.U School of Medicine, is seen the first Wednesday of each month (Sept.-May) The five programs begin at 12 Noon (Indianapolis time) and feature color videotape of surgical procedures relating to the topic under discussion Host for the monthly series is Thomas V N Ballantine M D., Assistant Professor of Pediatric Surgery Each Rounds offers two-way discussion via the telephone talkback.

November 3 Renal Transplant in Indiana
Ronald Filo M.D., Chief
Transplantation Section
Veterans Administration Hospital
and Assistant Professor of Surgery
Indiana University School of Medicine

TODAY'S MEDICINE

Today's Medicine, a series of special programs by I U School of Medicine physicians, is seen at 12 Noon (Indianapolis time) the second Thursday of each month (Sept May) The programs offer two way discussion via the telephone talkback.

November 11 Retrolental Fibroplasia
Eugene Helveston, M.D
Professor of Ophthalmology
Indiana University School of Medicine

Reprints of articles related to the topics presented on both 'Grand Rounds' and "Today's Medicine' are available, at no cost, as a courtesy of the I U School of Medicine Library Requests for articles and the year's complete schedule of programs should be addressed to the WAT 21 Station Manager

To receive postgraduate credit for programs, obtain registration forms from your Director of Medical Education or the Division of Postgraduate Medical Education, (317) 264-8353 See pages 4 and 5

WAT 21 VIEWING AREAS

Arnett Clinic (Lafayette)
Doctors' Lounge

Ball Memorial (Muncie)
Doctors Dining Room
Bingham Hall — Family Practice Office

Bloomington
1 East Lounge

Community (Indianapolis)
Multi Service 4 (Bldg. 3)
Doctors' Lounge (1st Floor)

Good Samaritan (Vincennes)
Physicians' Surgical Lounge
Nurses Surgical Lounge

Home (Lafayette)
Conference Room
Doctors' Lounge
Medical Staff Conf Room
X-ray Conference Room
Emergency Room Phys.'s Lounge
1PCW & 2PCW Conf Rooms

Howard Community (Kokomo)
Staff Library

I U Student Health Center (Bloomington)
Conference Room

Lafayette Center for Medical Education
Purdue Auto-tutorial Lab

Memorial (South Bend)
Doctors' Dining Room

Methodist (Gary)
Room 220

Methodist (Indianapolis)
Surgeons' Lounge
Wile Hall B-7
Medical Education Conference Room 4A
Media Center
Medical Lecture Room

Northwest Center for Medical Education (Gary)
Medical Education Resource Center
3400 Broadway — Room 13

Osteopathic (South Bend)
Doctors' Dining Room

Our Lady of Mercy (Dyer)
Doctors' Lounge

Porter Memorial (Valparaiso)
Doctors' Lounge

Purdue Student Hospital (W Lafayette)
Medical Library

Riley Hospital for Children (Indianapolis)
Conference Room A204

St. Catherine (East Chicago)
Library
Doctors' Lounge
Auditorium
Room 10

St. Elizabeth (Lafayette)
Conference Room
Doctors Lounge
Emergency Room Phys.'s Lounge

St. Francis (Indianapolis)
Self Study (Medical Education Office)
Conference Room 1
Conference Room 6

St. Joseph (Kokomo)
Doctors Lounge

St. Joseph (Mishawaka)
Doctors Lounge

St. Joseph (South Bend)
Pauline Room

St. Margaret (Hammond)
Conference Room — Nursing Service Office
Doctors' Lounge (1st Floor)
Doctors Lounge (4th Floor)

St. Mary Medical Center (Gary)
Medical Education Room

St. Vincent (Indianapolis)
Medical Education Conference Room
Surgery Lounge
Doctors Lounge

University (Indianapolis)
Medical Science Bldg. Rm. 119
School of Nursing Bldg. Rm. 114

Veterans Administration (Indianapolis)
Room A227
Room B206

Winona Memorial (Indianapolis)
Conference Room A"

Wishard Memorial (Indianapolis)
Myers Bldg. 7th Floor Conference Room

PANEL 7

APPENDIX (6)

TYPES OF COMMUNICATIONS

Voice (telephone)

Record Message (TWX, letter)

One Way TV (educational broadcast), to one or many terminals

Interactive TV eg. teacher to many classrooms with communication from classrooms to teacher
- a) Voice
- b) Voice and video

Facsimile (to one or many terminals)

Teleconferencing (many terminals)
- a) Audio
- b) Audio and video
- c) Audio and facsimile
- d) Audio and facsimile and video

Data transfer
- a) High data rate (Digital) eg. computer to computer
- b) Low data rate (Analog) eg ambulance EKG

NOTE: Consider giving attention to.
1. substituting electronic communications for other forms (eg. personal meetings; mail)
2. augmenting existing communications

Marketing Information

People doing the marketing study are looking for the following information
1. what the user is presently paying for all types of communications (by category/service).
2. estimate of what the user would be willing to pay for new or augmented services.

PANEL I —

APPENDIX (7) BIBLIOGRAPHY

LIST OF REFERENCES

Reference material available in the vestibule. This material can be looked at, but cannot be removed from premises.

1. Satellite Educational System Costs For Three Model Developing Countries. Prepared for the Executive Office of the President, Office of Telecommunications Policy, by Marshall Jamison with Stephen T. Bett.
2. Interim Working Party Plen/2 (Possible Broadcasting Satellite Systems and Their Relative Acceptability) International Radio Consultative Committee (Final Report)
3. Report of Task Force B, Broadcasting Service Group on Satellite Broadcasting (BSG/SAT) "Functional User Requirements." Draft April 23, 1976
4. User Functional Reqruiements For Broadcasting and Fixed-Satellite Services. U.S.A., CCIR Study Groups
5. Uses of Communications. Supporting Paper 2 of Practical Applications of Space Systems. Assembly of Engineering, National Research Council.
6. Tele-Education/Medicine Experiment Plan. Summary. HEW- CPB
7. Communications for Social Needs: Technological Opportunities NASA, Dr. Richard B. Marsten, Study Manager
8. Communications for Social Needs: Educational/Cultural. A Study for The President's Domestic Council, draft, 1971.
9. Report and Order, FCC Docket No. 20468, Preparations for the 1977 World Administrative Radio Conference of the International Telecommunication Union for planning of the Broadcasting-Satellite Service in the 11.7 - 12.2 GHz band. July 15, 1976

APPENDIX 8

APPENDIX TO STATE AND LOCAL GOVERNMENT REPORT

A M-110-1

Administrative Manual POLICY	SECTION	Administration
	SUBJECT	OFFICE OF TELECOMMUNICATIONS

Responsibilities

The Office of Telecommunications is responsible for the general oversight and development of the City's Telecommunications (Radio, Cable TV and Audio-Visual) Program. The Director of the Office of Telecommunications is charged with the establishment of a Telecommunications Program to combine and revise communications programs existing throughout the city and to introduce new communications technology when feasible. The program of the Office of Telecommunications provides for

- Frequency management.
- Communications operator training
- Communications equipment maintenance, inventory and purchasing procedures.
- Communications system design.
- Assessment of agency communications needs
- Other activities as maybe required by federal and state laws.
- Communications committees.

Existing Telecommunications Programs

By Executive Directive, agencies using radio, television or audio-visual equipment are responsible for obtaining prior approval from the Telecommunications Director to

- Purchase or transfer communications equipment
- Conduct City telecommunications business with private industry and with local, state and federal government.
- Alter existing tables of organization of communications personnel

COMMONWEALTH of VIRGINIA

Virginia Public Telecommunications Council
902 Ninth Street Office Building
[illegible]
[illegible]

PRELIMINARY

NEW INTERCONNECTION TELECOMMUNICATIONS NEEDS IN VIRGINIA

After conducting a Needs Assessment of intra state and inter state interconnection telecommunications services which are, or should come to be, required by the numerous State agencies and institutions, the VPTC can summarize its tentative findings* as follows:

*Largely excluded from this summary are conventional voice-grade CCO-supplied services except slow-speed data and facsimile transmission

VPTC
4/12/76

BROADBAND SERVICES (Continued)

Public Television Networking

All ETV Entities (5-6 sites)

Video Site Monitoring (Only where feasibly extendable)

Environmental Agencies (Smoke Abatement, etc)

Highway Department (Traffic Flow)

Forestry (Fire Monitoring)

Engineering and Buildings (Construction status compilations on VTR)

A8-3

NARROWBAND SERVICES (In Priority Order)

Slow Speed Data

Virtually all agencies and institutions having field offices, installations or activities

ADP (Acting for other agencies and institutions)

Alert and Alarm Signaling (Separate from CCO Systems)

State Police

Office of Emergency Services (Civil Defense)

Highway Department (Traffic Interruptions)

Emergency Voice Networking (Separate from CCO Systems)

State Police

Office of Emergency Services (Civil Defense)

Highway Department (Traffic Interruptions)

Telemetry Signaling

Highway (Traffic counting and structural stress monitoring)

Environmental Agencies (Air and Water Monitoring)

Medical Institutions (Diagnostic Examinations)

Servo Control Signaling

Highway Traffic Control (Computerized or manual)

A8-4

Slow-speed Facsimile

Virtually all agencies and institutions having field offices, installations or activities

Public Radio Networking

All Public Radio Stations (10 Sites - Voice grade only)

Instructional Programming (Audio and/or Slow scan Video)

Higher Education (Internal and via radio)

Public Education (Largely via radio)

State Personnel Training (especially through State Personnel System)

Administrative Audio Conferencing

Virtually all agencies and institutions

Aural Monitoring

Environmental Agencies (Noise Control)

Video Site Monitoring (Slow scan)

Environmental Agencies (Smoke abatement, etc)

Highway Department (Traffic Flow)

Forestry (Fire Monitoring)

We envision in Virginia a PUBLIC SERVICE SATELLITE SYSTEM which consists of:

(a) primarily, broadband transceiver capacities in those 31 Virginia "locality clusters" having state-supported institutions of higher education, perhaps with common-carrier-supplied (or radio-spectrum) narrow-band extensions to each nearby School Division Headquarters, DMV local office, Highway Department Depot, State Hospital facility, local hospital, Corrections installation, Health Department Office, Welfare Office, Environmental Monitoring facility, Employment Office, Public Telecommunications Entity*, public radio station**, State Police Headquarters as well as the principal sites of local government and local law enforcement administration. In those 8 localities where there are several institutions of higher education in close vicinity, broadband links can be used to inter-connect them with the nearby transceivers. (There are 16 such installations in all).

(b) perhaps also, narrow-band transceiver capacities in all or certain of those 52 Virginia "locality clusters" lacking an institution of higher education but having a School Division Headquarters with common-carrier-supplied (or radio spectrum) narrow-band extensions to each nearby DMV local office, Highway Department Depot, State Hospital facility, local hospital, Corrections installation, State-owned radio station, Health Department Office, Welfare Office, Environmental Monitoring facility, Employment Office, State Police Headquarters as well as the principal sites of local government and local law enforcement administration.

*The five regional Public Telecommunications Entities would actually provide suitable broadband links from their Master Control Rooms to and from the closest transceiver sites

**Similarly, CPB-qualified public radio stations in Richmond, Norfolk, Roanoke, Harrisonburg and Fairfax would provide high-fidelity, audio-bandwidth links to and from their own Control Rooms

N B Broadband and/or narrowband extensions could also often be accomplished through local CATV systems

The regional multiplexing broadband facilities would be employed to receive, send and relay duplexed video (unencrypted), high fidelity or voice-grade audio (including various slow-scan video formats), high-speed and slow-speed data (including facsimile, telemetry, servo and alarm signals).

The local limited multiplexing narrowband capacities would be employed to receive, send and relay duplexed voice-grade audio (including certain slow-scan video formats) and slow-speed data (including facsimile, telemetry, servo and alarm signals).

MIP terminal systems would include

Video Monitors and/or recorders
High-fidelity Audio Monitors and/or recorders
High-speed Facsimile Print-outs and/or copiers
High-speed Computer Inter-faces
Parallel Telemetry Mechanisms and recorders

NIP terminal systems would include

Slow-scan Video Monitors and/or recorders
Audio Monitors and/or recorders
Slow speed Facsimile Print-outs and/or copiers
Slow-speed Computer Inter-faces (including Teletypewriters)
Alarm Mechanisms
Telemeters and/or signal recorders
Servo Control Mechanisms

Concomitant Origination Systems would include

Video Cameras and Mixers
Audio-video recorders/playback machines
Microphones and Audio Processors/Mixers
Audio recorder/playback machines and Rate Change Devices
Facsimile Encoders (Micro-form and other)
Teletypewriters
Keypunchers and Readers
Cathode-ray writers and similar electro-optical device systems
Data recorder/playback machines
Environmental Sensors and Meters (Heat Light, Chemical, etc)
Stress and pressure sensors and meters
Signal Activators (Manual and programmed)
Computers (Digital or Analog)
Medical Sensor Instruments

A8-5

The envisioned Broadband interconnection system would likely require:

(a) 2 hours of broadband single-channel service between 8 a.m. and 5 p.m. each workday.

(b) 2 hours of broadband single-channel service between 5 p.m. and 11 p.m. each weeknight.

(c) 2 hours of broadband single-channel service between 11 p.m. and 8 a.m. each day.

If double-channel broadband capacities were made available, overall time requirements might be halved.

Narrowband requirements would be

(a) 24 hour instant access to an emergency channel

(b) 10 minutes per hour on a data conditioned channel (to be used largely in a polling, share-time mode for critical update relaying)

(c) 2 continuous hours in the 8 a.m. - 5 p.m., 5 p.m. to 11 p.m. and 11 p.m. to 8 a.m. time periods each day.

(d) 1 minute in every 5 for relay of telemetered data on a conditioned channel (to be used in a polling, share-time mode)

All figures are minimums

NOTE: It is presumed that Narrowband facilities would be devised and used only where, and to the extent that, CCO-supplied circuits or conventional microwave or radio links are unavailable, more expensive, significantly less reliable, or technically inferior.

SYSTEM REACH

The envisioned intra-and-inter-state Interconnection System should be designed to allow any Virginia Transceiver to interconnect directly with any other technically compatible transceiver within satellite range but under strict traffic protocols which are managed from a central organizational point in Richmond and which are in turn fully integrated with overall traffic configurations determined by the national satellite operating authority.

A8-7

STRUCTURAL OUTLOOK

The VPTC believes that there is strong merit in the concept that the five Public Telecommunications Entities in Virginia become jointly the principal intra-state operators of the public service satellite system elements described heretofore, interfacing them where logical with CCO and state-owned radio-spectrum or computer facilities. Such an arrangement might best be effected by having the entities incorporate with the VPTC (acting on behalf of the Commonwealth government) as an ADDED VALUE NETWORK ORGANIZATION (AVNO). In this way, the interconnection system would be "synergized" through the regular accessing of media production, storage, maintenance, design, and management resources.

The AVNO, centered at Richmond, would be responsible for clearing and implementing all intra-state and inter-state switching protocols with the national satellite operating organization.

POSSIBLE BROADBAND TRANSCEIVER POINTS (Locality Clusters Showing Community College, College, University Campuses, and Telecommunications Entities Within)

1 - Richmond U(2) + CC(2) + WCVE/WCVW + FM

2 - Norfolk U + C + CC(3) + WHRO + FM

3 - Wallops Island CC

4 - Newport News* C + CC

5 - Franklin CC

6 - Gloucester County* (Glenns) CC

7 - Williamsburg C

8 - Richmond County (Warsaw) CC

9 - Dinwiddie County (Petersburg) C + C + CC

10 - Alberta CC

11 - Farmville C

12 - Keysville* CC

13 - Fredericksburg C + CC

14 - Fairfax (Annandale) CC(3) + U + WNVT + FM

15 - Loudon County (Leesburg)* CC

16 - Middletown CC

17 - Harrisonburg C + WVPT + FM

18 - Augusta County (Weyers Cave)* CC

19 - Charlottesville U + CC

20 - Lexington C

21 - Clifton Forge CC

22 - Danville CC

23 - Lynchburg CC

24 - Roanoke CC + WBRA/WSVN + FM

25 - Abington CC

26 - Wise C (+ WSVN?)

27 - Richlands CC

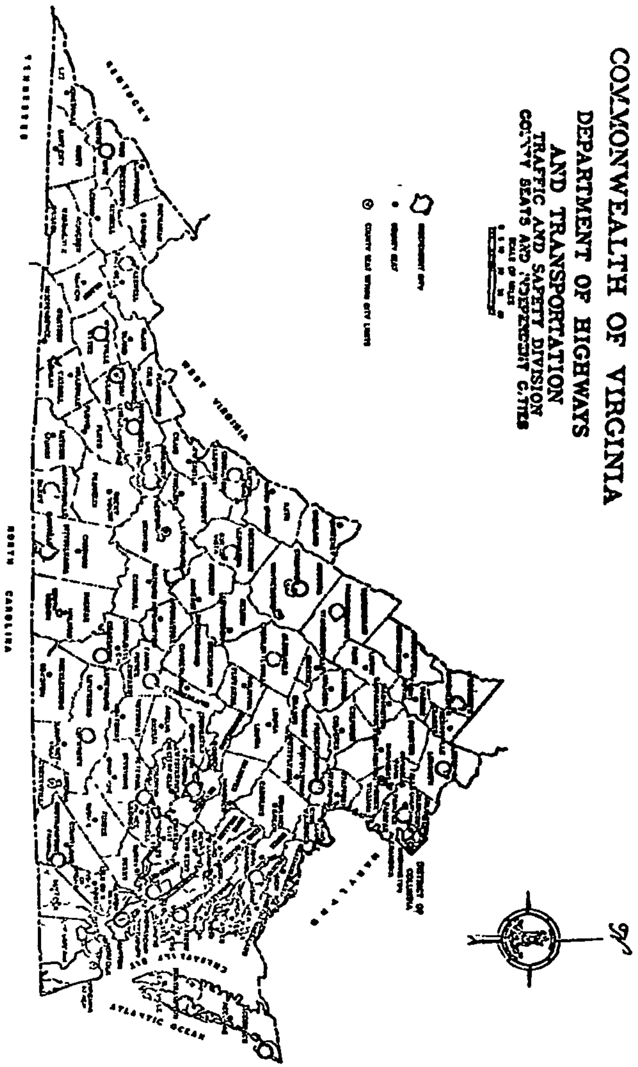
28 - Wytheville CC

29 - Blacksburg* U + C

30 - Dublin* CC

31 - Martinsville CC

*These seven points might be combined with others, reducing the number of BTPs to 24



Possible, additional Narrowband Transceiver Points ("Locality Clusters")
(It is likely that transceivers will not be needed at all points identified below)

1 - Northampton County
2 - Suffolk
3 - Isle of Wight County
4 - Surry County
5 - Lancaster - Northumberland Counties
6 - King and Queen - Middlesex Counties
7 - Sussex County
8 - Essex County
9 - Westmoreland County
10 - King George County
11 - Caroline County
12 - Hanover County
13 - Greensville County
14 - Mecklenburg County
15 - Nottoway County
16 - Amelia County
17 - Powhatan County
18 - Goochland County
19 - Louisa County
20 - Fluvanna County
21 - Buckingham County
22 - Appomattox County
23 - Charlotte County
24 - Halifax County
25 - Franklin County

26 - Patrick County

27 - Floyd County

28 - Carroll County

29 - Grayson County

30 - Smyth County

31 - Scott County

32 - Lee County

33 - Russell County

34 - Dickenson County

35 - Buchannan County

36 - Bland County

37 - Giles County

38 - Craig County

39 - Bedford County

40 - Botetourt County

41 - Amherst County

42 - Nelson County

43 - Cumberland County

44 - Bath County

45 - Highland County

46 - Madison County

47 - Page County

48 - Shenandoah County

49 - Warren-Rappahannock Counties

50 - Culpeper County

51 - Stafford County

52 - Fauquier County

PHASING PRIORITIES

Assuming the demonstrated cost-effectiveness of the capacities and facilities to be involved at each installation phase, the VPTC tentatively anticipates the following priority schedule for the development of the interconnection system envisioned

(a) Main BTP at Richmond interconnected through satellite to comparable State BTPs elsewhere (but especially in the East) and BTPs at Norfolk. Roanoke and Fairfax (4 BTPs)

(b) BTPs at Harrisonburg and Wise (2 BTPs)

(c) BTPs at Danville, Fredericksburg, Wallops Island, Williamsburg, Farmville, Abingdon, and Charlottesville (7 BTPs)

(d) BTPs at Franklin, Warsaw, Petersburg, Alberta, Middletown, Lexington, and Wytheville (7 BTPs)

(e) BTPs at Clifton Forge, Lynchburg, Richlands, Martinsville, Blacksburg*, Newport News*, and Leesburg* (4-7 BTPs)

(f) BTPs at Keysville*, Weyers Cave*, Dublin* and Cleans* (up to 4 BTPs)

(g) NTPs at Greensville County, Halifax County, Lee County, Highland County, Louisa County, Culpeper County, Grayson County, Lancaster-Northumberland Counties (8 NTPs)

(h) Other NTPs as required (up to 44 NTPs)

*Engineering studies might obviate need for these BTPs by extending broadband services from other locality clusters nearby.

AGENCIES DIRECTLY PARTICIPATING IN NEEDS ASSESSMENT SURVEY

OF NEW INTERCONNECTION SERVICES

Division of State Planning & Community Affairs

State Water Control Board

Office of Emergency Services

Council On Higher Education

Department of Highways & Transportation

Division of Automated Data Processing

Air Pollution Control Board

State Library

Department of Health

Department of Purchases & Supply

Department of Community Colleges

Highway Safety Division

State Corporation Commission

Department of Mental Health & Mental Retardation

Department of Corrections

Department of Welfare

Division of Motor Vehicles

Department of Education

Division of Engineering & Buildings

Employment Commission

Virginia Institute of Marine Science

State Police

State Forestry Service

VPI & State University

Medical College of Virginia - Health Science Division

AGENCIES DIRECTLY PARTICIPATING IN NEEDS ASSESSMENT SURVEY

University of Virginia

University of Virginia Hospital

Central Virginia ETV Corporation

Shenandoah Valley ETV Corporation

Blue Ridge ETV Association, Incorporated

Hampton Roads ETV Association, Incorporated

WVWR - FM Radio

WRFK - FM Radio

WMRA - FM Radio

Common Carrier Telephone Companies of Virginia

APPENDIX 9

APPENDIX TO VOLUNTARY AND SOCIAL SERVICES REPORT

A STUDY OF

COMMUNICATIONS NEEDS, USES AND COSTS

OF

NON-PROFIT ORGANIZATIONS

Conducted for

PUBLIC INTEREST SATELLITE ASSOCIATION

55 West 44th Street

New York, New York 10036

(212) 661-2540

Melvin A. Goldberg Inc /Communications
347 Madison Avenue
New York, New York 10017

PUBLIC INTEREST SATELLITE ASSOCIATION
55 West 44th Street
New York, N Y 10036
212-661-2540

1 June 1976

Mr Harry Fine
Chairman, Steering Committee for
Preparations for 1979 WARC
Office of Chief Engineer
Federal Communications Commission
1919 M Street, N W
Washington, D C 20554

Dear Mr Fine:

The attached survey of the communications needs, uses, and costs of a representative sample (207) of non-profit organizations in the United States is hereby transmitted to the Federal Communications Commission as an addendum to the Report of the Broadcasting Service Group on Satellite Broadcasting (Bsg/Sat) It is submitted by the Public Interest Satellite Association (PISA), a non-profit unincorporated association with principal offices at 55 West 44th Street, New York, New York, 10036 PISA has been an active participant on the Task Force designated by Bsg/Sat (Task Force B) to assess the anticipated needs, prospective users, and spectrum requirements for satellite broadcast services over the general time frame 1979-2000

From all available evidence, this survey represents the most comprehensive study ever undertaken to explore the techniques currently being used by organizations in the non-profit sector to meet their telecommunications needs, to determine how extensively various techniques are being used, and to ascertain how much money non-profit groups are spending today to communicate (A copy of the Questionnaire and the cover letter that was sent out is appended to the study)

The study is predicated on the belief that satellite telecommunications services may soon become available to this segment of society at a level of technology it can manage and at costs it can afford Hence, the survey includes an assessment of what the respondents would like to do with a satellite if one were to be put at their disposal The results are surprising Billions of dollars are being spent today by non-profit organizations for communications The predominant use is of narrow-band communications; the predominant preference would be for telephony first, radio second, and television third.

The study further presumes that organizations in the non-profit world are involved in three basic kinds of communications inter-organizational (organizations to their own chapters and members), intra-organizational (organizations to other organizations), and communications to the public-at-large This last form of communication -- organizations reaching members of the general public -- is particularly important so far as the work of Bsg/Sat is concerned <u>The study indicates that hundreds of millions of dollars are being spent by groups to deliver messages to individuals in the home via such conventional means as direct-mail and telephone campaigns and, to a lesser degree (because of the high costs involved), radio and television spots</u> <u>The desirability of devising lower-cost alternatives to serve this significant communications requirement seems great</u> <u>The advent of direct-to-home/office radio and television broadcasting via satellite would constitute a quantum jump in the non-profit sector's ability to communicate</u>

Based upon the findings presented in this report, the Public Interest Satellite Association, which commissioned this survey conducted by an independent communications research company, is convinced that there is a need for low-cost satellite communications for the non-profit sector of society PISA also is convinced that the extent and depth of this need argues strongly that international and domestic policy options be kept open for the development of the kind of satellite technology that can deliver communications signals to small, inexpensive ground terminals for home and office use While the study is by no means all-inclusive (although the section on methodology does show how truly representative it is), it offers considerable evidence supporting the view that it would be a disservice to the public interest to foreclose future satellite possibilities and opportunities in the absence of more extensive study and until much more information about the potential of the technology can be made available to the entire non-profit and social service communities

PISA believes that it must clearly be understood that, with satellites, the world is positioned at another crossroads in the history of telecommunications The most obvious difference between this point and those of the past is that the public is developing a stronger awareness of its needs and of its rights than ever before Yet much more needs to be known, despite the pressures of arriving at a policy prior to both the 1977 and 1979 World Administrative Radio Conferences To create policy in the absence of knowledge that can be obtained represents a violation of the democratic process While telecommunications policy makers have done this before, there seems little excuse now, expecially in light of announced plans for low-cost satellite systems in other countries, to yield to any clamor for haste (Indeed, attached as an appendix to this study are the views of several national non-profit organizations which have already indicated an awareness of the potential They, with PISA, ask that the benefit to the public -- the "public dividend" of its investment in space technology -- be dealt with in the serious and deliberate manner the issue demands and deserves)

PISA's overriding purpose in both commissioning and disseminating the results of this survey, in filing them with the appropriate regulatory bodies, and in placing them before this policy-making forum is to urge upon all concerned that there is a need to respond to the "public interest, convenience and necessity " That phrase has ample precedent in both law and practice Satellites -- and their future development -- represent a totally new opportunity for regulatory agencies to honor their commitment to both

The attached is,

Respectfully submitted,

by

Bert Cowlan

Andrew Horowitz
Co-Directors, The Public Interest
Satellite Association

Christian Service Brigade

BOX 150 • WHEATON ILLINOIS 60187 • 312/665-0630

April 30, 1976

Public Interest Satellite Association
55 West 44th Street
New York, New York 10036

Gentlemen

I trust you will mount the strongest possible effort to petition the Federal Communications Commission to consider the needs and interests of non-commercial, public-interest organizations in the availability of satellite communications technology

As a representative of the non-profit sector I can conceive of numerous applications for satellite communications capability if it could be made available Since most of the technology to date has been developed at public expense, it seems reasonable to expect some public benefits

Sincerely,

C Samuel Gray
Executive Director

CSG/ms

"BUILDING MEN TO SERVE CHRIST"

MGMNYAT HSB
2-001635E135 05/14/76
ICS IPMMNLZ CSP
4156356398 MGM TDRN OAKLAND CA 200 05-14 0155A EST

western union Mailgram

PUBLIC INTEREST SATELLITE ASSOC
55 WEST 44 ST
NEW YORK NY 10036

THE FOLLOWING RESOLUTION WAS ADOPTED BY THE MEMBERSHIP OF THE COMMITTEE TO SAVE KQED MAY 13 1976.

THE COMMITTEE TO SAVE KQED ADOPTS AND ENDORSES THE TEXT OF THE JANUARY 24 1976 RESOLUTION OF CONSUMER FEDERATION OF AMERICA ENCOURAGING ACTION BY THE FEDERAL COMMUNICATIONS COMMISSION DIRECTED TO DEVELOPING APPLICATIONS OF COMMUNICATIONS SATELLITE TECHNOLOGY TO BENEFIT NON COMMERCIAL PUBLIC INTEREST ORGANIZATIONS. WE SUPPORT THE EFFORTS OF THE PUBLIC INTEREST SATELLITE ASSOC TO OPEN CONSIDERATION OF THE FEASIBILITY OF PUBLIC INTEREST COMMUNICATIONS BY SATELLITE AND URGE THE FCC TO MAKE A THOROUGH STUDY OF SUCH OPPORTUNITIES BY WHICH THIS NEW TECHNOLOGY CAN BE UTILIZED FOR THE PUBLIC GOOD.

THE COMMITTEE TO SAVE KQED NOT AFFILIATED WITH KQED INC IS AN ASSOCIATION REPRESENTING APPROXIMATELY 16 THOUSAND SAN FRANCISCO BAY AREA MEMBERS AND VIEWERS OF PUBLIC TELEVISION STATION KQED

LAURENCE S HALL PRESIDENT
7695 CREST AVE
OAKLAND CA 94605

01:55 EST

MGMNYAT HSB

A9-4

community video center

6225 Federal Boulevard
San Diego, California 92114
April 29, 1976

Public Interest Satolite Association
55 West 44th Street
New York City 10036

Federal Communications Commission
Washington, D.C. 20554

The Community Video Center, incorporated under the laws of the State of California, is a non-profit organization chartered to manage public access channels on CATV systems in San Diego, surrounding municipalities, and San Diego County.

Due to our proximity to cable operators, associations with regulatory bodies, attendance at the NCTA convention in Dallas; participation in a California-wide "Citizens for Cable" conference; and general knowledge of communications technology we are acutely aware of the issues surrounding the imminent profligation of satelite technology at the hand of commercial business involved in communication

There is a great danger that the communications industry--in its fervor for advances, through its strong lobby in legislative corridors--will consume all the benefits of the satelite system, present and future, in their excess of demand and leave no part of the system available for those communications entities which act in direct interest of the public but lack funding comparable to that of free-enterprise corporations.

This danger has been extensively discussed in my own committee of the Community Video Center, within a group of public access supporters at the NCTA community video center

convention earlier this month and among the statewide gathering of Citizens for Cable in Santa Barbara this past week As party to all of these discussions, I know that I speak for more than myself in supporting the contentions and position of the Public Interest Satelite Association

Satelites should not become another tool for commercialism without a portion of their capabilities being set aside for the use of non-commercial, public interest organizations The concept of "public access --defined and actualized in the FCC's 1972 Report and Order--should strongly prevail in these vital considerations

The attached resolution will be entered into Committee at our next meeting, May 12, 1976 When accepted, the document will be immediately forwarded to PISA, once again

Paul D. Denn

Paul D. Denn, Administrator
Community Video Center

ON JANUARY 24, 1976, THE FOLLOWING RESOLUTION WAS ADAPTED BY THE MEMBERSHIP OF THE CONSUMER FEDERATION OF AMERICA

Because communications satellite technology was developed at public expense, CFA believes that, as satellite frequencies are allocated, the needs and interests of non-commercial, public-interest organizations, and of those potential users who would most benefit by small and inexpensive technological methods, must be protected through legislation and regulatory policies

CFA urges the FCC to initiate a full-scale study of the use of satellites to transmit programs directly to home television sets Direct satellite-to-home transmission would increase programming diversity by allowing consumers to receive many more channels than the average three or four now being received, and by fostering the development of additional networks Since the technological capability to provide these consumer benefits will exist shortly, the FCC should immediately proceed to encourage realization of such benefits

Delta Chi Fraternity

HEADQUARTERS OFFICE
O. Box 110
IOWA CITY IOWA 52240
Phone 319-337-4811

EXECUTIVE DIRECTOR
Larry Audlehelm

1975-77 OFFICERS
MARCUS GARY MONK "AA"
1480 Waterford Court
Marietta, Georgia 30062
J. NICK GRAY "CC"
320 West Cooper Street
Maryville Missouri 64468
ROBERT P LaBOUY JR. DD
1547 NE 05th
Seattle, Washington 0811[illegible]

April 23, 1976

Messrs Bert Cowlan and
Andy Horowitz
Public Interest Satellite Association
55 West 44th Street
New York, NY 10036

Dear Sirs

Since my job fundamentally is communication, I wish to state my personal/professional support for PISA. While this cannot be taken as an official Delta Chi Fraternity policy (our Board will not meet until August), I feel it is in the Fraternity's best interest for me to offer my own support of your work

I strongly urge the FCC to examine the possibilities and potentialities of satellite communication for organisations such as mine With daily decreasing efficiency in current communications systems costing ever more money, organisations such as Delta Chi will soon be forced to expend as much as 25% of their budget for postage stamps

Sincerely,

Larry Audlehelm

Larry Audlehelm
Executive Director

LA:jb

REGENTS

REGION 1	REGION 2	REGION 3	REGION 4	REGION 5	REGION 6	REGION 7	REGION 8
[illegible]	[illegible]	William [illegible]	Richard [illegible]	Raymond [illegible]	Paul [illegible]	[illegible]	Philip [illegible]
[illegible]	[illegible]	[illegible]	P.O. Box 774	[illegible]	P.O. Box [illegible]	[illegible]	Univ of Tennessee
[illegible], ID [illegible]	Los Angeles, CA [illegible]	Dallas, TX [illegible]	Omaha, NE [illegible]	[illegible], IL [illegible]	Columbus, OH [illegible]	[illegible], MS [illegible]	Student Serv. Bldg. [illegible]
							Knoxville, TN [illegible]

Liberal Religious Youth

Non Credal Youth Organization Affiliated with the Unitarian Universalist Association

Gary Decker
Director of Business Affairs

Jennifer Shaw
Director of Publications

Carlotta Woolcock
Director of Programmatic Development

Dear Friends;

I Have Been Recieving information from PISA in reference to Direct sattalite to home broadcasting for Public use In my official position as Director of Business Affairs for Liberal Religious Youth(a non-profit corporation) ,I feel that the FCC should study PISA's user-needs study with great care A decision made in this area will have far-reaching effects on this and future generations; We must act with all the peoples of the world in mind

Sincerly
Gary Decker
Gary Decker
Director of Business Affairs

25 Beacon Street Boston Massachusetts 02108 617 742 2105 ext 370

NCCB

May 18, 1976

Andy Horowitz
PISA
55 W 44th St
New York, NY 10036

Dear Andy

After due consideration, the National Citizens Committee for Broadcasting has decided to endorse your work to develop a user-needs study to determine the extent to which the public interest community can utilize satellite technology We strongly urge that the FCC consider the study that you are conducting with great care and that the results of the study deserve serious consideration in the process of allocating satellite frequencies

Sincerely,

Ted Carpenter
Executive Director

TC RA

cc Nick Johnson

National Citizens Committee for Broadcasting
1346 CONNECTICUT AVENUE, WASHINGTON DC 20036 202-466-8407

NATIONAL POLICE OFFICERS ASSOCIATION
OF AMERICA

22 April 1976

Mr Bert Cowlan
Public Interest Satellite Association
55 West 44th Street
New York, New York 10036

Dear Mr Cowlan

Due to the fact no Board of Directors meeting was scheduled prior to 15 May 1976, a telephone conference was handled with each Board Member

The Consumer Federation of America Resolution was read to each Board Member with the unanimous vote to adopt this Resolution and to urge the Federal Communications Commission to study with great care the Public Interest Satellite Association's user-needs report and to urge more time for study of the issues

Sincerely,

Frank J Schira
Chairman, Board of Directors

FJS/amk

NATIONAL HEADQUARTERS [illegible] SOUTH TAMIAMI TRAIL [illegible] VENICE FLORIDA 335[illegible] Telephone Area Code 813 [illegible]

A9-8

INTERNATIONAL

Rho Pi Phi Fraternity

FOUNDED 1919

UNITED STATES **Pharmaceutical** CANADA

PUERTO RICO

RESOLUTION

BE IT RESOLVED THAT

Whereas at least fourteen states now mandate continuing education for renewal of pharmaceutical licenses and

Whereas Rho Pi Phi International Pharmaceutical Fraternity was one of the original non-profit purveyors and providers of such Continuing Education and

Whereas it is of the utmost import that low priced, expeditious and far-reaching communications be made available to our fraternity and to all other organizations seeking to provide Continuing Professional Education in many fields

Rho Pi Phi International Pharmaceutical Fraternity does hereby request that the Federal Communications Commission ensure that low-cost satellite technology remain open as an option to the non-profit sector

Under mandate of the Supreme Council of Rho Pi Phi International Pharmaceutical Fraternity, and given under my hand this sixth day of May, 1976 at Ft Lauderdale, Florida, County of Broward

/signature

Murray M Wolfe, Ph D , F R S H

Director of Continuing Education

THE SEEING EYE, INC MORRISTOWN NEW JERSEY

Telephone 539-4425
Area Code 201

Zip Code 07960

Seeing Eye is registered in the patent offices of the United States and Canada as a trademark for dog guides originating at The Seeing Eye Inc

Founded 1929

April 19, 1976

Mr Bert Cowlan
Mr Andy Horowitz
Public Interest Satellite
Association
55 West 44th Street
New York, NY 10036

Dear Messrs Cowlan & Horowitz

While we would like to be in a position to support your request that we contact the Federal Communications Commission relative to the allocation of satellite frequencies for use by the non-profit sector, our Charter specifically precludes us from contacting any government agency or legislator to endorse a specific piece of legislation or otherwise influence decisions by an agency at any governmental level, local, state or national

We do, however, wish you success in your efforts to insure that the non-profit sector's interest in gaining access to low cost satellite technology are not foreclosed

Sincerely yours,

Stuart Grout

Stuart Grout

SG sa

UNITED CALVINIST YOUTH *BOX 7244 GRAND RAPIDS MICHIGAN 49510 • PHONE 616 241 5616*

April 26, 1976

Public Interest Satellite Association
55 West 44th Street
New York, NY 10036

Gentlemen

United Calvinist Youth will not have an organizational meeting which could pass a resolution such as that passed by the Consumer Federation of America, before May 15

I, on behalf of U C Y , however, urge the Federal Communication Commission to consider the needs of the non-profit community in the design of satellite policy The benefits which accrue to the general public through the activities of non-profit organizations should be protected in the area of satellite utilization also

Yours very truly,

A W Ganzevoort
Administrator

AWG/rtc

DIVISIONS CALVINETTES — CALVINIST CADET CORPS — YOUNG CALVINIST FEDERATION

A STUDY OF

COMMUNICATIONS NEEDS, USES AND COSTS

OF

NON-PROFIT ORGANIZATIONS

Conducted for

PUBLIC INTEREST SATELLITE ASSOCIATION

55 West 44th Street

New York, New York 10036

(212) 661-2540

Melvin A Goldberg Inc /Communications
347 Madison Avenue
New York, New York 10017

May, 1976

A9-10

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STUDY OBJECTIVES

To determine present usage, costs and needs and potential usage, costs and needs for telecommunications facilities of a sample of non-profit/public interest/community organizations/social action organizations

METHODOLOGY

A questionnaire with a covering letter stating the purpose of the study and the nature of the Public Interest Satellite Association was sent to a sample of five groups of organizations, all of which are non-profit

The primary source for the sample was a list of non-profit organizations having 10,000 or more members, which is maintained by Dr David Horton Smith, Department of Sociology, Boston College This list is based on the organizations listed in Gale's "Encyclopedia of Associations" This list was updated to conform with the 1975 edition of Gale's, and was placed in the Master File at Boston College A computer print out of mailing labels of non-profit organizations having 10,000 or more members was utilized for questionnaire distribution

897 questionnaires were sent to the Gale/Smith list These represent the non-profit organizations having 10,000 or more members Telephone follow ups were made in the New York and Washington areas of those organizations that did not respond by April 23

Additional organizations were sent questionnaires as follows

139 Members of the National Citizens Committee for Broadcasting (NCCB)

All Educational Radio Stations -- 640

All Educational Television Stations -- 215

Other organizations in the Public Interest field whose names were known to PISA but who were not included in the other lists of names -- 140

In all 2031 questionnaires were sent out Self addressed stamped envelopes were enclosed to make return mail easier Respondents were given less than three weeks to return the questionnaires in order to have the report ready in time for submission to FCC For the Gale's list, the questionnaires were sent out March 29, to be returned by April 20

The questionnaires to the other groups were sent out April 15, with replies due by April 30 May 7 all replies were cut off, and coding begun At that time, replies were received from 207 organizations*

In the questionnaire, respondents were asked to check off those communications techniques they utilized, even if they did not have the figures on usage or costs Best estimates were requested even if actual data was unavailable

We believe that the results of the survey do give an indication of usage and costs of the communications facilities used by non-profit organizations, despite the small sample We suggest that the sub-group information, that is, the data on usage of small vs large membership groups, and organizations that are concerned with social problems vs those with other purposes, are more indicative of the usage of similar organizations. Although not statistically significant, the insights provided can be indicative of potential use of satellite service

*After the cut-off date an additional 40 questionnaires were received which could not be included in this study

PUBLIC INTEREST SATELLITE ASSOCIATION (PISA)
55 West 44th Street
New York, N Y , 10036
212-661-2540

Dear Friend:

Please bear with us as we, a non-profit organization like your own, explain why it is essential that you cooperate by filling out the attached Questionnaire and return it by April 20th

> The information we are asking you to provide is vitally needed to achieve but one basic purpose to have an effect upon policy decisions now being made that could make it possible for you to take advantage of low-cost communications facilities These, in the years ahead, will allow you to communicate more economically with your chapters and members, to other organizations and to the public-at-large if the voice of the non-profit community is heard now

You know, of course, about telecommunications satellites and their capability of providing world-wide television, radio, data, telex and facsimile services to business, industry and to the military What you may not know, though, is that the development of this powerful space technology has been wholly subsidized with nearly $80 billion in public funds, although public groups have not had an opportunity to enjoy its many benefits

The Public Interest Satellite Association (PISA), now has been formed to do something about this We are convinced that satellite technology, if permitted to develop in the right ways, can provide you with communications facilities that will be cheaper, better and faster than the methods you now use And, in the end, we believe that the public sector, the non-profit and service organizations, may benefit most from a non-profit satellite designed to meet its needs

This Questionnaire, which is an attempt to ascertain these needs, is the beginning of what must be done

Decisions about satellites are made at the level of World Administrative Radio Conferences This is done under the auspices of the International Telecommunications Union, in order to ensure that all needs are met, free from interference between one country and another The next such Conference (called WARC), will take place in 1979 Decisions made at that meeting will be binding, for all practical purposes, until the end of this century If the public sector is not heard from now, does not participate in the decision-making process, satellites will remain a totally commercial entity and their benefits will not be available to the public-service, non-profit organizations we are trying to KEEP OPTIONS OPEN, trying to PREVENT FORECLOSING the application of this technology for low-cost public use

The timing, however, is critical The year 1979 seems a long way off, but policy is made slowly and through a series of determinations by regulatory and other agencies These agencies must be made aware of what non-profit users want and need If there is not a strong response by the public sector, it is certain only the needs of commercial interests will be served

For some time, there has been a Federal Communications Commission Joint Government/Industry Working Group to consider these matters PISA has been a member of it The final report of that Working Group must be submitted to the Federal Communications Commission in mid-May of 1976 PISA only recently obtained the necessary funding to undertake this study of user-needs

This timing has placed upon us the kind of burden that can only be alleviated with your cooperation The attached Questionnaire is for the user-needs study the FCC requires in order to make its judgements Their recommendations, in turn, get passed on to the State Department and, in turn to the World Administrative Radio Conference

ALL REPLIES WILL BE KEPT CONFIDENTIAL Only the aggregate data will be submitted If we have your answers back by April 20th, we will be able to analyze the needs of the non-profit sector and prepare a submission to the FCC With your cooperation, the return of completed Questionnaires should be sufficient to yield an adequate and representative sample of public interest organizations

We know the time is short and that we are asking for complicated information But, as short as is the time, so are the stakes high The potential is too great to allow satellites to remain solely the province of the network broadcasters, the commercial carriers, industry and the military The public and the public sector have helped pay for the development of the technology and are entitled to benefits from it. The benefits can be made to come about, but only if you help

Please join us in this effort by filling out the attached.

Thank you

Bert Cowlan
Co-Director

Andrew Horowitz
Co-Director

P S Even if you can't complete all the questions asked, please return the Questionnaire with the information you can answer And, of course, we will be happy to make the results of the full study available to you

PUBLIC INTEREST SATELLITE ASSOCIATION
55 West 44th Street
New York, N Y 10036
(212) 661-2540

The objective of this questionnaire is to obtain information on your communications uses and needs Even if you can't complete all of the questions asked, please return the questionnaire with the information you can answer All replies will be kept confidential

1 Would you please indicate (in the appropriate space in column 1), which communications techniques are used by your organization to communicate with its members or chapters, with other organizations and with the general public Place an X in the space in Column 1 next to that communications technique

2 For each communications technique used by your organization (and marked in column 1) fill in the appropriate spaces in columns 4, 5 and 6 to indicate the following

a) The number of times yearly the specific communications facility is used (column 4) (Example If there are two mailings per year to members, the number 2 would be written next to mailings in column 4)

b) The number of units (items) (pieces) distributed each time (column 5) (Example If there are 10,000 members to which the mailing is sent, the number 10,000 would be written in column 5)

c) The yearly cost for the communications service used (col 6)

(1) Commun Used	(2) Communications Technique	(3) Type of Service	(4) (Annual Usage) Frequency	(5) No of Items	(6) Annual Cost
	Mail	Mailings (General)			
	Mail	Newsletters			
	Mail	Magazines			
	Mail	Promotions			
	Mail	Surveys			
	Mail	Ballots			
	Mail	Renewals			

Public Interest Satellite Associatic

(1) Commun Used	(2) Communications Technique	(3) Type of Service	(4) (Annual Usage) Frequency	(5) No of Items	(6) Annual Cost
	Telephone	Long Distance			
	Telephone	WATS Lines			
	Telephone	Tie Lines			
	Telephone	Leased Lines			
	Telephone	Foreign Exch Lines			
	Telex	Telex			
	Telecopier/ Facsimile	Telecopier			
	Mailgrams	Mailgrams			
	Telegrams	Telegrams			
	Radio	Tapes			
	Radio-Closed Circuit	Closed Circuit			
	Television	Spots			
	TV-Closed Circuit	Closed Circuit			
	TV Slow Scan	Slow Scan			
	Pvt Micro Wave	Micro Wave			
	Data Transmission	Data			
	Meetings/Conferences	Conferences			
	National or Regional Meetings/Conferences	Training			
	Other (Please list)				

3 If Satellite Service dedicated to non-profit organizations were made available, for which kinds of services would you give first priorities? Please rank the Top 5 (1 is highest)

Long Distance Telephone ______	Mailgrams ______
Telex ______	Telecopier/Facsimile ______
Data Transmission ______	Radio ______
Television ______	Closed Circuit Radio ______
Closed Circuit TV ______	Slow Scan Television ______
Telegrams ______	National/Regional Meetings ______

4 To what other uses, if any, would you put the satellite service, if it were made available to your organization?

______

______

______

Name of Organization ______

Address ______

City and State ______ Zip Code ______

Telephone (   ) ______

Number of Chapters ______

Number of Members ______

Purpose of Organization ______

______

______

______

Name of Person Filling Out This Form ______

______

Title of Person Filling Out Form ______

Date ______

DEFINITIONS

In analyzing the data, the organizations in our sample were categorized according to the major purpose for which they were ostensibly organized Then, these were grouped under general definitions For clarification, our broad categories are shown below with the sub-groups of which they are comprised

SOCIAL	Socially active organizations involved in Civic affairs, Political Action, Voting, Community Services, Social Welfare and Social Problems, Consumer Services, Family Services, Health, Racial and Ethnic Affairs
COMMUNICATIONS	Organizations involved in Communications, Media and Public Relations
EDUCATIONAL	Organizations concerned with Education, Cultural Aesthetic or Artistic Affairs, Scientific Learned or Religious Interests
CLUBS & HOBBIES	Fellowship Organizations, Social or Kinship Clubs, Fraternities, Veterans Organizations, Sports and Hobby Organizations
EMPLOYMENT	Organizations whose major interest is occupational — Labor Organizations, Business Associations, Professional and Non-professional organizations, Agricultural Organizations

SUMMARY

A STUDY OF

COMMUNICATIONS NEEDS, USES AND COSTS

OF

NON-PROFIT ORGANIZATIONS

Conducted for

PUBLIC INTEREST SATELLITE ASSOCIATION

55 West 44th Street

New York, New York 10036

(212) 661-2540

Melvin A Goldberg Inc /Communications
347 Madison Avenue
New York, N Y 10017

May, 1976

Communications Usage by Size of Membership

The degree to which the communications facilities and techniques are used will vary according to size and type of organization

While most larger organizations are more likely to have general mailings, magazines, promotions, ballots and renewals, smaller organizations are as likely to use the mails for surveys as are the very large ones Those organizations having 50-100,000 members mention the mails least, but at a level of better than 50% for general mailings For Newsletters, 62% of the 25-50,000 member organizations was mentioned At the low end, only 40% of those with less than 25,000 mention magazines Almost 2/3 of the largest organizations mention Promotions as compared to almost 1/3 of those with memberships of 50-100,000

While 82 1% of the respondent organizations indicate they use long distance telephone service to communicate with members and other organizations, the degree of usage seems to vary For example, all of the organizations in our sample with 25,000-50,000 members, say they use long distance as compared to 73 7% of those with 100,000 or more members WATS lines are used almost equally by these two groups, while only 7 7% of those with 50-100,000 members say they use WATS lines

Tie Lines are used least by the smaller organizations while leased lines are used most

Approximately a fifth of the organizations use Mailgrams and Telegrams, with the larger membership organizations more likely to use them

Radio Tape usage is used least by the organizations having 25,000-50,000 members (10%) and most by the larger and smaller groups

Television usage goes from a low of 14 3% among the 25,000-50,000 group to almost a third of those with 100,000 or more members National and Regional Meetings as a means of communicating with membership is very popular On average, more than half use it However, the 50-100,000 membership group tends to make the greatest use -- 92 3% mention meetings

This group is also more likely to use National and Regional training meetings as well -- 53 8%, twice the average

USAGE OF COMMUNICATIONS TECHNIQUES

BY SIZE OF MEMBERSHIP

COMMUNICATIONS TECHNIQUES	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 Up (19)	NO Answer* (53)
	%	%	%	%	%	$
General Mailings	72 0	78 2	76 2	53 9	89 4	56 6
Newsletters - Mail	63 8	71 3	61 9	76 9	68 4	45 3
Magazines - Mail	45 9	41 6	61 9	76 9	84 2	26 4
Promotions - Mail	37 7	40 6	47 6	30 8	63 2	20 8
Surveys - Mail	35 3	41 6	29 0	30 8	42 1	28 3
Ballots - Mail	22 7	27 7	33 3	23 1	36 8	3 8
Renewals - Mail	38 2	39 6	47 6	46 2	63 2	20 8
Long Distance - Phone	82 1	84 2	100 0	92 3	73 7	71 7
Wats Lines - Phone	19 3	19 8	28 6	7 7	31 6	- 13 2
Tie Lines - Phone	9 2	5 9	19.0	15 4	10 5	9 4
Leased Lines - Phone	15 0	16 8	9 5	0 0	5 3	20 8
Foreign Exchange - Phone	1 0	0 0	4 8	0 0	0.0	1 9
Telex	9 7	8 9	14 3	7 7	15 8	7 5
Telecopier	5 7	4 0	9 5	15 4	0 0	7 5
Mailgrams	19 3	20 8	23 8	23 1	31 6	9 4
Telegrams	22 2	23 8	28 6	38 5	31 6	9 4
Radio Tapes	31 9	32 7	9 5	23 1	26 3	43 4
Radio Closed Circuit	2 9	4 0	0 0	0 0	0 0	3 8
TV Spots	17 9	19 8	14 3	23 1	31 6	9 4
TV Closed Circuit	10 1	9 9	14 3	0 0	10 5	11 3
TV Slow Scan	0 5	1 0	0 0	0 0	0 0	0 0
Pvt Microwave	3 4	4 0	4 8	0 0	0 0	3 8
Data Transmission	5 8	5 0	9 5	15 4	5 3	3 8
National/Regional Meetings	55 6	56 4	71 4	92 3	57 9	37 7
National/Regional Train Mtg	26 6	26 7	28 6	53 8	36 8	15 1
Wire Services	1 4	1 0	0 0	0 0	5 3	1 9
TV Prog - Documentary	1 4	2 0	0 0	0 0	0 0	1 9
Cable TV	2 4	4 0	0 0	0 0	0 0	1 9
Satellite	1 0	1 0	0 0	0 0	0 0	1 9
Conference, Network	1 0	1 0	0 0	7 7	0 0	0 0
Other	1 4	3 0	0 0	0 0	0 0	0 0

*Respondent indicated usage but did not list number of members in organization

Communications Usage by Number of Chapters in Organization

Those organizations with fewer than 20 chapters are less likely to mention magazines or ballots in terms of mail usage Other than that, there are few differences in mail usage by size of chapter, as represented by number of chapters

With regard to use of Phones, the number of chapters in an organization do seem to have a substantial influence Those with 50 or more chapters mention long distance most often But those with fewer than 50 chapters are more likely to use WATS lines, Tie lines, Leased lines and even Foreign exchange

Telegrams and Mailgrams are mentioned most often by those organizations with 20-50 chapters This might be used as a supplement to the long distance calls

Radio tape use declines as the number of chapters increase while TV Spots usage is largest for the middle group

Meetings are used least by the organizations with the fewest number of chapters

USAGE OF COMMUNICATIONS TECHNIQUES

BY CHAPTERS

COMMUNICATIONS TECHNIQUES	TOTAL (207)	Under 20 (39)	20 - 50 (11)	50 Up (55)	No Answer * (102)
	%	%	%	%	%
General Mailings	72 0	82 1	90 9	85 5	58 8
Newsletters - Mail	63 8	74 4	72 7	76 4	52 0
Magazines - Mail	45 9	12 8	63 6	71 8	37 3
Promotions - Mail	37 7	46 2	45 5	45 5	29 4
Surveys - Mail	35 3	46 2	27 3	36 4	31 4
Ballots - Mail	22 7	17 9	36 4	47 3	9.8
Renewals - Mail	38 2	33 3	36 4	58 2	29 4
Long Distance - Phone	82 1	79 5	71 8	94 5	76 5
Wats Lines - Phone	19 3	23 1	0 0	11 8	18 6
Tie Lines - Phone	9 2	20 5	0 0	3 6	11 8
Leased Lines - Phone	15 0	20 5	0 0	1 8	21 6
Foreign Exchange - Phone	1 0	2.6	0 0	0 0	1 0
Telex	9 7	7 7	0 0	3 6	14 7
Telecopier	5 7	10 3	0 0	1 8	6 9
Mailgrams	19 3	12 8	27 3	25 5	17 6
Telegrams	22 3	20 5	54 5	29 1	15 7
Radio Tapes	31 9	46 2	27 3	9 1	39 2
Radio Closed Circuit	2 9	5 1	0 0	0 0	3 9
TV Spots	17 9	15 4	27 3	12 7	20 6
TV Closed Circuit	10 1	12 8	0 0	1 8	14 7
TV Slow Scan	0 5	0 0	0 0	0 0	1 0
Pvt Microwave	3 4	0 0	0 0	0 0	6 9
Data Transmission	5 8	7 7	0 0	5 5	5 9
National/Regional Meetings	55 6	51 3	72 7	71 8	41 2
National/Regional Train Mtgs	22 6	23 1	45 5	40.0	18 6
Wire Services	1 4	5 1	0 0	1 8	0 0
TV Prog - Documentary	1 4	2 6	0 0	0.0	2.0
Cable TV	2 4	7 7	0 0	0 0	2 0
Satellite	1 0	2 6	0 0	0 0	1 0
Conference, Network	1 0	2 6	0 0	0 0	1 0
Other	1 4	2 6	9.1	1 8	0 0

* Respondent indicated usage but did not list number of chapters

A9-18

Communications Usage by Organization Purpose

Generally, Club and Hobby organizations tend to use the mails more than the others Primarily, they use it for general mailings and magazines and to a much greater degree than the other organizations

Newsletters are mentioned equally by those organizations based on employment or occupation, the Activist Social organizations as well as Club and Hobby groups

Mail promotions are mentioned by more than half of the Club and Hobby organizations and almost 2/3 of those concerned with employment

Ballots and Renewals are mentioned most often by Club and Hobby groups with the employment organizations the next largest user

As was true with mails, the Club and Hobby organizatons and those concerned with employment mention Long Distance phone calls most often -- 94 1%

However, even for the group with the lowest mention of usage -- the educational group -- 3/4 mention long distance phone calls as one of the means by which they communicate with their members and other organizations

In effect, almost all organizations use long distance phone service

In addition, substitute services for long distance, such as WATS lines, Tie lines, Leased lines and foreign exchange lines are used

WATS Lines are mentioned most often (about 25%) by the Social Active, Clubs and Hobbies and Employment oriented groups Tie Lines by the Communications, Educational and Clubs and Hobbies organizations

Leased lines by Communications Organizations (primarily Radio and TV Stations)

Telex, although mentioned less frequently, is listed primarily by Employment and Communications oriented organizations, but at a level of 17 6% and 13 2% respectively

Mailgrams and Telegrams are mentioned most often by the organizations concerned with employment, secondarily by Club and Hobby organizations and thirdly, by the Activist Social groups

As expected, Radio Tapes are mentioned most often by the Communications group (Radio Stations) However, they are still mentioned by more than a quarter of the Active Social organizations and more than a fifth of the Educational organizations

Television spots, generally to the public, is mentioned by more than a 1/3 of the Active Social organizations and almost a quarter of the employment oriented organizations

The other major communications techniques used are National and Regional Meetings This technique is mentioned most often by the Employment organizations

Fully 85% of this group uses National or Regional Meetings and half of them mention using meetings for Training

All groups use meetings, with the Communications organizations with 40 7% showing the lowest usage

The same pattern is true of Training meetings with Communications lowest and Employment highest

USAGES OF COMMUNICATIONS TECHNIQUES

BY ORGANIZATION PURPOSE

	TOTAL	No Ans*	Active Social	Commun	Educa tional	Clubs & Hobbies	Employment
	(207)	(9)	(22)	(91)	(33)	(17)	(34)
	%	%	%	%	%	%	%
General Mailings	72 0	77 8	77 8	62 6	75 8	94 1	79 4
Newsletter-Mail	63 8	77 8	72 7	54 9	63 6	70 6	76 5
Magazine - Mail	45 9	44 4	45 5	26 4	57 6	94 1	61 8
Promotions-Mail	37 7	55 6	27 3	25 3	42 4	52 9	61 8
Surveys-Mail	35 3	33 3	27 3	37 4	27 3	35 3	44 1
Ballots-Mail	22 7	44 4	13 6	8 8	30 3	52 9	38 2
Renewals	38 2	44 4	18 2	31 9	42 4	58 8	52 9
Long Distance Phone	82 1	88 9	81 8	78 0	75 8	94 1	94 1
Wats Lines - Phone	19 3	22 2	27 3	16 5	15 2	23 5	23 5
Tie Lines - Phone	9 2	0 0	0 0	14 3	12 1	11 8	0 0
Leased Lines - Phone	15 0	0 0	4 5	30 8	6 1	0 0	0 0
Foreign Exchange - Phone	1 0	0 0	0 0	1 1	3 0	0 0	0 0
lex	9 7	0 0	0 0	13 2	6 1	0 0	17 6
Telecopier	5 7	11 1	4 5	6 6	6 1	5 9	2 9
Mailgrams	19 3	11 1	27 3	13 2	15 2	29 4	32 4
Telegrams	22 2	22 2	22 7	12 1	12 1	35 3	52 9
Radio Tapes	31 9	11 1	26 4	48 4	21 2	5 9	14 7
Radio-Closed Circuit	2 9	0 0	0 0	5 5	0 0	0 0	2 9
TV Spots	17 9	11 1	36 4	15 4	18.2	0 0	23 5
TV-Closed Circuit	10 1	11 1	4 5	13.2	9 1	0 0	11 8
TV Slow Scan	0 5	0 0	0 0	1 1	0 0	0 0	0 0
Pvt Microwave	3 4	11 1	0 0	6 6	0 0	0 0	0 0
Data Transmission	5 8	0 0	4 5	5 5	9 1	0 0	8 8
National/Regional Meetgs	55 6	77.8	54 5	40 7	51 5	70 6	85 3
Natl/Reg -Training Meets	26 6	33 3	31 8	14 3	24 2	41 2	50 0
Wire Services	1 4	0 0	4 5	2 2	0 0	0 0	0 0
TV Prog-Documentary	1 4	0 0	4 5	2 2	0.0	0 0	0.0
Cable TV	2 4	0 0	0 0	4 4	3 0	0 0	0 0
Satellite	1 0	0 0	0 0	2 2	0 0	0 0	0 0
Conference,Network	1 0	0 0	0 0	2 2	0 0	0 0	0 0
Other	1 4	0 0	0 0	2 2	0 0	0.0	2 9

* Respondent indicated usage but did not indicate purpose of organization

Communications Usage by Source of Sample

General Mailings are utilized by all groups, but the Public radio group tends to use it least (48 8%) The organizations that comprise Gale's Encyclopedia of Associations tend to use General Mailings and Magazines most Newsletters are used by the National Citizens Committee for Broadcasting (NCCB)

Public Radio uses Long Distance Telephone least (60 5%) while the NCCB group uses it the most (95 7%) 86% of the Gale's organizations use Long Distance Telephone WATS Lines are used mostly by the Public TV Stations and secondarily by the Gale's and Public Radio group NCCB uses it least Public Radio and TV Stations are most likely users of Tie Lines and Lease Lines

Public TV uses Telex -- 34%

The Gale's sample organizations use Mailgrams (27%) and Telegrams (33%) As expected, Radio Stations use Radio Tapes more than the others, and TV Stations use the Television spots However, 18% of the Gale's sample of non-profit organizations say they use Radio tapes and 21% say they use TV spots -- ostensibly to reach the public and their own members

National and Regional Meetings are used most by the Gales and NCCB groups, least by Public Radio and TV The former by 69% and 61% respectively The latter 33% and 35% respectively

36% of the Gale's organizations say they do have training meetings

USAGE OF COMMUNICATIONS TECHNIQUES

BY SOURCE OF SAMPLE

COMMUNICATIONS TECH	TOTAL (207)	Gale's (100)	NCCB (23)	Public Radio (43)	Public TV (26)	Other (10)
General Mailings	72 0%	81 0%	82 6%	48 8%	61 5%	80 0%
Newsletters	63 8	74 0	82 6	39 5	46 2	90.0
Magazines	45 9	67 0	26 1	16 3	42 3	20 0
Promotions	37 7	48 0	30 4	18 6	34 6	40 0
Surveys	35 3	35 0	43 5	32 6	38 5	20 0
Ballots	22 7	38 0	8 7	4 7	15.4	--
Renewals	38 2	49 0	30 4	18 6	50 0	10 0
Long Distance-Phone	82 1	86 0	95 7	60 5	84 6	100 0
WATS Lines	19 3	19 0	8 7	18 6	30 8	3 0
Tie Lines	9 2	5 0	4 3	18 6	15 4	—
Leased Lines	15 0	1 0	13 0	37 2	34 6	10 0
Foreign Exchange	1 0	—	—	2 3	3 8	—
Telex	9 7	6 0	8 7	4 7	34 6	10 0
Telecopier	5 7	2 0	—	9 3	11 5	30 0
Mailgrams	19 3	27 0	13 0	4 7	19 2	30 0
Telegrams	22 2	33 0	13 0	4 7	23 1	20 0
Radio Tapes	31 9	18 0	39.1	67 4	23 1	30 0
Radio Closed Circuit	2 9	1.0	—	11 6	—	—
TV Spots	17 9	21 0	17 4	2 3	38 5	10 0
TV Closed Circuit	10 1	5 0	4 3	9 3	34 6	20 0
TV Slow Scan	0 5	—	—	—	3 8	—
Pvt Microwave	3 4	—	—	4 7	19 2	—
Data Transmission	5 8	6 0	4 3	4 7	11 5	—
National/Reg Meetings	55 6	69 0	60 9	32 6	34 6	50 0
Nat /Reg Trng Mtgs	26 6	36 0	21 7	14 0	15 4	20 0
Wire Services	1 4	1 0	4.3	7 0	—	—
TV Prog	1 4	1 0	8.7	—	—	—
Cable TV	2.4	—	17 4	—	3 8	—
Satellite	1 0	—	8.7	—	—	—
Conference, Netw	1.0	—	—	4 7	—	—
Other	1 4	1.0	8.7	—	—	—

Average Annual Costs of Communications Facilities by Size of Membership

As expected, the organizations with the largest membership will have the largest costs for most communications use While the average annual expenditures for all organizations was $13,765 for general mailings for those with 100,000 or more members, the average was $40,772 For Newsletters, the average expenditures was $6,845 but for those organizations having 100,000 or more members, the average annual expenditure was $21,000

In Mail promotions, the larger average expenditure for organizations with 25-50,000 membership may be due to a sample fluke, since only four organizations in that group gave cost figures and one listed promotional costs of more than $100,000

With regard to Telephone costs, generally the larger the organization the greater the expenditure The average expenditure for long distance phone calls was $7,432 but for those organizations with 100,000 or more members, the average was $12,650 With regard to WATS lines costs, the small number of replies from organizations with 25-50,000 members may be responsible for the large expenditure shown and it may just be a sample distortion

However, for the small groups generally, there seems to be an increase in WATS, Tie and Leased line usage apparently as compensation for the lower long distance costs and perhaps to supplement the long distance usage

Telex, Mailgrams and Telegrams tend to be used more by larger organizations More money is spent on Data Transmission by the smaller organizations (fewer than 50,000 members) than the others

With regard to National/Regional Regular Meetings and Training Meetings the annual expenditures increase with the size of organizations with the exception of those with 50-100,000 members They indicate the lowest expenditures for such meetings as compared to an average of $34,527 and $48,089 for all organizations for Regular Meetings and Training Meetings respectively, for the associations with 50-100,000 members, the average expenditure is $21,083 and $3,438 respectively

Other communications techniques were volunteered by a few organizations, and are shown in the table

ANNUAL

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY SIZE OF MEMBERSHIP

	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 & Up (19)	No Answers* (53)
	$	$	$	$	$	$
General Mailings	13,765	6,943	3,950	6,250	40,772	21,845
Newsletters - Mail	6,845	5,453	8,107	5,916	21,000	3,763
Magazine - Mail	42,235	26,887	35,275	51,300	92,645	32,704
Promotions - Mail	13,557	5,809	54,812	--	27,071	11,055
Surveys - Mail	1,372	668	1,500	125	5,375	1,302
Ballots - Mail	1,486	1,065	1,895	375	2,230	3,150
Renewals - Mail	4,674	2,534	4,911	6,500	8,305	6,431
Long Distance - Phone	7,432	5,713	9,607	9,722	12,650	8,375
Wats Lines - Phone	36,330	29,363	101,250	2,500	4,000	43,875
Tie Lines - Phone	1,500	2,000	875	250	4,000	500
Leased Lines - Phone	21,270	32,372	9,500	--	1,500	6,625
Foreign Exchange - Phone	750	--	--	--	--	750
Telex	4,844	1,350	2,625	12,500	10,500	6,312
Telecopier	1,361	1,208	125	2,375	--	1,250
Mailgrams	4,057	250	250	500	3,083	37 625
Telegrams	1,729	712	1,094	125	5,833	292
Radio Tapes	3,344	2, 78	1,250	500	3,291	5,665
Radio-Closed Circuit	2,625	2,187	--	--	--	3,500
TV Spots	6,895	4,861	4,000	--	17,500	17,500
TV-Closed Circuit	10,212	9,562	10,500	--	--	11,875
TV-Slow Scan	--	--	--	--	--	--
Pvt Microwave	40,000	53,083	--	--	--	750
Data Transmission	46,928	57,166	83,750	--	--	3,500
National/Regional Meetings	34,527	31,699	45,000	21,083	50,694	31,523
Natl/Regl Trng Meetgs	48,089	25,375	45,450	3,438	56,313	75,000
Wire Services	37,500	--	--	--	--	37,500
TV Programming- Doc	3,188	125	--	--	--	6,250
Cable TV	3,950	4,062	--	--	--	3,500
Satellite	5,625	2,500	--	--	--	8,750
Conferences, Network	1,062	1,750	--	375	--	--
Other	27,167	27,167	--	--	--	--

* Respondent volunteered cost information but did not list size of organization

Average Annual Costs of Communications Facilities By Number of Chapters

Generally, mail costs increase with size of organization and number of chapters In the case of general mailings, of 39 organizations with fewer than 20 chapters, 15 did not respond on costs, one indicated expenditures of more than $100,000 If we exclude the two highest cost organizations, the average expenditure for general mailings for the remaining 22 would be $1,341

The cost of telephone service also tends to increase with size However, leased lines expenditures are much higher for smaller organizations based on extra-ordinary expenditures by two organizations

Costs for Mailgrams and Telegrams also tend to increase as the number of chapters increase

Radio Tape costs and television costs are based on very small sample responses

The annual expenditures for National and Regional Meetings and for Training Meetings also ends to increase with size or organizations as indicated by the number of chapters

Expenditures for each of the 55 6% of the organizations in our sample that use National and Regional Meetings average $34,527 annually Those with 50 or more chapters average $48,397 annually for such meetings

Training Meetings expenditures range from an annual average of $1,107 for those with 20 or less chapters to $76,613 for those with 50 or more chapters The average for the sample is $48,089 annually

AVERAGE COSTS OF COMMUNICATION FACILITIES

NUMBER OF CHAPTERS

	TOTAL	Under 20	20-49	50+	No Answer *
	(207)	(39)	(11)	(55)	(102)
	$	$	$	$	$
General Mailings	13,765	11,125	2,500	10,922	19,313
Newsletters - Mail	6,845	2,175	1,708	6,358	10,500
Magazine - Mail	42,235	28,417	44,850	37,265	49,107
Promotions - Mail	13,557	6,205	500	24,017	11,063
Surveys - Mail	1,372	781	125	3,034	940
Ballots - Mail	1,486	671	975	1,574	2,308
Renewals - Mail	4,674	2,000	1,938	3,810	6,676
Long Distance - Phone	7,432	4,583	5,875	8,467	8,377
Wats Lines - Phone	36,330	32,464	0	53,000	32,727
Tie Lines - Phone	1,500	667	0	2,125	1,656
Leased Lines - Phone	21,270	41,042	0	1,500	15,778
Foreign Exchange - Phone	750	0	0	0	750
Telex	4,844	3,500	0	3,500	1,750
Telecopier	1,361	2,219	0	0	675
Mailgrams	4,057	250	250	321	7,818
Telegrams	1,729	325	125	2,325	1,071
Audio Tapes	3,344	1,973	10,500	3,188	3,571
Radio-Closed Circuit	2,625	875	0	0	3,500
TV Spots	6,895	1,875	0	17,500	8,250
TV-Closed Circuit	10,212	7,958	0	0	11,179
TV-Slow Scan	--	--	--	--	--
Pvt Microwave	40,000	--	--	--	40,000
Data Transmission	46,928	10,750	0	0	64,900
National/Regional Meetings	34,527	6,857	12,250	48,397	38,390
Natl /Regional Traing Meets	48,089	1,107	28,333	76,613	58,000
Wire Services	37,500	37,500	--	--	--
TV Programming-Doc	3,188	125	--	--	6,250
Cable TV	3,950	1,250	--	--	8,000
Satellite	5,625	8,750	--	--	2,500
Conferences, Network	1,062	375	--	--	1,750
Other	27,167	2,500	75,000	4,000	--

* Respondent volunteered cost information but did not indicate number of chapters

Average Annual Communications Costs by Organization Purpose

When we analyze the annual costs of communications by organization purpose we get other insights into communications use

General Mailings (as shown by average annual expenditures) tend to be used by Educational Organizations and organizations oriented toward Business and employment As compared to the average expenditure of $13,765, the Educational organizations spend $24,188 and the Employment oriented organizations spend $19,446

Magazines are major costs of "Employment" and Educational organizations -- $59,732 and $58,992 respectively vs $42,235 annual expenditure for the average

Clubs and Hobby organizations spend their money on magazines ($29,841) and Promotions ($24,875)

Long distance telephone and WATS lines are major annual expenditures of the *Business* and labor oriented associations as well as the social active organizations, equaling $133,000 and $65,000 respectively as compared to $44,000 for long distance and WATS combined for the average organizations

For National and Regional Meetings as well as Training Meetings the "Employment" Association spend by far the most,-- averaging almost $100,000 annually for Meetings and $125,000 for Training Meetings

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY ORGANIZATION PURPOSE

	TOTAL	No Ans *	Social	Communi-cations	Educa-tional	Clubs & Hobbies	Employ ment
	(207)	(9)	(22)	(91)	(33)	(17)	(34)
	$	$	$	$	$	$	$
General Mailings	13,765	1,500	1,750	12,061	24,188	6,568	19,446
Newsletters - Mail	6,845	14,500	2,175	2,641	10,778	1,750	16,433
Magazine - Mail	42,235	104,166	15,700	21,855	58,922	29,841	59,732
Promotions - Mail	13,557	20,000	9,125	3,658	9,818	24,875	11,550
Surveys - Mail	1,372	6,250	125	1,606	1,196	188	1,958
Ballots - Mail	1,486	4,375	50	1,568	250	115	3,093
Renewals - Mail	4,674	20,000	—	3,693	5,721	4,813	4,050
Long Distance - Phone	7,432	11,333	8,538	3,311	5,500	5,312	13,888
Wats Lines - Phone	36,330	--	56,000	8,125	3,666	4,000	119,750
Tie Lines - Phone	1,500	—	—	1,386	250	4,000	—
Leased Lines - Phone	21,270	—	4,000	1,483	100,750	—	--
Foreign Exchange -Phone	750	—	—	750	—	—	—
Telex	4,844	--	—	6,156	2,625	--	1,813
Telecopier	1,361	—	3,500	1,350	375	--	1,250
Mailgrams	4,057	—	18,938	1,194	250	250	250
Telegrams	1,729	625	375	125	375	208	3,222
Radio Tapes	3,344	—	1,750	3,681	1,375	125	6,500
Radio-Closed Circuit	2,625	--	—	2,188	—	—	3,500
TV Spots	6,895	—	8,875	6,813	4,000	—	12,667
TV-Closed Circuit	10,212	17,500	17,500	4,208	11,167	—	10,500
TV-Slow Scan	--	--	—	—	—	—	—
Pvt Microwave	40,000	150,000	—	3,333	—	—	--
Data Transmission	46,928	--	—	43,625	83,750	--	4,000
National/Regional Meet	34,527	108,750	10,321	7,760	28,019	12,000	92,279
Natl/Reg Train Meets	48,089	--	28,167	929	34,214	3,667	125,625
Wire Services	37,500	—	--	37,500	—	—	—
TV Programming-Doc	3,188	—	--	6,250	—	—	—
Cable TV	3,950	--	--	1,813	—	--	--
Satellite	5,625	--	—	2,500	—	—	—
Conferences, Network	1,062	—	—	375	—	—	—
Other	27,167	—	—	4,000	—	—	--

* Respondent volunteered cost information but did not indicate purpose of organization

Communications Costs by Source of Sample

The Sample we used is basically composed of four different lists, Gale's Encyclopedia of Associations (non-profit organizations having 10,000 or more members), National Citizens Committee for Broadcasting, Public Radio Stations and Public Television Stations

An analysis of Yearly Expenditures for organizational and public Communications Services shows the different functions and costs attributable to each sample For example, the organizations from Gale's and those from Public Television spend the most amount of money, on average, for General Mailings ($17,674 and $19,464 respectively) Public Radio spends relatively little ($1,717) The NCCB average is $14,824

Gale's and Public Television again spend the most per organization for Magazines -- $49,924 and $36,444 respectively NCCB and Public Radio spend $6,063 and $4,958 respectively

For Promotions, the average Gale organization spends $23,033 annually, by far the largest of all

Long Distance telephone expenditures are highest for Public TV Stations with 12,750 Gale's is next with $9,082 However, expenditures for WATS lines goes up drastically for the average Gale's organization -- $63,375, as compared to $12,900 for Public TV, $4,000 for NCCB and $3,800 for Public Radio

It is surprising to note that the average non-profit organization taken from our Gale sample spends $10,964 annually for TV spots, even more than the Public TV station for this purpose and $3,261 for Radio Tapes

In addition, for Data Transmission, the Gale organization spends $77,000 annually and the Public TV station spends $61,667 The amount spent by the others is minor in comparison

AVERAGE COSTS OF COMMUNICATIONS FACILITIES

By Source of Sample

	TOTAL	Gale's	NCCB	Public Radio	Public TV
	(207)	(100)	(23)	(43)	(26)
	$	$	$	$	$
General Mailings	13,765	17,674	14,824	1,717	19,464
Newsletters - Mail	6,845	11,206	1,956	1,942	2,795
Magazine - Mail	42,235	49,924	6,063	4,958	36,444
Promotions - Mail	13,557	23,033	6,958	2,583	1,000
Surveys - Mail	1,372	2,397	1,179	250	583
Ballots - Mail	1,486	1,553	563	275	400
Renewals - Mail	4,674	5,063	2,354	1,646	4,400
Long Distance -Phone	7,432	9,082	3,072	2,838	12,750
Wats Lines - Phone	36,330	63,375	4,000	3,800	12,900
Tie Lines - Phone	1,500	2,125	1,500	500	3,417
Leased Lines - Phone	21,270	1,500	20,750	2,538	36,500
Foreign Exchange-Phone	750	--	--	750	--
Telex	4,844	1,813	125	--	6,781
Telecopier	1,361	1,250	--	1,792	688
Mailgrams	4,057	292	250	250	2,375
Telegrams	1,729	2,033	125	125	292
Radio Tapes	3,344	3,261	6,000	3,066	3,000
Radio-Closed Circuit	2,265	3,500	--	2,188	--
TV Spots	6,895	10,964	250	--	1,667
TV-Closed Circuit	10,212	8,167	125	--	11,875
TV-Slow Scan	--	--	--	--	--
Pvt Microwave	40,000	--	--	1,625	78,025
Data Transmission	46,928	77,000	4,000	2,500	61,667
National/Regl Meets	34,527	51,644	15,200	594	6,714
Natl/Regl Trng Meetgs	48,089	66,412	3,500	667	1,417
Wire Services	37,500	--	37,500	--	--
TV Programming-Doc	3,188	--	3,188	--	--
Cable TV	3,950	--	1,813	--	12,500
Satellite	5,625	--	5,625	--	--
Conferences, Network	1,062	--	--	1,063	--
Other	27,167	75,000	3,250	--	--

CONCLUSION

One thing the study makes absolutely clear -- A considerable amount of money is spent by Non-profit organizations on communications services to their members, other organizations and the public at large

Just taking those organizations in our sample that were derived from Gale's Encyclopedia of Associations, the annual communications expenses for the average non-profit organization is $160,000

For all hundred "Gale" organizations in our sample, weighting for usage and cost, the average yearly communications expenditure comes to $16,013,000

Projecting these figures to the 897 non-profit organizations having 10,000 or more members to whom the questionnaire was sent, the total annual expenditures for communications is $143,632,340

The costs for Long Distance telephone calls for these 897 organizations comes to $7,006,040 If we add to that the $10,801,000 of WATS Line costs, we show approximately $17,807,000 spent annually for telephone service by these non-profit organizations

Telex, Telecopier, Mailgrams and Telegrams add another $800,000 to the communications costs annually

With this kind of expenditure faced annually by the non-profit organizations, we can understand why the Long Distance Telephone Service was given the highest priority by our respondents in the event that Satellite Service is made available to non-profit organizations

Communications Usage

In terms of this study, we attempted to find out the degree to which various communications facilities are used by these non-profit organizations We provided our respondents with a check list of various techniques to indicate those they used They then were asked to write in the actual or best estimates of frequency and amount of usage (In some cases, the technique was checked off, but the figures were omitted In others, some figures were inserted, and others left out)

For the 207 organizations that replied, the degree to which a communications facility is utilized, depends upon several factors

- The size of the membership of the organization
- The number of chapters
- The purpose or function of the organizations
- The cost of the communications facility
- The function for-which the facilty or technique is being used

We tried to relate these elements as much as possible in order to allow for projections of present costs to future needs Overall, in terms of communications facility usage, the long distance telephone ranks as the most widely used 82% of those responding say they use long distance telephone to communicate with members and other organizations (Regular daily mail and local telephone calls were excluded)

Since the questions related to communications techniques used to reach members, other organizations and the general public, the diversity of communications techniques used is not surprising After long distance phone calls the mails were mentioned next most often General mailings by 72% and newsletters by 64% National and Regional Meetings were mentioned fourth (56%) followed by magazines (46%) The alternatives to long distance telephone calls, WATS lines, Leased lines and Tie lines were mentioned by 19%, 15%, and 9% respectively

It would seem that for some organizations, the cost of long distance phone calls make the services of WATS lines, Leased lines and Tie lines a necessary supplement

Overall, with the exception of long distance telephone, the mails are the major form of communications technique used

Almost a third of these non-profit organizatons use Radio Tapes while 27% say they hold National or Regional Training Meetings

USAGE OF COMMUNICATIONS TECHNIQUE

COMMUNICATION TECHNIQUE	TOTAL
	(207)
	%
Long Distance - Phone	82 1
General Mailings	72 0
Newsletters - Mail	63 8
National/Regional Meetings	55 6
Magazines - Mail	45 9
Renewals - Mail	38 2
Promotions - Mail	37 7
Surveys - Mail	35 3
Radio Tapes	31 9
National/Regional Training Meetings	26 6
Ballots - Mail	22 7
Telegrams	22 2
Wats Lines - Phone	19 3
Mailgrams	19 3
TV Spots	17 9
Leased Lines - Phones	15 0
TV Closed Circuit	10 1
Telex	9 7
Tie Lines - Phone	9 2
Data Transmission	5 8
Telecopier	5.7
Pvt Microwave	3 4
Radio Closed Circuit	2 9
Wire Services	1 4
TV Programming-Doc	1 4
Cable TV	2 4
Satellite	1 0
Conference, Network	1 0
Other	1 4

Communications Costs

The greatest amount of money spent annually for a communications technique is for National or Regional Training Meetings, $48,089 Data Transmission is next most costly at $46,928

Magazine mailings are third at $42,235 annually

The more unique communications techniques such as Private Microwaves and Wire Services are next most costly at $40,000 and $37,500 respectively

General Mailings are ninth most costly at $13,765 annually for the average organizations, Long Distance phone calls are twelfth at $7,432 annual expenditure for the average non-profit organizations

Annual Costs of Communications Techniques

COMMUNICATIONS TECHNIQUE	AVERAGE ANNUAL COSTS*
	$
National/Regional Training Meetings	48,089
Data Transmission	46,928
Magazine - Mail	42,235
Private Microwave	40,000
Wire Services	37,500
WATS Lines - Phone	36,330
National/Regional Meetings	34,527
Leased Lines - Phone	21,270
General Mailings	13,765
Promotions - Mail	13,557
TV - Closed Circuit	10,212
Long Distance - Phone	7,432
TV Spots	6,895
Newsletters - Mail	6,845
Satellite	5,625
Telex	4,844
Renewals - Mail	4,674
Mailgrams	4,057
Cable TV	3,950
Radio Tapes	3,344
TV Programming - Doc	3,188
Radio - Closed Circuit	2,625
Telegrams	1,729
Tie Lines - Phone	1,500
Ballots - Mail	1,486
Surveys - Mail	1,372
Telecopier	1,361
Conferences, Network	1,062
Foreign Exchange - Phone	750
TV Slow Scan	--

* Based on Mean Average of Costs of Communications Techniques for those organizations that gave the information

Communications Expenditures

Although Long Distance Telephone calls are utilized by more organizations than any other facility for communicating with their own members and other organizations the greatest expense on the average, for those replying is National and Regional Training Meetings, followed by Data Transmission, Magazines, Private Microwave, Wire Services and WATS Lines However, we must keep in mind the fact that these figures represent the average expenditures only of those organizations who use the facility and submitted the cost figures on the questionnaire

To give some feeling for the costs involved, if we apply the average organizations cost per communications technique for just those organizations in our sample that indicated usage and the total yearly sum is $20,734,762

When we weight these costs and usage data, we find that magazine mailings represent almost a fifth of all communications expenditures National and Regional Meetings represent almost the same proportions of costs, with Training Meetings representing about an eighth of all communications expenditures by these non-profit organizations

General Mailings to members and the general public represent 10%, while total phone costs for long distance and the various special lines represent one-sixth of all communications costs of the organizations in our sample

TOTAL COMMUNICATIONS EXPENDITURE FOR

THE ORGANIZATIONS IN THIS SAMPLE

	TOTAL EXPENDITURES	% OF TOTAL EXPENDITURES
	$	%
General Mailings	2,051,536	9 9
Newsletters - Mail	903,992	4 4
Magazine - Mail	4,012,874	19 4
Promotions - Mail	1,057,975	5 1
Surveys - Mail	100,253	0 5
Ballots - Mail	69,826	0 3
Renewals - Mail	369,592	1 8
Long Distance - Phone	1,263,046	6 1
Wats Lines - Phone	1,451,420	7 0
Tie Lines - Phone	28,566	0 1
Leased Lines - Phone	660,434	3 2
Foreign Exchange - Phone	1,553	*
Telex	97,263	0.5
Telecopier	16,058	0 1
Mailgrams	162,081	0 8
Telegrams	79,454	0 4
Radio Tapes	220,814	1 1
Radio-Closed Circuit	15,758	0 1
TV Spots	255,480	1 2
TV-Closed Circuit	213,502	1 0
TV-Slow Scan	--	
Pvt Microwave	281,520	1 4
Data Transmission	563,418	2 7
National/Regional Meetings	3,973,781	19 2
National/Regional Training Meetings	2,647,877	12 8
Wire Services	112,500	0 5
TV Programming - Doc	9,564	*
Cable TV	19,750	0 1
Satellite	11,250	0 1
Conferences, Network	2,124	*
Other	81,501	0 4
TOTAL	$ 20,734,762	100 0%

Ranking of Communications Satellite Use

After listing their present uses and costs of present communications services and techniques, respondents were asked to rank the top five from a list of twelve, for which they would give priorities if Satellite Service dedicated to non-profit organizations was made available to their organizations

In our analysis, we assigned a point value to the top three rankings The service with the highest score would be first choice Second highest score would be second choice etc We arbitrarily assigned a value of 7 points to 1st choice, 5 points to 2nd choice, 3 points to third choice and 2 points to those people who just indicated check marks despite the instructions to give a numerical choice

On this basis, Long Distance Telephone service would be given first priority by all organizations, large and small, and regardless of purpose for which organization exists The second choice varies with organization purpose and size

MAIL USAGE

About three quarters of the organizations send out General Mailings to their membership or the general public The tendency is to send them out at regular intervals About 15% send out General Mailings daily 13% send them out monthly and 11% send them out weekly 10% issue General Mailings every other month, while 12% send them out twice a year

Newsletters are not as evenly dispersed throughout the year Almost a third of those send out newsletters, do so quarterly 14% issue them monthly and 22% issue newsletters every other month or more frequently, but less than once a month

Magazines tend to be issued either monthly (39%), bi-monthly (18%) or quarterly (21%)

Promotions tend to be issued bi-monthly or even less frequently Thus 12% issue promotions every other month, 13% send them out quarterly, 18% semi-annually and 12% annually

More than two-thirds of all surveys are sent out annually or semi-annually Ballots are most likely to be sent out annually -- (57%)

44% of all organizations mailing out renewals do so only once a year 11% mail them out twice a year

FREQUENCY OF MAIL USAGE

OTHER THAN DAILY REGULAR MAIL

USERS	Genl Mail (149)	News-letters (132)	Magazines (95)	Promo-tions (78)	Surveys (73)	Ballots (47)	Renewals (80)
FREQUENCY	%	%	%	%	%	%	%
1 time per year	2 0	2 3	3 2	11 5	38 4	57 4	43 8
2 times per yr	12 1	6 8	3 2	17 9	31 5	10 6	11 3
3 times per yr	6 7	6 1	1 0	6 4	5 5	2 1	7 5
4 times per yr (quarterly)	5 4	30 3	21 1	12 8	6 8	10 6	6 3
5-6 times	10 1	9 8	17 9	11 5	1 4	2 1	6 3
7-11 times	6 0	12 1	4 2	3 8	2 7	4 3	2 5
12-15 times (monthly)	13 4	14 4	38 9	7 7	2 7	--	10 0
16-24 times (twice monthly)	2 0	8 3	3 2	5 1	--	2 1	2 5
25-52 times (weekly)	11 4	3 0	1 0	5 1	--	2 1	2 5
Daily/more than once wk	14 8	2 3	--	3 8	--	--	2 5
Varies	2 7	0 8	1 0	2 6	1 4	2 1	--
No Answer, but use	13 4	3 8	5 3	11 5	9 6	6 4	5 0
TOTAL USERS	100 0%	100 0%	100 0%	100 0%	100 0%	100 0%	100 0%

Average Number of Items Mailed Annually

The number of items mailed annually varies with type of mailing and obviously the size of membership, etc However, the average organization in our sample mails out more than 30,000 pieces in general mailings, and more than 50,000 promotion pieces

Magazines, however, represent the largest numbers of all mailings -- 67,333

AVERAGE NUMBER OF ITEMS MAILED ANNUALLY

COMMUNICATIONS TECHNIQUE	AVERAGE *NUMBER OF ITEMS ANNUALLY
General Mailings	31,291
Newsletters - Mail	25,788
Magazines - Mail	67,333
Promotions - Mail	52,392
Surveys - Mail	15,273
Ballots	16,470
Renewals	41,017

* Mean Average

Mail Usage by Size of Membership

The degree to which the communications facilities and techniques are used will vary according to size and type of organization

While most larger organizations are more likely to have general mailings, magazines, promotions, ballots and renewals, smaller organizations are as likely to use the mails for surveys as are the very large ones Those organizations having 50-100,000 members mention the mails least, but at a level of better than 50% for general mailings For Newsletters, 62% of the 25-50,000 member organizations was mentioned At the low end, only 40% of those with less than 25,000 mention magazines Almost 2/3 of the largest organizations mention Promotions as compared to almost 1/3 of those with memberships of 50-100,000

USAGE OF COMMUNICATIONS TECHNIQUES

BY SIZE OF MEMBERSHIP

COMMUNICATIONS TECHNIQUES	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 Up (19)	* No Answer (53)
	%	%	%	%	%	%
General Mailings	72 0	78 2	76 2	53 9	89 4	56 6
Newsletters - Mail	63 8	71 3	61 9	76 9	68 4	45 3
Magazines - Mail	45 9	41 6	61 9	76 9	84 2	26 4
Promotions - Mail	37 7	40 6	47 6	30 8	63 2	20 8
Surveys - Mail	35 3	41 6	29 0	30 8	42 1	28 3
Ballots - Mail	22 7	27 7	33 3	23 1	36 8	3 8
Renewals - Mail	38 2	39 6	47 6	46 2	63 2	20 8

*Respondent indicated usage but did not indicate size of membership

Mail Usage by Organization Purpose

Club and Hobby organizations tend to use the mails more than the others Primarily, they use it for general mailings and magazines and to a much greater degree than the other organizations

Newsletters are mentioned equally by those organizations based on employment or occupation, the Activist social organizations as well as Club and Hobby groups

Mail promotions are mentioned by more than half of the Club and Hobby organizations and almost 2/3 of those concerned with employment

Ballots and Renewals are mentioned most often by Club and Hobby groups with the employment organizations the next largest user

USAGES OF COMMUNICATIONS TECHNIQUES

BY PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	%	%	%	%	%	%	%
General Mailings	72 0	77 8	77 8	62 6	75 8	94 1	79 4
Newsletters - Mail	63 8	77 8	72 7	54 9	63 6	70 6	76 5
Magazine - Mail	45 9	44 4	45 5	26 4	57 6	94 1	61 8
Promotions - Mail	37 7	55 6	27 3	25 3	42 4	52 9	61 8
Surveys - Mail	35 3	33 3	27 3	37 4	27 3	35 3	44 1
Ballots - Mail	22 7	44 4	13 6	8 8	30 3	52 9	38 2
Renewals - Mail	38 2	44 4	18 2	31 9	42 4	58 8	52 9

* Respondent indicated usage but did not indicate purpose of organization

MAIL COSTS

The greatest amount of money spent annually by these non-profit organizations is on Magazines As expected, this expenditure tends to increase with size of membership Obviously, the more members an organization has, the more magazines it must distribute the higher the cost

Overall, the average non-profit organization in our survey reports spending $42,235 annually on Magazines However, those organizations with 100,000 or more members spend $92,645 annually on magazines (We must add a word of caution Some organizations may have listed mail charges alone In any event these data represent only those organizations that volunteered the information in this questionnaire)

With regard to mailings generally, costs will vary with size of membership, number of times a mailing is made annually, the size of the mailing, postal costs, etc Nevertheless, the amount of dollars involved is not insubstantial — even for the organizations in this sample

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY SIZE OF MEMBERSHIP

	TOTAL	Under 25,000	25,000-50,000	50,000-100,000	100,000 & Up	No Answer *
	(207)	(101)	(21)	(13)	(19)	(53)
	$	$	$	$	$	$
General Mailings	13,765	6,943	3,950	6,250	40,772	21,845
Newsletters - Mail	6,845	5,453	8,107	5,916	21,000	3,763
Magazine - Mail	42,235	26,887	35,275	51,300	92,645	32,704
Promotions - Mail	13,557	5,809	54,812	—	27,071	11,055
Surveys - Mail	1,372	668	1,500	125	5,375	1,302
Ballots - Mail	1,486	1,065	1,895	375	2,230	3,150
Renewals - Mail	4,674	2,534	4,911	6,500	8,305	6,431

*Respondent indicated costs but did not indicate size of membership

Overall, Educationally oriented organizations spend more money on the average for general mailings than others -- $24,188 annually versus $13,765 for the average

Newsletters expenditures annually average $6,845 for all organizations which mail them But organizations conceived with employment or occupations spend an average of $16,433 annually Educational groups are the next highest spenders for newsletters -- $10,778

Magazines are the major expenditure of all groups, averaging $42,235 But the Employment and Educational organizatons spend the most money on the average -- $59,732 and $58,922 respectively

The organizations conceived with Clubs and Hotties spend more on Promotions than any other -- $24,875 vs $13,557 for the average

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	$	$	$	$	$	$	$
General Mailings	13,765	1,500	1,750	12,061	24,188	6,568	19,446
Newsletters - Mail	6,845	14,500	2,175	2,641	10,778	1,750	16,433
Magazine - Mail	42,235	104,166	15,700	21,855	58,922	29,841	59,732
Promotions - Mail	13,557	20,000	9,125	3,658	9,818	24,875	11,550
Surveys - Mail	1,372	6,250	125	1,606	1,196	188	1,958
Ballots - Mail	1,486	4,375	50	1,568	250	115	3,093
Renewals - Mail	4,674	20,000	—	3,693	5,721	4,813	4,050

* Respondent indicated costs but did not indicate purpose of organization

TELEPHONE

Long distance telephone calls are the primary means of communication between the organization's headquarters and its membership or with other organizations

As we noted previously, 82% say they use long distance telephone More than half of those responding on the question of frequency of usage, say they make long distance calls daily, with another fifth using it at least once a week but not daily

WATS lines, Tie lines and Leased lines when available, also tend to be used on a daily basis (It would seem that if the service is available there will be daily use) However, only 40 of the 207 organizations (19%) say they have WATS lines, and only 19 indicated the degree of usage

Leased lines are used by 31 organizations (15%) with 22 indicating frequency of usage

TELEPHONE USAGE

	Long Dist (170)	WATS Line (40)	Tie Line (19)	Leased Line (31)
1 time per week	2 9%	2 5%	--%	6 5%
2 times per week	4 1	7 5	—	9 7
3 times per week	2 9	5 0	5 3	3 2
4 times per week	2 4	2 5	—	3 2
Daily	34 1	30 0	52 6	29 0
12-40 time/year	4 7	--	5 3	6 5
12 times or less/year	3 5	—	—	3 2
Often, Frequently	1 2	—	—	3 2
Network	—	—	—	6 5
No Answer	44 1	52 5	36 8	29 0
	100 0%	100 0%	100 0%	100 0%

*Respondent indicated usage but did not indicate frequency

The data on number of calls made was submitted by only 34 (20%) of the 170 organizations that responded affirmatively to the question of long distance telephone usage Of these, more than 2/3 (24) indicated they make less than 500 calls per year

Tie lines were predominant among communications organizations, i e Radio and TV stations

WATS are similarly used

LONG DISTANCE PHONE CALL USAGE

	Number of Calls Annually (170)
Less than 500	14 1%
500-999	1 8
1,000 - 2,499	1 8
2,500 - 4,999	1 2
5,000 - 9,999	0 6
10,000 - 24,999	0 6
No Answer*	80 0

*Respondent indicated usage but did not indicate volume of usage

Telephone Usage by Size of Membership

While 82 1% of the respondent organizations indicate they use long distance telephone service to communicate with members and other organizations, the degree of usage seems to vary. For example, all of the organizations in our sample with 25,000-50,000 members, say they use long distance as compared to 73 7% of those with 100,000 or more members WATS lines are used almost equally by these two groups, while only 7 7% of those with 50,000-100,000 members say they use WATS lines

Tie lines are used least by the smaller organizations while Leased lines are used most

USAGE OF COMMUNICATIONS TECHNIQUES

BY SIZE OF MEMBERSHIP

COMMUNICATIONS TECHNIQUE	TOTAL (207)	Under 25,000 (101)	25 000-50,000 (21)	50,000-100,000 (13)	100,000 Up (19)	No Answer (53)
	%	%	%	%	%	%
Long Distance - Phone	82 1	84 2	100 0	92 3	73 7	71 7
Wats Lines - Phone	19 3	19 8	28 6	7 7	31 6	13 2
Tie Lines - Phone	9 2	5 9	19 0	15 4	10 5	9 4
Leased Lines - Phone	15 0	16 8	9 5	0 0	5 3	20 8
Foreign Exchange - Phone	1 0	0 0	4 8	0 0	0 0	1 9

*Respondent indicated usage but did not indicate size of membership

Telephone Usage by Organization Purpose

As was true with mails, the Club and Hobby organizations and those concerned with employment mention Long Distance phone calls most often -- 94 1%

However, even for the group with the lowest mention of usage -- the educational group -- 3/4 mention long distance phone calls as one of the means by which they communicate with their members and other organizations

In effect, almost all organizations use long distance phone service

In addition, substitute services for long distance, such as WATS lines, Tie lines, Leased lines and Foreign Exchange lines are used

WATS Lines are mentioned most often (about 25%) by the Social Active, Club and Hobbies and Employment oriented groups Tie Lines by the Communications, Educational and Clubs and Hobbies organizations

Leased Lines by Communications Organizations (primarily Radio and TV stations)

USAGES OF COMMUNICATIONS TECHNIQUES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	%	%	%	%	%	%	%
Long Distance - Phone	82 1	88 9	81 8	78 0	75 8	94 1	94 1
Wats Lines - Phone	19 3	22 2	27 3	16 5	15 2	23 5	23 5
Tie Lines - Phone	9 2	0 0	0 0	14 3	12 1	11 8	0 0
Leased Lines - Phone	15 0	0 0	4 5	30 8	6 1	0 0	0 0
Foreign Exchange - Phone	1 0	0 0	0 0	1 1	3 0	0 0	0 0

* Respondent indicated usage but did not indicate purpose of organization

Telephone Costs By Size of Membership

With regard to Telephone costs, generally the larger the organization the greater the expenditure The average expenditure for long distance phone calls was $7,432 but for those organizations with 100,000 or more members, the average was $12,650 With regard to WATS lines costs, the small number of replies from organizatons with 25,000-50,000 members may be responsible for the large expenditure shown and it may just be a sample distortion Nevertheless, the average WATS line expenditure is $36,330 per year, with the 25,000-50,000 member organizations spending $101,250 annually

However, for the small groups generally, there seems to be an increase in WATS, Tie and Leased line usage apparently as compensation for the lower long distance costs and perhaps to supplement the long distance usage

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY SIZE OF MEMBERSHIP

	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 & Up (19)	No Answer* (53)
	$	$	$	$	$	$
Long Distance - Phone	7,432	5,713	9,607	9,722	12,650	8,375
Wats Lines - Phone	36,330	29,363	101,250	2,500	4,000	43,875
Tie Lines - Phone	1,500	2,000	875	250	4,000	500
Leased Lines - Phone	21,270	32,372	9,500	--	1,500	6,625
Foreign Exchange - Phone	750	—	--	—	--	750

* Respondent volunteered cost information but did not list size of organization

Telephone Costs By Organization Purpose

Although Long Distance telephone usage ranks highest with all organizations, the costs vary Those organizations oriented toward Employment spend the most on the average — $13,888 The Social Active organizations spend $8,538 on the average annually

WATS Lines, also used by fewer organizations averages out at a much higher cost — $36,330 The Employment oriented organizations spend considerably more than all the others, averaging $119,750 The Social Active average $56,000 annually

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer * (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	$	$	$	$	$	$	$
Long Distance - Phone	7,432	11,333	8,538	3,311	5,500	5,312	13,888
WATS Lines - Phone	36,330	--	56,000	8,125	3,666	4,000	119,750
Tie Lines - Phone	1,500	--	—	1,836	250	4,000	--
Leased Lines - Phone	21,270	--	4,000	1,483	100,750	--	—
Foreign Exchange - Phone	750	00	—	750	--	--	—

* Respondent volunteered cost information but did not indicate purpose of organization

NATIONAL AND REGIONAL MEETINGS

More than half of the organizations in our survey have National and Regional Meetings The average number of attendees annually is 1294 Organizations with 20 or more chapters and 25,000-100,000 members are more likely to have such meetings than the others Business and Labor groups are more likely to have such meetings (85%) as compared to 70% of the Club and Hobby organizations and half of the socially oriented and educational groups At the low end, fully 40% of the Communications oriented groups also utilize National and Regional Meetings

For Training Meetings, slightly more than a quarter of the non-profit organizations report usage with the average number of attendees annually 1384 Organizations with 50,000-100,000 members and 20 to 50 chapters are more likely to use them Also, organizations oriented to business and labor are most likely to have training meetings, followed by those with interest in hobbies and fraternal activities

However, as the degree of usage indicated, the responses show a disparity in the number of attendees to these meetings For National/Regional Meetings the greatest attendance is derived from those organizations with fewer than 50,000 members On the other hand, for training meetings, those organizations with fewer than 25,000 members and 100,000 or more members show the greatest attendance

These meetings are more likely to be held once or twice a year In the questionnaire we did not differentiate between National and Regional, and therefore, we must expect some overlap in the answers We might expect Regional meetings to be held more frequently than one or two times per year, although perhaps not that often for any one region

It is therefore, conceivable that some of the frequency responses apply to Regional meetings, while others apply to National

Thus, the range of frequency is from once a year to daily

FREQUENCY OF NATIONAL AND REGIONAL MEETINGS

	Nat/Reg Meetings (115)	Nat/Reg Training Meetings (55)
1 time per year	22 6%	16 4%
2 times per year	16 5	14 5
3 times per year	8 7	5 5
4 times per year	10 4	7 3
5 times per year	8 7	5 5
7-11 times per year	7 8	14 5
Monthly (12-15)	7 8	—
16-24 times/year	1 7	1 8
Weekly	4 3	10 9
Daily	1 7	7 3
Varies	—	3 6
No Answer*	9 6	12 7
	100 0%	100 0%

* Respondent indicated usage of meetings but did not indicate frequency

NUMBER OF ATTENDEES

NATIONAL REGIONAL MEETINGS

Size of Membership	National/Regional Meetings (115)	National/Regional Training Meetings (55)
Under 25,000	1,668	2,118
25,000-49,999	1,525	719
50,000-99,999	238	238
100,000 or more	231	2,075
Average	1,294	1,384

USAGE OF COMMUNICATIONS TECHNIQUES

BY SIZE OF MEMBERSHIP

COMMUNICATIONS TECHNIQUES	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 Up (19)	No Answer* (53)
	%	%	%	%	%	%
Natl/Regional Meetings	55 6	56 4	71 4	92 3	57 9	37 7
Natl/Regl Traing Meetgs	26 6	26 7	28 6	53 8	36 8	15 1

*Respondent indicated usage but did not indicate size of membership

USAGES OF COMMUNICATIONS TECHNIQUES

BY PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communications (91)	Educational (33)	Clubs & Hobbies (17)	Employment (34)
	%	%	%	%	%	%	%
National/Regional Meetgs	55 6	77 8	54 5	40 7	51 5	70 6	85 3
Natl/Regl Traing Meetgs	26 6	33 3	31 8	14 3	24 2	41 2	50 0

*Respondent indicated usage of meetings but did not indicate purpose of organization

Average Annual Cost for Meetings By Size of Organization

Expenditures for National and Regional Meetings, both the regular and for Training purposes, tend to increase with the size of the organization, with the exception of those organizations having 50-100,000 members The responses from organizations of that size show the lowest annual expenditures for such meetings Compared with the average organizational expenditure of $34,527 for regular meetings, and $48,089 for training meetings, the 50-100,000 member group averages $21,083 and $3,438 respectively

The largest expenditures for meetings is made by those with 100,000 or more members, averaging $50,694 annually for Regular National/ Regional Meetings and $56,313 for Training Meetings

The trend for expenditures is even more evident when we compare meeting costs by number of chapters within the organization Thus, organizations with 50 or more chapters spend $48,397 for regular meetings and $76,613 for Training Meetings Those with fewer than 20 chapters spend $6,857 and $1,107 respectively

ANNUAL

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY SIZE OF MEMBERSHIP

	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 & Up (19)	No Answer* (53)
	$	$	$	$	$	$
National/Regional Meetings	34,527	31,699	45 000	21,088	50,694	31,523
National/Regional Training Meets	48,089	25,375	45,450	3,438	56,313	75,000

*Respondent volunteered cost information but did not list size of organization

Average Annual Cost of Meetings By Organization Purpose

Employment organizations, that is, those concerned with Business, Labor and the Professions, spend the most money on National and Regional Meetings and Training Meetings Whereas the average non-profit organization spends $34,527 annually for Regular Meetings, the Employment oriented groups spend $92,279 On Training Meetings, the Employment organization spends $125,625 compared with the average of $48,089

Educational Organizations are the next largest spenders for Meetings — $28,019 for regular National/Regional Meetings and $34,214 for Training Meetings

AVERAGE COSTS OF COMMUNICATION FACILITIES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi- cations (91)	Educa- tional (33)	Clubs & Hobbies (17)	Employ- ment (34)
	$	$	$	$	$	$	$
National/Regional Meetings	34,527	108,750	10,321	7,760	28,019	12,000	92,279
National/Reg Trang Meets	48,089	--	28,167	929	34,214	3,667	125,625

*Respondent volunteered cost information but did not list size of organization

ANNUAL

AVERAGE COSTS OF COMMUNICATION FACILITIES

NUMBER OF CHAPTERS

	TOTAL (207)	Under 20 (39)	20-49 (11)	50+ (55)	No Answer* (102)
	$	$	$	$	$
National/Regional Meetings	34,527	6,857	12,250	48,397	38,390
National/Regional Trng Meetings	48,089	1,107	28,333	76,613	58,000

*Respondents volunteered cost information but did not indicate number of chapters

AVERAGE COSTS OF COMMUNICATIONS FACILITIES

	TOTAL (207)	Gale's Assn (100)	NCCB (23)	Public Radio (43)	Public TV (26)
	$	$	$	$	$
Natl/Regional Meetings	34,527	51,644	15,200	594	6,714
Natl/Regl Trng Meetgs	48,089	66,412	3,500	667	1,417

Radio and TV Usage

Radio Tapes are mentioned by almost half of the Communications organizations (Public Radio Stations) But fully one quarter of the social active groups and more than a fifth of the educational also use Radio Tapes

TV Spots are mentioned by more than a third of the Social Active and almost a quarter of the Employment oriented organizations 18% of the Educational group mention TV Spot and 15% of the Communications Organizations

Usage of both media is spread However, the smaller size organization tend to use radio more and the larger Television Thus, a third of the organizations with fewer than 25,000 members use radio tapes, but 20% use TV

At the high end, 26% of those with 100,000 or more members use Radio and 31% use TV

USAGE OF COMMUNICATIONS TECHNIQUES

BY SIZE OF MEMBERSHIP

COMMUNICATIONS TECHNIQUES	TOTAL (207)	Under 25,000 (101)	25,000–50,000 (71)	50,000–100,000 (13)	100,000 Up (19)	No Answer* (53)
	%	%	%	%	%	%
Radio Tapes	31 9	32 7	9 5	23 1	26 3	43 4
Radio Closed Circuit	2 9	4 0	0 0	0 0	0 0	3 8
TV Spots	17 9	19 8	14 3	23 1	31 6	9 4
TV- Closed Circuit	10 1	9 9	14 3	0 0	10 5	11 3

*Respondent indicated usage but not size of membership

USAGES OF COMMUNICATIONS TECHNIQUES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	%	%	%	%	%	%	%
Radio Tapes	31 9	11 1	26 4	48 4	21 2	5 9	14 7
Radio-Closed Circuit	2 9	0 0	0 0	5 5	0 0	0 0	2 9
TV Spots	17 9	11 1	36 4	15 4	18 2	0 0	23 5
TV-Closed Circuit	10 1	11 1	4 5	13 2	9 1	0 0	11 8

*Respondent indicated usage but did not indicate purpose of organization

Radio and TV Costs

Television Spots are used primarily by non-profit organizations involved with Employment ($12,667) and those Socially Active ($8,875) Communications groups spend $6,813 annually for TV and Educational groups $4,000

Expenditures for Radio Tapes are $6,500 for Employment organizations and $3,681 for Communications

TV Closed Circuit, although used by only 10% of the sample is a high cost for those that use it Thus, those socially active organizations using TV Closed Circuit spend $17,500 a year for the service, Educational -organizations spend $11,167 and Employment $10,500

AVERAGE COSTS OF COMMUNICATION FACILITIES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	$	$	$	$	$	$	$
Radio Tapes	3,344	--	1,750	3,681	1,375	125	6,500
Radio-Closed Circuit	2,625	--	--	2,188	--	--	3,500
TV Spots	6,895	--	8,875	6,813	4,000	--	12,667
TV-Closed Circuit	10,212	17,500	17,500	4,208	11,167	--	10,500

*Respondent indicated usage but did not indicate purpose of organization

AVERAGE COSTS OF COMMUNICATIONS FACILITIES

	TOTAL (207)	Gale's Assn (100)	NCCB (23)	Public Radio (43)	Public TV (23)
	$	$	$	$	$
Radio Tapes	3,344	3,261	6,000	3,066	3,000
Radio-Closed Circuit	2,265	3,500	—	2,188	—
TV Spots	6,895	10,964	250	—	1,667
TV-Closed Circuit	10,212	8,167	125	—	11,875

AVERAGE COSTS OF COMMUNICATIONS FACILITIES

BY SIZE OF MEMBERSHIP

	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 & Up (19)	No Answer* (23)
Radio Tapes	$3,344	$2,478	$1,250	$ 500	$3,291	$5,666
Radio-Closed Circuit	2,625	2,187	—	—	—	3,500
TV Spots	6,895	4,861	4,000	—	17,500	17,500
TV-Closed Circuit	10,212	9,562	10,500	—	—	11,875

*Respondent volunteered cost information but did not list size of membership

Telegrams, Mailgrams, Telex, Telecopier

Telegram and Mailgram usage tends generally to increase with the size of the organizations Thus, 21% of the smaller organizations use Mailgrams as compared to 32% of those with 100,000 or more members Telegrams use rise from 24% to 32%

The greatest usage of Telegrams and Mailgrams appears to be made by the Employment oriented organizations More than half use Telegrams (vs 22% average) and almost a third use Mailgrams (vs 19% average)

Club and Hobby organizations are the second most frequent users -- 35% for Telegrams and 29% for Mailgrams

However, in terms of cost, by far the biggest users of mailgrams ($19,938) are the Social Active organizations They spend on the average more than all other groups combined

USAGE OF COMMUNICATIONS TECHNIQUES

BY SIZE OF MEMBERSHIP

COMMUNICATIONS TECHNIQUES	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 UP (19)	No Answer (53)
	%	%	%	%	%	%
Telex	9 7	8 9	14 3	7 7	15 8	7 5
Telecopier	5 7	4 0	9 5	15 4	0 0	7 5
Mailgrams	19 3	20 8	23 8	23 1	31 6	9 4
Telegrams	22 2	23 8	28 6	38 5	31 6	9 4

*Respondent volunteered cost information but did not list size of membership

USAGES OF COMMUNICATIONS TECHNIQUES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	%	%	%	%	%	%	%
Telex	9 7	0 0	0 0	13 2	6 1	0 0	17 6
Telecopier	5 7	11 1	4 5	6 6	6 1	5 9	2 9
Mailgrams	19 3	11 1	27 3	13 2	15 2	29 4	32 4
Telegrams	22 2	22 2	22 7	12 1	12 1	35 3	52 9

*Respondent indicated usage but did not indicate purpose of organization

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY SIZE OF MEMBERSHIP

	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 & Up (19)	No Answer * (53)
	$	$	$	$	$	$
Telex	4,844	1,350	2,625	12,500	10,500	6,312
Telecopier	1,361	1,208	125	2,375	—	1,250
Mailgrams	4,057	250	250	500	3,083	37,625
Telegrams	1,729	712	1,094	125	5,833	292

*Respondent indicated usage but did not size of membership

AVERAGE COSTS OF COMMUNICATIONS FACILITIES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	$	$	$	$	$	$	$
Telex	4,844	—	--	6,156	2,625	--	1,813
Telecopier	1,361	—	3,500	1,350	375	--	1,250
Mailgrams	4,057	--	19,938	1,194	250	250	250
Telegrams	1,729	625	375	125	375	208	3,222

AVERAGE COSTS OF COMMUNICATIONS FACILTIES

	TOTAL (207)	Gale's Assn (100)	NCCB (23)	Public Radio (43)	Public TV (26)
	$	$	$	$	$
Telex	4,844	1,813	125	—	6,781
Telecopier	1,361	1,250	—	1,792	688
Mailgrams	4,057	292	250	250	2,375
Telegrams	1,729	2,033	125	125	292

* Respondent volunteered cost information but did not list size of organization

Other Communications Techniques

The more esoteric communications services tend to be limited in use at the present time Thus, TV Slow Scan and Private Microwave seem to be mentioned only by Broadcast stations The same seems to be true of Cable TV, Satellite, Conferencing, etc

Data Transmission seems to get some use for Educational and Social Active organizations as well as Communications

USAGE OF COMMUNICATIONS TECHNIQUES

BY SIZE OF MEMBERSHIP

COMMUNICATIONS TECHNIQUES	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 Up (19)	No Answer * (53)
	%	%	%	%	%	%
TV Slow Scan	0 5	1 0	0 0	0 0	0 0	0 0
Pvt Microwave	3 4	4 0	4 8	0 0	0 0	3 8
Data Transmission	5 8	5 0	9 5	15 4	5 3	3 8

*Respondent volunteered usage but did not indicate size of membership

USAGES OF COMMUNICATIONS TECHNIQUES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	%	%	%	%	%	%	%
TV Slow Scan	0 5	0 0	0 0	1 1	0 0	0 0	0 0
Pvt Microwave	3 4	11 1	0 0	6 6	0 0	0 0	0 0
Data Transmission	5 8	0 0	4 5	5 5	9 1	0 0	8 8

* Respondent indicated usage but did not indicate purpose of organization

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY SIZE OF MEMBERSHIP

	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 & Up (19)	No Answer * (53)
	$	$	$	$	$	$
TV Slow Scan	—	—	—	—	—	—
Private Microwave	40,000	53,083	—	—	—	750
Data Transmission	46,928	57,166	83,750	—	—	3,500

*Respondent volunteered cost information but did not list size of membership

AVERAGE COSTS OF COMMUNICATION FACILITIES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	$	$	$	$	$	$	$
TV-Slow Scan	--	--	--		--	--	--
Pvt Microwave	40,000	150,000	--	3,333	--	--	--
Data Transmission	46,928	--	--	43,625	83,750	--	4,000

* Respondent indicated usage but did not indicate purpose of organization

AVERAGE COSTS OF COMMUNICATIONS FACILITIES

	TOTAL (207)	Gale's Assn (100)	NCCB (23)	Public Radio (43)	Public TV (2)
	$	$	$	$	$
TV-Slow Scan	--	--	--	--	--
Private Microwave	40,000	--	--	1,625	78,025
Data Transmission	46,928	77,000	4,000	2,500	61,667

USAGE OF COMMUNICATIONS TECHNIQUES

BY SIZE OF MEMBERSHIP

COMMUNICATIONS TECHNIQUES	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 Up (19)	No Answer * (53)
	%	%	%	%	%	%
Wire Services	1 4	1 0	0 0	0 0	5 3	1 9
TV Programming-Doc	1 4	2 0	0 0	0 0	0 0	1 9
Cable TV	2 4	4 0	0 0	0 0	0 0	1 9
Satellite	1 0	1 0	0 0	0 0	0 0	1 9
Conference, Network	1 0	1 0	0 0	7 7	0 0	0 0
Other	1 4	3 0	0 0	0 0	0 0	0 0

*Respondent indicated usage but did not indicate size of membership

USAGES OF COMMUNICATIONS TECHNIQUES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	%	%	%	%	%	%	%
Wire Service	1 4	0 0	4 5	2 2	0 0	0 0	0 0
TV Programming-Doc	1 4	0 0	4 5	2 2	0 0	0 0	0 0
Cable TV	2 4	0 0	0 0	4 4	3 0	0 0	0 0
Satellite	1 0	0 0	0 0	2 2	0 0	0 0	0 0
Conference, Network	1 0	0 0	0 0	2 2	0 0	0 0	0 0
Other	1 4	0 0	0 0	2 2	0 0	0 0	2 9

*Respondent indicated usage but did not indicate purpose of organization

AVERAGE COSTS OF COMMUNICATION FACILITIES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
	$	$	$	$	$	$	$
Wire Services	37,500	—	—	37,500	—	—	—
TV Programming-Doc	3,188	—	—	6,250	--	—	—
Cable TV	3,950	—	—	1,813	--	--	—
Satellite	5,625	—	—	2,500	--	--	--
Conferences, Network	1,062	—	—	375	--	--	--
Other	27,167	—	--	4,000	—	--	--

AVERAGE COSTS OF COMMUNICATION FACILITIES

BY SIZE OF MEMBERSHIP

	TOTAL (207)	Under 25,000 (101)	25,000-50,000 (21)	50,000-100,000 (13)	100,000 & Up (19)	No Answer* (53)
	$	$	$	$	$	$
Wire Services	37,500	—	—	—	—	37,500
TV Program-Doc	3,188	125	--	—	--	6,250
Cable TV	3,950	4,062	--	—	—	3,500
Satellite	5,625	2,500	--	—	--	8,750
Conferences, Network	1,062	1 750	—	375	—	—
Other	17,167	27,167	—	—	—	—

*Respondent volunteered cost information but did not list size of membership

Ranking of Communications Satellite Uses

After listing their present user and costs of present communications services and techniques, respondents were asked to rank the top five from a list of twelve, for which they would give first priorities if Satellite Service dedicated to non-profit organizations was made available to their organizations

In our analysis, we assigned a point value to the top three rankings The service with the highest score would be first choice Second highest score would be second choice Etc We arbitrarily assigned a value of 7 points to 1st choice, 5 points to 2nd choice, 3 points to 3rd choice and 2 points to those people who just indicated check marks despite the instructions to give a numerical choice

On this basis, Long Distance telephone service would be given first priority by all organizations, large and small, and regardless of purpose for which organization exists

The second choice varies with organization purpose and size Thus, those organizations with 100,000 or more members selected telecopier second and telegram third The 50-100,000 group chose Data Transmission second and National and Regional Meetings third The organizations having 25-50,000 members were equally divided for second place between Telegram and Telex Those with fewer than 25,000 selected Radio and Television, but this is probably due to the weighting of the sample for Public Radio and TV Stations

PRIORITY RANK SCORE OF COMMUNICATIONS SATELLITES USES

NUMBER OF MEMBERS

	TOTAL	Under 25,000	25,000-50,000	50,000-100,000	100,000 & up	No Answer*
	(207)	(101)	(21)	(13)	(19)	(53)
Long Distance- Phone	4 0	4 3	6 1	4 9	4 2	2 5
Radio	1 4	1 4	0 0	0 8	0 0	2 4
Television	1 1	1 3	0 3	0 9	0 7	1 3
Meetings-Natl/Regional	1 0	1 1	0 8	1 4	0 8	0 4
Data Transmission	0 8	0 8	0 5	1 5	0 8	0 6
TV Closed Circuit	0 7	0 8	0 8	0 0	0 4	0 8
Mailgrams	0 6	0 7	0 6	1 1	0 4	0 1
Telex	0 4	0 4	1 1	-	0 4	0 4
Telecopier	0 4	0 4	0 4	0 0	1 0	0 3
Telegram	0 4	0 3	1 1	0 8	0 9	0 1
Radio Closed Circuit	0 3	0 2	0 0	0 0	0 2	0 8
TV Slow Scan	0 0	0 1	0 0	0 0	0 0	0 0

Note Respondents were asked to rank the first five communications techniques for satellite use from among those listed

A point value was assigned to the top three rankings to yield an overall priority ranking for the study
- 1st place was assigned 7 points
- 2nd place was assigned 5 points
- 3rd place was assigned 3 points

Some respondents did not give a numerical ranking They just checked techniques Checks were given a value of two points

*Respondents indicated priority rankings but did not indicate size of organization

After Long Distance Telephone use, the Social Active organizations would utilize Satellite Service for National and Regional Meetings as second choice and Television as third choice

Communications organizations as expected would select Radio and Television after Long Distance Telephone Service

Educational Groups would utilize Satellite Service for Long Distance Telephone service and then would select Data Transmission Third choice was a tie between Meetings and Mailgrams

The organizations involved with Clubs and Hobbies chose Meetings second and Telegrams third, after Long Distance Telephone Service

The Employment oriented organizations selected Long Distance Telephone Service first, Telex second, Mailgrams third and National and Regional Meetings fourth as their Satellite Service priorities

PRIORITY RANK SCORE OF COMMUNICATIONS SATELLITES USES

PURPOSE OF ORGANIZATION

	TOTAL (207)	No Answer* (9)	Social (22)	Communi-cations (91)	Educa-tional (33)	Clubs & Hobbies (17)	Employ-ment (34)
Long Distance - Phone	4 0	2 7	3 3	3 4	4 1	6 1	5 6
Radio	1 4	0 3	0 6	2 75	0 4	0 0	0 2
Television	1 1	1 1	1 0	1 9	0 4	0 0	0 4
Meetings/Natl/Regional	1 0	0 0	1 1	1 0	0 8	1 8	1 1
Data Transmission	0 8	0 6	0 6	0 8	1 4	0 6	0 7
TV Closed Circuit	0 7	0 8	0 3	1 0	0 3	0 6	0 4
Mailgrams	0 6	0 6	0 3	0 2	0 8	0 9	1 2
Telex	0 4	0 0	0 4	0 3	0 2	0 3	1 3
Telecopier	0 4	0 0	0 0	0 6	0 2	0 2	0 0
Telegram	0 4	0 0	0 0	0 2	0 5	1 1	1.0
Radio Closed Circuit	0 3	0 0	0 0	0 6	0 2	0 2	0 0
TV Slow Scan	0 0	0 0	0 0	0 1	0 0	0 0	0 0

Note Respondents were asked to rank the first five communications techniques for satellite use from among those listed

A point value was assigned to the top three rankings to yield an overall priority ranking for the study
1st place was assigned 7 points
2nd place was assigned 5 points
3rd place was assigned 3 points

Some respondents did not give a numerical ranking They just checked techniques Checks were given a value of two points

*Respondents indicated priority rankings but did not indicate purpose of organization

When rankings are analyzed by number of chapters in the organization, National and Regional Meetings are second to Long Distance Telephone at each level Third choice is Television for those with fewer than 20 chapters and those with 20 - 49 chapters However, for those organizations with 50 or more chapters, third choice is Mailgrams

PRIORITY RANK SCORE OF COMMUNICATIONS SATELLITES USES

NUMBER OF CHAPTERS

	TOTAL (207)	Under 20 (39)	20 - 49 (11)	50+ (55)	No Answer* 102
Long Distance - Phone	4 0	4 1	4 0	5 5	3 3
Radio	0 3	0 5	0 0	0 1	0 5
Television	1 1	1 4	0 8	0 3	1 4
Meetings-Natl/Regional	1 0	1 6	1 3	1 3	0 6
Data Transmission	0 8	0 5	0 3	0 9	0 8
TV Closed Circuit	0 7	0 7	0 2	0 3	0 9
Mailgrams	0 6	0 7	0 2	1 2	0 2
Telex	0 4	0 3	0 6	0 5	0 5
Telecopier	0 4	0 5	0 2	0 3	0.5
Telegram	0 4	0 3	0 5	0 9	0 2
Radio Closed Circuit	0 3	0 5	0 0	0 1	0 5
TV Slow Scan	-	0 1	-	-	-

Note Respondents were asked to rank the first five communications techniques for satellite use from among those listed

A point value was assigned to the tope three rankings to yield an overall priority ranking for the study
1st place was assigned 7 points
2nd place was assigned 5 points
3rd place was assigned 3 points.

Some respondents did not give a numerical ranking They just checked techniques Checks were given a value of two points

*Respondent indicated priority ranking but did not indicate number of chapters

Other Uses of Satellite Service

After ranking the kinds of services they would give first priorities to if Satellite Service dedicated to non-profit organizations were made available, our respondents were asked, "To what other uses, if any, would you put the satellite service, if it were made available to your organization ?"

39 respondents (19%) offered suggestions The use of the Satellite Service for Training and Education was, by far, the most frequent mention (5 8) Networking was mentioned next most often by 3 9% Increased communications by 2 4% and use for meetings and conferences by 1 9%

The use to which these respondents would put a satellite service is seen more clearly by looking at what they say, rather than just looking at the numbers For example, one looks at satellite service as a means of offering "at-home training to professionals in our field " This same individual thought "it might provide a system for the delivery of care to the isolated elderly "

One thought of satellite service as an "education, health and community development resource sharing on an international basis "

Still another thought it might be useful for "research in rural areas -- health and education "

OTHER USES OF SATELLITE SERVICE

Suggested Uses of Satellite Service	Number	Per Cent
Training and Education	12	5 8%
Meetings & Conferences	4	1 9
Increased Communication	5	2 4
Information to Rural Areas	3	1 4
Networking	8	3 9
Alternate News Coverage	1	0 5
Cheaper, Faster Communication	3	1 4
15KC, Stereo	2	1 0
Library Access	1	0 5
No Answer	168	81 1
	207	100 0%

Responses to Question on "Other Uses of Satellite Service"

"Basic information transmission such as transferring mailing lists, shipping information, etc -- computer input." (007)

"We are in need of satellite services for international communications primarily for example, to tie together affiliated project groups in the USA, Germany, Canada, Australia and Japan, where telephone and HF Amateur radio are primarily now used " (136)

"It would permit us to offer at-home training to professionals in our field It might also provide a system for the delivery of care to the isolated elderly (011) "

"Education, health and community development resource sharing on an international basis " (144)

"Networking (syndicating) non-commercial radio programming (also TV) " (110)

"To better carry out the mission of channel in responsible public television broadcasting of educational, community affairs, and cultural programs -- including broadcast of college-credit TV courses " (115)

"International and National Public Access Cable Television -- Two way programming for public experimentation and use Library Access Massachusetts Open University Free School Instructional Television Health Services " (138)

"We already have two satellites of our own that we built Both work just fine, and do our job well " (109)

Note: Numbers in parentheses indicate interview numbers

"All Nome Communications are on RCA Satcom I We currently lease two lines One for our national network servie, one for A-P teletype Can't see any other immediate use, though we'd sure like to see a reduction of charges' " (153)

" Public education programs via radio/television " (027)

" Unknown However, we are looking for a way to extend superior faculty output to more people " (019)

" One of our long range plans is to cooperate in an international information exchange utilizing our computer capabilities " (018)

" Electronic mail services " (017)

" Continuing education programs and in service programs for union careers, and inter-regional services by specialists on various fields and a demonstration center and tie in with non-commercial use of community cable!" (015)

' Radio, meetings " (051)

" Two-way seminars or review sessions -- TV or phone " (044)

" Invitations to congressional and military leaders to address thousands of Reserve officers via TV " (038)

" Research in rural areas -- health and education "(035)

" Conference calls across the U S /Canada for needed imput to programs " (032)

"For video links between schools, media groups, and cable systems, Perhaps for alternative news coverage by hooking cable systems in cities together " (062)

"Increased communications " (055)

"Would depend upon possibilities offered -- our needs at that time of availability of cheaper and faster means of communications " (086)

"Intercontinental Public radio networks-- Many languages or inter-continental and intracontinental public television "(045)

"Radio network planned for late 1976 start "(048)

"Stereo 15KC transmission "(043)

"Basic feature is immediate access to programs that are too timely for mail and too expensive for phone (line or dial) connections Music quality 15KC would be nice for some programs 5KC very adequate for most " (107)

"Conference calls " (094)

"Conduct national meetings by TV or Radio " (078)

"PBS CPB are currently negotiating for public broadcasting satellite system "(205)

SAMPLE

SAMPLE

Source of List	Number Sent Out	Number Responded	Response Rate
Gale's Encyclopedia of Associations	897	100	11 1%
National Citizens Committee For Broadcasting (NCCB)	139	23	16 5
Educational Radio Stations	640	43	6 7
Educational Television Stations	215	26	12 0
Other	140	10	7 1
Don't Know (No indication of Derivation of Respondent	--	5	--
TOTAL	2,031	207	10 1%

SAMPLE

PURPOSE OF ORGANIZATION

	FREQUENCY	PERCENTAGE
Civic Affairs, Political Action, Voting	4	1 9%
Civil Defense War, Veterans Organizations	7	3 4
Communications, Media, P R	2	1 0
Community Services, Social Welfare Social Problems	91	44 0
Consumer Services	9	4 3
Cultural, Aesthetic, Artistic	2	1 0
Education	5	2 4
Labor Unions, Employment	14	6 8
Business Associations-non-professional	2	1 0
Professional rganizations	13	6 3
Family-Youth	17	8 2
Health	2	1 0
Fellowship, Social Clubs, Kinship	2	1 0
Racial, Ethnic	2	1 0
Conservation, Ecology	12	5 8
Scientific, Learned	2	1 0
Religious	3	1 4
Agricultural	11	5 3
Sports & Hobbies	1	0 5
Fraternal	1	0 5
Law Enforcement	1	0 5
Philanthropic	1	0 5
Miscellaneous	1	0 5
No Answer, Don't Know	4	1 9

FILE NFLPISA (CREATION DATE = 05/18/76)

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * *
VAR150 PURPOSE OF ORGANIZATION SCALE BY VAR109 SOURCE OF MAILING LIST
* PAGE 1 OF 1

VAR109

VAR150 — COUNT / ROW PCT / COL PCT / TOT PCT	BLANK 0	GALE ENC ASSNS 75 1	NCCR 2	PUBLIC RADIO 3	PUBLIC TV 4	OTHER 6	ROW TOTAL
0 BLANK-NO ANSWER	2 22.2 40.0 1.0	5 55.5 5.0 2.4	0 0.0 0.0 0.0	1 11.1 2.3 0.5	1 11.1 3.8 0.5	0 0.0 0.0 0.0	9 4.3
1 SOCIAL	0 0.0 0.0 0.0	14 63.6 14.0 6.8	3 13.6 13.0 1.4	0 0.0 0.0 0.0	0 0.0 0.0 0.0	5 22.7 50.0 2.4	22 10.6
2 COMMUNICATIONS	1 1.1 20.0 0.5	4 4.4 4.0 1.9	20 22.0 87.0 9.7	40 44.0 93.0 19.3	23 25.3 88.5 11.1	3 3.3 30.0 1.4	91 44.0
3 EDUCATIONAL	0 0.0 0.0 0.0	27 81.8 27.0 13.0	0 0.0 0.0 0.0	2 6.1 4.7 1.0	2 6.1 7.7 1.0	2 6.1 20.0 1.0	33 15.9
4 CLUBS & HOBBIES	2 11.8 40.0 1.0	15 88.2 15.0 7.2	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	17 8.2
5 EMPLOYMENT	0 0.0 0.0 0.0	34 100.0 34.0 16.4	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	34 16.4
99 MISC	0 0.0 0.0 0.0	1 100.0 1.0 0.5	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 0.5
COLUMN TOTAL	5 2.4	100 48.3	23 11.1	43 20.8	26 12.6	10 4.8	207 100.0

CHI SQUARE = 135.93303 WITH 30 DEGREES OF FREEDOM SIGNIFICANCE = 0.0
CRAMER'S V = 0.43571
CONTINGENCY COEFFICIENT = 0.65425
LAMBDA (ASYMMETRIC) = 0.28648 WITH VAR150 DEPENDENT = 0.33645 WITH VAR109 DEPENDENT
LAMBDA (SYMMETRIC) = 0.30942
UNCERTAINTY COEFFICIENT (ASYMMETRIC) = 0.35142 WITH VAR150 DEPENDENT = 0.38544 WITH VAR109 DEPENDENT.
UNCERTAINTY COEFFICIENT (SYMMETRIC) = 0.36764
KENDALL'S TAU B = [illegible] SIGNIFICANCE = 0.0309
KENDALL'S TAU C = -0.32135 SIGNIFICANCE = 0.0000
GAMMA = -0.53954
SOMERS'S D (ASYMMETRIC) = -0.36[illegible] WITH VAR150 DEPENDENT = -0.36431 WITH VAR109 DEPENDENT
SOMERS'S D (SYMMETRIC) = -0.37902
ETA = [illegible] WITH VAR150 DEPENDENT = 0.60449 WITH VAR109 DEPENDENT

VISA STUDY FILE CREATION THREE 05/18/76 PAGE 455

FILE NFLPISA (CREATION DATE = 05/18/76)

* * * * * * * * * * * * * * * * * * C R O S S T A B U L A T I O N O F * * * * * * * * * * * * * * * * *
VAR149 NUMBER OF MEMBERS SCALE BY VAR109 SOURCE OF MAILING LIST
* PAGE 1 OF 1

VAR109

VAR149 — COUNT / ROW PCT / COL PCT / TOT PCT	BLANK 0	GALE ENC ASSNS 75 1	NCCR 2	PUBLIC RADIO 3	PUBLIC TV 4	OTHER 6	ROW TOTAL
1 UNDER 24,999	2 2.0 40.0 1.0	47 46.5 47.0 22.7	13 12.9 56.5 6.3	19 18.8 44.2 9.2	13 12.9 50.0 6.3	7 6.9 70.0 3.4	101 48.8
2 25,000 -49,999	1 4.8 20.0 0.5	17 81.0 17.0 8.2	0 0.0 0.0 0.0	0 0.0 0.0 0.0	3 14.3 11.5 1.4	0 0.0 0.0 0.0	21 10.1
3 50,000 -99,999	1 7.7 20.0 0.5	10 76.9 10.0 4.8	0 0.0 0.0 0.0	1 7.7 2.3 0.5	1 7.7 3.8 0.5	0 0.0 0.0 0.0	13 6.3
4 100,000 & UP	0 0.0 0.0 0.0	18 94.7 18.0 8.7	0 0.0 0.0 0.0	0 0.0 0.0 0.0	1 5.3 3.8 0.5	0 0.0 0.0 0.0	19 9.2
9 BLANK-NO ANSWER	1 1.9 20.0 0.5	8 15.1 8.0 3.9	10 18.9 43.5 4.8	23 43.4 53.5 11.1	8 15.1 30.8 3.9	3 5.7 30.0 1.4	53 25.6
COLUMN TOTAL	5 2.4	100 48.3	23 11.1	43 20.8	26 12.6	10 4.8	207 100.0

CHI SQUARE = 66.66177 WITH 20 DEGREES OF FREEDOM SIGNIFICANCE = 0.0000
CRAMER'S V = 0.28374
CONTINGENCY COEFFICIENT = 0.49355
LAMBDA (ASYMMETRIC) = 0.03774 WITH VAR149 DEPENDENT = 0.14019 WITH VAR109 DEPENDENT.
LAMBDA (SYMMETRIC) = 0.08920
UNCERTAINTY COEFFICIENT (ASYMMETRIC) = 0.14974 WITH VAR149 DEPENDENT. = 0.13880 WITH VAR109 DEPENDENT.
UNCERTAINTY COEFFICIENT (SYMMETRIC) = 0.14360
KENDALL'S TAU B = 0.08269 SIGNIFICANCE = 0.0811
KENDALL'S TAU C = 0.07060 SIGNIFICANCE = 0.0811
GAMMA = 0.12014
SOMERS'S D (ASYMMETRIC) = 0.08156 WITH VAR149 DEPENDENT = 0.08383 WITH VAR109 DEPENDENT
SOMERS'S D (SYMMETRIC) = 0.08268
ETA = 0.22060 WITH VAR149 DEPENDENT = 0.38006 WITH VAR109 DEPENDENT.

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TK 5104.2.P75 U79 1977
/Wolff, Edward A./
Public service
communications satellite
user requirements workshop