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LEVEL III

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COST EFFECTIVENESS PROGRAM PLAN FOR JOINT TACTICAL COMMUNICATIONS

VOLUME III

LIFE CYCLE COSTING

APPENDIX F
COMPUTER MODELS FOR LCC

JUNE 1978

USA-USN-USAF-USMC

JOINT TACTICAL COMMUNICATIONS OFFICE
FORT MONMOUTH, N.J.

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This appendix has been revised to update and correct some of the factors and cost estimating relationships (CER's) contained in the 1976 issue. This revision describes and documents computer models for CER's and presents sample life cycle cost calculations using the models. It also includes a revised FORTRAN IV Program User's Guide incorporating military personnel and training costs as part of it's costing methodology. The TRI-TAC Life Cycle Cost Element Structures from Volume III is used for formatting output costs. New features have also been added which will assist in formatting the estimates in a manner suitable for CAIG/DSARC presentations.

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APPENDIX F

COMPUTER MODELS FOR LCC

Volume III

Life Cycle Costing

COST EFFECTIVENESS PROGRAM PLAN
FOR
JOINT TACTICAL COMMUNICATIONS

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June 1978

Joint Tactical Communications Office
Fort Monmouth, New Jersey

SOURCE OF ADDITIONAL INFORMATION

ON

APPENDIX F

This document on Computer Models for Life Cycle Cost estimating has been prepared by the staff of the Operations Research Division, Operations Research, Test and Analysis Directorate, TRI-TAC Office.

Questions on Life Cycle Costs and the TRI-TAC Models may be directed to the following individuals.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDIX F

COMPUTER MODELS FOR LCC

1.0 INTRODUCTION

1.1 Background

The Cost Effectiveness Program Plan (CEPP) for Joint Tactical Communications provides guidance and instructions to the Services and Agencies for conducting cost effectiveness studies, economic analyses, trade-offs, and other program management and planning studies associated with TRI-TAC architectural and equipment acquisitions. There are currently nineteen TRI-TAC equipment programs assigned, respectively, for development and procurement to the Army, Air Force, Navy, Marine Corps and National Security Agency. Vol III, Life Cycle Costing of the CEPP, provides a cost element work breakdown structure and methodology for estimating and analyzing elements of LIfe Cycle Costs (LCC) on a common and consistent Joint Service and Agency basis for these programs.[1]

Several Appendices have been added to Vol III. Appendices A thru C, which were included in Vol III, present cost element definitions and operating and support cost estimating relationships (CER's). Appendices D and E, which have been published separately, present more details on Military Personnel costs and specialized alternative CER's for Transportation costs.

The CER's presented in Vol III and the Appendices thru E, have been structured into automated computerized models to assist the Services/Agencies in performing rapid and consistent computation of LCC. These models and their computer programs should be used in total or in part to estimate TRI-TAC equipment programs and systems costs.

1.2 Purpose

The purpose of this Appendix F is to describe and document these computer models and to present sample life cycle cost calculations using the models. The automated models primarily concentrate on O&S costs; however, complete life cycle costs are computed by using as inputs point estimates for R&D, Production and equipment unit production costs.

This Appendix has been revised to update and correct some of the factors and CER's contained in the TRI-TAC LCC Model programs presented in earlier issues of Appendix F. More importantly, some new features in the FORTRAN version have been added which assist in formatting the estimates in a manner suitable for CAIG/DSARC presentations.

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[1] Joint Tactical Communications Office, Cost Effectiveness Program Plan, Vol III, Life Cycle Costing, TTO-ORT-032-78C-V3, April 1978.

In addition, this revision includes a revised FORTRAN IV Program User's Guide (Annex I to this Appendix). The revised FORTRAN IV Program incorporates the Appendix D, Military Personnel and Training Costs as part of it's costing methodology and uses the TRI-TAC Life Cycle Cost Element Structures from Vol III for formatting it's output costs. [1]

The computer models, in various programmed versions, have been used on several specific planning and trade-off problems for the TRI-TAC Programs. These models are generally applicable to any communications equipment trade-off study or design optimization. In fact, they have found application by some Services for equipment programs outside of TRI-TAC.

It should be noted that several cost factors are stored in the computer programs. However, these and any other inputs can be easily changed when doing trade-off or sensitivity analyses.

1.3 Organization of Document

This Appendix is divided into three sections. Section 1 provides the basic purpose and organization of the document.

Section 2 presents the basic TRI-TAC LCC Model (LCCM) with the program as written for a Hewlett-Packard, HP-9821A.

Section 3 provides an expanded version of the LCCM program written for the Hewlett-Packard, HP-9821A. This version allows for acceptance of multiple input data at the Line Replaceable Unit (LRU) level for most of the CER's. New CER's are included for calculating Software Support Costs, Modification Costs, Replacement of Common Support Equipment Costs, and Technical Data Support Costs.

Annex I is the "TRI-TAC Life Cycle Cost Model, Program User's Guide." Annex I gives the instructions for operating the LCCM using a Hazeltine 2000 as a remote terminal in the B5500 Time Sharing System. Although this version of the TRI-TAC LCCM has been written for use with the Burroughs Time Sharing System, with only slight modification the program can be run on any system utilizing a FORTRAN IV Compiler.

1/ Ibid, Appendix D, Military Personnel and Training Costs, TTO-ORT-032-76A-V-APD, October 1976.

2.0 THE BASIC TRI-TAC LCCM

2.1 Cost and Data Elements

Life Cycle Costs, as used for planning and analysis of TRI-TAC equipment programs, comprises Research and Development (R&D)[1], Production Costs, and Operating and Support Costs. These broad categories and sub-elements are listed and defined in Vol III. CER's and input data requirements are also provided in Vol III, especially for many of the elements in the Operating and Support Costs Category.

The major categories and sub-elements have been detailed to the extent necessary to provide cost analysts and decision makers opportunities to gain insight into significant relationships Most important of these are relationships of equipment and system designs and the consequences or impacts on recurring and non-recurring cost elements of alternative choices or plans concerning these designs. Sensitivity analyses for ranges of possible alternative changes can now be explored more expeditiously.

Tables 1 to 3 provide listings of all of the cost elements from a total Life Cycle Cost Model point of view. These lists include the register location of that element for the Hewlett-Packard calculator. The same "R" coding is used in the equations, sample calculations and program listings that follow. Table 1 presents data constants. Table 2 presents data inputs, and Table 3 presents cost data outputs.

Cost analysts should note that cost elements associated with R&D and Production, including the basic Unit Procurement estimate, are throughputs. Detailed CER's using engineering parameters for these types of elements will be included as soon as Services/Agencies and their Program Offices of TRI-TAC equipment can assist in their preparation and release. Attention has been focused on O&S elements because of interest in the cost implications of alternative deployment and ILS schemes for total networks of equipment.

[1] Also called RDT&E.

TABLE 1

DATA CONSTANTS/ASSUMPTION
FOR THE BASIC TRI-TAC LCCM

R1.	Operating Hrs (2920 hrs/yr)
R2.	Depot Overhaul Rate (.20)
R3.	Transportation Cost Factor ($.50/lb)
R4.	Support Equipment Maintenance Factor (.10)
R5.	Repair Material Cost Factor (.05)
R6.	Years of Operation (10)
R7.	Holding Inventory Factor (.03)
R8.	Power Cost (0.04 $/kwh)
R60.	Transportation Cost Factor (.05)
R63.	Dist. A. (Org. to Int. Level) (25 mi)
R64.	Dist. B. (Int. to Depot Level) (3000 mi)
R65.	Transportation Factor A. (.001 $/lb/mi)
R66.	Transportation Factor B. (.0001 $/lb/mi)
R67.	Non-recurring Investment Cost Factor (.40)
R90.	Available Manhours per year (1656 hrs)

NOTE: Registers A, B, C, X, Y, and Z are used in the computer and in this Appendix for intermediate calculations where required.

TABLE 2

DATA INPUTS
FOR THE BASIC TRI-TAC LCCM

R9.	Equipment Quantity (#)
R10.	No. Operators/equipment (#)
R11.	Operator Cost ($/hr)
R12.	No. of new FSN (#)
R13.	Equipment Weight (lbs)
R14.	Avg Replacement Assembly (LRU) Cost ($)
R15.	MTTR (Org Level)(hrs)
R16.	MTBF (hrs)
R17.	LRU MTTR (Int or Depot Level)(hrs)
R18.	Unit Production Cost Est ($)
R19.	Quantity Used for UPC Est (#)
R20.	Learning Curve Slope (%)
R21.	Power Rating (kw)
R22.	Preventative Maintenance (hr/yr)
R24.	Material No. 1 Consumption Rate (units/yr/equip)
R25.	Material No. 1 Cost ($/unit)
R26.	Org Level Maintenance Personnel Cost ($/hr)
R27.	Discard Rate (decimal)
R28.	Int Level Maintenance Personnel Cost ($/hr)
R50.	Operational Facilities ($)
R51.	Equipment leaseholds ($)
R52.	Other Operating Costs ($)
R53.	Maintenance Facilities ($)
R54.	Contractor Services ($)
R55.	Supply Facilities ($)
R56.	Other Logistic Support Costs ($)
R57.	No. Depot Overhaul Personnel (#)
R61.	WT of Avg LRU (lbs)
R62.	WT of Repair Parts (lbs)
R71.	P2 (% of all failed LRU's to be repaired/discarded at Int level)(expressed as a decimal)
R72.	P3 (% of all failed LRU's to be repaired/discarded at Depot level)(expressed as a decimal)
R75.	Depot Personnel ($/hr)
R77.	Equipment Code
R78.	Iteration Number (for subsequent runs)
R200.	R&D Estimate
R312.	Peculiar Support Equipment Costs ($)
R321.	Other Non-recurring Production Costs ($)
R331.	Common Support Equipment Costs ($)
R343	Other Recurring Production Costs ($)

TABLE 3

COST DATA OUTPUT
FOR THE BASIC TRI-TAC LCCM

R23.	Inventory Management Cost ($)
R30.	Operations & Logistic Support Total ($)
R31.	Operations Cost ($ K)
R32.	Logistic Support Cost ($ K)
R33.	Energy Consumption Cost ($)
R34.	Material Consumption Cost Total ($)
R35.	Total Maintenance Personnel Cost ($)
R36.	Org Maintenance Personnel Cost ($)
R37.	Int Maintenance Personnel (LRU Repair) Cost ($)
R38.	Depot Maintenance Personnel (Depot Overhaul) Cost ($)
R39.	Support Equipment Maintenance Cost ($)
R40.	Spare Parts & Repair Material ($)
R41.	Operator Personnel Costs ($)
R42.	Supply Personnel Cost ($)
R43.	Inventory Administration Cost ($)
R44.	Transportation Cost ($)
R48.	Total Life Cycle Cost ($ K)
R49.	Unit Production Cost Calculated ($)
R68.	Inventory Holding Cost ($)
R70.	P1 (% failed LRU's discarded at Org. Level) (expressed as a decimal)
R73.	P21 (% failed LRU's discarded at Int. Level) (expressed as a decimal)
R74.	P22 (% failed LRU's repaired at Int. Level) (expressed as a decimal)
R300.	Total Production Cost ($ K)
R301.	Production Non-recurring ($ K)
R334.	Inventory Management ($)
R336.	Production Recurring ($ K)

2.2 LCC MODEL EQUATIONS

2.2.1 General

This section presents all of the equations used in the program. Each equation is shown as it was programmed using the coding format shown in Tables 1 through 3. An explanation and/or paragraph number from Volume III, Appendix A, is referenced for each equation so that analysts can obtain additional background information on the derivation of these equations.

2.2.2 Energy Consumption Cost (para 311)

$$R33 = R_{21} \times R_1 \times R_8 \times R_9$$

2.2.3 Material Consumption (para 312)

$$R34 = R24 \times R25$$

2.2.4 Operator Personnel (para 313 Alternate)

$$R41 = R11 \times R10 \times R9 \times R1$$

2.2.5 Maintenance Personnel Cost (para 321.1)

$$R35 = R36 + R37 + R38$$

where, [1]

$$R36 = \left[R22 + \left(\frac{R1 \times R15}{R16}\right)\right] \times R26 \times R9 \qquad \text{(para 321.11)}$$

and

$$R37 = \frac{R1 \times R9}{R16} \times \left[1 - R27\right] \times R17 \times R28 \qquad \text{(para 321.12)}$$

and

$$R38 = R57 \times R75 \times R90 \qquad \text{(para 321.13)}$$

2.2.6 Support Equipment Maintenance (para 321.3)

$$R39 = R4 \times \left(R312 + R321\right)$$

2.2.7 Supply Personnel (para 322.1)

$$R42 = 0.03 \left(R36 + R37\right)$$

[1] If there are no scheduled Preventive Maintenance (R22) then R16, Mean-Time-Between-Failures (MTBF) can be interpreted as Mean-Time-Between-Maintenance (MTBM).

2.2.8 Replenishment Spares and Repair Material (para 322.21 Alternate)

$$R40 = \left[\frac{R1 \times R9 \times R14 \times R27}{R16}\right] + \left[\frac{R1 \times R9 \times (1-R27) \times R14 \times R5}{R16}\right]$$

2.2.9 Inventory Administration Cost (para 322.3)

$$R43 = \sum_{i=1}^{4} R12_i \times Y_i + \left[R7 \times \left(.15 \times R9 \times R49 - \frac{R40}{2}\right)\right]$$

Y_i = Annual Recurring Cost

$R12_i$ = No of New FSN items in the i^{th} category

The first term of the above equation is the Inventory Management Cost calcuation (R23) and the second term is the Holding Inventory Cost calculation (R68). The portion in the parenthesis of the second term calculates the average annual value of the spares in storage. (Introduction costs are accounted for in para 212.18.)

2.2.10 Transportation Cost (para 322.5 and Appendix E)

The analyst has a choice of (a) para 322.5 cost formula or (b) formula shown in Appendix E.

[Note: Alternate cost equation (para 322.5) was not programmed.]

(a) $R44 = R3 \times R13$ (para 322.5)

(b) $$R44 = R9 \times R61 \times \frac{R1}{R16} \times \left\{\left[(R70 + 2R71 + 2R72) \times R63 \times R65\right] + R64 \times R66 \times \left[R70 + R71\left(\frac{R62 \times R74}{R61}\right) + R73 + 2R72\right]\right\}$$

2.2.11 Production Recurring (para 220)

$$R336 = R49 \times R9 + R343$$

2.2.12 Production Non-Recurring (para 210)

$$R301 = R67 \times R336 + R334 + R331 + R312 + R320$$

2.2.13 Unit Production Cost (Volume III, para 5.3) [1]

$$B = \frac{\log R20/100}{\log 2}$$ = Learning curve slope expressed as exponent to learning curve equation

$$X_1 = \left[\frac{R19 \quad (1+B)}{(R19 + 0.5)^{1+B} - (1-0.5)^{1+B}}\right]^{-1/B}$$ = Unit number that costs R18

$$C = \frac{R18}{(X_1)^B}$$ = 1st Unit Cost

$$X_2 = \left[\frac{R9 \quad (1+B)}{(R9 + 0.5)^{1+B} - (0.5)^{1+B}}\right]^{-1/B}$$ = Unit number that costs R49

$R49 = C\ (X_2)^B$ = Average unit cost for total buy

2.2.14 R&D

R&D is a point estimate made by the analyst

2.2.15 Summation Formulas

Operations	R31	=	(R33 + R34 + R41 + R50 + R51 + R52) R6
Logistic Support	R32	=	(R35 + R39 + R40 + R42 + R43 + R44 + R53 + R54 + R55 + R56) R6
Operations & Logistics Support	R30	=	R31 + R32
Production	R300	=	R301 + R336 + R347
LCC	R48	=	R200 + R300 + R30

[1] See also, "The Experience Curve Tables," U. S. Army Missile Command, Redstone Arsenal, Alabama, September 1962.

2.3 Program Operation

This section presents a detailed listing of the steps required to run the program on a HP-9821A Calculator (See Figure F-2.1). It should be noted that after the initial baseline run is made, the operator can easily change any of the input data and rerun the program. These additional runs, using whatever new inputs are required to reflect different equipment design features or operational assumptions, could assist in performing useful trade-off analysis or sensitivity analysis.

FIGURE F-2.1

OPERATOR PROCEDURES

STEP	DISPLAY	INSTRUCTIONS
1.		Press ERASE LDF (X) EXECUTE
2.		Press END RUN PROGRAM Machine automatically loads programmed cost factors in appropriate Registers.
3.	EQU QUAN, NO. OPRS, OPR COST, EQU WT, AVG LRU COST, ORG MTTR, EQU MTBF, INT MTTR, BASE UPC, UPC QUAN, SLOPE, EQU PWR, PM HR, MATL RATE, MATL COST, ORG PERS COST, INT PERS COST, DISCARD RATE, DEPOT PERS COST, NO DEPOT PERS, EQU CODE, ITERATION NO.	Enter values for R9 thru R28 (Excluding R12 and R23) and R75, R57, R77, and R78. See Table 2. Press RUN PROGRAM for each value entered.
4.	OTHER ESTIMATES	The machine is at a stop. Enter desired point estimates in the categories printed on the tape using the following procedure: Enter Estimate into desired Register number followed by an EXECUTE command, for example: 120,000 → R( ) 321 EXECUTE
	120,000 → R321 120,000.00	
		Repeat this procedure for each point estimate. When all desired values have been entered, press RUN PROGRAM to proceed. NOTE: If no point estimate is entered in a given register, the program assumes a zero for its value.

FIGURE F-2.1

OPERATOR PROCEDURES
(Cont'd)

STEP	DISPLAY	INSTRUCTIONS
5.	FSN 0-5K FSN 5K-50K FSN 50K-500K FSN>500K	Enter the number of new FSN's in this dollar range then, Press RUN PROGRAM Repeat this procedure for each range of values
6.	TRANS EQU 1 OR 2?	Enter Equation No. Desired, Then, Press RUN PROGRAM Equation 1 calculates Transportation costs as shown in para 2.2.10(A). Program then jumps to Line 35 and continues to execute all the remaining lines of the program. Equation 2 calculates Transportation costs using Transportation model equation shown in Appendix E to Volume III of the Cost-Effectiveness Program Plan. Program goes to Line 31.
7.	LRU WT, PART WT, P2, P3	If Equation 2 (Step 6 above) is used, enter values as required. Press RUN PROGRAM for each value entered.
8.	STOP	The machine has calculated and printed all LCC values and is at a stop. The operator can take one of these actions: a. If no additional runs are desired, press REWIND EXECUTE The tape cassette can then be withdrawn from the machine.

FIGURE F-2.1

OPERATOR PROCEDURES
(Cont'd)

STEP	DISPLAY	INSTRUCTIONS
8. Cont'd		b. Perform trade-off or sensitivity analysis by entering new values in any register by the following procedure:
	XX → RX XX.00	value xx → Register R (x) EXECUTE
		This may be repeated as many times as desired. To continue the program, enter the next iteration number into R78 and press RUN PROGRAM.
		The machine will go to Program Line 14 and execute the program.
		c. If a duplicate tape is desired, Press RUN PROGRAM.
		The machine will go to Program Line 14 and execute the program.

2.4 PROGRAM LISTING

This section presents the basic Hewlett-Packard computer program for the TRI-TAC Life Cycle Cost Program (see Figure F-2.2). Lines 0 and 1 enter preprogrammed cost factors into the appropriate registers. Lines 2 through 8 are enter instructions which allow the operator to enter data into the machine. Lines 9 through 13 are print statements which identify for the operator, the particular register where "other" data may be entered. Lines 14 through 16 are the learning curve equations. The equations for the life cycle costs are contained in Lines 17 through 44. All computer operations are automatic except for entering FSN data (Lines 25 to 28) and the transportation equation (Lines 30 to 34). When entering FSN data, the machine will automatically go to subroutine "A" in Line 52 and then return. Line 30 allows the operator to choose one of two equations to calculate transportation costs.

In Equation 1, transportation is calculated using a transportation cost factor and total equipment weight. Equation 2, is sensitive to weight, distance and logistic support concept. It is fully discussed in Appendix E to Volume III, Life Cycle Costing.

Lines 45 to 49 are the instructions to printout the contents of the registers. Line 51 contains a stop instruction. During this stop input data may be changed, as required, for trade-off or sensitivity analysis. By pressing RUN PROGRAM, the machine will cycle back to Line 14.

FIGURE F-2.2

PROGRAM LISTING FOR LCC MODEL

```
0:
FXD 2;2920→R1;.2
→R2;.5→R3;.1→R4;
.05→R5;10→R6;.03
→R7;.04→R8⊢
1:
.05→R60;25→R63;3
000→R64;.001→R65
;.0001→R66;.4→R6
7;1656→R90⊢
2:
ENT "EQU QUAN",R
9,"NO.OPRS",R10,
"OPR COST",R11,"
EQU WT",R13⊢
3:
ENT "AVE LRU COS
T",R14,"ORG MTTR
",R15,"EQU MTBF"
,R16,"INT MTTR",
R17⊢
4:
ENT "BASE UPC",R
18,"UPC QUAN",R1
9,"SLOPE",R20,"E
QU PWR",R21⊢
5:
ENT "PM HR",R22,
"MATL RATE",R24,
"MATL COST",R25⊢
6:
ENT "ORG PERS CO
ST",R26,"INT PER
S COST",R28,"DIS
CARD RATE",R27⊢
7:
ENT "DEPOT PERS.
COST",R75⊢
8:
ENT "NO.DEPOT PE
RS",R57,"EQU COD
E",R77,"ITERATIO
N NO.",R78⊢
9:
PRT "OPS FACLTS→
R50","EQU LESHLD
S→R51","OTHER OP
S→R52"⊢
10:
PRT "MAINT FACLT
S→R53","CONTRCT
SVCS→R54","SPLY
FACLTS→R55"⊢
11:
PRT "OTHR LOGIST
S→R56","R&D→R200
","PEC.SUPT.EQU→
","R312"⊢
12:
PRT "OTR NR PROD
→R320","COMMON S
PT EQU→","R331",
"OTR R PROD→R343
"⊢
13:
PRT "----------
-----";SPC 2;
DSP "OTHER ESTIM
ATES";STP ⊢
14:
"C";LOG R20/LOG
2→B;(R19(1+B)/((
R19+.5)↑(1+B)-.5
↑(1+B)))↑(-1/B)→
X⊢
15:
R18/X↑B→C;(R9(1+
B)/((R9+.5)↑(1+B
)-.5↑(1+B)))↑(-1
/B)→X⊢
16:
PRT "UPC CALCULA
TED",CX↑B→R49;
SPC ;PRT "------
----------";SPC
⊢
17:
PRT "ANNUAL O&S
COST","IN $";
SPC 2;PRT "ENERG
Y CONSUMPT",R21R
8R19→R33⊢
18:
PRT "MATL CONSUM
PT",R24R25R9→R34
,"OPER PERS",R9R
11R10R1→R41⊢
19:
PRT "OTHER OPS C
OST",R52,"  ORG
MAINT",(R22→R1R1
5/R16)R26R9→R36⊢
20:
PRT "  LRU REPAI
R",(R1R9/R16)(1-
R27)R17R28→R37,"
DEPOT OVRHL PERS
"⊢
21:
PRT R57R75R90→R3
8,"MAINT PERS CO
ST",R36+R37+R38→
R35⊢
22:
PRT "SUPT EQU MA
INT",R4(R312+R33
1)→R39,"CONTRCT
SVCS",R54⊢
23:
PRT "SUPY PERS",
.03(R36+R37)→R42
,"SPARE PARTS"⊢
24:
PRT R1R9R14/R16+
(R27+R5(1-R27))→
R40;0→C→Z→R23→R1
2⊢
25:
0→R334;ENT "FSN
0-5K",C;306→X;23
6→Y;GSB "A"⊢
```

FIGURE F-2.2

PROGRAM LISTING FOR LCC MODEL
(Cont'd)

```
26:
ENT "FSN 5K-49.9
K",C;306→X;326→Y
;GSB "A"⊢
27:
ENT "FSN 50K-500
K",C;306→X;918→Y
;GSB "A"⊢
28:
ENT "FSN 500K",C
;306→X;1489→Y;
GSB "A"⊢
29:
PRT "INV MGT",R2
3,"INV HOLD",R7(
(15R49R9-R40/2)→
R68,"INV ADM"⊢
30:
PRT R23+R68→R43;
ENT "TRS EOU 1 O
R 2?",Z;IF Z=1;
PRT "TRANS",R3+R
13→R44;JMP 5⊢
31:
ENT "LRU WT",R61
,"PART WT",R62,"
P2",R71,"P3",R72
;1-(R71+R72)→R70
⊢
32:
(R27-R70)/(R71+R
72)→R73;1-R73→R7
4;R70+2R71+2R72→
X⊢
33:
R70+R71(R62/R61R
74+R73)+2R72→Y⊢
34:
PRT "TRANS",R61R
9(R1/R16)(R63R65
X+R64R66Y)→R44⊢
35:
PRT "OTHER LOGIS
TS",R56⊢
36:
PRT "-----------
-----";SPC ;PRT
"LIFE CYCLE COST
","      IN $K";
SPC ⊢
37:
PRT "R&D",R200/1
000⊢
38:
PRT "PROD M-R",(
(R49R9→R337(R67+
R334+R331+R312+R
320)/1000→R301⊢
39:
PRT "PROD REC",(
R337+R343)/1000→
R336⊢
40:
PRT "TOTAL PROD"
,R301+R336→R300⊢
41:
PRT "TOTAL OPNS"
,(R33+R34+R41+R5
0+R51+R52(R6/100
0→R31⊢
42:
R35+R39+R40+R42+
R43+R44+R53+R54+
R55+R56→R32⊢
43:
PRT "TOT LOG SUP
T",R32R6/1000,"T
OTAL O&S",R31+R3
2R6/1000→R30⊢
44:
PRT "TOTAL LCC",
R300+R200/1000+R
30→R48;SPC 2;
PRT "-----------
-----";SPC ⊢
45:
PRT "   REGISTER
S","   R1 TO R78
";1→Z;SPC 2⊢
46:
PRT RZ;IF 5INT (
Z/5)=Z;SPC ;PRT
Z;SPC ⊢
47:
Z+1→Z;IF Z≤78;
GTO -1⊢
48:
PRT "REGISTERS",
"R200,R300,R301"
,"R312,R321,R331
","R334,R336,R34
3"⊢
49:
PRT R200,R300,R3
01,R312,R321,R33
1,R334,R336,R343
⊢
50:
SPC 3;PRT "BEGIN
 TRADE-OFF","ANA
LYSIS.SEE"⊢
51:
PRT "  APPENDIX
F";SPC 6;DSP "ST
OP";STP ;GTO "C"
⊢
52:
"A";C(YR6)/R6+R2
3→R23;R12+C→R12;
CX+R334→R334;
RET ⊢
53:
END ⊢
Σ17653
R558
```

2.5 Sample LCC Estimate

2.5.1 General

The computer model has been used to estimate the Life Cycle Cost of several communications equipment items. This section presents one of these estimates made for the Tactical Digital Facsimile equipment which is one of the 19 TRI-TAC equipment programs and is assigned to the Navy. This sample is included not only to aid in the understanding of the operation of the computer program but to show the data inputs required and an example of the various outputs that are obtained. A copy of the actual computer print-out tape is shown in Figure F-2.3.

2.5.2 Assumptions

The following cost factors and assumptions are made for the Tactical Digital Facsimile equipment. It should be noted that the majority of these assumptions/factors can be used for most tactical communications equipment and, therefore, they have been programmed into the computer model.

a. Operating hours per year is 2920 hrs/yr (R1)

b. Depot Overhaul Rate if 20% (R2)

c. Transportation Factor is $.50/lb (R3)

d. Support Equipment Maintenance Factor is 10% (R4)

e. Repair Material Cost Factor is 5% (R5)

f. Years of Operation are 10 (R6)

g. Holding Inventory Factor is 3% (R7)

h. Power Cost is $0.04 per kwh (R8)

i. Transportation Cost Factor is 5% (R60)

j. Distance from Organization to Intermediate Maintenance Level is 25 mi (R63)

k. Distance from Intermediate to Depot Maintenance Level is 3,000 mi (R64)

l. Transportation Factors of $.001/lb/mi for short distances (R65) and $0.0001 $/lb/mi for long distances (R66)

m. Non-recurring Investment Factor is 40% (R67)

n. Available Manhours per Year is 1656 hrs (R90)

2.5.3 Input Data

The following are the input data used for the Facsimile equipment example:

a. Equipment quantity to be procured in 1000 units (R9).

b. Number of operators/equipment is 1/32 (R10) (one man, 15 min/day)(this included for illustration purposes only).

c. Cost of operator is $9.00 per hour (R11).

d. Facsimile equipment weight is 80 lbs (R13).

e. Average assembly or replacement module cost for this equipment is $300 (R14).

f. Mean Time to Repair (MTTR) this equipment at Organizational Level is 15 min (.25 hr)(R15).

g. Mean Time Between Failures (MTBF) is 2,500 hrs (R16).

h. Mean Time To Repair (MTTR) the average replacement module is one hour (R17).

i. The unit production cost is estimated at $9,500 per unit (R18) for the first 500 units (R19).

j. .85 learning curve slope (R20) is considered applicable for this equipment.

k. Equipment has a power rating of 400 watts (.4 kw)(R21).

l. Preventive maintenance time required for this equipment is 20 hrs/yr (R22).

m. It is estimated that each equipment will use an average of 10,000 (R24) sheets of paper per year at $0.05 (R25) per sheet.

n. The average cost for maintenance personnel is $8.50 per hour (R26) at Orgnization Level and $9.00 per hour (R28) at Intermediate Level.

o. It is assumed that 15% (R27) of the failed parts/modules will be discarded/scraped.

p. Depot personnel cost is $16.00 per hr (R75, number of Depot personnel is 3 (R57).

q. For bookkeeping purposes, the equipment is given a code number 4.01 (R77) and an iteration number 1 (R78).

r. The Research and Development Costs for this equipment are assumed to be $4 million (R200).

s. Peculiar Support Equipment $20,000 (R312), Common Support Equipment $20,000 (R331).

t. Other Non-recurring Production Costs (R320) are estimated at $120,000.

u. Facsimile equipment will require the supply system to introduce 50 new FSN's values less than $5,000 and 3 FSN's valued between $5,000 and $50,000. Total number of new FSN's is 53 (R12).

v. The average weight of packaged LRU's (line replaceable units) and repair parts is estimated to be 8 lbs (R61) and 2 lbs (R62) respectively.

w. P2 (R71) and P3 (R72) are estimated to be 0.05 and .93 respectively.

2.5.4 Cost Element Outputs

A detailed breakdown of costs are available to the analyst as a result of intermediate level cost computations in the life cycle cost program. The specific results for the Tactical Digital Facsimile example are as follows:

a. Unit Production Cost (R49) is $8,089.

b. Energy Consumption Cost (R33) is $46,720 per year.

c. Material Consumption Cost (R34) is $500,000 per year.

d. Operating Personnel Cost (R41(is $821,250 per year.

e. Maintenance Personnel Cost (R35) is $260,905 per year.

1. At Organization Level (R36), $172,482.

2. At Intermediate Level (LRU Repair)(R37), $8,935.

3. At Depot Level (Depot overhaul)(R38), $79,488.

f. Support Equipment Maintenance Cost (R39) is $4,000 per year.

g. Supply Personnel Cost (R42) is $5,433 per year.

h. Spare Parts and Repair Material Cost (R40) is $67,452 per year.

i. Inventory Management Cost (R23) is $12,778 per year.

j. Inventory Holding Cost (R68) is $35,388 per year.

k. Inventory Administrative Cost (R43) is $48,165 per year.

l. Transportation Cost (R44) is $5,792 per year.

m. Production Non-recurring Costs (R301) are $3,412K.

n. Production Recurring Costs (R336) are $8,089K.

o. Operations Costs (R31) are $13,680K.

p. Logistics Costs (R32) are $3,918K.

2.5.5 Total Cost Outputs

The total Life Cycle Cost figures computed by the computer program for the TDF are:

Total Life Cycle Cost (R48), $33.098M.

a. Research and Development Cost (R200), $4.000 million.

b. Production Cost (R300), $11.5 million.

c. Operations and Logistics Costs (R30), $17.597 million.

FIGURE F-2.3

COMPUTER OUTPUT TAPE

TACTICAL

DIGITAL

FACSIMILE

EXAMPLE

OPS FACLTS→R50
EQU LESHLDS→R51
OTHER OPS→R52
MAINT FACLTS→R53
CONTRCT SVCS→R54
SPLY FACLTS→R55
OTHR LOGISTS→R56
R&D→R200
PEC.SUPT.EQU→
R312
OTR NR PROD→R320
COMMON SPT EQU→
R331
OTR R PROD→R343

UPC CALCULATED
8088.76

ANNUAL O&S COST
IN $

ENERGY CONSUMPT
46720.00
MATL CONSUMPT
500000.00
OPER PERS
821250.00
OTHER OPS COST
0.00
ORG MAINT
172482.00
LRU REPAIR
8935.20
DEPOT OVRHL PERS
79488.00
MAINT PERS COST
260905.20
SUPT EQU MAINT
4000.00
CONTRCT SVCS
0.00
SUPV PERS
5442.52
SPARE PARTS
67452.00
INV MGT
12778.00
INV HOLD
35387.66
INV ADM
48165.66
TRANS
5791.54
OTHER LOGISTS
0.00

LIFE CYCLE COST
IN $K

R&D
4000.00
PROD N-R
3411.72
PROD REC
8088.76
TOTAL PROD
11500.49
TOTAL OPNS
13679.70
TOT LOG SUPT
3917.57
TOTAL O&S
17597.27
TOTAL LCC
33097.76

REGISTERS
R1 TO R78

2920.00
.20
.50
.10
.05
5.00
10.00
.03
.04
1000.00
.03
10.00

FIGURE F-2.3

COMPUTER OUTPUT TAPE
(Cont'd)

		8.00
9.00	172402.00	2.00
52.00	8935.20	25.00
80.00	79488.00	3000.00
300.00	4000.00	.00
.25	67452.00	
		65.00
15.00	40.00	
		.00
2500.00	821250.00	.40
1.00	542.52	35387.66
9500.00	4315.56	0.00
800.00	5791.54	.02
.25	0.00	
		70.00
20.00	45.00	
		.05
.40	0.00	.2
20.00	0.00	.1
12773.00	33097.76	.8
10000.00	2088.76	16.00
.05	0.00	
		75.00
25.00	50.00	
		0.00
8.50	0.00	4.01
.15	0.00	1.00
9.00	0.00	
0.00	0.00	REGISTERS
17597.27	0.00	R200,R300,R301,
		R312,R321,R331
		R334,R336,R343
30.00	55.00	4000000.00
		11500.49
13679.70	0.00	3411.72
391756.91	3.00	20000.00
46720.00	0.00	0.00
500000.00	0.00	20000.00
260905.20	.05	16218.00
		2088.76
35.00	60.00	0.00
		BEGIN TRADE-OFF
		ANALYSIS, SEE
		APPENDIX F

3.0 EXPANDED TRI-TAC LCCM

The expanded TRI-TAC LCCM was also written for a Hewlett-Packard HP-9821A, programmable calculator, which has approximately 935 registers of storage capacity, a cassette tape unit capable of manipulating both programs and data, a Mathematics Read-Only-Memory (ROM) and a User Definable Function (UDF) ROM. The UDF allows programming of the subroutine in unassigned variables.

This version of the TRI-TAC LCCM takes the basic TRI-TAC LCCM of Section 2 and expands its capabilities. This was accomplished by restructuring the basic LCCM into an executive program which calls forth, in a sequencial manner, the various CER's which have been programmed as subroutines. This method allows an increased flexibility in that the CER's are now structured to allow the user of the model to input more extensive data (i.e., the CER for spares will now have the capability to accept data on individual LRU's and calculate LCC based on that data. The basic LCCM does not have the capability of accepting multiple data at the LRU level.

3.1 Cost and Data Elements

3.1.1 General

All of the cost and data elements used in this program are listed and defined in Volume III. The data elements have been coded in the same manner as in Section 2 for mathematical manipulation and programming purposes. Tables 4 to 6 provide a listing of all the elements used, and include the register location of that element in the calculator. This same "R" coding is also used in the equations, program listing, and sample LCC estimates that follow in Sections 3.2, 3.4, and 3.5.

TABLE 4

DATA CONSTANTS/ASSUMPTIONS
FOR THE EXPANDED LCC MODEL

R1.	Operating Hrs (2920 hrs/yr)
R2.	Depot Overhaul Rate (20%)
R3.	Transportation Cost Factor ($.50/lb)
R4.	Support Equipment Maintenance Factor (.10)
R5.	Repair Material Cost Factor (.05)
R6.	Years of Operation (10)
R7.	Holding Inventory Factor (.03)
R8.	Power Cost (0.04 $/kwh)
R60.	Transportation Cost Factor (.05)
R63.	Dist. A. (Org. to Int. Level)(25 mi)
R64.	Dist. B. (Int. to Depot Level)(3000 mi)
R65.	Transportation Factor A. (.001 $/lb/mi)
R66.	Transportation Factor B. (.0001 $/lb/mi)
R67.	Non-recurring Investment Cost Factor (.40)
R80.	Inventory Replenishment Cost Factor (.05)
R90.	Available Manhours per year (1656 hrs)
R107.	Modification Factor (.005)
R108.	Replenishment Factor (.07)

TABLE 5

DATA INPUTS
FOR THE EXPANDED LCC MODEL

R9.	Equipment Quantity (#)
R10.	Avg. No. Operators/equipment (#)
R11.	Avg. Operator Cost ($/hr)
R12.	No. of new FSN (#)
R13.	Equipment Weight (lbs)
R14.	Avg. Replacement Assembly (LRU) Cost ($)
R15.	Avg. MTTR (Org Level)(hrs)
R16.	Avg. MTBF (hrs)
R17.	Avg. MTTR (Int Level)(hrs)
R18.	Unit Production Cost Est ($)
R19.	Quantity Used for UPC Est (#)
R20.	Learning Curve Slope (%)
R21.	Avg. Power Rating (kw)
R22.	Avg. Preventative Maintenance (hr/yr)
R24.	Avg. Material Consumption Rate (units/yr/equip)
R25.	Avg. Material Cost ($/unit)
R26.	Org Level Maintenance Pers Costs ($/hr)
R27.	Discard Rate (decimal)
R28.	Int Level Maintenance Personnel Cost ($/hr)
R29.	Tech. Data Management Costs ($/page)
R46.	Avg. MTTR (Depot Level)(hrs)
R47.	No. Pages in Set of Tech. Data (pages)
R50.	Operational Facilities ($)
R51.	Equipment leaseholds ($)
R52.	Other Operating Costs ($)
R53.	Maintenance Facilities ($)
R54.	Contractor Services ($)
R55.	Supply Facilities ($)
R56.	Other Logistic Support Costs ($)
R57.	No. Depot Overhaul Personnel (#)
R61.	Avg. WT of LRU (lbs)
R62.	Avg. WT of Repair Parts (lbs)
R71.	P2 (% of all failed LRU's to be repaired/discarded at Int level)(expressed as a decimal)
R72.	P3 (% of all failed LRU's to be repaired/discarded at Depot level)(expressed as a decimal)
R75.	Depot Personnel ($/hr)
R76.	Support Equipment Area (ft2/yr)
R77.	Equipment Code
R78.	Iteration Number (for subsequent runs)(#)
R79.	Avg. Depot Level Repair Rate (%)

TABLE 5

DATA INPUTS
FOR THE EXPANDED LCC MODEL
(cont'd)

R86.	Floor Area Cost ($/yr)
R89.	Maint Work Area (ft^2/yr)
R92.	Maint of Software Center ($/yr)
R109.	No. Software Personnel (#)
R110.	Avg. Software Personnel Costs ($/hr)
R200.	R&D Estimate ($)
R312.	Peculiar Support Equipment Costs ($)
R320.	Other Non-recurring Production Costs ($)
R331.	Common Support Equipment Costs ($)
R343	Other Recurring Production Costs ($)

TABLE 6

COST DATA OUTPUT
FOR THE EXPANDED LCC MODEL

R23.	Inventory Management Cost ($)
R30.	Operations & Logistic Support Total ($)
R31.	Operations Cost ($ K)
R32.	Logistic Support Cost ($ K)
R33.	Energy Consumption Cost ($)
R34.	Material Consumption Cost Total ($)
R35.	Total Maintenance Personnel Cost ($)
R36.	Org Maintenance Personnel Cost ($)
R37.	Int Maintenance Personnel (LRU Repair) Cost ($)
R38.	Depot Maintenance Personnel (Depot Overhaul) Cost ($)
R39.	Support Equipment Maintenance Cost ($)
R40.	Spare Parts & Repair Material ($)
R41.	Operator Personnel Costs ($)
R42.	Supply Personnel Cost ($)
R43.	Inventory Administration Cost ($)
R44.	Transportation Cost ($)
R48.	Total Life Cycle Cost ($ K)
R49.	Unit Production Cost Calculated ($)
R68.	Inventory Holding Cost ($)
R69.	Depot LRU Repair Costs ($)
R70.	P1 (% failed LRU's discarded at Org. Level) (expressed as a decimal)
R73.	P21 (% failed LRU's discarded at Int. Level) (expressed as a decimal)
R74.	P22 (% failed LRU's repaired at Int. Level) (expressed as a decimal)
R81.	Org Level Spares ($)
R82.	Int/Depot Level Spares ($)
R83.	Repair Material ($)
R84.	Maintenance Costs ($)
R85.	Supply Costs ($)
R87.	Software Support Costs ($)
R91.	Software Personnel Costs ($)
R93.	Org Supply Personnel Costs ($)
R94.	Int Supply Personnel Costs ($)
R95.	Depot Supply Personnel Costs ($)
R97.	Modification Costs ($)
R98.	Replacement Common Support Equipment ($)
R99.	Personnel Training & Support Costs ($)

TABLE 6

COST DATA OUTPUT
FOR THE EXPANDED LCC MODEL
(Cont'd)

R101.	Replacement Training Costs ($)
R102.	Health Care Costs ($)
R103.	Personnel Activities (PCS) Costs ($)
R104.	Personnel Support Costs ($)
R105.	Base Operating Support Costs ($)
R106.	Depot Overhaul Transportation Costs ($)
R300.	Total Production Costs ($)
R301.	Production Non-recurring Costs ($)
R336.	Production Recurring Costs ($)

3.2 LCC Model Equations

3.2.1 General

This section presents all of the equations used in the expanded version of the LCC Model. The equations presented here are similar to those LCC Model equations in Section 2.2. An explanation and/or paragraph number from Vol III, Appendix B, is referenced to give background information on the derivation of that equation. The P-numbers used within the following sub-routines represent unassigned variables. Values for the variables are either transferred from the executive program or are entered by the operator from the keyboard.

3.2.2 Energy Consumption Cost (para 311)
(Sub-routine "FB")

$$R33 = \sum_{0}^{P4} P1\ P2\ P5\ P6$$

where:
- P1 = Equipment Operating Hours (hrs)(R1)
- P2 = Electrical Power Cost ($/kwh)(R8)
- P4 = Number of different LRU or Equipment (#)
- P5 = Quantity of LRU or equipment (#)(R9)
- P6 = Power Rating of LRU or Equipment (kw)(R21)

3.2.3 Materials Consumption Cost (para 312)
(Sub-routine "FC")

$$R34 = \sum_{0}^{P2} P1\ P3\ P4$$

where:
- P1 = Equipment Quantity (#)(R9)
- P2 = Number of Special Materials (#)
- P3 = Material Consumption Rate (units/yr/equip)(R24)
- P4 = Material Cost ($/unit)(R25)

3.2.4 Operator Personnel Cost (para 313)
(Sub-routine "FD")

$$R41 = \sum_{0}^{P5} P1\ P2\ P3\ P10$$

where:
- P1 = Equipment Quantity (#)(R9)
- P2 = Equipment Operating Hours (hrs)(R1)
- P3 = Number of Operator/Equipment (#)(R10)
- P5 = Number of Different Types Operator Personnel (#)
- P10 = Cost of Operator ($/hr)(R11)

3.2.5 Software Support Cost (para 316)
(Sub-routine "FE")

$$R91 = P1\ P2\ P3$$

and,

$$R87 = P91 + P4$$

where: P1 = Number of Personnel Assigned to Software Center (#)(R109)
P2 = Average Cost of Personnel ($/hr)(R110)
P3 = Annual Manhours (hrs/yr)(R90)
P4 = Maintenance of Software Center ($/yr)(R92)

3.2.6 Summation of Operations Cost (para 310)

$$R31 = R33 + R34 + R41 + R50 + R51 + R52 + R87$$

where: R33, R34, and R41 are as defined previously
R50 = Operational Facilities Cost ($)
R51 = Equipment Leaseholds Cost ($)
R52 = Other Operating Cost ($)
R87 = Software Support Cost ($)

Note: R50, R51, and R52 are contained in (Sub-routine "FP")

3.2.7 Organizational Maintenance Personnel Cost (para 321.11)
(Sub-routine "GA")

$$R36 \overset{1/}{=} \sum_{0}^{P4} \left[P5 + \frac{P1\ P6}{P7} \right] P2\ P3$$

where: P1 = Operating Hours (hrs)(R1)
P2 = Equipment Quantity (#)(R9)
P3 = Organizational Personnel Cost ($/hr)(R26)
P4 = Number of LRU's per Equipment (#)
P5 = Preventative Maintenance LRU or Equip (hr/yr)(R22)
P6 = Organizational MTTR for LRU or Equip (hr)(R15)
P7 = LRU or Equipment MTBF (hrs)

3.2.8 Intermediate Maintenance Personnel Cost (para 321.12)
(Sub-routine "GB")

$$R37 = \sum_{0}^{P7} P1\ P2\ P4\ P5\ \frac{P6}{P3}$$

1/ If P5 equal zero, then P7 MTBF can be equated to MTBM.

where: P1 = Operating Hours (hr)(R1)
P2 = Equipment Quantity (#)(R9)
P3 = LRU or Equipment MTBF (hr)
P4 = LRU or Equipment MTTR (hr)(R17)
P5 = Intermediate Personnel Cost ($/hr)(R28)
P6 = Intermediate Maintenance Repair Rate (%)(R74)
P7 = Number of Different LRU or Equipment (#)
to be Repaired at the Intermediate Level

3.2.9 Depot Maintenance Personnel (Scheduled Overhaul) Cost (para 321.13)
(Sub-routine "GC")

$$R38 = P1\ P2\ P3$$

where: P2 = No. Depot Personnel (#)(R57)
P3 = Depot Personnel Cost ($/hr)(R75)
P1 = Annual Depot Manhours (hrs/yr/man)(R90)

3.2.10 Depot Maintenance Personnel (LRU) Cost (para 321.14)
(Sub-routine "GD")

$$R69 = \sum_{0}^{P7} P1\ P2\ P4\ P5\ \frac{P6}{P3}$$

where: P1 = Operating Hours (hr)(R1)
P2 = Equipment Quantity (#)(R9)
P3 = LRU MTBF (hr)
P4 = Depot MTTR (hr)(R46)
P5 = Depot Personnel Cost ($/hr)(R75)
P6 = Depot Repair Rate (%)(R79)
P7 = Number of LRU's per Equipment (#)
to be Repaired at the Depot Level

3.2.11 Summation of Maintenance Personnel Cost (para 321.1)

$$R35 = R36 + R37 + R38 + R69$$

where: R36, R37, R38, and R69 are as previously defined.

3.2.12 Maintenance Facilities Cost (para 321.2)
(Sub-routine "GE")

EQUATION ONE:

$$R53 = P12$$

where: P12 = Maintenance Facilities Cost ($/yr)(R53)

EQUATION TWO:

R 53 = (P13 + P4) P5

where: P13 = Maintenance Work Area (ft^2/yr)(R89)
P4 = Support Equipment Area (ft^2/yr)(R76)
P5 = Cost of Floor Space ($/$ft^2$/yr)(R86)

3.2.13 Support Equipment Maintenance Cost (para 321.3)
(Sub-routine "GE")

EQUATION ONE:

R39 = P7

where: P7 = Support Equipment Maintenance Cost ($)(R39)

EQUATION TWO:

R39 = P1 P2 P3

where: P1 = Support Equipment Maintenance Factor (%)(R4)
P2 = Cost Peculiar Support Equipment ($)(R312)
P3 = Cost of Common Support Equipment ($)(R331)

3.2.14 Contractor Services Cost (para 321.4)

R 54 = P10

where: P10 = Contractor Services ($/yr)(R54)

3.2.15 Summation of Maintenance Cost (para 321)

R84 = R35 + R53 + R39 + R54

where: R35, R53, R39, and R54 are as previously defined.

3.2.16 Organizational Supply Personnel Cost (para 322.11)
(Sub-routine "GF")

P3 = .03 P1

where: P1 = Organizational Maintenance Personnel Cost (R36)

3.2.17 Intermediate Supply Personnel Cost (para 322.12)
(Sub-routine "GF")

P4 = .03 P2

where: P2 = Intermediate Maintenance Personnel Cost (R37)

3.2.18 Summation of Supply Personnel Cost (para 322.1)

$$R42 = P3 + P4$$

where: P3 and P4 are as previously defined.

Note: Depot Supply Personnel Cost is included in overhead of para 321.13 and 321.14.

3.2.19 Sustaining Investments (para 322.2)
(Sub-routine "GG")

$$R58 = R40 + R97 + R98$$

where:
R40 = Replenishment Spares & Repair Material
R97 = Modifications
R98 = Replacement Common Support Equipment

3.2.19.1 Replenishment Spares (para 322.21)
(Sub-routine "GG")

EQUATION ONE:

$$R40 = P1\ P2\ P3$$

where:
P1 = Equipment Quantity (#)(R9)
P2 = Inventory Replenishment Cost Factor (R80)
P3 = Unit Production Cost Calculated ($)(R49)

EQUATION TWO:

is comprised of 322.211, 322.212 and 322.13

3.2.19.1.1 Organizational Maintenance Spares Cost (para 322.211)

$$R81 = \sum_{0}^{P15} P1\ P4\ \frac{P6}{P5}$$

where:
P1 = Equipment Quantity (#)(R9)
P4 = Operating Hours (hrs)(R1)
P5 = MTBF of Discarded LRU's (hr)
P6 = Cost of Discarded LRU's ($)
P15 = Number of LRU's discarded at Organization (#)

3.2.19.1.2 Intermediate/Depot Maintenance Spares Cost (para 322.212)

$$R82 = \sum_{0}^{P15} \frac{P1\ P4\ P8\ P9}{P7}$$

where:
- P1 = Equipment Quantity (#)(R9)
- P4 = Operating Hours (hr)(R1)
- P7 = Repairable LRU MTBF (hr)
- P8 = Repairable LRU Cost ($)
- P9 = Discard Rate (%)(R27)
- P15 = Number of LRU's which are Repairable (#)

3.2.19.1.3 Repair Material Cost (para 322.213)

$$R83 = P17\ P10\ P11$$

where:

$$P17 = \sum_{0}^{P15} \frac{P1\ P4\ P8}{P7} (1-P9)$$

and,

P1, P4, P8, P7, and P9 are as previously defined.

P10 = LRU/Equipment Repair Rate (%)

P11 = Repair Material Rate (%)(R5)

3.2.19.2 Modifications (para 322.22)

$$R97 = P1\ P3\ P5$$

where:
- P1 = Equipment Quantity (#)(R9)
- P3 = Unit Production Cost Calculated (R49)
- P5 = Modification Factor (R107)

3.2.19.3 Replacement Common Support Equipment (para 322.23)

$$R98 = P6\ P7$$

where:
- P6 = Cost of Common Support Equipment (R331)
- P7 = Replenishment Factor (R108)

then,

$$R58 = R40 + R97 + R98$$

where: R40, R97, and R98 are as previously defined.

3.2.20 Inventory Administration Cost (para 322.3)

$$R43 = R23 + R68 + R59$$

where: R23, R68, and R59 are as previously defined.

3.2.20.1 Inventory Management Cost (para 322.31)
(Sub-routine "GH")

$$R23 = \sum_{1}^{4} P2\ P4$$

where: P2 = Number of FSN in Stated Dollar Range (#)
P4 = Annual Recurring Cost

Note: Summation is over four categories of FSN, which have been categorized in cost ranges. (Introduction Costs are accounted for in R334 for para 212.18)

3.2.20.2 Inventory Holding Cost (para 322.32)
(Sub-routine "GI")

EQUATION ONE:

$$R68 = P2\ (.15\ P3\ P5 - P4/2)$$

where: P2 = Holding Inventory Factor (%)(R7)
P3 = Equipment Quantity (#)(R9)
P4 = Spares and Repair Material Cost ($)(R40)
P5 = Unit Production Cost Calculated (R49)

Note: The portion in the parenthesis calculates the average annual value of the spares in storage, with .15 P3 P5 representing the cost of the initial spares and P4/2 the average cost of replacement spares.

EQUATION TWO:

$$R68 = \sum_{0}^{P10} P2 \left[P3 \left(P1\ P7/P11 \right) P12 \left(.03\ P13 + .25\ P14 + 1.5\ P15 \right) - \frac{P4}{2} \right]$$

where: P1 = Operating Hours (hr)(R1)
P2 = Holding Inventory Factor (%)(R7)
P3 = Equipment Quantity (#)(R9)
P4 = Spares and Repair Material Cost ($)(R40)
P7 = Quantity LRU per Equipment (#)

P10 = Number of Different Types LRU's (#)
P11 = LRU MTBF (hrs)*
P12 = LRU Cost ($)*
P13 = Intermediate LRU Repair Rate (%)*
P14 = Depot LRU Repair Rate (%)*
P15 = LRU Discard Rate (%)*

Note: The .03 and .25 are 10 days and 90 days stockage level factors for LRU failures. The 1.5 is a 18 month stockage level factor for LRU discards.

* P11 thru P15 for the individual LRU's are summed in the sub-routine and then their average values are used to determine R68.

3.2.20.3 Technical Data Support (para 322.33)

R59 = P1 P2

where: P1 = Number of pages in a set of Technical Data (pages)(R47)
P2 = Technical Data Management Costs ($/page)(R29)

3.2.21 Supply Facilities Cost (para 322.4)
(Sub-routine "GF")

R55 = P5

where: P5 = Supply Facilities Cost ($)(R55)

3.2.22 Transportation Costs (para 322.5)
(Sub-routine "GJ")

3.2.22.1 Depot Overhaul Transportation Costs (included in para 322.5)

R106 = 2 P5 P7 P9 P11 P12

where: P5 = Distance in Miles (mi)(R64)
P7 = Transportation factor ($/lb/mi)(R66)
P9 = Equipment Quantity (#)(R9)
P11 = Equipment Weight (lbs)(R13)
P12 = Depot Overhaul Rate (%)(R2)

3.2.22.2 Spares Transportation Cost (included in para 322.5)

EQUATION ONE:

$$R44 = P1\ P2 + R106$$

where:
P1 = Spares and Repair Material Cost ($)(R40)
P2 = Transportation Cost Factor (%)(R60)
R106 = Transportation Cost for Depot Overhaul

EQUATION TWO:

$$R44 = \sum_{0}^{P20} P9\ P15\ \frac{P8}{P14} \left\{ \left[(P19 + 2\ P17 + 2\ P18)\ P4\ P6 \right] + P5\ P7 \left[P19 + P17 \left(\frac{P16\ P22}{P15} + P21 \right) + 2\ P18 \right] \right\} + R106$$

where:
P4 = Distance A. (ORG to INT)(mi)(R63)
P5 = Distance B. (INT to DEPOT)(mi)(R64)
P6 = Transportation Factor for Dist. A ($/lb/mi)(R65)
P7 = Transportation Factor for Dist. B ($/lb/mi)(R66)
P8 = Operating Hours (hrs)(R1)
P9 = Equipment Quantity (#)(R9)
P14 = LRU or EQP MTBF (hrs)(R16)
P15 = Wt of LRU or EQP (lbs)(R61)
P16 = Wt of Repair Parts (lbs)(R62)
P17 = "P2" (% of all failed LRU's to be repaired/ discarded at INT Level)(%)(R71)
P18 = "P3" (% of all failed LRU's to be repaired/ discarded at DEPOT Level)(%)(R72)
P19 = "P1" (% of all failed LRU's to be discarded at ORG Level)(%)(R70)
P20 = Number of LRU's per equipment (#)
P21 = "P21" (% of failed LRU's discarded INT Level)(%)(R73)
P22 = "P22" (% of failed LRU's repaired INT Level)(%)(R74)

3.2.23 Summation of Supply Costs (para 322)

$$R85 = R42 + R43 + R44 + R55 + R58$$

where:
R42, R43, R44, R55, and R58 are as previously defined.

3.2.24 Other Logistics Cost (para 323)

$$R56 = \text{Point estimate made by the analyst.}$$

3.2.25 Summation of Logistic Support (para 320)

R32 = R84 + R85 + R56

where:

R84, R85, and R56 are as previously defined.

3.2.26 Personnel Training & Support (para 330)

R99 = R101 + R102 + R103 + R104 + R106

where:
R101 = Replacement Training Costs ($)
R102 = Health Care Costs ($)
R103 = Personnel Activities ($)
R104 = Personnel Support ($)
R105 = Base Operating Support ($)

3.2.27 Summation of O&S Costs (para 300)

R30 = R31 + R32 + R99

where:

R31, R32, and R99 are as previously defined.

3.2.28 R&D (para 100)

R200 = Point estimate made by the analyst.

3.2.29 Production Non-recurring (para 210)

R301 = Point estimate input or the program will compute it as:

R301 = R49 R9 R67 + R320

where:

R49 = Unit Production Cost Calculated ($)
R9 = Equipment Quantity (#)
R67 = Non-recurring Investment Cost Factor (%)
R320 = Other Investment Non-recurring ($)

3.2.30 Production Recurring (para 220)

R336 = Point estimate input or the program will compute it as:

R336 = R49 R9 + R343

where:

R49 = Unit Production Cost Calculated ($)
R9 = Equipment Quantity (#)
R343 = Other Investment Recurring ($)

3.2.31 Summation of Investment Costs

$$R300 = R301 + R336$$

where:

R301 and R336 are as previously defined.

3.2.32 Unit Production Cost (Vol III, Para 5.3)*

$$P5 = \frac{LOG\ P4}{LOG\ 2} = \text{learning curve slope expressed as exponent to learning curve equation.}$$

$$P6 = \left[\frac{P3\ (1+P5)}{(P3+.5)^{1+P5} - (1-.5)^{1+P5}}\right]^{\frac{-1}{P5}} = \text{Unit Number that Costs P2}$$

$$P7 = \frac{\cdot\ P2}{(P6)^{P5}} = \text{1st unit cost}$$

$$P6 = \left[\frac{P1\ (1+P5)}{(P1+.5)^{1+P5} - (.5)^{1+P5}}\right]^{\frac{-1}{P5}} = \text{Unit Number that Cost R49}$$

$$R49 = P7\ (P6)^{P5}$$

where:

P1 = Equipment Quantity (#)(R9)
P2 = Unit Production Cost Estimate (#)(R18)
P3 = Quantity used for UPC Estimate (#)(R19)
P4 = Learning Curve Slope (%)(R20)

P5 = (B)
P6 = (X_1/X_2) **
P7 = (C)

* See also, "The Experience Curve Tables," U. S. Army Missile Command, Redstone Arsenal, AL., Sept 1962

** Same as defined in Section 2.2.13.

3.2.33 Summation for LCC

R&D = R200
Production Non-recurring = R301
Production Recurring = R336
Total Production = R300
Total Operations = R31
Total Logistic Support = R32
Total Personnel Training & Support = R99
Total Operations & Support = R30
R30 = (R31 + R32 + R99) R6
Total LCC = R48
R48 = R200 + R300 + R30

where: R6 = Years of operation and all other "Rxx" are as previously defined.

3.3 Program Operation

This section presents a detailed listing of the steps required to run the expanded LCC program on an HP-9821A Calculator (see Figure F-3.1). It should be noted that after the initial baseline run is made, the operator can easily change any of the input data and rerun the program. Therefore, trade-off analysis or sensitivity analysis is an inherent capability of the program. An example of the typical input data to run this program is in Section 3.5.3.

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES

STEP	DISPLAY	INSTRUCTIONS & REMARKS
1.		Press: ERASE LDF (X) EXECUTE
2.		Press: END RUN PROGRAM Machine automatically loads programmed cost factors in appropriate Registers. Note: All % and factor inputs are required to be input as decimals. Rates are also decimal inputs.
3.	EQU QUAN, EQU WT, DSCRD RATE, EQU CODE, ITERATION NO.	Enter Requested data Press: RUN PROGRAM after each data is entered. Machine automatically stores data in correct Register.
4.	OTHR LOG COSTS, R&D PROD N-R, OTHR PROD N-R, PROD REC, OTHR PROD REC, CMMN SPT EQU, PEC SPT EQU	Press: RUN PROGRAM Enter point estimates, Press: RUN PROGRAM after each data entry.
5.	CALC LEARN CURVE BASE UPC, UPC QTY, SLOPE %	The machine is at a stop. When ready to proceed with the learning curve sub-routine, Press: RUN PROGRAM Enter required data Press: RUN PROGRAM after each data entry.
6.	CALC ENRGY CNSMPT, NO DIFF LRU/EQP, LRU/EQP QTY, PWR RATING.	Press: RUN PROGRAM to run the ELEC PWR sub-routine Press: RUN PROGRAM after each data entry.

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES
(Cont'd)

STEP	DISPLAY	INSTRUCTIONS & REMARKS
6.	Cont'd	NOTE: NO DIFF LRU/EQP - data input specifies the number of different LRU's or equipment for which the power will be calculated. LRU/EQP QTY - the number of LRU's per equipment. PWR RATING - input is in KWH.
7.	CLC MTRL CNSMPTN, NO SPEC MTL'S, MATL RATE, MATL COST.	To run Special Material sub-routine, Press: RUN PROGRAM also Press: RUN PROGRAM after each data input. NOTE: Sub-routine will calculate as many special materials as are input to it. MATL RATE - is the Material Consumption Rate (units/yr/equip).
8.	CALC OPER PRES, NO TYPE OF PER, NO OPER/EQP, OPER COST $/HR.	To run the Operator Personnel Sub-routine, Press: RUN PROGRAM enter required data and, Press: RUN PROGRAM after each entry. NOTE: NO TYPE OF PER - is the number of different operator MOS, AFSC, etc. required to operate the equipment. NO OPER/EQP, OPER COST $/HR - self-explanatory, if more than one MOS, AFCS, enter the data in sequences, i.e., for two different type operators: NO OPR/EQP 1 OPER COST $/HR $9.25 } 1st MOS NO OPR/EQP 1 OPER COST $/HR $10.35 } 2nd MOS

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES
(Cont'd)

STEP	DISPLAY	INSTRUCTIONS & REMARKS
9.	OPR FCLTS, EQP LSHLDS, NO PRS SFTWR CTR, PERS COST $/HR, SFTWR CNTR MNT, OTHER OPER'L	Press: RUN PROGRAM after each data is entered.
10.	CALC O L M PERS, OLM PERS $/HR, NO LRU/EQP, P.M. HR/YR, ORG. MTTR HRS, MTBF HRS.	To run Organizational Level Maintenance Personnel sub-routine, Press: RUN PROGRAM enter data, and Press: RUN PROGRAM after each entry. NOTE: NO LRU/EQP - specifies number of LRU's per equipment. PM HR/YR, ORG MTTR HRS, MTBF - are repeated for each LRU. If data is only available on equipment, then use that data as input in place of LRU.
11.	CALC I L M PERS, NO LRU/EQP, ILM PERS $/HR, MTBF HRS, INT MTTR HRS, I M RPR RATE.	To run Intermediate Level Maintenance Personnel sub-routine, Press: RUN PROGRAM enter data, and, Press: RUN PROGRAM after each data is entered. NOTE: MTBF, INT MTTR, I M RPR RATE - are inputs for each individual LRU in sequence, or input data for equipment if LRU data is not available.
12.	CALC D L M PERS NO. DEPOT PERS, DLM PERS. $/HR,	To run Depot Level Maintenance Personnel sub-routine, Press: RUN PROGRAM enter equation No. desired, then Press: RUN PROGRAM Input required data, Press: RUN PROGRAM after each data entry.

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES
(Cont'd)

STEP	DISPLAY	INSTRUCTIONS & REMARKS
13.	CALC D L M LRU, NO LRU/ EQP, D L M PERS $/HR, MTBF, DEP MTTR HR, DLM RPR RATE.	To run Depot Level Maintenance LRU sub-routine, Press: RUN PROGRAM enter required data, Press: RUN PROGRAM after each data entry. If LRU data not available, use equipment data.
14.	CALC FCLT COST, FCLT EQ 1 OR 2.	To run sub-routine, Press: RUN PROGRAM, enter Equation No. desired, then Press: RUN PROGRAM
	MAINT FCLT $/YR	EQUATION 1: Enter point estimate
	WRK AREA FT↑2/YR, SPT EQU FT↑2/YR, FLOOR AREA $/YR	EQUATION 2: Calculates Maintenance Facilities Cost as: (Maintenance Work spaces + Support Equipment Space) x cost of floor space. Enter required data, Press: RUN PROGRAM after each data entry
	CNTRCT SRV $/YR	Enter data, Press: RUN PROGRAM
15.	CALC SPARES, SPARES EQ 1 OR 2.	To run Spares and Repair Material sub-routine, Press: RUN PROGRAM enter Equation No. desired Press: RUN PROGRAM EQUATION 1: Calculates spares using (Equipment Quantity) x (Inventory Replenishment Cost Factor) x (Unit Production Cost Calculated).

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES
(Cont'd)

STEP	DISPLAY	INSTRUCTIONS & REMARKS
15.	Cont'd NO LRU DISCARDED, DISCARD LRU MTBF, DISCARD LRU COST	EQUATION 2: Calculates Organizational Level Spares. Enter data, Press: RUN PROGRAM after each data entry. NOTE: LRU MTBF, DISCRD LRU COST - are repeated for each LRU DISCARDED.
	NO LRU RPRBLE, % LRU DISCD, RPRBLE LRU MTBF, RPRBLE LRU COST.	Calculates Intermediate/Depot Level Spares. Enter data, Press: RUN PROGRAM after each data entry. NOTE: RPRBLE LRU MTBF, RPRBLE LRU COST - are repeated for each LRU repairable.
16.	CALC INV MGT NO FSN 0-5K NO FSN 5-49.9K NO FSN 50K-500K NO FSN >500K	To run Inventory Management sub-routine, Press: RUN PROGRAM enter the number of new FSN's within the displayed dollar range, Press: RUN PROGRAM Repeat the above procedure for each range as it is displayed.
17.	CALC INV HLD, INV HD EQ 1 OR 1.	To run Inventory Holding sub-routine, Press: RUN PROGRAM enter Equation No. desired, Press: RUN PROGRAM EQUATION 1: Calculates Inventory Holding Cost as (Holding Factor) x (Equipment Quantity) x (Spares & Repair Material Cost) x (Unit Production Cost Calculated).

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES

STEP	DISPLAY	INSTRUCTIONS & REMARKS
17.	*Cont'd.* NO TYPES LRU, QTY THIS LRU/EQP, LRU MTBF, LRU COST, LRU IL RPR %, LRU DPT RPR %, LRU DSCD %.	EQUATION 2: Calculates Inventory Holding Cost using data called for in display. QTY THIS LRU/EQP...LRU DSCD % is repeated for each type LRU. Enter data, Press: RUN PROGRAM after each data entry. If LRU data is not available, enter data for equipment.
	NO PAGES, COST PER PAGE, SPLY FCLT $	Calculates Technical Data Support, and allows input for Supply Facilities Cost.
	CALC TRANS TRANS EQ 1 OR 2.	To run Transportation Cost sub-routine, Press: RUN PROGRAM enter Equation No. desired Press: RUN PROGRAM EQUATION 1: Calculates Transportation Costs using: (Transportation Cost factor) x (Spares & Repair Material Cost).
	NO LRU/EQP, LRU MTBF, LRU WT, WT RPR PARTS, P2 (% FAIL I.L.) P3 (% FAIL DPT).	EQUATION 2: Calculates Transportation Cost using Transportation model equation shown in Appendix E to Vol III of the Cost Effectiveness Program Plan. Enter data, Press: RUN PROGRAM after each data entry. LRU MTBF....P3(% FAIL DPT) is repeated for each LRU. If LRU data is not available, enter data for equipment.

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES
(Cont'd)

STEP	DISPLAY	INSTRUCTIONS & REMARKS
19.	STOP	The machine has calculated and printed all LCC values and is at a stop. The operator can take one of these actions: a. If no additional runs are desired, Press: REWIND EXECUTE The tape cassette can then be withdrawn from the machine.
	XX → RX XX.00	b. Perform trade-off or sensitivity analysis by entering new values in those registers which you wish to change (See Table 4 & 5) using the following procedures: Value XX → Register R(X) This procedure may be repeated as many times as desired. To continue the program, enter the next iteration number into R78 and Press: RUN PROGRAM The machine will go to the Executive Program Line 3 and execute the program.
		c. If a duplicate tape is desired, Press: RUN PROGRAM The machine will go to Program Line 7 and execute the program. Operator will have to input data into the subroutines as they are called for.

3.4 Program Listing

This section presents the computer program for the expanded TRI-TAC Life Cycle Cost Program (See Figure F-3.2).

Lines 0 & 1	Enters preprogrammed cost factors into the appropriate registers.
Lines 2 thru 6	Allows the operator to enter data into the machine.
Lines 7 thru 16	Sequentially loads the sub-routines "FA" through "FE", to allow data inputs to calculate the Unit Production Cost and Operations Costs.
Line 17	Prints the total Operations Cost.
Lines 18 thru 28	Sequentially loads sub-routines "GA" through "GE" to allow the input of the data to calculate the cost of Maintenance Personnel and other maintenance cost.
Line 26	Prints total Maintenance Personnel Cost.
Line 29	Prints total Maintenance Cost.
Lines 30 thru 39	Sequentially loads sub-routines "GF" thru "GJ" to allow the input of data to calculate Supply Cost.
Line 40	Prints out the total Supply Cost.
Line 41	Prints out Other Logistics Cost and the total Logistics Support Costs.
Lines 44 thru 52	Prints out the Life Cycle Costs.
Lines 53 thru 57	Prints out the values contained in Registers 1 through 110. R200, R300, R301, R312, R320, R331, R336 and R343.
Lines 58 & 59	Are Instructions for trade-off analysis.

The program is at a stop, during this stop the preprogrammed and operator input data of Lines 0 through 6 may be changed as required for trade-off or sensitivity analysis.

By pressing RUN PROGRAM, the machine will return to Line 7 and load Sub-Routine "FA".

Lines 60 & 61 — Are the sub-routine loading areas within the executive program.

NOTE: The sub-routines have print statements that print out intermediate calculations. The executive program automatically loads the data elements required for the sub-routine computations, other than the data that has to be input by the operator.

3.5 Sample LCC Estimates

3.5.1 General

The computer model has been used to estimate the Life Cycle Cost of several communications equipment items. This section presents one of these estimates made for the Data Adapter equipment which is one of 19 TRI-TAC programs and is assigned to the Air Force. This sample is included not only to aid in the understanding of the operation of the computer program, but to show the data inputs required and an example of the various outputs that are obtained. A copy of the actual computer printout tape is shown in Figure F-3.3.

3.5.2 Assumptions

The following cost factors and assumptions are made for the Data Adapter equipment. It should be noted that many of these assumptions/factors are applicable to most tactical communications equipment and therefore they have been programmed into the computer model.

a. Operating hours per year is 2920 hrs/yr (R1)

b. Depot overhaul rate is 20% (.20)(R2)

c. Transportation Factor is $.50/lb (R3)

d. Support Equipment Maintenance Factor is 10% (.10)(R4)

e. Repair Material Cost Factor is 5% (.5)(R5)

f. Years of Operations are 10 (R6)

g. Holding Inventory Factor is 23% (.23)(R7)

h. Power Cost is $.04 per kwh (R8)

i. Transportation Cost Factor is 5% (.05)(R60)

j. Distance from Organization to Intermediate Maintenance Level is 25 mi (R63)

k. Distance from Intermediate to Depot Maintenance Level is 3,000 mi (R64)

l. Transportation Factors of .001 $/lb/mi for short distances (R65) and $.0001 $/lb/mi for long distances (R66)

m. Non-recurring investment factor is 40% (.40)(R67)

n. Inventory Replenishment Cost factor (.05)(R80)

o. Available manhours per year (1656 hrs)(R90)

p. Modification factor (.005)(R107)

q. Replenishment factor (.07)(R108)

3.5.3 Input Data

The following are the input data used for the Basic Data Adapter (BDA) Equipment:

a. "EQU QUAN" 2,000 units (R9)

b. "EQU WT" 47.5 lbs (R13)

c. "DSCRD RATE" 15% (.15)(R27)

d. "EQU CODE" 3.01 (R77), iteration number 1 (R78)

e. The following are point estimates to be input by the analyst:

(1)	"OTHR LOGISTS"	0	(R56)
(2)	"R&D"	4,014,078	(R200)
(3)	"PROD N-R"	6,129,552	(R301)
(4)	"OTHR PROD N-R"	201,390	(R320)
(5)	"PROD REC"	29,042,000	(R336)
(6)	"OTHR PROD REC"	0	(R343)
(7)	"CMMN SPT EQU"	7,000	(R331)
(8)	"PEC SPT EQU"	7,000	(R312)

f. For sub-routine "FA", Learning Curve:

(1) "BASE UPC $" is estimated at $21,130 per unit (R18)

(2) "UPC QTY" is 100 (R19)

(3) "SLOPE %" 91.4% (.914)(R20)

g. For sub-routine "FB", Energy Consumption:

(1) "NO DIFF LRU/EQP", 10 LRU's, 1* EQP

(2) "LRU/EQP QTY"	(3) "PWR RATING"	BDA LRU Level
1	= .002 kw	
1	= .007 kw	
1	= .003 kw	
1	= .002 kw	
1	= .007 kw	
1	= .007 kw	
1	= .0	
1	= .028 kw	
1	= .005 kw	
1	= .0	
(2) 1*	(3) = .061 kw*	BDA Equipment Level

h. For sub-routine "FC", Material Consumption:

The BDA requires no special materials, but an example of typical input (i.e., 2.5.3n) is:

		BDA	2.5.3n
(1)	"NO SPEC MAT'S:	0	1
(2)	"MATL RATE"	0	10,000
(3)	"MATL COST"	0	.05

i. For sub-routine "FD", Operator Personnel:

The BDA is assumed to require no operator personnel, but an example is 2.5.3 b and c.

		BDA	2.5.3 b&c
(1)	"NO TYPE OF PER"	0	1
(2)	"NO OPR/EQP"	0	1/32
(3)	"OPER COST $/HR"	0	sh 9.00

j. For sub-routine "FE", Operational Facilities:

(1)	"OPR FCLTS"	0	(R50)
(2)	"EQP LSHLDS"	0	(R51)
(3)	"CLC SOFTWARE SPT"	0	
(4)	"NO PERS SOFT WR"	0	
(5)	"PERS COST $/HR	0	

(6) "SFTWR CNTR MAINT"

(7) "OTHR OPER'L"

k. For sub-routine "GA", Organizational Level Maintenance Personnel:

(1) "OLM PERS $/HR" 9.25 (R26)

(2) "NO LRU/EQP" 10 LRU; 1* EQP

(3) "P.M. HR/YR"	(4) "MTTR HRS"	(5) "MTBF HRS"	BDA LRU Level
0	.212	92,166	
0	.117	52,910	
0	.117	35,448	
0	.117	41,841	
0	.125	191,571	
0	.125	191,571	
0	.233	80,000	
0	.183	113,636	
0	.383	61,920	
0	.05	50,000,000	
(3) 0*	(4) .25*	(5) 7706*	BDA Equipment Level

l. For Sub-routine "GB", Intermediate Level Maintenance Personnel:

(1) "NO LRU/EQP" 10 LRU; 1* EQP

(2) "I L M PERS $/HR" $10.27 (R28)

(3) "MTBF HRS"	(4) "INT MTTR HRS"	(5) "IMP RPR RATE"	BDA LRU Level
92,166	1.0	1.0	
52,910	0	0	
35,448	0	0	
41,841	0	0	
191,571	0	0	
191,571	0	0	
80,000	0	0	
113,636	0	0	
61,920	.4	1.0	
50,000.000	.42	.95	
(3) 7706*	(4) 1.0*	(5) .3*	BDA Equipment Level

m. For Sub-routine "GC", Depot Level Maintenance Personnel:

(1) "NO DEPOT PERS" 2

(2) "DLM PERS $/HR 16.00

n. For sub-routine "GD", Depot Level Maintenance, LRU Repair:

(1) "NO LRU/EQP" 10 LRU; 1* EQP

(2) "D L M PERS $/HR" 16.00 (R75)

(3) "MTBF HRS"	(4) "DPT MTTR HRS"	(5) "DLM RPR RATE"	BDA LRU Level
92,166	16	.85	
52,910	10	.85	
35,448	9	.85	
41,841	8	.85	
191,571	7	.85	
191,571	7	.85	
80,000	6	.85	
113,636	29.8	.85	
61,920	4	.95	
50,000,000	3	.60	
(3) 7706*	(4) 10*	(5) .85*	BDA Equipment Level

o. For sub-routine "GE", Facilities Cost:

(1) "FCLT EQ 1 OR 2" 1 (See Fig 3.1, step 13)

(2) "MAINT FCLT $/YR" 0 (R53)

(3) "CONTRCT SRU $/YR" 0

p. For sub-routine "GG", Spares:

(1) "SPARES EQ 1 OR 2" 2 (See Fig 3.1, step 15)

(2) "NO LRU DISCARD" 0 (If LRU's are discarded, the sub-routine requires data on their MTBF and Cost)

(3) "NO LRU RPRBLE" 10 LRU; 1* EQP

(4) "% LRU DSCD" .15 (R27)

(5) "RPRBLE LRU MTBF"	(6) "RPRBLE LRU COST"	BDA LRU Level
92,166	3,152	
52,910	1,310	
35,448	1,736	
41,841	1,087	
191,571	961	
191,571	961	
80,000	825	
113,636	2,521	
61,920	1,562	
50,000,000	404	
(5) 7706*	(6) 1,452	BDA Equipment Level

q. For sub-routine "GH", Inventory Management:

(1) "NO FSN 0- 5K" 118

(2) "NO FSN 5-49.9K" 8

(3) "NO FSN 50-500K" 0

(4) "NO FSN >500K" 0

r. For sub-routine "GI", Inventory Holding"

(1) "INV HD EQ 1 OR 2" 2 (See Fig 3.1, step 17)

(2) "NO TYPES LRU" 10 LRU; 1* EQP

(3) "QTY THIS LRU/EQP"	(4) "LRU MTBF"	(5) "LRU COST"	(6) "LRU I L RPR %"	(7) "LRU DPT RPR %"	(8) "LRU DSCD %"	BDA LRU LEVEL
1	92,166	3,152	1.0	.85	.15	
1	52,910	1,310	0	.85	.15	
1	35,448	1,736	0	.85	.15	
1	41,841	1,087	0	.85	.15	
1	191,571	961	0	.85	.15	
1	191,571	961	0	.85	.15	
1	80,000	825	0	.85	.15	
1	113,636	2,521	0	.85	.15	
1	61,920	1,562	1.0	.95	.15	
1	50,000,000	404	.95	.60	.15	
(3) 1*	(4) 7706*	(5) 14,521*	(6) .3*	(7) .85*	(8) .15*	BDA EQUIPMENT LEVEL

(9) "NO PAGES" 1,000

(10) "COST PER PAGE" $2.00

(11) "SPLY FCLT $" 0

s. For sub-routine "GJ", Transportation:

(1) "TRAN EQ 1 OR 2" 2 (See Fig 3.1, step 18)

(2) "NO. LRU/EQP" 10 LRU; 1* EQP

(3) "LRU MTBF"	(4) "LRU WT"	(5) "WT RPR PARTS"	(6) "% FAIL I.L."	(7) "%FAIL DPT"	BDA LRU LEVEL
92,166	22.5	1.0	.4	.6	
52,910	1.0	1.0	0	1.0	
35,448	1.0	1.0	0	1.0	
41,841	1.0	1.0	0	1.0	
191,571	1.0	1.0	0	1.0	
191,571	1.0	1.0	0	1.0	
80,000	1.0	1.0	0	1.0	
113,636	12.0	1.0	0	1.0	
61,920	4.5	1.0	.95	.02	
50,000,000	2.5	1.0	.1	.9	BDA EQP
(3) 7706*	(4) 4.75*	(5) 1.0*	(6) .145*	(7) .852	LEVEL

* If the model is to be run at the equipment level, the equipment data marked with an asterisk (*) should be entered instead of the LRU data.

3.5.4 Cost Element Outputs

A detailed breakdown of the cost if available to the analyst as a result of the intermediate cost computations in the LCC program. The specific results for the Basic Data Adapter are as follows:

a. Unit Production Cost (R49) is $14,521.

b. Energy Consumption Cost (R33) is $14,250 per year.

c. Special Materials (consumables) Cost (R34) is $0.0 per year.

d. Operating Personnel Cost (R41) is $0.0 per year.

e. Maintenance Personnel Cost (R35) is $160,147 per year.

(1) At Organizational Level (R36), $1,753.

(2) At Intermediate Level (LRU Repair)(R37), $2,335.

(3) At Depot Level (Depot Overhaul)(R38), $52,992.

(4) At Depot Level (Depot LRU Repair)(R69), $103,068.

f. Support Equipment Maintenance Cost (R39), $1,400 per year.

g. Supply Personnel Cost (R42) is $123 per year.

h. Sustaining Investment Cost (R58) is $335,134 per year.

(1) Spares & Repair Material (R40), $189,430.

(2) Modifications (R97), $145,214.

(3) Replacement Common Support Equipment (R98), $490.

i. Inventory Administration Cost (R43) is $177,023 per year.

(1) Inventory Management (R23), $30,456.

(2) Inventory Holding (R68), $144,567.

(3) Technical Data Support (R59), $2,000.

j. Transportation Cost (R44) is $12,110 per year.

k. Supply Costs (R85) is $524,390 per year.

3.5.5 Total Costs Outputs

The total Life Cycle Cost figures computed by the program are:

Total Life Cycle Costs (R48), $46.389 million.

a. Research & Development Cost (R200), $4.014 million.

b. Production Cost (R300), $35.373 million.

c. Operations & Support Cost (R30), $7.001 million.

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL

```
0:
FXD 2;2920→R1;.2
→R2;.5→R3;.1→R4;
.05→R5;10→R6;.03
→R7;.04→R8⊢
1:
.05→R60;25→R63;2
000→R64;.001→R65
;.0001→R66;.4→R6
7;.05→R80⊢
2:
1656→R90;ENT "EO
U QUAN",R9,"LOU
WT",R13,"DSCRD R
ATE",R27⊢
3:
.005→R102;.07→RI
08;ENT "EQU CODE
",R77,"ITERATION
 NO.",R78⊢
4:
ENT "OTHR LOG CO
STS",R56,"R&D",R
200,"PROD N-R",R
301⊢
5:
ENT "OTHR PROD N
-R",R320,"PROD R
EC",R336,"OTHR P
ROD REC",R343⊢
6:
ENT "CMMN SPT EQ
U",R331,"PEC.SPT
.EQU.",R312⊢
7:
8→R100;0→X;GSB "
LOAD"⊢
8:
CLL "FA"R9⊢
9:
10→R100;GSB "LOA
D"⊢
10:
CLL "FB"R1,R8,R9
⊢
11:
12→R100;GSB "LOA
D"⊢
12:
CLL "FC"R9⊢
13:
14→R100;GSB "LOA
D"⊢
14:
CLL "FD"P9,R1⊢
15:
16→R100;GSB "LOA
D"⊢
16:
CLL "FE"0,0,R90⊢
17:
PRT "310","OPERA
TIONS",R33+R34+R
41+R50+R51+R52+R
87→R31⊢
18:
19→R100;GSB "LOA
D"⊢
19:
CLL "GA"R1,R9⊢
20:
21→R100;GSB "LOA
D"⊢
21:
CLL "GB"R1,R9⊢
22:
23→R100;GSB "LOA
D"⊢
23:
CLL "GC"R90⊢
24:
25→R100;GSB "LOA
D"⊢
25:
CLL "GD"R1,R9⊢
26:
PRT "321.1","MAI
NT PERS COST",R3
6+R37+R38+R69→R3
5⊢
27:
28→R100;GSB "LOA
D"⊢
28:
CLL "GE"R4,R312,
R331⊢
29:
PRT "321","MAINT
ENANCE",R85+R53+
R39+R54+R84⊢
30:
31→R100;GSB "LOA
D"⊢
31:
CLL "GF"R36,R37⊢
32:
33→R100;GSB "LOA
D"⊢
33:
CLL "GG"R9,R30,R
49,R1,R107,R108,
R331,0,0,0,R5⊢
34:
35→R100;GSB "LOA
D"⊢
35:
CLL "GH"R6⊢
36:
37→R100;GSB "LOA
D"⊢
37:
CLL "GI"R1,R7,R9
,R40,R49⊢
```

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL
(Cont'd)

```
38:
39→R100;GSB "LOA
D"⊢
39:
ELL "GJ"R40,R60,
R3,R63,R64,R65,R
66,R1,R9,R27,R13
,R2⊢
40:
PRT "322","SUPPL
Y",R42+R55+R43+R
44+R58→R85⊢
41:
PRT "323","OTHER
 LOGISTS",R56,"3
20","LOG SUPPORT
",R84+R85+R56→R3
2⊢
42:
PRT "330","PERS
TRNG & SPT","331
 TO 335","COSTS
ARE INCLD"⊢
43:
PRT "IN PERS $/H
R"⊢
44:
PRT "----------
-----";SPC ;PRT
"LIFE CYCLE COST
","      IN $K";
SPC ;1000→C⊢
45:
PRT "R&D",R200/C
;IF R301>0;PRT "
PROD N-R",(R301+
R320)/C→R301;
JMP 2⊢
46:
PRT "INVST NONRE
C",(R49R9R67+R32
0)/C→R301⊢
```

```
47:
IF R336>0;PRT "P
ROD R",(R336+R34
3)/C→R336;JMP 2⊢
48:
PRT "PROD R",(R4
9R9+R343)/C→R336
⊢
49:
PRT "TOTAL PROD"
,R301+R336→R300⊢
50:
PRT "TOTAL OPNS"
,R31R6/C→R31⊢
51:
PRT "TOTAL LOG S
UPT",R32R6/C,"TO
TAL O&S",R31+R32
R6/C→R30⊢
52:
PRT "TOTAL LCC",
R300+R200/C→R30→
R48;SPC 2;PRT "-
----------"
```

```
;SPC ⊢
53:
PRT "    REGISTE
RS","    R1 TO R
110";1→Z;SPC 2⊢
54:
PRT R2;IF FINT (
Z/5)=Z;SPC ;PRT
Z;SPC ⊢
55:
Z+1→Z;IF Z≤110;
GTO -1⊢
56:
PRT "REGISTERS",
"R200,R300,R301"
,"R312,R320,R331
","R336,R343"⊢
57:
PRT R200,R300,R3
01,R312,R320,R33
1,R336,R343⊢
58:
SPC 3;PRT "BEGIN
 TRADE-OFF","ANA
LYSIS.SEE"⊢
59:
PRT "   APPENDIX
 F";SPC 6;DSP "S
TOP";STP ;GTO 7⊢
60:
"LOAD";1→X;
GTO 61;LDF X,R10
0⊢
61:
⊢
62:
END ⊢
Σ25498
R632
```

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL
(Cont'd)

Sub-routine "FA"

```
0:
"FA";ENT "CALC
EARN CURVE",P90
1:
ENT "BASE UPC $"
,P2,"UPC QTY",P3
,"SLOPE %",P4
2:
LOG P4/LOG 2→P5;
P3(1+P5)/((P3+.
5)↑(1+P5)-.5↑(1+
P5))↑(-1/P5)→P6
3:
P2/P6↑P5→P7;(P1
+P5)/((P)+.5)↑(
(+P5)-.5↑(1+P5))
↑(-1/P5)→P6
4:
P2→R18;P3→R19;P4
→R20;PRT "UPC CA
LCULATED",P7P6↑P
5→R49;SPC 1
5:
PRT "----------
-----";SPC 1
6:
RET 1
Σ16044
R878
```

Sub-routine "FB"

```
0:
"FB";ENT "CLC EN
RGY CNSMPTN",P90
1
1:
"FB";P1P2→P4;
ENT "NO.DIFF LRU
/EQP",P5;0→P8→P1
0
2:
ENT "LRU/EQP QTY
",P6,"PWR RATING
",P7→P11→P11
3:
P8+1→P8;P6P7P4→P
9;P9→P10→P10
4:
IF P5>P8;JMP -2
5:
IF P5≤P8;PRT "31
1","ENGRY CNSMPT
N",P3P10→R33;P11
/P6→R21
6:
RET 1
Σ7606
R883
```

Sub-routine "FC"

```
0:
"FC";ENT "CLC MT
RL CNSMPTN",P90
1:
0→P6→P7→P8→P9;
ENT "NO.SPEC MTL
'S",P2;IF P2=0;.
1→P2
2:
ENT "MATL RATE",
P3,"MATL COST",P
4;P3→P8→P8;P4→P9
→P9
3:
P1P3P4→P5;P5→P6→
P6;P7+1→P7;IF P2
>P7;JMP -1
4:
IF P2≤P7;PRT "31
2","SPEC MATL",P
6→R34;P8/P2→R24;
P9/P2→R25
5:
RET 1
Σ23197
R881
```

Sub-routine "FD"

```
0:
"FD";ENT "CALC.O
PER PERS",P90
1:
0→P5→P6→P7→P8;
ENT "NO.TYPE OP
PER",P5;IF P5=0;
.1→P5
2:
ENT "NO.OPER/EQP
",P3,"OPER COST
$/HR",P10;P1P3P4
P2→P9→P9
3:
P3→P7→P7;P4→P8→P
8;1→P6→P6;IF P5>
P6;JMP -1
4:
IF P5≤P6;PRT "31
3","OPER PERS",P
9→R41;P7→R10;P8/
P5→R11
5:
RET 1
Σ29656
R881
```

Sub-routine "FE"

```
0:
"FE";ENT "OPR FC
LTS",P2→R50;PRT
"314","OPR FCLTS
",R50
1:
ENT "EQP LSHLDS"
,P2→R51;PRT "315
","EQP LSHLD",R5
1
2:
0→P1→P2;ENT "NO.
PRS.SFTWR CTR",P
1→R109,"PERS.COS
T $/HR",P2→R110
```

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL

(Cont'd)

```
3:
P1P2R90→R91:ENT
"SFTWR CNTR"," M
NT $",P4→R92:P91
+R92→R87⊢
4:
PRT "316","SOFTW
ARE SUPPORT",R87
⊢
5:
ENT "OTHER OPER'
L",P1→R52:PRT "3
17","OTHER OPS",
R52⊢
6:
RET ⊢
Σ3764
R875
```

Sub-routine "GA"

```
0:
"GA":ENT "CALC.O
 L M PERS",P90:0
→P4→P8→P9→P10→P1
1⊢
1:
ENT "O L M PERS
$/HR",P3→R26,"NO
.LRU/EQP",P4:IF
P4=0:.1→P4⊢
2:
ENT "P.M.HR/YR",
P5+P10→P10,"MTTR
 HRS",P6+P11→P11
,"MTBF HRS",P7⊢
3:
1+P8→P8:P5+P1P6/
P7+P9→P9:IF P4>P
8:JMP -1⊢
4:
IF P4≤P8:PRT "32
1.11","ORG MAINT
",P9P3P2→R36⊢
5:
P10/P4→R22:P11/P
4→R15⊢
6:
RET ⊢
Σ26477
R876
```

Sub-Routine "GB"

```
0:
"GB":ENT "CALC.I
 L M PERS",P90:0
→P7→P8→P9→P10⊢
1:
ENT "NO.LRU/EQP"
,P7,"I L M PERS
$/HR",P5→R28:IF
P7=0:.1→P7⊢
2:
ENT "MTBF HRS",P
3,"INT.MTTR HRS"
,P4+P10→P10,"I M
 RPR RATE",P6→R7
4⊢
3:
1+P8→P8:P1P2P4P5
P6/P3+P9→P9:IF P
7>P8:JMP -1⊢
4:
IF P7≤P8:PRT "32
1.12","I M L LRU
 REPAIR",P9→R37:
P10/P7→R17⊢
5:
RET ⊢
Σ11208
R877
```

Sub-routine "GC"

```
0:
"GC":ENT "CALC.D
 L M PERS",P90⊢
1:
ENT "NO.DEPOT PE
RS",P2→R57,"DLM
PERS.$/HR",P3→R7
5:P1R57R75→R38⊢
2:
PRT "321.13","DL
M OVRHL",R38⊢
3:
RET ⊢
Σ1583
R898
```

Sub-routine "GD"

```
0:
"GD":ENT "CALC.D
 L M LRU",P90:0→
P6→P7→P8→P9→P10⊢
1:
ENT "NO.LRU/EQP"
,P7,"D L M PERS
$/HR",P5→R75:IF
P7=0:.1→P7⊢
2:
ENT "MTBF HRS",P
3,"DPT.MTTR HRS"
,P4+P11→P11,"DLM
 RPR RATE",P6+P1
0→P10⊢
3:
1+P8→P8:P1P2P4P5
P6/P3+P9→P9:IF P
7>P8:JMP -1⊢
4:
IF P7≤P8:PRT "32
1.14","DEPOT LRU
 RPR",P9→R89:P10
/P7→R79:P11/P7→R
46⊢
5:
RET ⊢
Σ25795
R875
```

Sub-routine "GE"

```
0:
"GE":ENT "CALC.F
CLT COST",P90,"F
CLT EQ 1 OR 2",P
11⊢
1:
IF P11=1:ENT "MA
INT FCLT $/YR",P
12:JMP 3⊢
2:
IF P11=2:ENT "WR
K AREA FT↑2/YR",
P13→R89,"SPT EQP
 FT↑2/YR",P4→R76
⊢
```

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL
(Cont'd)

```
3:
ENT "FLOOR AREA
$/YR",P5→R86;(P1
3+P4)P5→P12⊢
4:
PRT "321.2","MAI
NT FCLT",P12→R53
⊢
5:
PRT "321.3","SPT
 EQP MAINT",P1(P
2+P3)→R39⊢
6:
ENT "CNTRCT SRV
$/YR",P10⊢
7:
PRT "321.4","CON
TRCT SVCS",P10→R
54⊢
8:
RET ⊢
```

Sub-routine "GF"

```
0:
 GF";PRT "322.11
","OPG SUPV PERS
",.03P1→P3→R93⊢
1:
PRT "322.12","IL
M SUPV PER",.03P
2→P4→R94⊢
2:
PRT "322.13","DE
POT SUPV PERS","
INCLD IN 321.13"
⊢
3:
PRT "322.1","SUP
LY PERS",P4+P3→R
42⊢
4:
RET ⊢
```

Sub-routine "GG"

```
0:
"GG";ENT "CALC.
SPARES",P90,"SPA
RES E0 1 OR 2",P
14⊢
1:
IF P14=2;JMP 2⊢
2:
PRT "322.21","SP
ARES",P1P3P2→R40
;JMP 13⊢
3:
0→P16→P17→P19→P2
1;ENT "NO.LRU DI
SCRD",P15→P22⊢
4:
IF P15=0;JMP 3⊢
5:
ENT "DISCRD LRU
MTBF",P25,"DISCR
D LRU COST",P26+
P19→P19⊢
6:
P1P4P26/P25+P17→
P17;1+P16→P16;
IF P15>P16;JMP -
2⊢
7:
PRT "322.211","0
 L M SPARES",P17
→R81⊢
8:
0→P15→P16→P17→P1
8;ENT "NO.LRU RP
RBLE",P15→P20;
IF P15=0;JMP 4⊢
9:
ENT "% LRU DISCD
",P9→R27;1-P9→P1
0⊢
10:
ENT "RPRBLE LRU
MTBF",P27,"RPRBL
E LRU COST",P8+P
21→P21⊢
11:
P1P4P8/P7+P18→P1
8;P18P9+P17→P17;
1+P16→P16;IF P15
>P16;JMP -1⊢
12:
IF P15≤P16;PRT "
322.212","I L M
SPARES",P18P9→R8
2⊢
13:
PRT "322.213","R
EPAIR MAT'L",P17
P10P11→R83⊢
14:
PRT "322.21","SP
ARES",R81+R82+R8
3→R40;(P21+P19)/
(P20+P22)→R14⊢
15:
PRT "322.22","MO
DIFICATIONS",P1P
3P5→R97⊢
16:
PRT "322.23","RP
L CMMN SPT E0U",
P6P7→R98⊢
17:
PRT "322.2","SUS
TAIN INVST",R40+
R97+R98→R58⊢
18:
RET ⊢
```

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL

(Cont'd)

Sub-routine "GH"

```
0:
"GH"⋮ENT "CALC.I
NV MGT",P90⋮0→P5
→P6⊢
1:
ENT "NO.FSN 0-5K
",P2⋮306→P3⋮236→
P4⋮GSB "A"⊢
2:
ENT "NO.FSN 5-49
.9K",P2⋮306→P3⋮3
26→P4⋮GSB "A"⊢
3:
ENT "NO.FSN 50K-
500K",P2⋮306→P3⋮
918→P4⋮GSB "A"⊢
4:
ENT "NO.FSN >500
K",P2⋮306→P3⋮148
9→P4⋮GSB "A"⊢
5:
JMP 2⊢
6:
"A"⋮P2P4P1/P1+P5
→P5⋮P6+P2→P6⋮
RET ⊢
7:
PRT "322.31","IN
V MGT",P5→R23⋮P6
→R12⋮P2P3+R334→R
334⊢
8:
RET ⊢
Σ25163
R871
```

Sub-routine "GI"

```
0:
"GI"⋮ENT "CALC.I
NV HLD",P90,"INV
 HD EQ 1 OR 2",P
6⊢
1:
IF P6=2⋮JMP 3⊢
2:
IF P6=1⋮PRT "322
.32","INV HLD",P
2(.15P3P5-P4/2)→
R68⊢
3:
JMP 10⊢
4:
ENT "NO.TYPES LR
U",P10⋮0→P8→P9→P
18→P19→P20→P21→P
17⊢
5:
ENT "QTY THIS LR
U/EQP",P7,"LRU M
TBF",P11,"LRU CO
ST",P12⋮1/P11+P8
→P8⊢
6:
P12+P9→P9⋮ENT "L
RU I L RPR %",P1
3,"LRU DPT RPR %
",P14⊢
7:
ENT "LRU DSCRD %
",P15⋮P13+P18→P1
8⋮P14+P19→P19⋮P1
5+P20→P20⊢
8:
1+P17→P17⋮IF P10
>P17⋮JMP -3⊢
9:
IF P10≤P17⋮1/P8→
P11⋮P9/P10→P12⋮P
18/P10→P13⋮P19/P
10→P14⊢
10:
P20/P10→P15⋮P10→
P7⊢
11:
(P1P7/P11)P12(.0
3P13+.25P14+1.5P
15)→P16⊢
12:
PRT "322.32","IN
V HLD",P2(P3P16-
P4/2)→R68⊢
13:
ENT "NO.PAGES",P
1→R47,"COST PER
PAGE",P2→R29⊢
14:
PRT "322.33","TE
CH DATA SPT",R47
R29→R59⊢
15:
PRT "322.3","INV
 ADM",R23+R68+R5
9→R43⊢
16:
ENT "SPLY FCLT $
",P5⋮PRT "322.4"
,"SPLY FCLT",P5→
R55⊢
17:
RET ⊢
Σ9560
R817
```

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL

(Cont'd)

Sub-routine "GJ"

```
0:
"GJ":ENT " CALC.T
RANS",P90+
1:
2P5P7P9P11P12→R1
06+
2:
ENT "TRAN EQ 1 O
R 2",P41;IF P41=
2;JMP 2+
3:
PRT "322.5","TRA
NS",P1P2+R106→R4
4;JMP 12+
4:
ENT "NO.LRU/EQP"
,P20;0→P23→P24→P
30→P31→P32+
5:
ENT "LRU MTBF",P
14,"LRU WT",P15+
P31→P31;1/P14→P3
0→P30+
6:
ENT "WT PER PART
S",P16,"P2% DSC
RD T.L.",P17,"P
3% DSCRD DPT",
P18+
```

```
7:
P16→P32→P32;P17+
P71→P71;P18→P72→
P72+
8:
1-(P17+P18)→P19;
(P10-P19)/(P17+P
18)→P21;1-P21→P2
2+
9:
P5P6(P2/P14)→P2
5;(P19+2P17(P22+
P21)+2P18)P4P6→P
26+
10:
P5P7(P19+P17(P16
P22/P15→P21);+2P1
8)→P27+
11:
P25(P26+P27)→P23
→P23;1+P23→P24;
IF P20>P24;JMP 1
6+
12:
IF P20=P24;1/P20
→P30;PRT "322.5
","TRANS",P23+R10
6→R44+
13:
R72/P20→R72;R71/
P20→R71;1-R21→R7
3;1-R73→R74+
14:
P30→R16;P31/P20→
R61;P32/P20→R62;
1-(R71+R721→P70+
15:
RET +
S17167
R819
```

FIGURE F-3.3

COMPUTER OUTPUT TAPE

BASIC DATA ADAPTER

UPC CALCULATED
14521.36

311
ENGRY CNSMPTN
14249.60

312
SPEC MATL
0.00

313
OPER PERS
0.00

314
OPR FCLTS
0.00

315
EQP LSHLD
0.00

316
SOFTWARE SUPPORT
0.00

317
OTHER OPS
0.00

310
OPERATIONS
14249.60

321.11
ORG MAINT
1752.53

321.12
I M L LRU REPAIR
2334.94

321.13
DLM OVRHL
52992.00

321.14
DEPOT LRU RPR
103067.74

321.1
MAINT PERS COST
160147.21

321.2
MAINT FCLT
0.00

321.3
SPT EQP MAINT
1400.00

321.4
CONTRCT SVCS
0.00

321
MAINTENANCE
161547.21

322.11
ORG SUPY PERS
52.58

322.12
ILM SUPY PER
70.05

322.13
DEPOT SUPY PERS
INCLD IN 321.13

322.1
SUPLY PERS
122.62

322.211
O L M SPARES
0.00

322.212
I L M SPARES
181707.43

322.213
REPAIR MAT'L
7722.57

322.21
SPARES
189429.99

322.22
MODIFICATIONS
145213.60

322.23
RPL CMMN SPT EQU
490.00

322.2
SUSTAIN INVST
335133.60

322.31
INV MGT
30456.00

322.32
INV HLD
144567.24

322.33
TECH DATA SPT
2000.00

322.3
INV ADM
177023.24

322.4
SPLY FCLT
0.00

322.5
TRANS
12110.40

322
SUPPLY
524389.86

323
OTHER LOGISTS
0.00

320
LOG SUPPORT
685937.07

330
PERS TRNG & SPT
331 TO 335
COSTS ARE INCLD
IN PERS $/HR

FIGURE F-3.3

COMPUTER OUTPUT TAPE
(Cont'd)

```
LIFE CYCLE COST
     IN $K

R&D
          4014.08
PROD N-R
          6330.94
PROD R
         29042.00
TOTAL PROD
         35372.94
TOTAL OPNS
           142.50
TOTAL LOG SUPT
          6854.37
TOTAL O&S
          7001.87
TOTAL LCC
         46388.89

-------------------

    REGISTERS
    R1 TO R110


         1000.00
             .20
             .50
             .10
             .05

            5.00

           10.00
            2.00
             .04
         2000.00
            0.00

           10.00

            0.00
          126.00
           47.50
         1452.00
             .25

           15.00
```

```
         7706.00
            1.00
        21310.00
          100.00
             .91

           20.00

             .06
            0.00
        30456.00
            0.00
            0.00

           25.00

            9.25
             .15
           10.27
            2.00
         7001.87

           30.00

          142.50
       685937.07
        14249.60
            0.00
       160147.21

           35.00

         1752.53
         2334.94
        52992.00
         1400.00
       189429.99

           40.00

            0.00
          122.62
       177023.24
        12110.40
            0.00

           45.00
```

```
           10.00
         1000.00
        46388.89
            0.00
            0.00

           50.00

            0.00
            0.00
            0.00
            0.00
            0.00

           55.00

            0.00
            2.00
       335133.60
         2000.00
             .05

           60.00

            4.75
            1.00
           25.00
         3000.00
             .00

           65.00

             .00
             .40
       144567.24
       103067.74
             .00

           70.00

             .15
             .85
             .86
             .15
           16.00

           75.00
```

FIGURE F-3.3

COMPUTER OUTPUT TAPE

(Cont'd)

```
        0.00
        3.01
        1.00
         .85
         .05

       80.00

        0.00
   181707.43
     7722.57
   161547.21
   524389.86

       85.00

        0.00
        0.00
        0.00
        0.00
     1656.00

       90.00

        0.00
        0.00
       52.58
       70.05
        0.00

       95.00
```

```
           0.00
      145213.60
         490.00
           0.00
          39.00

         100.00

           0.00
           0.00
           0.00
           0.00
           0.00

         105.00

       11400.00
            .01
            .07
           0.00
           0.00

         110.00

REGISTERS
R200,R300,R301
R312,R320,R331
R336,R343
     4014078.00
       35372.94
        6330.94
        7000.00
      201390.00
        7000.00
       29042.00
           0.00


BEGIN TRADE-OFF
ANALYSIS.SEE
   APPENDIX F
```

ANNEX I

TRI-TAC

LIFE CYCLE COST MODEL PROGRAM

USER'S GUIDE

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SECTION A

INTRODUCTION

I. PURPOSE

The purpose of this Guide is to provide users of the TRI-TAC Life Cycle Cost Model (TTLCCM) program with a detailed set of instructions for the operation of the program.

II. FUNCTIONS PERFORMED

The TTLCCM program is a real-time application programmed in FORTRAN IV (refer to Figure 1, FORTRAN IV Program for TTLCCM) for use on a B5500 Time Sharing System (TSS). It accepts cost and data element variables provided by the user and generates various cost projections based upon the formulas outlined in Appendix F, Computer Models for LCC. In addition, it can calculate Military Personnel and Training Costs using the costs and methodologies of Appendix D.[1] Although the program is written for use with a Burroughs TTS, only slight modifications in the program need be made to allow execution on any hardware having a FORTRAN IV Compiler.

[1] Joint Tactical Communications Office, Cost Effectiveness Program Plan, Vol III, Life Cycle Costing, Appendix D, Military Personnel & Training Costs, October 1976, TTO-ORT-032-76A-V3-APD.

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCOM

```
10000 FILE  1=FILE1,UNIT=REMOTE
10100 FILE  2=INFILE,UNIT=DISK,BLOCKING=30,RECORD=10
10200 C-
10300 C-  **PROGRAMED BY D.J.BOYD,OPERATIONS RESEARCH DIVISION**
10400 C-  **DIRECTORATE FOR OPERATIONS RESEARCH TEST AND ANALSIS,**
10500 C-  **JOINT TACTICAL COMMUNICATIONS(TRI-TAC)OFFICE(TT-RT-OR),**
10600 C-  **TINTON FALLS,N.J.07724,AUTOVON 992-8383                **
10700 C-
10800       DIMENSION AE(9,4),AM(4,4),AC(10,4),AER(9,4),AMR(4,4),
10900 -     ACR(10,4),AMC(54,4),ARTR(54,4),EN(4),EM(4),
11000 -     CN(4),CM(4),CA(4),BCC(4),MOC1(4),MOC2(4)
11100       REAL MSG,MOS,LIK,VAL
11200       DIMENSION AM(108,4),MOS(4,4),BPCS(4,4),ATCS(4,4),
11300 -     MOCS(4,4),PCSS(4,4),BOCS(4,4),RTCS(4,4),TPCS(4,4)
11400       DIMENSION X(4),Y(4),R(400),CMGS(400),R(2(4),Z(4),
11500 -     S(100),IRD(100),IP(100),IOS(100),RD(7,43),PD(7,55),
11600 -     OS(7,46),RP(100,100),IROS(100)
11700       DIMENSION VL(1,3),RR(9,32),RV(124),VAL(400)
11800       DATA((AOS(L,M),L=1,4),M=1,4)/16*0/
11900       DATA((BPCS(L,M),L=1,4),M=1,4)/16*0/
12000       DATA((ATCS(L,M),L=1,4),M=1,4)/16*0/
12100       DATA((MOCS(L,M),L=1,4),M=1,4)/16*0/
12200       DATA((PCSS(L,M),L=1,4),M=1,4)/16*0/
12300       DATA((BOCS(L,M),L=1,4),M=1,4)/16*0/
12400       DATA((RTCS(L,M),L=1,4),M=1,4)/16*0/
12500       DATA((TPCS(L,M),L=1,4),M=1,4)/16*0/
12600 C-
12700 C-     ALL FORMATS FOR MIL.PERSONNEL COSTING ARE LOCATED HERE
12800 C-
12900   1    FORMAT("APPENDIX D MILITARY PERSONNEL AND TRAINING COSTS"/
13000 -      "INDICATE THE SERVICE OF THE PERSONNEL TO BE COSTED"/
13100 -     "ANSWER WITH A FOR ARMY, N FOR NAVY, MC FOR MARINE CORPS,"/
13200 -     "OR AF FOR AIR FORCE"/)
13300   2    FORMAT("INVALID ENTRY-PLEASE RE-ENTER DATA/CODES"/)
13400   3   FORMAT("ENTER THE PERSONNEL INFORMATION IN THE ORDER"/
13500 -     "AND FORMAT INDICATED USING THE FOLLOWING CODES AND"/
13600 -     "SEPERATING THE DATA BY COMMAS!"/
13700 -     "UNDER **LEVEL** ENTER ONE OF THE FOLLOWING CODES:"/
13800 -     "          OPR = OPERATOR"/
13900 -     "          SMP = SOFT-WARE PERSONNEL"/
14000 -     "          OLM = ORGANIZATIONAL LEVEL MAINTENCE"/
14100 -     "          ILM = INTERMEDIATE LEVEL MAINTENANCE"/
14200 -     "UNDER **MOS** ENTER THE APPROPRIATE CODE AS FOLLOWS:"/
14300 -     "FOR ARMY: MOS CODE MUST BE OF TYPE XXAXX "/
14400 -    "FOR NAVY: MOS CODE MUST BE AA-XXXX,AAAXXAA OR AA-XXAAB"/
14500 -     "FOR MARINE CORP MOS CODE MUST BE XXXX"/
14600 -     "FOR AIR FORCE MOS CODE MUST BE XXXXX"/
14700 -     "WHERE:X=NUMBER, AND A=ALPHA"/
14800 -     "UNDER **PAY GRADE** ENTER PAY GRADE AS E1 TO E9."/
14900 -     "UNDER **NUMBER** ENTER THE NUMBER OF PERSONNEL (01 TO 99)"/
15000 -     "TO BE COSTED FOR EACH: LEVEL,MOS AND PAY GRADE ENTERED."/
15100 -     "UNDER **DONE** ENTER ZZ WHEN AND ONLY IF YOU ARE "/
15200 -     "FINISHED WITH ALL INPUTS AT ALL LEVELS.**"/
15300 -     "(EX-OPR,03820,E3,07,ZZ)"/)
15400   21   FORMAT("**LEVEL**","**MOS**","**PAY GRADE**","**NUMBER**","**DONE**"/)
15500   22   FORMAT(A3,1X,A5,1X,A1,I1,1X,I2,1X,A2)
15600   23   FORMAT(A3,1X,A6,1X,A1,I1,1X,I2,1X,A2)
15700   24   FORMAT(A3,1X,A4,1X,A1,I1,1X,I2,1X,A2)
```

FIGURE 1

FORTRAN IV PROGRAM FOR TTLCCM

(Cont'd)

```
15800      70    FORMAT(A2)
15900      39    FORMAT(A1)
16000      78    FORMAT(A5)
16100      79    FORMAT(A6,A6)
16200      80    FORMAT(A8)
16300       6    FORMAT("WHAT IS MOS,NEC,AFSC ?")
16400       7    FORMAT("AVAILABLE ARMY MOS(S) ARE"/
16500      -     "05B20   20V40   31L40   32A10   32E40   35L20   74B20"/
16600      -     "05B40   20V50   31M20   32B20   32F20   36G20   74B30"/
16700      -     "05C20   20Y20   31M40   32B40   32F40   36H20   74B40"/
16800      -     "20L10   20Y40   31N20   32C20   32G20   36H40   74C20"/
16900      -     "26L20   31B20   31N40   32C40   32G40   41F20   74C40"/
17000      -     "26L40   31E20   31S20   32D20   35B20   51A10   74F20"/
17100      -     "26N20   31J20   31S30   32L40   35D20   52B20"/
17200      -     "26V20   31L20   31T30   32E20   35K20   72B10"/)
17300       8    FORMAT("AVAILABLE NAVY NEC(S) ARE"/
17400      -     "CE-5642   CTM48JB   CTO48MB   DS-1636   ET-1412   ET-1462"/
17500      -     "CE-5644   CTM48JC   CTO48MC   ET-1402   ET-1421   ET-1463"/
17600      -     "CTM48IB   CTM48JP   CTR48QB   ET-1403   ET-1423   ET-1464"/
17700      -     "CTM48ID   CTM48JM   CTT48BA   ET-1404   ET-1426   RM-0000"/
17800      -     "CTM48IF   CTM48JL   CTT48CB   ET-1405   ET-1431   RM-2304"/
17900      -     "CTM48IH   CTM48JJ   DS-1615   ET-1406   ET-1432   RM-2305"/
18000      -     "CTM48II   CTM48JN   DS-1616   ET-1407   ET-1436   RM-2393"/
18100      -     "CTM48IK   CTM48KV   DS-1617   ET-1408   ET-1448   RM-48JA"/
18200      -     "CTM48IS   CTO48JA   DS-1618   ET-1411   ET-1449   RM-48MA")
18300      72    FORMAT("AVAILABLE MARINE CORP MOS(S) ARE"/
18400      -     "2511 , 2542 , 2818 , 2831 , 2871,"/
18500      -     "2519 , 2549 , 2825 , 2841 , 2872,"/
18600      -     "2531 , 2591 , 2826 , 2851,"/
18700      -     "2532 , 2811 , 2827 , 2852,"/
18800      -     "2534 , 2813 , 2828 , 2861,"/
18900      -     "2537 , 2814 , 2829 , 2869")
19000      73    FORMAT("AVAILABLE AIR FORCE AFSC(S) ARE"/
19100      -     "27450 , 30450 , 30650 , 36120 , 36254 , 54550,"/
19200      -     "29150 , 30454 , 30651 , 36134 , 36350,"/
19300      -     "29353 , 30456 , 30750 , 36221 , 51150,"/
19400      -     "29550 , 30554 , 32850 , 36252 , 53550")
19500      28    FORMAT("IS PERSONNEL COSTING FOR TRADE-OFF(A) OR BASE LINE COST"/
19600      -     "ESTIMATE, INDEPENDENT PARAMETRIC COST ESTIMATE OR"/
19700      -     "CAIG PRESENTATION (B)?"/
19800      -     "NOTE:OUTPUT TO LCC MODEL FOR TRADE-OFF (A) IS AVERAGE"/
19900      -     "COST PER MAN HOUR, FOR (B) OUTPUT IS ACCUMULATED "/
20000      -     "PERSONNEL COSTS, ANSWER WITH A OR B"/)
20100      C-    **PERSONNEL COSTS CALCULATED HERE***
20200      C-    **COMPOSITE PAY RATES FROM TABLES 1,2,3 AND 4***
20300      C-    ***PAY RATE DATA ARE SEQUENCED BY GRADE***
20400      C-    **ARMY COMPOSITE ENLISTED PAY RATES FROM TABLE 1**
20500            DATA AE/6144.,6748.,7165.,8154.,9583.,11471.,13634.,15875.,
20600      -     19067.,
20700      C-    **NAVY COMPOSITE ENLISTED PAY RATES FROM TABLE 2**
20800      -     5981.,6703.,7395.,8359.,10094.,12298.,14407.,
20900      -     16524.,19023.,
21000      C-    **MARINE CORP COMPOSITE ENLISTED PAY RATES FROM TABLE 3**
21100      -     5952.,6502.,6975.,7838.,9228.,11139.,13141.,
21200      -     15470.,18518.,
21300      C-    **AIR FORCE COMPOSITE ENLISTED PAY RATES FROM TABLE 4**
21400      -     6035.,6647.,7275.,9031.,10550.,12336.,14360.,16291.,
21500      -     19033./
21600      C-    **ARMY WARRENT OFFICER COMPOSITE PAY RATES FROM TABLE 1**
21700            DATA AW/13529.,15270.,18472.,22005.,
21800      C-    **NAVY WARRENT OFFICER COMPOSITE PAY RATES FROM TABLE 2**
21900      -     14626.,16572.,,18349.,,22631.,
```

FIGURE 1

FORTRAN IV PROGRAM FOR TTLCCM

(Cont'd)

```
C-    **MARINE CORP WARRENT OFFICER COMPOSITE PAY RATES, TABLE 5**
      13054.,15509.,18455.,21906./
C-    *AIR FORCE WARRENT OFFICER COMPOSITE PAY RATES FROM TABLE 4.
      3.0.,24439./
C-    **ARMY OFFICER COMPOSITE PAY RATES FROM TABLE 1**
      DATA A0/11722.,17554.,19832.,23551.,28346.,34514.,37883.,
     41931.,41208.,43719.,
C-    **NAVY OFFICER COMPOSITE PAY RATES FROM TABLE 2**
      11314.,16242.,21402.,24293.,29062.,35002.,38107.,
     44886.,41959.,43713.,
C-    **MARINE CORP OFFICER COMPOSITE PAY RATES FROM TABLE 3*
      11011.,16340.,20433.,23789.,28430.,33510.,38311.,
     42921.,42296.,43175.,
C-    **AIR FORCE OFFICER COMPOSITE PAY RATES FROM TABLE 4**
      12080.,16247.,20751.,24203.,29249.,34196.,38883.,
     44488.,44110.,46418./
C-    **% OF PERSONNEL TO CONTINUE ON ACTIVE DUTY, TABLE 7**
C-    **% OF ARMY ENLISTED PERSONNEL, TABLE 7**
      DATA AER/.135,.144,.157,.243,.541,.837,.965,.981,.983,
C-    **% OF NAVY ENLISTED PERSONNEL, TABLE 7**
     .123,.129,.168,.645,.584,.817,.961,.979,.983,
C-    **% OF MARINE CORP ENLISTED PERSONNEL, TABLE 7**
     .103,.104,.113,.140,.341,.710,.939,.970,.970,
C-    **% OF AIR FORCE ENLISTED PERSONNEL, TABLE 7**
     .141,.142,.159,.310,.751,.955,.978,.982,.982/
C-    **% OF ARMY WARRENT OFFICER PERSONNEL, TABLE 7**
      DATA AWR/.820,.894,.965,.979,
C-    **% OF NAVY WARRENT OFFICER PERSONNEL, TABLE 7**
     .331,.895,.983,.991,
C-    **% OF MARINE CORP WARRENT OFFICER PERSONNEL, TABLE 7**
     .726,.877,.977,.984,
C-    **% OF AIR FORCE WARRENT OFFICER PERSONNEL, TABLE 7**
     3*0.,.979/
C-    **% OF ARMY OFFICER PERSONNEL, TABLE 7**
      DATA AOR/.281,.371,.741,.905,.963,.983,.988,.989,.989,.988,
C-    **% OF NAVY OFFICER PERSONNEL, TABLE 7**
     .277,.336,.543,.928,.962,.987,.993,.992,.992,.991,
C-    **% OF MARINE CORP OFFICER PERSONNEL, TABLE 7**
     .196,.300,.658,.928,.980,.980,.992,.993,.993,.993,
C-    **% OF AIR FORCE OFFICER PERSONNEL, TABLE 7**
     .266,.315,.602,.869,.963,.970,.977,.980,.981,.981/
C-    **MOS,NEC,MOS,AFSC--TABLES 11,12,14 AND 13**
C-    **ARMY MOS(S),TABLE 11***
      DATA(AM(I,1),I=1,54)/
     "05B20","05B40","05C20","26L10","26L20","26L40",
     "26N20","26V20","26Y40","26Y30","26Y20","26Y40","31B20",
     "31E20","31J20","31L20","31L40","31M20","31M40","31N20",
     "31N40","31S20","31S30","31T40","32A10","32B20","32B40",
     "32C20","32C40","32D20","32D40","32E20","32E40","32F20",
     "32F40","32G20","32G40","35B20","35D20","35K20","35L20",
     "36G20","36H20","36M40","41F20","51A10","52B20","72B10",
     "72B20","72B30","72B40","72L40","72C40","70F20"/
C-    **NAVY NEC(S),TABLE 12**
      DATA(AN(I,2),I=1,108)/
     "CE-564","2","CE-264","4","CTM481","B","CTM481","D",
     "CTM481","F","CTM481","H","CTM481","I","CTM481","K",
     "CTM481","S","CTM48J","J","CTM48J","C","CTM48J","F",
     "CTM48J","B","CTM48J","I","CTM48J","J","CTK-48","K",
     "CTM48K","L","CTM48J","A","CTC48M","B","CTC48M","C",
     "CTM48Q","B","CTT48B","A","CTT48C","B","DS-161","5",
     "DS-161","6","DS-161","7","DS-161","8","DS-163","6",
     "CT-180","2","CT-180","3","CT-180","8","CT-180","9",
```

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM
(Cont'd)

```
28400 -      "ET-140","0","ET-140","7","ET-140","8","ET-141","1",
28500 -      "ET-141","2","ET-142","1","ET-142","3","ET-142","6",
28600 -      "ET-143","1","ET-143","2","ET-143","6","ET-144","8",
28700 -     "ET-144","9","ET-146","2","ET-146","3","ET-146","4",
28800 -      "RM-000","0","RM-230","4","RM-230","5","RM-239","3",
28900 -      "RM-488","4","RM-488","4"/
29000 C-     **MARINE CORP MOS(S), TABLE 14***
29100        DATA(AM(I,4),I=1,54)/
29200 -      "2511","2519","2531","2532","2534","2537","2542","2549",
29300 -      "2591","2811","2813","2814","2818","2825","2826","2827",
29400 -      "2828","2829","2831","2841","2851","2853","2861","2866",
29500 -      "2871","2872","2874","0"/
29600 C-     **AIR FORCE AFSC(S),TABLE 13**
29700        DATA(AM(I,4),I=1,54)/
29800 -      "27450","29150","29353","28550","30450","30454","30456",
29900 -      "30554","30650","30651","30750","32850","36150","36154",
30000 -      "36251","36252","36254","36350","51150","53550","54550",
30100 -      33*"0"/
30200 C-     ****TRAINING COSTS****
30300 C-     ****TRAINING COSTS ARE SEQUENCED BY MOS,NEC,MOS OR AFSC****
30400 C-     *ARMY TRAINING COSTS, TABLE 11*
30500        DATA(AMC(I,1),I=1,54)/
30600 -      7925.,7925.,15300.,15470.,50146.,50146.,51884.,
30700 -      33683.,33683.,33983.,23469.,23468.,9047.,17884.,13144.,
30800 -      20930.,20930.,10375.,10375.,14160.,14160.,12345.,15808.,
30900 -      50146.,11407.,39402.,39402.,11407.,11407.,24146.,24146.,
31000 -      26771.,26771.,28062.,28062.,19904.,19904.,15667.,10889.,
31100 -      10788.,19110.,11095.,21678.,21678.,10987.,5969.,8077.,
31200 -      2965.,7665.,7665.,7665.,6811.,6811.,7521/
31300 C-     **NAVY TRAINING COSTS, TABLE 12**
31400        DATA(AMC(I,2),I=1,54)/
31500 -      15003.,15570.,22428.,21246.,21246.,31034.,23318.,
31600 -      23318.,24007.,35040.,42485.,20075.,19810.,21292.,24627.,
31700 -      18613.,20868.,20868.,17786.,11337.,20444.,11208,17535.,
31800 -      29262.,21630.,19436.,19710.,20241.,20562.,25044.,23529.,
31900 -      20562.,20562.,20562.,20562.,23412.,22845.,20644.,20644.,
32000 -      23781.,20947.,21906.,22788.,20109.,24868.,27323.,20947.,
32100 -      21556.,11317.,8102.,6836.,8132.,9100.,14657./
32200 C-     ***MARINE TRAINING COSTS,TABLE14***
32300        DATA(AMC(I,3),I=1,54)/
32400 -      5281.,9054.,6521.,7259.,6521.,11248.,6880.,9053.,
32500 -      10325.,7524.,7524.,7524.,6761.,6735.,6735.,6735.,6735.,
32600 -      17426.,6411.,9859.,11875.,11875.,19764.,22151.,10419.,
32700 -      10419.,28*0./
32800 C-     ****AIR FORCE TRAINING COSTS, TABLE 13****
32900        DATA(AMC(I,4),I=1,54)/
33000 -      10101.,11916.,9077.,23910.,20942.,20191.,15757.,
33100 -      20115.,21070.,20707.,15950.,17724.,15387.,13559.,22110.,
33200 -      22513.,14611.,15462.,10579.,9204.,15988.,33*0./
33300 C-     ****REPLACEMENT TURNOVER RATES (RTR)****
33400 C-     ****RTR ARE SEQUENCED BY MOS,NEC,MOS OR AFSC****
33500 C-     *ARMY RTR, TABLE 11*
33600        DATA(ARTR(I,1),I=1,54)/
33700 -      .25,.20,.27,.23,.20,.20,.37,.14,.14,.14,.26,.26,
33800 -      .27,.28,.27,.16,.16,.20,.20,.20,.20,.31,.38,.28,.20,.20,.26,
33900 -       .26,.26,.17,.17,.19,.19,.25,.25,.22,.22,.36,.30,.24,.16,
34000 -      .24,.15,.15,.27,.16,.22,.25,.25,.25,.25,.29,.29,.29/
34100 C-     **NAVY RTR, TABLE 12**
34200        DATA(ARTR(I,2),I=1,54)/
34300 -      .364,.364,.496,.369,.369,.133,.219,.254,.148,
34400 -       .110,.120,.181,.400,.551,.500,.488,.460,.406,.400,.291,
34500 -      .181,.224,.232,.226,.351,.465,.190,.140,.234,.325,.170,
```

REF F
29468
R892

ENT "RPRBLE LRU MTBF",P27,"RPRBL E LRU COST",P8+P 21→P21⊢

FIGURE 1

FORTRAN IV PROGRAM FOR TTLCCM

(Cont'd)

```
  -   .285,.309,.275,.337,.33,.217,.161,.330,.200,.209,.360,
  -   .251,.150,.340,.323,.150,.270,.104,.430,.164,.177,.172,.129/
  C-  ***MARINE CORP RTR, TABLE 14***
      DATA(ARTR(I,3),I=1,54)/
  -   .358,.433,.399,.373,.433,.433,.373,.433,.433,
  -   .390,.433,.490,.402,.623,.502,.307,.562,.283,.407,.429,
  -   .433,.433,.433,.433,.544,.433,28*0./
  C-  ****AIR FORCE RTR, TABLE 13****
      DATA(ARTR(I,4),I=1,54)/
  -   .1051,.1250,.1274,.1148,.1321,.1278,.1121,
  -   .1235,.1634,.1634,.1213,.1229,.1273,.1208,.1440,.1154,
  -   .1273,.1240,.1161,.1225,.1200,33*0./
  C-  ****THE FOLLOWING COSTS ARE SEQUENCED BY SERVICE
  C-         A,N,MC,AF****
  C-  *ENLISTED PCS COSTS,TABLE 6,ENLISTED &RETIRED COSTS PARA 2.4
      DATA EN/939.,510.,488.,940./,EM/.283,.292,.309,.239/
  C-  *OFFICER PCS COSTS,TABLE 6,OFFICER & RETIRED COSTS PARA 2.4
      DATA ON/2845.,1474.,1458.,1457./,OM/.205,.235,.218,.254/
      DATA CA/521.,0.,0.,0.,0.,0./,BUC/770.,505.,600.,620./
      DATA MDC1/975.,640.,278.,500./,MDC2/975.,640.,278.,580./
  C-  **LCC MODEL STARTS HERE**
      INTEGER SWXA,SWXB,SWXC,ONE
      ONE=1
      SWXB=1
      SWXA=2
      SWXC=1
      DATA  CPGS/400*0./
      DATA R12/4*0./
      DATA VAL/400*0./
  C-  ##X IS 1ST YEAR RECCURRING COST##
      DATA X/30.,130.,240.,390./
  C-  ##Y IS ANNUAL RECCURRING COST##
      DATA Y/110.,130.,420.,720./
  C-  ##Z IS INTRODUCTION COST INTO INVENTORY LCC ELMNT 4.2.17##
      DATA Z/430.,450.,530.,680./
  C-  ****INDEXES SET POSITION OF COST IN PRINT OUT MATRIX****
  C-  **INDEX DATA POSITION FOR R&D SUMMARY**
      DATA IRD/5*4,3,3*4,4,3,2,1,2*1,1,2,1,1,1,1,1,2,1,1,1,
  -   2,2,1,1,1,1,1,2,4,2,2,2,2,2,4,3,2,1,2,2,3,57*0/
  C-  ***INDEX DATA POSITION FOR PRODUCTION SUMMARY***
      DATA IP/5,4,3,2,1,2,1,1,2,1,1,1,2,2,1,1,1,1,1,2,2,3,2,
  -   1,1,1,2,1,1,2,2,4,2,2,2,2,4,3,2,1,2,1,1,2,3,2,2,2,1,
  -   1,1,2,2,2,4,45*0/
  C-  ****INDEX DATA POSITION FOR O&S SUMMARY****
      DATA IOS/5*4,3,3*3,3,3,3,2,2,3,4,3,3,2,2,2,2,3,3,3,3,3,
  -   2,2,2,3,2,1,1,1,4,2,3,2,2,2,3,3,3,4,3,3,3,3,3,54*0/
  C-  ****THIS INDEX SETS THE SEQUENCE OF RCs TO BE PRINTED****
      DATA IROS/30,31,33,34,41,50,51,87,91,92,52,32,84,35,36,
  -   37,38,69,53,39,59,85,42,93,94,95,58,40,81,82,83,97,98,
  -   43,23,68,55,55,44,56,99,101,102,103,104,105,54*0/
      DATA R/2920.,.2,.5,.1,.05,10.,.03,.09,41*0.,
  -   .05,0.,0.,.85,3000.,.001,.0001,.4,12*0.,.05,9*0.,
  -   1656.,1640.,.005,.07,292*0./
  C-  ALL FORMATS FOR LCC MODEL LOCATED HERE
  C-
    5 FORMAT(20X,"LIFE CYCLE COSTING MODEL"/)
    9 FORMAT("DO YOU WANT TO CHANGE/DISPLAY THE MODELS ASSUMPTIONS"/
  -   "ANSWER Y FOR YES, N FOR NO."/)
   11 FORMAT("  THE FOLLOWING ASSUMPTIONS ARE MADE  "///
  -   "(R001) OPERATING HOURS  IS 2920 HRS/YR "/
  -   "(R002) DEPOT OVERHAUL RATE  IS 20% "/
  -   "(R003) TRANSPORTATION FACTOR  IS $.50/LB "/
```

FIGURE 1

FORTRAN IV PROGRAM FOR TTLCCM

(Cont'd)

```
-        "(R004) SUPPORT EQUIPMENT MAINTENANCE FACTOR  IS 10% "/
-        "(R005) REPAIR MATERIAL COST FACTOR  IS 5% "/
-        "(R006) YEARS OF OPERATION  IS 10 YEARS "/
-        "(R007) HOLDING INVENTORY FACTOR  IS 3% "/
-        "(R008) POWER COST  IS $0.04 PER KWH "/
-        "(R060) TRANSPORTATION COST FACTOR  IS 5% "/
-        "(R063) DISTANCE FROM ORGANIZATION TO INTERMEDIATE "/
-        "MAINTENANCE LEVEL  IS 25 MI "/
-        "(R064) DISTANCE FROM INTERMEDIATE TO DEPOT MAINTENANCE "/
-        "LEVEL  IS 3000 MI "/
-       "(R065) SHORT DISTANCE TRANSPORTATION FACTOR  IS $.001 $/LB/MI"/
-       "(R066) LONG DISTANCE TRANSPORTATION FACTOR  IS $.0001 $/LB/MI"/
-        "(R067) NON RECURRING INVESTMENT FACTOR  IS 40% "/
-        "(R040) INVENTORY REPLINISHMENT FACTOR IS 5%"/
-        "(R090) AVAILABLE MANHOURS PER YEAR 1656 HRS"/
-        "(R107) MODIFICATION FACTOR .005"/
-        "(R108) REPLENISHMENT FACTOR 7%"/)
     12  FORMAT("IF ANY OF THE ABOVE ASSUMPTIONS ARE NOT VALID"/
-       "FOR YOUR SYSTEM/EQUIPMENT, ENTER THE CODES AND CORRECT VALUES"/
-        "ONE AT A TIME AS FOLLOWS "/
-        "RNNN=X, WHERE RNNN IS THE DATA ELEMENT(R001,R014,ETC) "/
-        "AND X IS THE DATA VALUE(ENTER AS A REAL NUMBER). "/
-        "IF NO CHANGES ARE REQUIRED, OR AFTER LAST CHANGE HAS BEEN"  /
-        "MADE,ENTER R999=0.")
     13  FORMAT("ENTER INPUT VARIABLE VALUES AS INDICATED."/
-       "ENTER ONLY THE VALUES(NO CODES NEEDED), IN THE ORDER"/
-       "SPECIFIED. SEPARATE EACH VALUE WITH A COMMA."/
-        "EX - 1000.,.003125,10500.,80.,0. ")
     16  FORMAT("INVALID ENTRY - PLEASE RE-ENTER OPTION")
     32  FORMAT("ENTER 4 (REAL #) VALUES FOR R123 SEPARATE BY COMMAS")
     38  FORMAT("DO YOU WANT FORMULA R44A OR R44B?   "/
-        "ANSWER A OR B  ")
     60 FORMAT(A1)
    100  FORMAT(A1,I3,A1,F13.2)
    101  FORMAT(9A6)
    121 FORMAT(1H )
    136  FORMAT("ENTER CHANGES IN VARIABLES")
    137 FORMAT("DO YOU WANT TO MAKE CHANGES TO ANY OF THE"/
-       " ASSUMPTIONS AND/OR VARIABLES?"/
-       "ANSWER WITH N(NO) B(BOTH) A(ASSUMPTIONS ONLY) "/
-       " OR V(VARIABLES ONLY)")
    138 FORMAT("ENTER CHANGES IN ASSUMPTIONS ")
    139 FORMAT("ENTER ONLY THOSE DATA ELEMENTS TO BE CHANGED"/
-        "ONE AT A TIME AS FOLLOWS "/
-        "RNNN=X, WHERE RNNN IS THE DATA ELEMENT(R001,R014,ETC) AND X IS"/
-        "THE DATA VALUE(ENTER AS A REAL NUMBER). IF NO CHANGES ARE "/
-        "REQUIRED, OR AFTER LAST CHANGE HAS BEEN MADE, ENTER R999=0.")
    140 FORMAT(15X,"CHANGES IN COST ELEMENT OUTPUTS"//)
    201  FORMAT(9A6)
    202  FORMAT("DO YOU WANT TO USE APPENDIX D, "/
-        "MILITARY PERSONNEL AND TRAINING TO COST THE"/
-        "MILITARY PERSONNEL OF YOUR SYSTEM ?"/
-             "ANSWER Y FOR YES, N FOR NO." /)
    206  FORMAT("DO YOU WANT TO INPUT ALL THE COST"/
-        "ELEMENTS FOR R&D(R200-R242) AND PRODUCTION(R300-R354)"/
-        "(A) OR JUST THE MINIMUM INPUTS TO OPERATE THE "/
-        "LCC MODEL (B)?"/)
   1200 FORMAT("ENTER INPUT VALUES AS INDICATED."/
-        "ENTER ONLY THE VALUES, IN THE ORDER AS SPECIFIED."/
-        "SEPERATE EACH VALUE WITH A COMMA."/
-        "EXAMPLE-- 1000.,.002,0.,43.1")
   1000 FORMAT("*******"*******************************************"
```

FIGURE I

FORTRAN IV PROGRAM FOR TTLCCM

(Cont'd)

```
 -        "*****************************"/
 -        40X," COSTS IN ($) OF CONSTANT 1978  $"/
 -        "       TRI-TAC LIFE CYCLE COST ELEMENTS     LEVEL LEVEL   SUB"/
 -        16X,"STRUCTURE",17X,"3",5X,"6",2X,"ELEMENT  ELEMENT  CAT."/
 -        "-----------------------------------------"
 -        "-----------------------------------------"/)
   1005 FORMAT(1H ,5X,"TRI-TAC LIFE CYCLE COST ELEMENTS"/
 -        16X,"STRUCTURE",15X,"PRIOR ","FY-78 ","FY-79 ","FY-80 ",
 -        "FY-81 ","FY-82 ","FY-83 ","FY-84 ","FY-85 ","FY-86 ",
 -        "FY-87 ","FY-88 ","FY-89 ","FY-90 ","TOTAL"/)
   1006 FORMAT(1H ,5X,"TRI-TAC LIFE CYCLE COST ELEMENTS"/
 -        16X,"STRUCTURE",15X,"PRIOR ","FY-78 ","FY-79 ","FY-80 ",
 -        "FY-81 "/)
   1007 FORMAT(1H ,"FY-86 ","FY-83 ","FY-84 ","FY-85 ","FY-86 ",
 -       "FY-87 ","FY-88 ","FY-89 ","FY-90 ","TOTAL"/)
   1008 FORMAT(40X,5F6.2/
   1009 FORMAT(9F6.2,F7.2)
   2001 FORMAT(7A6,T34,F13.2)
   2002 FORMAT(7A6,T39,F13.2)
   2003 FORMAT(7A6,T46,F13.2)
   2004 FORMAT(7A6,T55,F13.2)
   2005 FORMAT(7A6,T63,F13.2)
   2021 FORMAT("-----------------------------------------"
 -        "-----------------------------------------"/
 -        "TOTAL RESEARCH AND DEVELOPEMENT COSTS",T63,F13.2/
 -        "-----------------------------------------"
 -        "-----------------------------------------"/)
   2022 FORMAT("-----------------------------------------"
 -        "-----------------------------------------"/
 -        "TOTAL PRODUCTION COSTS",T63,F13.2/
 -        "-----------------------------------------"
 -        "-----------------------------------------"/)
   2023 FORMAT("-----------------------------------------"
 -        "-----------------------------------------"/
 -        "TOTAL OPERATING AND SUPPORT COSTS",T63,F13.2/
 -        "-----------------------------------------"
 -        "-----------------------------------------"/)
   2024 FORMAT("-----------------------------------------"
 -        "-----------------------------------------"/
 -        "TOTAL LIFE CYCLE COSTS",T63,F13.2/
 -        "-----------------------------------------"
 -        "-----------------------------------------"/)
   2025 FORMAT("****************************************************************"
 -        "*****************************"/
 -        "THERE WERE NO CHANGES IN THE LIFE CYCLE COSTS"/
 -         "****************************************************************"
 -        "*****************************"/)
   2026 FORMAT(20X,"--------------------------------------"/
 -        20X,"TRI-TAC LIFE CYCLE COST MODEL"/
 -        20X,"--------------------------------------"/)
   2030 FORMAT("LIFE CYCLE COSTS CALCULATED FOR THE")
   2029 FORMAT(30H                              )
   2028 FORMAT(
 -      "WITH A UTUPC OF $",F13.2," BASED ON",F13.2," EQUIPMENTS"/
 -        "AND A PRODUCTION BUY OF",F13.2," EQUIPMENTS"/)
   2027 FORMAT("INPUT THE NAME OF YOUR SYSTEM/EQUIPMENT"/
 -        "IN THIRTY(30) LETTERS OR LESS"/)
C-        ****ANY CHANGES IN COST ELEMENT STRUCTURES WILL
C-        REQUIRE CHANGES IN THE CORRESPONDING INDEXES****
C-        ****R&D COST ELEMENT STRUCTURE PRINT OUT****
          DATA((RD(I,J),I=1,7),J=1,30)/
 -        40H100 RESEARCH & DEVELOPEMENT             ,
```

FIGURE 1

FORTRAN IV PROGRAM FOR TTLCCM (Cont'd)

```
53000 -      40H 110 CONCEPT FORMULATION & VALIDATION    ,
53100 -      40H  111 CONTRACTOR                         ,
53200 -      40H  112 GOVERNMENT                         ,
53300 -      40H 120 FULL SCALE DEVELOPMENT              ,
53400 -      40H  121 FULL SCALE DEVELOPMENT (NON-RECUR),
53500 -      40H   122.1 CONTRACTOR(N-R)                 ,
53600 -      40H    122.11 PRIME MISSION EQUIP (PME)     ,
53700 -      40H     122.111 SUBSYSTEMS (SPECIFY)        ,
53800 -      40H    122.12 SYSTEM/PROJECT MANAGEMENT     ,
53900 -      40H     122.121 SYSTEM ENGINEERING          ,
54000 -      40H     122.122 PROJECT MANAGEMENT          ,
54100 -      40H    122.13 SYSTEM TEST & EVALUATION      ,
54200 -      40H     122.131 DEVELOP TEST & EVAL (DT&E)  ,
54300 -      40H     122.132 OPRTNL TEST & EVAL (OT&E)   ,
54400 -      40H     122.133 MOCKUPS                     ,
54500 -      40H     122.134 TEST & EVALUATION SUPPORT   ,
54600 -      40H     122.135 TEST FACILITIES             ,
54700 -      40H    122.14 TRAINING                      ,
54800 -      40H     122.141 EQUIPMENT                   ,
54900 -      40H     122.142 SERVICES                    ,
55000 -      40H     122.143 FACILITIES                  ,
55100 -      40H    122.15 PECULIAR SUPPORT EQUIP        ,
55200 -      40H    122.16 DATA                          ,
55300 -      40H     122.161 TECH ORDERS & MANUALS       ,
55400 -      40H     122.162 ENGINEERING DATA            ,
55500 -      40H     122.163 MANAGEMENT DATA             ,
55600 -      40H     122.164 SUPPORT DATA                ,
55700 -      40H     122.165 SOFTWARE SUPPORT DATA       ,
55800 -      40H    122.17 OTHER (SPECIFY)               /
55900        DATA((RD(I,J),I=1,7),J=31,43)/
56000 -      40H   123.1 GOVERNMENT (N-R)                ,
56100 -      40H    123.11 PROGRAM MNGMNT               ,
56200 -      40H    123.12 TEST SITE ACTIVATION         ,
56300 -      40H    123.13 GVRNMNT TEST (DTE/IOTE)      ,
56400 -      40H    123.14 GOVT FURN EQUIP(GFE)(SPECIFY),
56500 -      40H    123.15 OTHER(SPECIFY)               ,
56600 -      40H  124 FULL SCALE DEVELOPMENT (RECUR)    ,
56700 -      40H   125.1 CONTRACTOR (RECUR)             ,
56800 -      40H    125.11 PRIME MISSION EQUIP          ,
56900 -      40H     125.111 SUBSYSTEMS (SPECIFY)       ,
57000 -      40H    125.12 SYSTEM/PROJECT MNGMNT        ,
57100 -      40H    125.13 OTHER (SPECIFY)              ,
57200 -      40H   126.1 GOVERNMENT (RECUR)             /
57300 C-     ****PRODUCTION COST ELEMENT PRINT OUT****
57400        DATA((PD(I,J),I=1,7),J=1,29)/
57500 -      40H200 PRODUCTION                          ,
57600 -      40H 210 PRODUCTION (NON-RECUR)             ,
57700 -      40H   211.1 CONTRACTOR (N-R)               ,
57800 -      40H    211.11 PRIME MISSION EQUIP          ,
57900 -      40H     211.111 SUBSYSTEMS (SPECIFY)       ,
58000 -      40H    211.12 SYSTEM/PROJECT MNGMNT        ,
58100 -      40H     211.121 SYSTEM ENGINEERING         ,
58200 -      40H     211.122 PROJECT MNGMNT             ,
58300 -      40H    211.13 TRAINING                     ,
58400 -      40H     211.131 EQUIPMENT                  ,
58500 -      40H     211.132 SERVICES                   ,
58600 -      40H     211.133 FACILITIES                 ,
58700 -      40H    211.14 PECULIAR SUPPORT EQUIP       ,
58800 -      40H    211.15 DATA                         ,
58900 -      40H     211.151 TECH ORDERS & MANUALS      ,
59000 -      40H     211.152 ENGINEERING                ,
59100 -      40H     211.153 MANAGEMENT                 ,
```

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM
(Cont'd)

```
59200 -      40H      211.154 SUPPORT                              ,
59300 -      40H      211.155 SOFTWARE SUPPORT                     ,
59400 -      40H    211.16 INITIAL SPARES & RPR PRTS               ,
59500 -      40H    211.17 OTHER (SPECIFY)                         ,
59600 -      40H   212.1 GOVERNMENT (N-R)                          ,
59700 -      40H    212.11 INITIAL TRAINING                        ,
59800 -      40H      212.111 EQUIPMENT                            ,
59900 -      40H      212.112 SERVICES                             ,
60000 -      40H      212.113 FACILITIES                           ,
60100 -      40H    212.12 SYSTEM TEST & EVALUATION                ,
60200 -      40H      212.121 PROD ACCPT TEST&EVAL(PATE)           ,
60300 -      40H      212.122 OPRTNL TEST & EVAL(OT&E)             /
60400        DATA((PU(I,J),I=1,7),J=10,55)/
60500 -      40H    212.13 PROGRAM MANAGEMENT                      ,
60600 -      40H    212.14 TEST SITE ACTIVATION                    ,
60700 -      40H    212.15 COMMON SUPPORT EQUIP                    ,
60800 -      40H    212.16 SOFTWARE CENTER                         ,
60900 -      40H    212.17 GOVT FURN EQUIP(GFE)(SPECIFY)           ,
61000 -      40H    212.18 INVENTORY MANAGEMENT                    ,
61100 -      40H    212.19 OTHER (SPECIFY)                         ,
61200 -      40H 220 PRODUCTION(RECURRING)                         ,
61300 -      40H   221.1 CONTRACTOR (RECUR)                        ,
61400 -      40H    221.11 PRIME MISSION EQUIP                     ,
61500 -      40H      221.111 SUBSYSTEMS (SPECIFY)                 ,
61600 -      40H    221.12 SYSTEMS/PROJECT MAGMNT                  ,
61700 -      40H      221.121 SYSTEM ENGINEERING                   ,
61800 -      40H      221.122 PROJECT MANAGEMENT                   ,
61900 -      40H    221.13 OTHER (SPECIFY)                         ,
62000 -      40H   222.1 GOVERNMENT (RECUR)                        ,
62100 -      40H    222.11 QUALITY CONTROL & INSPECT               ,
62200 -      40H    222.12 TRANSPORTATION                          ,
62300 -      40H    222.13 OPERATIONAL/SITE ACT                    ,
62400 -      40H      222.131 SITE CONSTRUCTION                    ,
62500 -      40H      222.132 SITE/SHIP/VEHICLE CONV               ,
62600 -      40H      222.133 ASSMBLY ,INSTAL & CHCKOUT            ,
62700 -      40H    222.14 TECH ORDERS & MANUALS                   ,
62800 -      40H    222.15 GOVT FURN EQUIP(GFE)(SPECIFY)           ,
62900 -      40H    222.16 SUPPORT ENGINEERING                     ,
63000 -      40H    222.17 OTHER (SPECIFY)                         /
63100 C-     ****OPS COST STRUCTURE PRINT OUT****
63200        DATA((OS(I,J),I=1,7),J=1,30)/
63300 -      40H300 OPERATING & SUPPORT                            ,
63400 -      40H 310 OPERATIONS                                    ,
63500 -      40H  311 ENERGY CONSUMPTION                           ,
63600 -      40H  312 MATERIAL CONSUMPTION                         ,
63700 -      40H  313 OPERATOR PERSONNEL                           ,
63800 -      40H  314 OPERATIONAL FACILITIES                       ,
63900 -      40H  315 EQUIPMENT LEASEHOLDS                         ,
64000 -      40H  316 SOFTWARE SUPPORT                             ,
64100 -      40H   316.1 SOFTWARE PERSONNEL                        ,
64200 -      40H   316.2 SOFTWARE CENTER                           ,
64300 -      40H  317 OTHER OPERATIONS                             ,
64400 -      40H 320 LOGISTIC SUPPORT                              ,
64500 -      40H  321 MAINTENANCE                                  ,
64600 -      40H   321.1 PERSONNEL                                 ,
64700 -      40H    321.11 ORGNZTNL MAINT                          ,
64800 -      40H    321.12 INTRMDT MAINT                           ,
64900 -      40H    321.13 DEPOT MAINT                             ,
65000 -      40H    321.14 DEPOT MAINT(CNG/MOD RPR)                ,
65100 -      40H   321.2 MAINT FACILITIES                          ,
65200 -      40H   321.3 SUPPORT EQUIP MAINT                       ,
65300 -      40H   321.4 CONTRACTOR SERVICES                       ,
```

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM
(Cont'd)

```
65400 -      &OH  322 SUPPLY                                    ,
65500 -      &OH   322.1 PERSONNEL                              ,
65600 -      &OH    322.11 ORGNZTNL SUPPLY                      ,
65700 -      &OH    322.12 INTRMDT SUPPLY                       ,
65800 -      &OH    322.13 DEPOT SUPPLY                         ,
65900 -      &OH   322.2 SUSTAIN INVEST                         ,
66000 -      &OH    322.21 REPLNHMNT SUPPLIES                   ,
66100 -      &OH     322.211 ORGNZTNL LEVEL                     ,
66200 -      &OH     322.212 INT/DEPOT LEVEL                    /
66300        DATA((DS(I,J),I=1,7),J=31,46)/
66400 -      &OH     322.213 MPR MATERIAL                       ,
66500 -      &OH    322.22 MODIFICATIONS                        ,
66600 -      &OH    322.23 RPLCMNT COMMON SPPRT EQUIP           ,
66700 -      &OH   322.3 INVNTRY ADMIN                          ,
66800 -      &OH    322.31 INVNTRY MNGMNT                       ,
66900 -      &OH    322.32 INVNTRY DIST/HOLDING                 ,
67000 -      &OH    322.33 TECH DATA SUPPORT                    ,
67100 -      &OH   322.4 SUPPLY FACILITIES                      ,
67200 -      &OH   322.5 TRANSPORTATION                         ,
67300 -      &OH  323 OTHER LOGISTIC SPT                        ,
67400 -      &OH 330 PERSONNEL TRNING & SPT                     ,
67500 -      &OH  331 RPLCMNT TRNING                            ,
67600 -      &OH  332 HEALTH CARE                               ,
67700 -      &OH  333 PERSONNEL ACTIVITIES (PCS)                ,
67800 -      &OH  334 PERSONNEL SUPPORT                         ,
67900 -      &OH  335 BASE OPERATING SUPPORT                    /
68000 C-  ******  THE MAIN PROGRAM STARTS HERE *******
68100    10  WRITE(1,2046)
68200        WRITE(1,2047)
68300        READ(1,2024)
68400        WRITE(1,9)
68500        READ(1,39)LTR
68600        IF(LTR.EQ."N")GO TO 30
68700        WRITE(1,11)
68800        WRITE(1,12)
68900 C-     READ IN CHANGES TO BE MADE TO THE ASSUMPTIONS AND OVERLAY
69000 C-     THEM IN THE VALUES ARRAY.
69100    14  READ(1,180)RO,RNUM,EQS,VALUE
69200        IF(RNUM.EQ.012)GO TO 241
69300        IF(RNUM.EQ.999) GO TO 30
69400        R(RNUM)=VALUE
69500        GO TO 14
69600   114  WRITE(1,134)
69700        GO TO 14
69800 C-    WRITE MSGS REQUESTING INPUTS FOR THE VARIOUS VARIABLES
69900 C-    ACCEPT INPUTS AND STORE IN THE VALUES ARRAY
70000   241  WRITE(1,32)
70100        READ(1,/)R12
70200        GO TO 14
70300    30  IF(SWXC.EQ.1)GO TO 100
70400        IF(SWXC-3)55,200,200
70500        DATA(VL(I,1),I=1,3)/"ENTER","VALUE","FORM"/
70600        DATA RV/202,203,208,210,211,213,214,215,216,217,219,
70700 -      220,221,224,224,225,226,227,228,229,231,232,233,234,
70800 -      235,239,240,241,242,12,12,12,304,306,307,309,310,311,312,
70900 -      314,315,316,317,318,319,320,323,324,325,327,328,329,
71000 -      330,331,334,333,334,335,339,341,342,343,345,346,340,
71100 -      349,350,351,352,353,354,12,9,18,19,20,10,
71200 -      11,109,110,57,75,26,28,13,61,62,14,15,17,46,16,27,71,
71300 -      72,79,91,24,24,25,29,47,50,51,52,53,54,55,56,76,77,78,
71400 -      86,89,92,14,200,312,320,331,343,12,12,12/
71500        DATA((RR(I,J),I=1,4),J=1,18)/
```

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM
(Cont'd)

```
71600 C-   **INPUTS FOR RESEARCH & DEVELOPMENT  **
71700 -      2HR202,R203,R208,R210,     ,
71800 -      2HR211,R213,R214,R215,     ,
71900 -      2HR216,R217,R218,R220,     ,
72000 -      2HR221,R222,R224,R225,     ,
72100 -      2HR226,R227,R228,R229,     ,
72200 -      2HR231,R232,R233,R234,     ,
72300 -      2HR235,R239,R240,R241,     ,
72400 -      2HR242,                    ,
72500 C-   **INPUTS FOR PRODUCTION **
72600 -      2HR304,R306,R307,R309,     ,
72700 -      2HR310,R311,R312,R314,     ,
72800 -      2HR315,R316,R317,R318,     ,
72900 -      2HR319,R320,R323,R324,     ,
73000 -      2HR325,R327,R328,R329,     ,
73100 -      2HR330,R331,R334,R333,     ,
73200 -      2HR338,R335,R339,R341,     ,
73300 -      2HR342,R343,R345,R346,     ,
73400 -      2HR348,R349,R350,R351,     ,
73500 -      2HR352,R353,R354,          /
73600        DATA((RR(I,J),I=1,4),J=19,29)/
73700 C-     **INPUTS FOR ORS**
73800 -      2HR9,R18,R19,R20,          ,
73900 -      2HR10,R11,R109,R110,       ,
74000 -      2HR57,R75,R26,R28,         ,
74100 -      2HR13,R61,R62,R14,         ,
74200 -      2HR15,R17,R46,R16,         ,
74300 -      2HR27,R71,R72,R79,         ,
74400 -      2HR21,R22,R24,R45,         ,
74500 -      2HR29,R47,R50,R51,         ,
74600 -      2HR52,R53,R54,R55,         ,
74700 -      2HR56,R76,R77,R78,         ,
74800 -      2HR86,R89,R92,             /
74900        DATA((RR(I,J),I=1,4),J=30,31)/
75000 -      2HR200,R312,R320,R331,     ,
75100 -      2HR343,                    /
75200   100  WRITE(1,202)
75300        READ(1,39)TOO
75400        IF(TOO.EQ."Y")GO TO 740
75500        IF(SWXC.EQ.1)GO TO 71
75600        IF(SWXC.NE.1)GO TO 200
75700 C-
75800 C-     **USER TO PICK SERVICE OF PERSONNEL TO BE COSTED**
75900 C-     ****USES METHODOLOGY AND DATA OF TTQ-CRT-032-76A-VJ-APD****
76000   740  WRITE(1,1)
76100   74   READ(1,70)MSG
76200   92   IF(MSG.EQ."A")GO TO 75
76300          IF(MSG.EQ."N")GO TO 76
76400        IF(MSG.EQ."MC")GO TO 77
76500        IF(MSG.EQ."AF")GO TO 15
76600        WRITE(1,2)
76700        GO TO 74
76800   75   L=1
76900         WRITE(1,3)
77000        GO TO 25
77100   76   L=2
77200        WRITE(1,3)
77300        GO TO 26
77400   77   L=3
77500        WRITE(1,3)
77600         GO TO 27
77700   15   L=4
```

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM
(Cont'd)

```
77800          WRITE(1,3)
77900          GO TO 25
78000    26    WRITE(1,21)
78100          READ(1,22)LVL,MOS,G,K,NO,DONE
78200          GO TO 120
78300    24    WRITE(1,21)
78400          READ(1,23)LVL,MOS,MOS1,G,K,NO,DONE
78500          GO TO 120
78600    27    WRITE(1,21)
78700          READ(1,24)LVL,MOS,G,K,NO,DONE
78800    120   IF(G.EQ."E")GO TO 81
78900          GO TO 82
79000    81    PCS=EN(L)
79100          RCF=EM(L)
79200          MOC=MOC1(L)
79300          BPC=AE(K,L)
79400          BBG=AER(K,L)
79500          GO TO 84
79600    82    IF(G.EQ."W")GO TO 83
79700          GO TO 86
79800    83    PCS=ON(L)
79900          RCF=OM(L)
80000          MOC=MOC2(L)
80100          BPC=AW(K,L)
80200          BBG=AWR(K,L)
80300          GO TO 84
80400    86    IF(G.EQ."O")GO TO 131
80500          GO TO 124
80600    131   PCS=ON(L)
80700          RCF=OM(L)
80800          MOC=MOC2(L)
80900          BPC=AO(K,L)
81000          BBG=AOR(K,L)
81100          GO TO 84
81200    124   WRITE(1,2)
81300          GO TO 25
81400    84    GO TO(85,87,85,85),L
81500    87    I=1
81600          J=2
81700    237   IF(MOS.EQ.AM(I,2).AND.MOS1.EQ.AM(J,2))GO TO 227
81800          I=I+2
81900          J=J+2
82000          IF(J.GT.108)GO TO 128
82100          GO TO 237
82200    227   I=(I+1)/2
82300          GO TO 127
82400    85    I=1
82500    90    IF(MOS.EQ.AM(I,L))GO TO 127
82600          I=I+1
82700          IF(I.GT.54)GO TO 128
82800          GO TO 90
82900    128   GO TO(91,132,133,134),L
83000    91    WRITE(1,7)
83100          WRITE(1,2)
83200          GO TO 25
83300    132   WRITE(1,8)
83400          WRITE(1,2)
83500          GO TO 25
83600    133   WRITE(1,72)
83700          WRITE(1,2)
83800          GO TO 25
83900    134   WRITE(1,73)
```

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM
(Cont'd)

```
84000         WRITE(1,2)
84100         GO TO 25
84200   127   ATC=(AMC(I,L)*AHIR(I,L))+CA(L)
84300          RTC=RPC+RGF+FRG
84400 C-      **CALCULATIONS FOR, AND STORAGE OF RESULTS**
84500         IF(LVL.EQ."OPR")M=3
84600         IF(LVL.EQ."SWP")M=4
84700         IF(LVL.EQ."ULM")M=1
84800         IF(LVL.EQ."ILM")M=2
84900   95    NOS(L,M)=NO+NOS(L,M)
85000         RPCS(L,M)=RPC*NO*RPCS(L,M)
85100         ATCS(L,M)=ATC*NO*ATCS(L,M)
85200         MDCS(L,M)=MDC*NO*MDCS(L,M)
85300         PCSS(L,M)=PCS*NO*PCSS(L,M)
85400         BDCS(L,M)=BDC(L)*NO+BDCS(L,M)
85500         RTCS(L,M)=RTC+RTCS(L,M)
85600         TPCS(L,M)=RPCS(L,M)+PCSS(L,M)+ATCS(L,M)+BDCS(L,M)+
85700     *   MDCS(L,M)+RTCS(L,M)
85800         IF(DONE.NE."ZZ")GO TO (25,26,27,25),L
85900         R81B=RPCS(L,3)
86000         R91B=RPCS(L,4)
86100         R36B=RPCS(L,1)
86200         R37B=RPCS(L,2)
86300         R101B=ATCS(L,1)+ATCS(L,2)+ATCS(L,3)+ATCS(L,4)
86400         R102B=MDCS(L,1)+MDCS(L,2)+MDCS(L,3)+MDCS(L,4)
86500         R103B=PCSS(L,1)+PCSS(L,2)+PCSS(L,3)+PCSS(L,4)
86600         R105B=BDCS(L,1)+BDCS(L,2)+BDCS(L,3)+BDCS(L,4)
86700         WRITE(1,28)
86800         READ(1,39)100
86900         IF(100.EQ."B")GO TO 29
87000         IF(NOS(L,4).EQ.0)GO TO 301
87100         R110A=(TPCS(L,4)/NOS(L,4))/1056.
87200   301   IF(NOS(L,1).EQ.0)GO TO 302
87300         R26A=(TPCS(L,1)/NOS(L,1))/1056.
87400   302   IF(NOS(L,2).EQ.0)GO TO 303
87500         R28A=(TPCS(L,2)/NOS(L,2))/1056.
87600   303   IF(NOS(L,3).EQ.0)GO TO 304
87700         R11A=(TPCS(L,3)/NOS(L,3))/1056.
87800   304   R10A=NOS(L,3)
87900         R105A=NOS(L,4)
88000         GO TO 71
88100   29    R(41)=R91B
88200         R(36)=R36B
88300         R(37)=R37B
88400         R(91)=R91B
88500         R(101)=R101B
88600         R(102)=R102B
88700         R(103)=R103B
88800         R(105)=R105B
88900   71    IF(SWXC.NE.1)GO TO 200
89000 C-      ****REQUESTS INPUTS FOR LCCM****
89100         WRITE(1,209)
89200         READ(1,39)ANN
89300         WRITE(1,1206)
89400         IF(ANN.EQ."A")GO TO 109
89500         M=73
89600         N=19
89700         MM=31
89800         GO TO 104
89900   109   M=1
90000         N=1
90100         MM=29
```

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM
(Cont'd)

```
90200   104   DO 105 J=A*MM
90300         WRITE(1,101)(V(I,1),I=1,3),(RR(I,J),I=1,4)
90400         IF(J=8)GO TO 108
90500         IF(J=18)GO TO 107
90600         IF(J=31)GO TO 106
90700         IF(J=29)GO TO 107
90800 C-      ****READS INPUTS USING DATA RV FOR INDIRECT ADDRESSING
90900 C-      TO ASSIGN VALUES TO CORRESPONDING R() LOCATIONS
91000 C-      RV ARE SEQUENCED TO R() INPUTS****
91100         READ(1,*)A,B,C,D
91200         GO TO 106
91300   108   READ(1,*)A
91400         GO TO 106
91500   107    READ(1,*)A,B,C
91600         GO TO 106
91700   106   KK=RV(M)
91800         R(KK)=A
91900         M=M+1
92000         KK=RV(M)
92100         R(KK)=B
92200         M=M+1
92300         KK=RV(M)
92400         R(KK)=C
92500         M=M+1
92600         KK=RV(M)
92700         R(KK)=D
92800         M=M+1
92900   105   CONTINUE
93000         WRITE(1,32)
93100         READ(1,*)R12
93200 C-    THE USER IS GIVEN THE OPTION OF SELECTING THE TRANS"
93300 C-    PORTATION COST FORMULA TO BE USED.
93400 C-    THE VARIOUS COMPUTATIONS ARE MADE HERE. REFER TO
93500 C-    VARIOUS APPENDICIES OF TTO-ONT-032-78-V3 LIFE CYCLE COSTING
93600 C-    FOR AN EXPLANATION/ANALYSIS OF THE FORMULAS USED
93700 C-      **O&S CALCULATIONS**
93800 C-   **LEARNING CURVE CALCULATION**
93900    200   B=ALOG10(R(20))/ALOG10(2.)
94000         X1=(R(19)*(1.+B)/((R(19)+.5)**(1.+B)-(.5)**(1.+B)))**(-1./B)
94100         X2=((R(9)*(1.+B)/(((R(9)+.5)**(1.+B))-((.5)**(1.+B))))
94200     -     **(-1./B)
94300         C=((R(18))/(X1)**B)
94400         R(49)=C*((X2)**B)
94500         R(70)=1.-(R(71)+R(72))
94600         R(73)=(R(27)-R(70))/(R(71)+R(72))
94700         R(74)=1.-R(73)
94800         R(40)=((R(1)*R(9)*R(14)*R(27))/R(16))+
94900     -     ((R(1)*R(9)*(1.-R(27))*R(14)*R(5))/R(16))
95000         R(43)=R(23)+R(68)
95100 C-      **311**ENERGY CONSUMPTION**
95200         R(33)=R(21)*R(1)*R(8)*R(9)
95300 C-      **312**MATERIAL CONSUMPTION**
95400         R(34)=(R(24)*R(25))*R(9)
95500 C-      **313**OPERATOR PERSONNEL**
95600         IF(R10A.NE.0.)R(10)=R10A
95700         IF(R11A.NE.0.)R(11)=R11A
95800         R41A=R(11)*R(10)*R(9)
95900         IF(TOO.NE."B")R(41)=R41A
96000 C-      **314**OPERATIONAL FACILITIES**
96100 C-      R(50) IS DIRECT INPUT
96200 C-      **315**EQUIPMENT LEASEHOLDS**
96300 C-      R(51) IS DIRECT INPUT
```

FIGURE 1
FORTRAN IV PROGRAM FOR TELCOM
(Cont'd)

```
C-    **316**SOFTWARE SUPPORT**
      IF(R109A.NE.0.AND.R(109).EQ.0.)R(109)=R109A
      IF(R110A.NE.0.AND.R(110).EQ.0.)R(110)=R110A
      R91A=R(109)+R(110)+R(90)
      IF(I00.NE."B")R(91)=R91A
      R(87)=R(92)+R(91)
C-    **317**OTHER OPERATIONS COSTS**
C-    R(52) IS DIRECT INPUT
C-    **310**OPERATIONS**
      R(31)=(R(33)+R(34)+R(41)+R(50)+R(51)+R(52)+R(87))
C-    **321.11**ORGANIZATIONAL MAINT**
      IF(R26A.NE.0.AND.R(26).EQ.0.)R(26)=R26A
      R26A=(R(22)+((R(1)+R(15))/R(16)))+R(26)+R(9)
      IF(I00.NE."B")R(34)=R34A
C-    **321.12**INTERMEDIATE MAINT**
      IF(R28A.NE.0.AND.R(28).EQ.0.)R(28)=R28A
      R28A=((R(1)+R(9))/R(16))*R(7)+R(17)+R(28)
      IF(I00.NE."B")R(37)=R37A
C-    **321.13**DEPOT MAINT(OVERHAUL)**
      R(38)=R(57)+R(75)+R(80)
      IF(R(2).EQ.0.)R(38)=0.
C-    **321.14**DEPOT LRU/MODULE REPAIR**
      R(69)=R(1)+R(8)+R(88)+R(75)+R(79)/R(16)
C-    **321.14**TOTAL MAINT PERSONNEL COST**
      R(35)=R(36)+R(37)+R(38)+R(69)
C-    **321.2**MAINTENANCE FACILITIES**
      R53T=(R(80)+R(76))+R(86)
      IF(R(53).EQ.0.)R(53)=R53T
C-    **321.3**SUPPORT EQUIPMENT MAINTENANCE**
      R(39)=R(8)+(R(312)+R(331))
C-    **321.4**CONTRACTOR SERVICES**
C-    R(54) IS DIRECT INPUT
C-    **321**MAINT-NANCE**
      R(84)=R(35)+R(53)+R(39)+R(54)
C-    **322.11**ORGANIZATIONAL SUPPLY PERS.**
      R(93)=.03*R(36)
C-    **322.12**INTERMEDIATE SUPPLY PERS.**
      R(94)=.03*R(37)
C-    **322.13**DEPOT SUPPLY PERS.**
C-    COSTS ARE INCLUDED IN OVERHEAD RATES OF 321.13
C-    **322.1**SUPPLY PERSONNEL**
      R(82)=R(93)+R(94)+R(95)
C-    **322.21**ORGANIZATIONAL SPARES**
      R(81)=R(70)+R(9)*R(1)+R(14)/R(16)
C-    **322.212**INTER/DEPOT SPARES**
      R(82)=(R(9)+R(1)*R(14)/R(16))+R(27)
C-    **322.213**REPAIR MATERIAL**
      R(83)=(1-R(27))*R(5)+(R(9)*R(1)*R(14)/R(16))
C-    **322.214**REPLENISHMENT SPARES**
      R(80)=R(81)+R(82)+R(83)
C-    **322.23**MODIFICATIONS**
      R(97)=R(9)+R(49)*R(107)
C-    **322.23**REPLACEMENT COMMON SUPPORT EQUIPMENT**
      R(98)=R(108)*R(331)
C-    **322.2**SUSTAINING INVESTMENTS**
      R(58)=R(40)+R(97)+R(98)
C-    **322.31**INVENTORY MANAGEMENT**
      R331=0.
      R334T=0.
      R(334)=0.
      R(334)=0.
      DO 300 I=1,4,1
```

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM
(Cont'd)

```
102600         R23T=R12(I)*(X(I)+Y(I)*(R(6)-1.))/R(6)
102700         R334T=R12(I)*Z(I)
102800         R(23)=R(23)+R23T
102900         R(334)=R(334)+R334T
103000   300   CONTINUE
103100 C-      **322.32**INVENTORY DISTRIBUTION/HOLDING**
103200         R(68)=R(7)*((.15*R(9)+R(49))*(R(40)/2.))
103300 C-      **322.33**TECHNICAL DATA SUPPORT**
103400         R(59)=R(47)+R(29)
103500 C-      **322.3**INVENTORY ADMINISTRATION**
103600         R(43)=R(23)+R(68)+R(59)
103700 C-      **322.4**SUPPLY FACILITIES**
103800 C-      R(55) IS DIRECT INPUT
103900 C-      **322.5**TRANSPORTATION**
104000         R(106)=2.*(R(64)*R(66)+R(9)*R(13)*R(2))
104100         R44A=R(60)*R(40)*R(106)
104200 C-      ***R44A FORMULA IS DERIVED FROM APPENDIX E OF VOL.I***
104300 C-      ***TTO-ORT-032-78-V3-APE***
104400         R44B=(R(1)*R(9)/R(16))*
104500 C-      ***DISCARD AT ORG LEVEL,NEW LRU FROM DEPOT***
104600 -       (R(70)*(R(61)*R(63)*R(65)+R(61)*R(64)*R(66))
104700 C-      ***ORG TO INT REPAIR AND RETURN***
104800 -       +R(71)*R(74)*(2.*R(61)*R(63)*R(65)+R(62)*R(64)*R(66))
104900 C-      ***ORG TO INT AND DISCARD,NEW LRU TO ORG***
105000 -       +R(71)*R(73)*(2.*R(61)*R(63)*R(65)+R(61)*R(64)*R(66))
105100 C-      ***DEPOT REPAIR/DISCARD RETURN TO ORG***
105200 -        +R(72)*(2.*R(61)*R(63)*R(65)+2.*R(61)*R(64)*R(66)))
105300 C-      ****USER TO SELECT TRANSPORTATION FORMULA-SEE
105400 C-      TTO-ORT-032-78R-V3-APF FOR EXPLANATION OF CHOICES****
105500         WRITE(1,38)
105600         READ(1,39)LTR
105700   501   IF(LTR.EQ."A" .OR. LTR.EQ."B") GO TO 141
105800         WRITE(1,16)
105900         READ(1,39)LTR
106000         GO TO 501
106100   141   IF(LTR.EQ."A")R(44)=R44A
106200         IF(LTR.EQ."B")R(44)=R44B
106300 C-      **322**SUPPLY**
106400         R(85)=R(42)+R(58)+R(43)+R(55)+R(44)
106500 C-      **323**LOGISTIC SUPPORT COSTS**
106600 C-      R(56) IS DIRECT INPUT
106700 C-      **320**LOGISTIC SUPPORT**
106800         R(32)=R(84)+R(85)+R(56)
106900 C-      **330**PERSONNEL TRAINING & SUPPORT **
107000         R(99)=R(101)+R(102)+R(103)+R(104)+R(105)
107100 C-      **300**OPERATING AND SUPPORT**
107200         R(30)=R(31)+R(32)+R(99)
107300         IF(AMN.EQ."A")GO TO 1111
107400         R(301)=(R(49)*R(9)*R(67))+R(320)+R(312)+R(331)+R(334)
107500         R(336)=R(49)*R(9)+R(343)
107600         R(300)=R(301)+R(336)
107700         GO TO 111
107800 C-    ***R &D CALCULATIONS***
107900  1111   R(238)=R(239)
108000         R(237)=R(238)+R(240)+R(241)
108100         R(236)=R(237)+R(242)
108200         R(230)=R(231)+R(232)+R(233)+R(234)+R(235)
108300         R(223)=R(224)+R(225)+R(226)+R(227)+R(228)
108400         R(218)=R(219)+R(220)+R(221)
108500         R(212)=R(213)+R(214)+R(215)+R(216)+R(217)
108600         R(209)=R(210)+R(211)
108700         R(207)=R(208)
```

```
      R(204)=R(207)+R(209)+R(212)+R(218)+R(222)+R(223)+R(229)
      R(205)=R(206)+R(436)
      R(208)=R(265)+R(436)
      R(201)=R(202)+R(403)
      R(200)=R(201)+R(404)
C-    ***PRODUCTION CALCULATIONS  ***
      R(347)=R(348)+R(349)+R(350)
      R(344)=R(345)+R(346)+R(347)+R(351)+R(352)+R(353)+R(354)
      R(340)=R(341)+R(342)
      R(338)= R(339)
      R(337)=R(338)+R(340)+R(343)
      R(336)=R(337)+R(344)
      R(326)=R(327)+R(328)
      R(322)=R(323)+R(324)+R(325)
      R(321)=R(322)+R(326)+R(329)+R(330)+R(331)+R(332)+R(333)
     -     +R(334)+R(335)
      R(313)=R(314)+R(315)+R(316)+R(317)+R(318)
      R(308)=R(309)+R(310)+R(311)
      R(305)=R(306)+R(307)
      R(303)= R(304)
      R(302)=R(303)+R(305)+R(308)+R(312)+R(313)+R(319)+R(320)
      R(301)=R(302)+R(321)
      R(300)=R(301)+R(336)
  111 DTUPC=R(69)
      QTY=R(19)
      BUY=R(9)
      WRITE(1,121)
      WRITE(1,121)
      IF(SWXR.EQ.2) WRITE(1,140)
      IF(R(49).NE.CHGS(49))WRITE(1,2026)
      IF(R(49).NE.CHGS(49))WRITE(1,2030)
      IF(R(49).NE.CHGS(49))WRITE(1,2029)
      IF(R(49).NE.CHGS(49))WRITE(1,2028)DTUPC,QTY,BUY
      IF(R(200).EW.CHGS(200))GO TO 998
      IF(SWXR.EQ.2)WRITE(1,1000)
      IF(SWXR.EQ.1)WRITE(1,1000)
C-    ****CONVERSIONS AND FORMAT PRINTOUTS DONE HERE****
C-    **NOTE:.000001*R(K) CONVERTS VALUES TO MILLIONS**
C-    ***READ***
  123 K=200
      L=1
      DO 126 M=1,93
      M=IRD(L)
      VAL(K)=.000001*R(K)
      GO TO(2006,2007,2008,2009,2010),M
 2006 IF(R(K).NE.CHGS(K))WRITE(1,2001)(RD(I,J),I=1,7),VAL(K)
      GO TO 122
 2007 IF(R(K).NE.CHGS(K))WRITE(1,2002)(RD(I,J),I=1,7),VAL(K)
      GO TO 122
 2008 IF(R(K).NE.CHGS(K))WRITE(1,2003)(RD(I,J),I=1,7),VAL(K)
      GO TO 122
 2009 IF(R(K).NE.CHGS(K))WRITE(1,2004)(RD(I,J),I=1,7),VAL(K)
      GO TO 122
 2010 IF(R(K).NE.CHGS(K))WRITE(1,2005)(RD(I,J),I=1,7),VAL(K)
  122 K=K+1
      L=L+1
  126 CONTINUE
      WRITE(1,2041)VAL(200)
C-    ****PRODUCTION****
      WRITE(1,121)
      WRITE(1,121)
  998 IF(R(300).EW.CHGS(300))GO TO 997
```

FIGURE 1

FORTRAN IV PROGRAM FOR TTLCCM

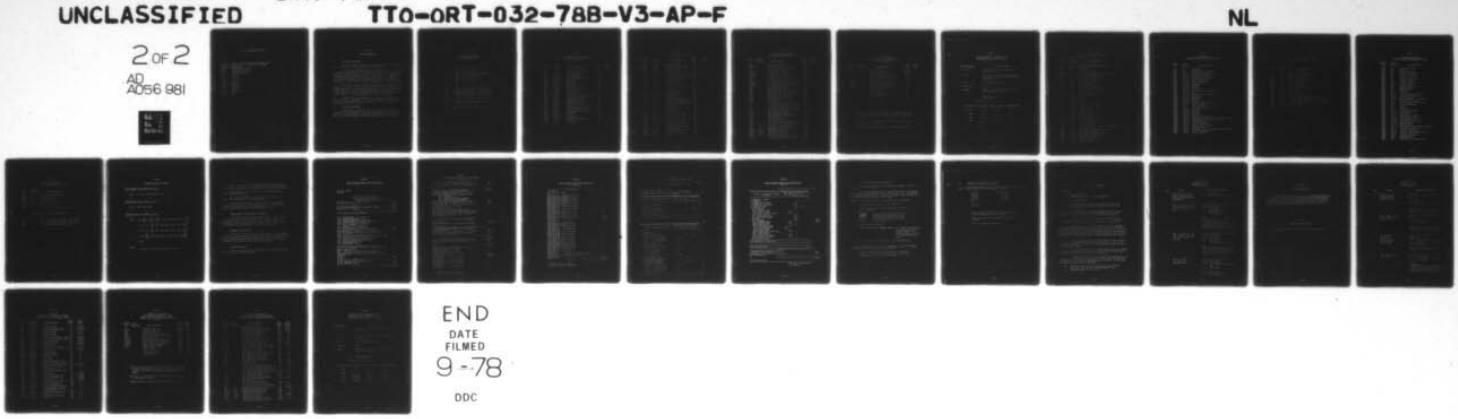
(Cont'd)

```
115000        WRITE(1,1000)
115100        K=300
115200        L=1
115300        DO 150 J=1,55
115400        M=IP(L)
115500        VAL(K)=.000001*R(K)
115600        GO TO(2011,2012,2013,2014,2015),M
115700  2011  IF(R(K).NE.CHGS(K))WRITE(1,2001)(PD(I,J),I=1,7),VAL(K)
115800        GO TO 155
115900  2012  IF(R(K).NE.CHGS(K))WRITE(1,2002)(PD(I,J),I=1,7),VAL(K)
116000        GO TO 155
116100  2013  IF(R(K).NE.CHGS(K))WRITE(1,2003)(PD(I,J),I=1,7),VAL(K)
116200        GO TO 155
116300  2014  IF(R(K).NE.CHGS(K))WRITE(1,2004)(PD(I,J),I=1,7),VAL(K)
116400        GO TO 155
116500  2015  IF(R(K).NE.CHGS(K))WRITE(1,2005)(PD(I,J),I=1,7),VAL(K)
116600  155   K=K+1
116700        KK=KK+1
116800        L=L+1
116900  150   CONTINUE
117000        WRITE(1,2042)VAL(300)
117100 C-     ****OPS***R(K)*R(6) CONVERTS ANNUAL COSTS TO LCC**
117200        WRITE(1,121)
117300        WRITE(1,121)
117400  997   IF(R(30).E.CHGS(30))GO TO 996
117500        WRITE(1,1000)
117600        L=1
117700        M=1
117800        DO 160 J=1,46
117900        K=IRDS(M)
118000        VAL(K)=.000001*R(K)*R(6)
118100        N=IDS(L)
118200        GO TO(2016,2017,2018,2019,2020),N
118300  2016  IF(R(K).NE.CHGS(K))WRITE(1,2001)(DS(I,J),I=1,7),VAL(K)
118400        GO TO 165
118500  2017  IF(R(K).NE.CHGS(K))WRITE(1,2002)(DS(I,J),I=1,7),VAL(K)
118600        GO TO 165
118700  2018  IF(R(K).NE.CHGS(K))WRITE(1,2003)(DS(I,J),I=1,7),VAL(K)
118800        GO TO 165
118900  2019  IF(R(K).NE.CHGS(K))WRITE(1,2004)(DS(I,J),I=1,7),VAL(K)
119000        GO TO 165
119100  2020  IF(R(K).NE.CHGS(K))WRITE(1,2005)(DS(I,J),I=1,7),VAL(K)
119200  165   L=L+1
119300        M=M+1
119400  160   CONTINUE
119500        WRITE(1,2043)VAL(30)
119600        VAL(48)=VAL(200)+VAL(300)+VAL(30)
119700        R(48)=VAL(48)
119800        WRITE(1,2044)VAL(48)
119900  996   IF(R(48).E.CHGS(48))WRITE(1,2025)
120000 C-     ****LOADS CHGS() AND R() HERE
120100 C-     NOTE=ON SUBSEQUENT RUNS ONLY THE CHANGES ARE PRINTED OUT****
120200        IF(SWX8.NE.1) GO TO 500
120300        DO 450 K=1,400,1
120400        CHGS(K)=R(K)
120500  450   CONTINUE
120600  500   SWX8=2
120700        DO 600 L=1,400,1
120800        R(L)=CHGS(L)
120900  600   CONTINUE
121000 C-    THE USER IS GIVEN THE OPTION HERE TO MAKE ANY CHANGES
121100 C-    TO THE ORIGINAL INPUTS, THE OPTIONS ARE TO CHANGE JUST
```

AD-A056 981 JOINT TACTICAL COMMUNICATIONS OFFICE FORT MONMOUTH N J F/G 17/2
COST EFFECTIVENESS PROGRAM PLAN FOR JOINT TACTICAL COMMUNICATIO--ETC(U)
JUN 78

UNCLASSIFIED TTO-ORT-032-78B-V3-AP-F NL

2 OF 2
AD
A056 981



END
DATE
FILMED
9-78
DDC

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM
(Cont'd)

```
121400 C-    VARIABLES, JUST ASSUMPTIONS, OR BOTH, ONLY THOSE
121300 C-    ELEMENTS THAT ARE TO BE CHANGED ARE ENTERED.
121400         WRITE(1,137)
121500    50   READ(1,70)MSG
121600         IF(MSG.EQ."N") GO TO 900
121700         IF(MSG.EQ."B") GO TO 51
121800         IF(MSG.EQ."A") GO TO 52
121900         IF(MSG.EQ."V") GO TO 53
122000         WRITE(1,14)
122100         GO TO 50
122200    51   SWXC=2
122300         WRITE(1,138)
122400         GO TO 110
122500    52   SWXC=3
122600         WRITE(1,135)
122700         GO TO 110
122800    53   SWXC=4
122900         WRITE(1,136)
123000         GO TO 110
123100    55   SWXC=5
123200         WRITE(1,136)
123300         GO TO 110
123400   900   STOP
123500         END
```

SECTION B

GENERAL INFORMATION

I. ACCEPTABLE INPUT DATA

The cost and data elements that drive this model are broken down into two categories; constants/assumptions and variables.

The constants/assumptions are data delements that have a high degree of constancy and so have been incorporated into the program to reduce data entry time. Although labeled "constants", these items may be changed during the execution of the program if so desired by the user. Upon completion of the program, the constants revert to their original values. Permanent change of these elements must be made by amendment to the program and re-compilation. The list of this category of data elements is shown in Table 1.

The list of variables, or user determined items, is depicted in Tables 2, 3, 4, and 5. These items will be entered during execution of the program in response to program generated requests. For the convenience of the user, Tables 2, 3, 4, and 5 have been designed so that they can be used as input sheets by putting the required input data into the input value column. Tables 6, 7, and 8 show the model's output cost structure.

In addition to the aforementioned categories of data, the user will be required to indicate, in response to a program generated message, which one of two transportation cost formulas is to be used. These two formulas are described in Table 9.

II. PROCESSING AVAILABLE

Options within the program allow both the variables and the "constants" to be manipulated to show cost sensitivity to changing factors. After the initial generation of cost data, the program will generate and print only those items that have changed from the original cost figures.

TABLE 1

DATA CONSTANTS/ASSUMPTIONS
FOR FORTRAN LCC MODEL

R001	Operating Hrs (2920 hrs/yr)
R002	Depot Overhaul Rate (.20)
R003	Transportation Cost Factor ($.50/lb)
R004	Support Equip Maintenance Factor (.10)
R005	Repair Material Cost Factor (.05)
R006	Years of Operation (10)
R007	Holding Inventory Factor (.03)
R008	Power Cost (.0.04 $/kwh)
R060	Transportation Cost Factor (.05)
R063	Dist. A. (Org. to Int. Level) (25 mi)
R064	Dist. B. (Int. to Depot Level) (3000 mi)
R065	Transportation Factor A. (.001 $/lb/mi)
R066	Transportation Factor B. (.0001 $/lb/mi)
R067	Non-Recurring Investment Cost Factor (.40)
R080	Inventory Replenishment Cost Factor (.05)
R090	Available Manhours per year (1656 hrs)
R107	Modification Factor (.005)
R108	Replenishment Factor (.07)

TABLE 2

RESEARCH AND DEVELOPMENT
DATA INPUTS FOR FORTRAN LCC MODEL

Register No.	LCCM Cost Elem.	Data Description	Data Source	Input Value
R202	111	Contractor (Concept F&V)	(C)	
R203	112	Government (Concept F&V)	(G)	
R208	122.111	Subsystems (N-R)	(C)	
R210	122.121	System Engineering (N-R)	(C)	
R211	122.121	Project Management (N-R)	(C)	
R213	122.131	DT&E (N-R)	(C)	
R214	122.132	OT&E (N-R)	(C)	
R215	122.133	Mockups (N-R)	(C)	
R216	122.134	T&E Support (N-R)	(C)	
R217	122.135	Test Facilities (N-R)	(C)	
R219	122.141	Equipment (N-R)	(C)	
R220	122.142	Services (N-R)	(C)	
R221	122.143	Facilities (N-R)	(C)	
R222	122.15	Peculiar Support Equipment (N-R)	(C)	
R224	122.161	Tech. Orders & Manuals (N-R)	(C)	
R225	122.162	Engineering Data (N-R)	(C)	
R226	122.163	Management Data (N-R)	(C)	
R227	122.164	Support Data (N-R)	(C)	
R228	122.165	Software Support Data (N-R)	(C)	
R229	122.17	Other (N-R)	(C)	
R231	123.11	Program Management (N-R)	(G)	
R232	123.12	Test Site Activation (N-R)	(G)	
R233	123.13	Government (DTE/IOTE) (N-R)	(G)	
R234	123.14	GFE (N-R)	(G)	
R235	123.15	Other (N-R)	(G)	
R239	125.111	Subsystem (R)	(C)	
R240	125.12	System/Project Mgmt (R)	(C)	
R241	125.13	Other (R)	(C)	
R242	126.1	Government (R)	(G)	

TABLE 3

PRODUCTION
DATA INPUTS FOR FORTRAN LCC MODEL

Register No.	LCCM Cost Elem.	Data Description	Data Source	Input Value
R304	211.111	Subsystems (N-R)	(C)	
R306	211.121	System Engineering (N-R)	(C)	
R307	211.122	Project Management (N-R)	(C)	
R309	211.131	Equipment (N-R)	(C)	
R310	211.132	Services (N-R)	(C)	
R311	211.133	Facilities (N-R)	(C)	
R312	211.14	Peculiar Support Equip. (N-R)	(C)	
R314	211.151	Tech. Orders & Manuals (N-R)	(C)	
R315	211.152	Engineering (N-R)	(C)	
R316	211.153	Management (N-R)	(C)	
R317	211.154	Support (N-R)	(C)	
R318	211.155	Software Support (N-R)	(C)	
R319	211.16	Initial Spares & Rpr Pts (N-R)	(C)	
R320	211.17	Other (N-R)	(C)	
R323	212.111	Equipment (N-R)	(G)	
R324	212.112	Services (N-R)	(G)	
R325	212.113	Facilities (N-R)	(G)	
R327	212.121	PATE (N-R)	(G)	
R328	212.122	OT&E (N-R)	(G)	
R329	212.13	Program Management (N-R)	(G)	
R330	212.14	Test Site Activation (N-R)	(G)	
R331	212.15	Common Support Equip (N-R)	(G)	
R332	212.16	Software Center (N-R)	(G)	
R333	212.17	GFE (N-R)	(G)	
R334	212.18	Inventory Management (N-R)	(G)	
R335	212.19	Other (N-R)	(G)	
R339	221.111	Subsystem (R)	(C)	
R341	221.121	System Engineering (R)	(C)	
R342	221.122	Project Management (R)	(C)	
R343	221.13	Other (R)	(C)	
R345	222.11	Quality Control & Insp. (R)	(G)	
R346	222.12	Transportation (R)	(G)	
R348	222.131	Site Construction (R)	(G)	
R349	222.132	Site/Ship/Vehicle Conv (R)	(G)	
R350	222.133	System Assembly, Install, & Checkout (R)	(G)	
R351	222.14	Tech Orders & Manuals (R)	(G)	
R352	222.15	GFE (R)	(G)	
R353	222.16	Support Engineering (R)	(G)	
R354	222.17	Other (R)	(G)	

TABLE 4

OPERATIONS AND SUPPORT
DATA INPUTS FOR FORTRAN LCC MODEL

Register No.	LCCM Cost Elem.	Data Description	Data Source	Input Value
R009		Equipment Quantity (#)	(G)	
R018		Unit Production Cost Est. ($)	(G)	
R019		Quantity Used for UPC Est. (#)	(G)	
R020		Learning Curve Slope (%)	(G)	
R010 1/		No. Operators/Equipment (#)	(C/G)	
R011 1/		Operator Cost ($/hr)	(G)	
R109 1/		No. Software Personnel (#)	(G)	
R110 1/		Software Personnel Costs ($/hr)	(G)	
R057		No. Depot Personnel (#)	(C/G)	
R075		Depot Personnel Cost ($/hr)	(G)	
R026 1/		Org. Level Maint. Pers. Cost ($/hr)	(G)	
R028 1/		Int. Level Maint. Pers. Cost ($/hr)	(G)	
R013		Equipment Weight (lbs)	(C)	
R061		Avg. Weight of LRU (lbs)	(C)	
R062		Avg. Weight of Repair Parts (lbs)	(C)	
R014		Avg. Replacement Ass. (LRU) Cost ($)	(C)	
R015		Avg. MTTR (Org. Level) (hrs)	(C)	
R017		Avg. MTTR (Int. Level) (hrs)	(C)	
R046		Avg. MTTR (Depot Level) (hrs)	(C)	
R016		Avg. MTBF (hrs)	(C)	
R027		Discard Rate (%)	(C)	
R071		P2 (% of ALL failed LRU's to be repaired/discarded at Int. Level) (%)	(C)	
R072		P3 (% of ALL failed LRU's to be repaired/discarded at Depot Level) (%)	(C)	
R079		Avg. Depot Level Repair Rate (%)	(C)	
R021		Avg. Power Rating (kw)	(C)	
R022		Avg. Preventative Maint. (hr/yr)	(C)	
R024		Avg. Material Consumpation Rate (units/yr/equip)	(C)	
R025		Avg Material Cost ($/unit)	(C)	
R029		Tech. Data Mgmt Costs ($/page)	(G)	
R047		No. Page in Set of Tech Data (pages)	(C)	
R050	314	Operational Facilities Cost ($)	(G)	
R051	315	Equipment Leaseholds Cost ($)	(G)	
R052	317	Other Operating Costs ($)	(G/C)	
R053 2/	321.2	Maintenance Facilities ($)	(G)	
R054	321.4	Contractor Services ($)	(C)	
R055	322.4	Supply Facilities ($)	(G)	
R056	323	Other Logistic Support Costs ($)	(C/G)	
R076 2/		Support Equipment Area (ft^2/yr)	(C/G)	

TABLE 4

OPERATIONS AND SUPPORT
DATA INPUTS FOR FORTRAN LCC MODEL
(Cont'd)

Register No.	LCCM Cost Elem.	Data Description	Data Source	Input Value
R077		Equipment Code (#)	(Analyst)	
R078		Iteration Number (#)	(Analyst)	
R086		Floor Area Cost ($/yr)	(G)	
R089		Maintenance Work Area (ft^2/yr)	(C/G)	
R092		Maint. of Software Center ($/yr)	(G)	
R200 3/		R&D Estimate ($)	(C)	
R312 3/		Peculiar Support Equipment ($)	(C)	
R320 3/		Other N-R Production Costs ($)	(C/G)	
R331 3/		Common Support Equipment ($)	(C/G)	
R343 3/		Other Recurring Products ($)	(C/G)	
R012		Number of New FSN (#)	(C)	
		Under $5,000	(C)	
		$5,000 - $49,999	(C)	
		$50,000 - $500,000	(C)	
		Over $500,000	(C)	

1/ These inputs are not required if the Appendix D, Military personnel and Training Costs (MP & TC) portion of the model is used. (See Table 5 for inputs to MP & TC portions of model.)

2/ If data is to be input for R076, R086, and R089, an input is not required for R053.

3/ These inputs are required only if not previously input.

TABLE 5

MILITARY PERSONNEL & TRAINING COSTS
DATA INPUTS FOR FORTRAN LCC MODEL

Data Description		Choice of Values
1.	Service	A (Army), N (Navy), MC (Marine Corps), AF (Air Force)
2.	Level	OPR (Operator), SWP (Software Personnel), OLM (Org. Level Maint.), ILM (Intermediate Level Maint.)
3.	MOS	See TTO-ORT-032-76A-V3-APD
4.	Pay Grade	E 1 - E 9
5.	Number	Number of personnel at level in MOS and Pay Grade (99 or less)

Input Values For

Service _____

*** LEVEL ***,	***MOS***,	***PAY GRADE***,	***NUMBER***,***
OPR	_____	_____	_____
SWP	_____	_____	_____
OLM	_____	_____	_____
ILM	_____	_____	_____

TABLE 6

RESEARCH AND DEVELOPMENT
COST DATA OUTPUTS FOR FORTRAN LCC MODEL

Register No.	LCCM Cost Elem.	Data Description
R200	100	Research & Development
R201	110	Concept Formulation & Validation
R202	111	Contractor
R203	112	Government
R204	120	Full Scale Development
R205	121	Full Scale Development (Non-recurring)
R206	122.1	Contractor (Non-recurring)
R207	122.11	Prime Mission Equipment (PME)
R208	122.111	Subsystems (Specify)
R209	122.12	System/Project Management
R210	122.121	System Engineering
R211	122.122	Project Management
R212	122.13	System Test & Evaluation
R213	122.131	Development Test & Evaluation
R214	122.132	Operational Test & Evaluation
R215	122.133	Mockups
R216	122.134	Test & Evaluation Support
R217	122.135	Test Facilities
R218	122.14	Training
R219	122.141	Equipment
R220	122.142	Services
R221	122.143	Facilities
R222	122.15	Peculiar Support Equipment
R223	122.16	Data
R224	122.161	Technical Orders & Manuals
R225	122.162	Engineering Data
R226	122.163	Management Data
R227	122.164	Support Data
R228	122.165	Software Support Data
R229	122.17	Other (Specify)
R230	123.1	Government (Non-recurring)
R231	123.11	Program Management
R232	123.12	Test Site Activation
R233	123.13	Government Test (DTE/IOTE)
R234	123.14	Government Furnished Equipment (GFE) (Specify)
R235	123.15	Other (Specify)
R236	124	Full Scale Development (Recurring)
R237	125.1	Contractor (Recurring)
R238	125.11	Prime Mission Equipment (PME)
R239	125.111	Subsystems (Specify)
R240	125.12	System/Project Management
R241	125.13	Other (Specify)
R242	126.1	Government (Recurring)

TABLE 7

PRODUCTION
COST DATA OUTPUTS FOR FORTRAN LCC MODEL

Register No.	LCCM Cost Elem.	Data Description
R300	200	Production
R301	210	Production (Non-recurring)
R302	211.1	Contractor (Non-recurring)
R303	211.11	Prime Mission Equipment (PME)
R304	211.111	Subsystems (Specify)
R305	211.12	System/Project Management
R306	211.121	System Engineering
R307	211.122	Project Management
R308	211.13	Training
R309	211.131	Equipment
R310	311.143	Services
R311	2211.133	Facilities
R312	211.14	Peculiar Support Equipment
R313	211.15	Data
R314	211.151	Technical Orders & Manuals
R315	211.152	Engineering
R316	211.153	Management
R317	211.154	Support
R318	211.155	Software Support
R319	211.16	Initial Spares & Repair Parts
R320	211.17	Other (Specify)
R321	212.1	Government (Non-recurring)
R322	212.11	Initial Training
R323	212.111	Equipment
R324	212.112	Services
R325	212.113	Facilities
R326	212.12	System Test & Evaluation
R327	212.121	Production Acceptance Test & Evaluation (PATE)
R328	212.122	Operational Test & Evaluation (OT&E)
R329	212.13	Program Management
R330	212.14	Test Site Activation
R331	212.15	Common Support Equipment
R332	212.16	Software Center
R333	212.17	Government Furnished Equipment (GFE) (Specify)
R334	212.18	Inventory Management
R335	212.19	Other (Specify)

TABLE 7

PRODUCTION

COST DATA OUTPUTS FOR FORTRAN LCC MODEL

(Cont'd)

Register No.	LCCM Cost Elem.	Data Description
R336	220	Production (Recurring)
R337	221.1	Contractor (Recurring)
R338	221.11	Prime Mission Equipment (PME)
R339	221.111	Subsystem (Specify)
R340	221.12	System/Project Management
R341	221.121	System Engineering
R342	221.122	Project Management
R343	221.13	Other (Specify)
R344	222.1	Government (Recurring)
R345	222.11	Quality Control & Inspection
R346	222.12	Transportation
R347	222.13	Operational/Site Activation
R348	222.131	Site Construction
R349	222.132	Site/Ship/Vehicle Conversion
R350	222.133	System Assembly, Installation & Checkout
R351	222.14	Technical Orders & Manuals
R352	222.15	Government Furnished Equipment (GFE) (Specify)
R353	222.16	Support Engineering
R354	222.17	Other (Specify)

TABLE 8

OPERATING AND SUPPORT
COST DATA OUTPUT FOR FORTRAN LCC MODEL

Register No.	LCCM Cost Elem.	Data Description
R030	300	Operating & Support
R031	310	Operations
R033	311	Energy Consumption
R034	312	Material Consumption
R041	313	Operator Personnel
R050	314	Operational Facilities
R051	315	Equipment Leaseholds
R087	316	Software Support
R091	316.1	Software Personnel
R092	316.2	Software Center
R052	317	Other Operations Costs
R032	320	Logistic Support
R084	321	Maintenance
R035	321.1	Personnel
R036	321.11	Organizational Maintenance
R037	321.12	Intermediate Maintenance
R038	321.13	Depot Maintenance
R069	321.14	Depot Maintenance (LRU/Mod Rpr)
R053	321.2	Maintenance Facilities
R039	321.3	Support Equipment Maintenance
R054	321.4	Contractor Services
R085	322	Supply
R042	322.1	Personnel
R093	322.11	Organizational Supply
R094	322.12	Intermediate Supply
R095	322.13	Depot Supply
R058	322.2	Sustaining Investments
R040	322.21	Replenishment Spares
R081	322.211	Organizational Level
R082	322.212	Intermediate/Depot Level
R083	322.213	Repair Material
R097	322.22	Modifications
R098	322.23	Replacement Common Support Equipment
R043	322.3	Inventory Administration
R023	322.31	Inventory Management
R068	322.32	Inventory Distribution/Holding
R059	322.33	Technical Data Support
R055	322.4	Supply Facilities
R044	322.5	Transportation
R056	323	Other Logistic Support Costs

TABLE 8

OPERATING AND SUPPORT
COST DATA OUTPUT FOR FORTRAN LCC MODEL
(Cont'd)

Register No.	LCCM Cost Elem.	Data Description
R099	330	Personnel Training & Support
R101	331	Replacement Training
R102	332	Health Care
R103	333	Personnel Activities (PCS)
R104	334	Personnel Support
R105	335	Base Operating Support
R048		Total Life Cycle Cost
R049		Unit Production Costs Calculated ($)

Other Registers Used but not Printed Out

R070	P1 (% failed LRU's discarded at Org. Level)
R073	P2 (% failed LRU's discarded at Int. Level)
R074	P22 (% failed LRU's repaired at Int. Level)
R106	Depot Overhaul Transportation Costs ($)

TABLE 9

TRANSPORTATION COST FORMULAS

DEPOT OVERHAUL TRANSPORTATION FORMULA:

$$R106 = 2 \times R64 \times R66 \times R9 \times R13 \times R2$$

TRANSPORTATION COST FORMULA A (R44A):

$$R44A = R60 \times R40 + R106$$

TRANSPORTATION COST FORMULA B (R44B);

$$R44B = R9 \times \frac{R1}{R61} \times \Big\{ R70 \times \Big[R61 \times R63 \times R65 + R61 \times R64 \times R66 \Big]$$
$$+ R71 \times R74 \times \Big[2 \times R61 \times R63 \times R65 + R62 \times R64 \times R66 \Big]$$
$$+ R71 \times R73 \times \Big[2 \times R61 \times R63 \times R65 + R61 \times R64 \times R66 \Big]$$
$$+ R72 \times \Big[2 \times R61 \times R63 \times R65 + 2 \times R61 \times R64 \times R66 \Big] \Big\}$$
$$+R106$$

where,

R values are as defined in Tables 1, 4 and 8.

III OUTPUT DATA GENERATED

Figure 2 depicts the types and format of data generated by an example program. As shown on the figure, there are two types of output generated by the program (messages and data) and one type of input (replies).

The messages are lines generated by the program which may require a response by the user.

Data are lines generated by the program which reflects the results of the computations in a readable format.

In response to messages, replies are those entries made by the user to input variables, to make corrections, or to supply information which will determine the processing flow (NOTE: A reply is required following any ? symbols produced by the program).

IV CONVERSATIONAL SYSTEM CONTROL STATEMENTS

Input data is entered on-line, during execution of the program, in response to program generated messages. Each message indicates the type of data/response to enter and its format. Refer to Figure 2 for the messages and required entry formats. NOTE: All figures are entered as real numbers and, therefore, must contain a decimal point.

V. ENTERING YOUR INPUT DATA

Input data is entered on-line, during execution of the program, in response to program generated messages. Each message indicates the type of data/response to enter and its format. Refer to Figure 2 for the messages and required entry formats. NOTE: All figures are entered as real numbers and, therefore, must contain a decimal point.

VI LISTING DATA FILES

There are no data files associated with this system. All input and output is via the remote terminal.

FIGURE 2

SAMPLE PROGRAM OUTPUT (WITH ANNOTATIONS)

```
RUN TTLCOM/TRITAC_
 RUNNING

                    ------------------------------
                    TRI-TAC LIFE CYCLE COST MODEL
                    ------------------------------

INPUT THE NAME OF YOUR SYSTEM/EQUIPMENT                          _Msg
IN THIRTY(30) LETTERS OR LESS                                     #1

?TACTICAL DIGITAL FACIMILE_                                     -Reply
DO YOU WANT TO CHANGE/DISPLAY THE MODELS ASSUMPTIONS             _Msg
ANSWER Y FOR YES, N FOR NO.                                       #2

?Y_                                                             -Reply
  THE FOLLOWING ASSUMPTIONS ARE MADE


(R001) OPERATING HOURS  IS 2920 HRS/YR
(R002) DEPOT OVERHAUL RATE  IS 20%
(R003) TRANSPORTATION FACTOR  IS $.50/LB
(R004) SUPPORT EQUIPMENT MAINTENANCE FACTOR  IS 10%
(R005) REPAIR MATERIAL COST FACTOR  IS 5%
(R006) YEARS OF OPERATION  IS 10 YEARS
(R007) HOLDING INVENTORY FACTOR  IS 3%
(R008) POWER COST  IS $0.04 PER KWH
(R060) TRANSPORTATION COST FACTOR  IS 5%                         _Msg
(R063) DISTANCE FROM ORGANIZATION TO INTERMEDIATE                 #3
MAINTENANCE LEVEL  IS 25 MI
(R064) DISTANCE FROM INTERMEDIATE TO DEPOT MAINTENANCE
LEVEL  IS 3000 MI
(R065) SHORT DISTANCE TRANSPORTATION FACTOR  IS $.001 $/LB/MI
(R066) LONG DISTANCE TRANSPORTATION FACTOR  IS $.0001 $/LB/MI
(R067) NON RECURRING INVESTMENT FACTOR  IS 40%
(R080) INVENTORY REPLINISHMENT FACTOR IS 5%
(R090) AVAILABLE MANHOURS PER YEAR 1656 HRS
(R107) MODIFICATION FACTOR .005
(R108) REPLENISHMENT FACTOR 7%

IF ANY OF THE ABOVE ASSUMPTIONS ARE NOT VALID
FOR YOUR SYSTEM/EQUIPMENT, ENTER THE CODES AND CORRECT VALUES
ONE AT A TIME AS FOLLOWS
RNNN=X, WHERE RNNN IS THE DATA ELEMENT (R001,R014,ETC)
AND X IS THE DATA VALUE(ENTER AS A REAL NUMBER).
IF NO CHANGES ARE REQUIRED, OR AFTER LAST CHANGE HAS BEEN
MADE,ENTER R999=0.
?R001=4380._                                                    -Reply
?R002=0._
?R999=0._
DO YOU WANT TO USE APPENDIX D,                                   _Msg
MILITARY PERSONNEL AND TRAINING TO COST THE                       #4
MILITARY PERSONNEL OF YOUR SYSTEM ?
ANSWER Y FOR YES, N FOR NO.

?Y_                                                             -Reply
```

FIGURE 2

SAMPLE PROGRAM OUTPUT (WITH ANNOTATIONS)
(Cont'd)

```
APPENDIX D MILITARY PERSONNEL AND TRAINING COSTS
INDICATE THE SERVICE OF THE PERSONNEL TO BE COSTED
ANSWER WITH A FOR ARMY, N FOR NAVY, MC FOR MARINE CORP,
OR AF FOR AIR FORCE

?N_
ENTER THE PERSONNEL INFORMATION IN THE ORDER
AND FORMAT INDICATED USING THE FOLLOWING CODES AND
SEPERATING THE DATA BY COMMAS:
UNDER **LEVEL** ENTER ONE OF THE FOLLOWING CODES:
        OPR = OPERATOR
        SWP = SOFT-WARE PERSONNEL
        OLM = ORGANIZATIONAL LEVEL MAINTENCE
        ILM = INTERMEDIATE LEVEL MAINTENANCE
UNDER **MOS** ENTER THE APPROPRIATE CODE AS FOLLOWS:
FOR ARMY: MOS CODE MUST BE OF TYPE XXAXX
FOR NAVY: MOS CODE MUST BE AA-XXXX,AAAXXAA OR AA-XYAAA
FOR MARINE CORP MOS CODE MUST BE XXXX
FOR AIR FORCE MOS CODE MUST BE XXXXX
WHERE:X=NUMBER, AND A=ALPHA
UNDER **PAY GRADE** ENTER PAY GRADE AS E1 TO E9.
UNDER **NUMBER** ENTER THE NUMBER OF PERSONNEL (01 TO 99)
TO BE COSTED FOR EACH: LEVEL,MOS AND PAY GRADE ENTERED.
UNDER **DONE** ENTER ZZ WHEN AND ONLY IF YOU ARE
FINISHED WITH ALL INPUTS AT ALL LEVELS...
(EX-OPR,05B20,E5,07,ZZ)

**LEVEL**,**MOS**,**PAY GRADE**,**NUMBER**,**DONE**

?OLM,ET-1411,E3,01_
**LEVEL**,**MOS**,**PAY GRADE**,**NUMBER**,**DONE**

?ILM,ET-1411,E5,01,ZZ_
IS PERSONNEL COSTING FOR TRADE-OFF (A) OR BASE LINE COST
ESTIMATE, INDEPENDENT PARAMETRIC COST ESTIMATE OR
CAIG PRESENTATION (B)?
NOTE:OUTPUT TO LCC MODEL FOR TRADE-OFF (A) IS AVERAGE
COST PER MAN HOUR, FOR (B) OUTPUT IS ACCUMULATED
PERSONNEL COSTS. ANSWER WITH A OR B

?A_
DO YOU WANT TO INPUT ALL THE COST
ELEMENTS FOR R&D(R200-R242) AND PRODUCTION(R300-R354)
(A) OR JUST THE MINIMUM INPUTS TO OPERATE THE
LCC MODEL (B)?

?A_
ENTER INPUT VALUES AS INDICATED.
ENTER ONLY THE VALUES, IN THE ORDER AS SPECIFIED.
SEPERATE EACH VALUE WITH A COMMA.
EXAMPLE-- 1000.,.002,0.,43.1
ENTER VALUE FOR   R202,R203,R208,R210,
?2102520.,0.,4574161.,0._
ENTER VALUE FOR   R211,R213,R214,R215,
?0.,0.,0.,0._
ENTER VALUE FOR   R216,R217,R219,R220,
?0.,0.,0.,0._
ENTER VALUE FOR   R221,R222,R224,R225,
?0.,0.,0.,0._
ENTER VALUE FOR   R226,R227,R228,R229,
?0.,0.,0.,0._
ENTER VALUE FOR   R231,R232,R233,R234,
?0.,0.,0.,0._
```

Msg #5 — Reply

Msg #6 — Replies

Msg #7 — Reply

Msg #8 — Reply

Msgs* #9-14

*Call for entry of variables.
Answer required as indicated

FIGURE 2

SAMPLE PROGRAM OUTPUT (WITH ANNOTATIONS)
(Cont'd)

```
ENTER VALUE FOR    R235,R239,R240,R241,
?0.,0.,0.,0._
ENTER VALUE FOR    R242,
?0._
ENTER VALUE FOR    R304,R306,R307,R309,
?52000.,125000.,408159.,0._
ENTER VALUE FOR    R310,R311,R312,R314,
?50000.,0.,106516.,300000._
ENTER VALUE FOR    R315,R316,R317,R318,
?80000.,50000.,150000.,0._
ENTER VALUE FOR    R319,R320,R323,R324,
?2161000.,203000.,0.,0._
ENTER VALUE FOR    R325,R327,R328,R329,
?0.,0.,0.,0._
ENTER VALUE FOR    R330,R331,R332,R333,
?0.,1400000.,0.,0._
ENTER VALUE FOR    R334,R335,R339,R341,
?0.,0.,15257200.,80000._
ENTER VALUE FOR    R342,R343,R345,R346,
?221000.,52000.,0.,0._
ENTER VALUE FOR    R348,R349,R350,R351,
?0.,0.,0.,0._
ENTER VALUE FOR    R352,R353,R354,
?0.,0.,0._
ENTER VALUE FOR    R9,R18,R19,R20,
?1000.,14406.,1000.,.86_
ENTER VALUE FOR    R10,R11,R109,R110,
?0.,0.,0.,0._
ENTER VALUE FOR    R57,R75,R26,R28,
?10.,16.75,0.,0._
ENTER VALUE FOR    R13,R61,R62,R14,
?75.,6.,1.,1200._
ENTER VALUE FOR    R15,R17,R46,R16,
?.5,1.1,.8,2500._
ENTER VALUE FOR    R27,R71,R72,R79,
?.22,.42,.59,.85_
ENTER VALUE FOR    R21,R22,R24,R25,
?.3,5.,10000.,.05_
ENTER VALUE FOR    R29,R47,R50,R51,
?6.8,990.,50000.,0._
ENTER VALUE FOR    R52,R53,R54,R55,
?0.,0.,36100.,0._
ENTER VALUE FOR    R56,R76,R77,R78,
?0.,2.,2046.,1._
ENTER VALUE FOR    R86,R89,R92,
?8.,534.,0._
ENTER 4 (REAL #) VALUES FOR R12: SEPARATE BY COMMAS
?90.,10.,0.,0._
DO YOU WANT FORMULA FOR R34? (Y OR N)
ANSWER A OR B
?A_
```

Msqs* -#15- #38

-Msg #39

-Reply

*Call for entry of variables.
Answers required as indicated.

FIGURE 2

SAMPLE PROGRAM OUTPUT (WITH ANNOTATIONS)

(Cont'd)

TRI-TAC LIFE CYCLE COST MODEL

LIFE CYCLE COSTS CALCULATED FOR THE
TACTICAL DIGITAL FACIMILE
WITH A DTUPC OF $ 14408.00 BASED ON 1000.00 EQUIPMENTS
AND A PRODUCTION BUY OF 1000.00 EQUIPMENTS

TRI-TAC LIFE CYCLE COST ELEMENTS STRUCTURE	COSTS IN (M) OF CONSTANT 1978 $ LEVEL 3	LEVEL 2	SUB ELEMENT	ELEMENT	CAT.
100 RESEARCH & DEVELOPEMENT					6.68
110 CONCEPT FORMULATION & VALIDATION				2.10	
111 CONTRACTOR			2.10		
120 FULL SCALE DEVELOPMENT				4.57	
121 FULL SCALE DEVELOPMENT (NON-RECUR)				4.57	
122.1 CONTRACTOR(N-R)			4.57		
122.11 PRIME MISSION EQUIP (PME)		4.57			
122.111 SUBSYSTEMS (SPECIFY)	4.57				
TOTAL RESEARCH AND DEVELOPEMENT COSTS					6.68

Data Lines

TRI-TAC LIFE CYCLE COST ELEMENTS STRUCTURE	COSTS IN (M) OF CONSTANT 1978 $ LEVEL 3	LEVEL 2	SUB ELEMENT	ELEMENT	CAT.
200 PRODUCTION					20.77
210 PRODUCTION (NON-RECUR)				5.16	
211.1 CONTRACTOR (N-R)			3.72		
211.11 PRIME MISSION EQUIP		0.09			
211.111 SUBSYSTEMS (SPECIFY)	0.09				
211.12 SYSTEM/PROJECT MNGMNT		0.53			
211.121 SYSTEM ENGINEERING	0.13				
211.122 PROJECT MNGMNT	0.41				
211.13 TRAINING		0.05			
211.132 SERVICES	0.05				
211.14 PECULIAR SUPPORT EQUIP		0.11			
211.15 DATA		0.58			
211.151 TECH ORDERS & MANUAL	0.30				
211.152 ENGINEERING	0.08				
211.153 MANAGEMENT	0.05				
211.154 SUPPORT	0.15				
211.16 INITIAL SPARES & RPR PRTS		2.15			
211.17 OTHER (SPECIFY)		0.21			
212.1 GOVERNMENT (N-R)			1.44		
212.15 COMMON SUPPORT EQUIP		1.40			
212.18 INVENTORY MANAGEMENT		0.04			
220 PRODUCTION/RECUPPING)				15.61	
221.1 CONTRACTOR (RECUR)			15.61		
221.11 PRIME MISSION EQUIP		15.26			
221.111 SUBSYSTEMS (SPECIFY)	15.26				
221.12 SYSTEM/PROJECT MNGMNT		0.30			
221.121 SYSTEM ENGINEERING	0.08				
221.122 PROJECT MANAGEMENT	0.22				
221.13 OTHER (SPECIFY)		0.05			
TOTAL PRODUCTION COSTS					20.77

FIGURE 2

SAMPLE PROGRAM OUTPUT (WITH ANNOTATIONS)
(Cont'd)

TRI-TAC LIFE CYCLE COST ELEMENTS STRUCTURE	COSTS IN (M) OF CONSTANT 1978 $ LEVEL 3	LEVEL 2	SUB ELEMENT	ELEMENT	CAT.
300 OPERATING & SUPPORT					17.12
310 OPERATIONS				6.03	
311 ENERGY CONSUMPTION			0.53		
312 MATERIAL CONSUMPTION			5.00		
314 OPERATIONAL FACILITIES			0.50		
320 LOGISTIC SUPPORT				11.09	
321 MAINTENANCE			2.91		
321.1 PERSONNEL			1.00		
321.11 ORGNZTNL MAINT		0.61			
321.12 INTRMDT MAINT		0.19			
321.14 DEPOT MAINT(LRU/MOD RPR)		0.20			
321.2 MAINT FACILITIES			0.04		
321.3 SUPPORT EQUIP MAINT			1.51		
321.4 CONTRACTOR SERVICES			0.36		
322 SUPPLY			8.18		
322.1 PERSONNEL			0.02		
322.11 ORGNZTNL SUPPLY		0.02			
322.12 INTRMDT SUPPLY		0.01			
322.2 SUSTAIN INVEST			7.15		
322.21 REPLNMNT SUPPLIES		5.45			
322.212 INT/DEPOT LEVEL	4.63				
322.213 RPR MATERIAL	0.82				
322.22 MODIFICATIONS		0.72			
322.23 RPLCMNT COMMON SPPRT EQUIP		0.98			
322.3 INVNTRY ADMIN			0.74		
322.31 INVNTRY MNGMNT		0.10			
322.32 INVNTRY DIST/HOLDING		0.57			
322.33 TECH DATA SUPPORT		0.07			
322.5 TRANSPORTATION			0.27		
TOTAL OPERATING AND SUPPORT COSTS					17.12
TOTAL LIFE CYCLE COSTS					44.57

-Data Lines

DO YOU WANT TO MAKE CHANGES TO ANY OF THE
ASSUMPTIONS AND/OR VARIABLES?
ANSWER WITH N(NO) B(BOTH) A(ASSUMPTIONS ONLY)
OR V(VARIABLES ONLY) _Msg #40
?N_ -Reply

END TTLCCM 12.4 SEC. _*

*(No reply, termination of program)

VII INITIATING CONVERSATIONAL OPERATIONS

This paragraph describes the procedures to follow to activate or "dial-up" the remote terminals.

Turn the terminal modem ON. On the Hazeltine 2000, set the baud rate to 300, transmission mode to Batch, and the parity to 1. Dial one of the following telephone numbers: 542-8950 or 542-8960. When the tone comes on, place the telephone receiver into the modem.

Messages in the following format will appear on the screen/printer:

FORT MONMOUTH TIME SHARING - 02/08, STATION 20

ENTER USER CODE, PLEASE (Enter your user code here)*
AND YOUR PASSWORD

MMMMMMMM
WWWWWWWW
****
$$$$$$$$
@@@@@@@@

ON THE TTY these five lines will be overprinted so that when you enter your password it will be unreadable to anyone who might get hold of the printed output.

(Enter your password here)*

ENTER CHARGE CODE AND TERMINAL NUMBER - (enter charge code followed by a comma and then the terminal number. The terminal numbers are 40 for the Hazeltine and 48 for TTY.)*

WED JUL 30 REMOTES ON 0830-1130, 1300-1730 HRS TODAY.

IF YOU ARE UNFAMILIAR WITH THE USE OF THE TERMINALS, CONTACT THE SOFTWARE INTEGRATION AND INFORMATION BRACH FOR INSTRUCTIONS.

*These are responses that you must enter. Follow the entry with a (←) left arrow on the TTY or a left arrow followed by a SHIFT-XMIT on the Hazeltine.

VIII TERMINATING CONVERSATION OPERATIONS

To terminate processing on the remote terminals, enter the word "BYE". Messages similar to the following will appear:

```
ON FOR                    1 MIN, 40.3 SEC
C&E USE                          .5 SEC
EXECUTE                        10.0 SEC
I/O TIME                        5.5 SEC
OFF AT                         3:50 PM
BYE

06/03/78
```

After the above has been completed, the terminal will be disconnected from the computer.

Remove the phone from the modem and replace the receiver.

Turn the terminal and modem OFF.

SECTION C

EXECUTING THE PROGRAMS

PROGRAM TTLCCM

a. Restrictions, None
b. Starting the Program. Enter the command:

RUN TTLCCM/TRITAC

NOTE: All responses/entries require the system operation codes of left arrow or left arrow followed by SHIFT-XMIT for the Hazeltine 2000.

c. Conversational messages and responses (Refer to Figure 2). After entering the RUN command, the message "RUNNING" will come back, followed by a request for the name of the users system/equipment.

The user is then given the choice to change/display the model's assumptions or continue on with the program. If the assumptions are displayed, the user can make changes or verify the assumptions.

Next, the user is given the option of using the Appendix D, Military Personnel and Training Costs, which are contained in the model. If this option is taken, the program requests the military service of the personnel to be costed. The user is then requested to furnish the data necessary to run this portion of the model. After the personnel data inputs are completed, the program asks what form the personnel output costs should be in.

Next, the program gives the user a choice of full or limited input data. The program then generates messages asking for the entry of the required variables. For ease of input, the program accepts the data elements in small groups.

Upon completion of the cost element data entries, the program will generate a message requesting an indication of which transportation computation formula (refer to Table 9) is to be used.

Following this entry, the Cost Element Output figures will be displayed. The user, without terminating the program, may then make any adjustments to any of the variables/assumptions (or both). The user need only enter the proper reply as indicated.

NOTE: Subsequent to the original cost element output figures, only those items that have changed because of the adjustments made, will print out.

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES
(Cont'd)

STEP	DISPLAY	INSTRUCTIONS & REMARKS
9.	OPR FCLTS, EQP LSHLDS, NO PRS SFTWR CTR, PERS COST $/HR, SFTWR CNTR MNT, OTHER OPER'L	Press: RUN PROGRAM after each data is entered.
10.	CALC O L M PERS, OLM PERS $/HR, NO LRU/EQP, P.M. HR/YR, ORG. MTTR HRS, MTBF HRS.	To run Organizational Level Maintenance Personnel sub-routine, Press: RUN PROGRAM enter data, and Press: RUN PROGRAM after each entry. NOTE: NO LRU/EQP - specifies number of LRU's per equipment. PM HR/YR, ORG MTTR HRS, MTBF - are repeated for each LRU. If data is only available on equipment, then use that data as input in place of LRU.
11.	CALC I L M PERS, NO LRU/EQP, ILM PERS $/HR, MTBF HRS, INT MTTR HRS, I M RPR RATE.	To run Intermediate Level Maintenance Personnel sub-routine, Press: RUN PROGRAM enter data, and, Press: RUN PROGRAM after each data is ertered. NOTE: MTBF, INT MTTR, I M RPR RATE - are inputs for each individual LRU in sequence, or input data for equipment if LRU data is not available.
12.	CALC D L M PERS NO. DEPOT PERS, DLM PERS. $/HR,	To run Depot Level Maintenance Personnel sub-routine, Press: RUN PROGRAM enter equation No. desired, then Press: RUN PROGRAM Input required data, Press: RUN PROGRAM after each data entry.

SECTION D

SYSTEM ERROR MESSAGES

The system error messages and their corresponding explanations are outlined in the Burroughs B5500 FORTRAN COMPILER REFERENCE MANUAL. This manual is available in the Software Integration and Information Branch Library. However, users should refer all system errors to the Software Integration and Information Branch for corrective action.

SECTION E

SAMPLE DATA INPUT SHEETS

The following Sample Data Input Sheets were used for the Figure 2 example.

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES
(Cont'd)

STEP	DISPLAY	INSTRUCTIONS & REMARKS
15.	Cont'd NO LRU DISCARDED, DISCARD LRU MTBF, DISCARD LRU COST	EQUATION 2: Calculates Organizational Level Spares. Enter data, Press: RUN PROGRAM after each data entry. NOTE: LRU MTBF, DISCRD LRU COST - are repeated for each LRU DISCARDED.
	NO LRU RPRBLE, & LRU DISCD, RPRBLE LRU MTBF, RPRBLE LRU COST.	Calculates Intermediate/Depot Level Spares. Enter data, Press: RUN PROGRAM after each data entry. NOTE: RPRBLE LRU MTBF, RPRBLE LRU COST - are repeated for each LRU repairable.
16.	CALC INV MGT NO FSN 0-5K NO FSN 5-49.9K NO FSN 50K-500K NO FSN >500K	To run Inventory Management sub-routine, Press: RUN PROGRAM enter the number of new FSN's within the displayed dollar range, Press: RUN PROGRAM Repeat the above procedure tor each range as it is displayed.
17.	CALC INV HLD, INV HD EQ 1 OR 1.	To run Inventory Holding sub-routine, Press: RUN PROGRAM enter Equation No. desired, Press: RUN PROGRAM EQUATION 1: Calculates Inventory Holding Cost as (Holding Factor) x (Equipment Quantity) x (Spares & Repair Material Cost) x (Unit Production Cost Calculated).

TABLE 11

PRODUCTION
DATA INPUTS FOR FORTRAN LCC MODEL
SAMPLE OF TABLE 3 SHOWING INPUT VALUES

Register No.	LCCM Cost Elem.	Data Description	Data Source	Input Value
R304	211.111	Subsystems (N-R)	(C)	82,000.
R306	211.121	System Engineering (N-R)	(C)	125,000.
R307	211.122	Project Management (N-R)	(C)	408,159.
R309	211.131	Equipment (N-R)	(C)	0.
R310	211.132	Services (N-R)	(C)	50,000.
R311	211.133	Facilities (N-R)	(C)	0.
R312	211.14	Peculiar Support Equip. (N-R)	(C)	106,516.
R314	211.151	Tech. Orders & Manuals (N-R)	(C)	300,000.
R315	211.152	Engineering (N-R)	(C)	80,000.
R316	211.153	Management (N-R)	(C)	50,000.
R317	211.154	Support (N-R)	(C)	150,000.
R318	211.155	Software Support (N-R)	(C)	0.
R319	211.16	Initial Spares & Rpr Pts (N-R)	(C)	2,161,000.
R320	211.17	Other (N-R)	(C)	208,000.
R323	212.111	Equipment (N-R)	(G)	0.
R324	212.112	Services (N-R)	(G)	0.
R325	212.113	Facilities (N-R)	(G)	0.
R327	212.121	PATE (N-R)	(G)	0.
R328	212.122	OT&E (N-R)	(G)	0.
R329	212.13	Program Management (N-R)	(G)	0.
R330	212.14	Test Site Activation (N-R)	(G)	0.
R331	212.15	Common Support Equip (N-R)	(G)	1,400,000.
R332	212.16	Software Center (N-R)	(G)	0.
R333	212.17	GFE (N-R)	(G)	0.
R334	212.18	Inventory Management (N-R)	(G)	0.
R335	212.19	Other (N-R)	(G)	0.
R339	221.111	Subsystem (R)	(C)	15,257,200.
R341	221.121	System Engineering (R)	(C)	80,000.
R342	221.122	Project Management (R)	(C)	221,000.
R343	221.13	Other (R)	(C)	52,000.
R345	222.11	Quality Control & Insp. (R)	(G)	0.
R346	222.12	Transportation (R)	(G)	0.
R348	222.131	Site Construction (R)	(G)	0.
R349	222.132	Site/Ship/Vehicle Conv (R)	(G)	0.
R350	222.133	System Assembly, Install, & Checkout (R)	(G)	0.
R351	222.14	Tech Orders & Manuals (R)	(G)	0.
R352	222.15	GFE (R)	(G)	0.
R353	222.16	Support Engineering (R)	(G)	0.
R354	222.17	Other (R)	(G)	0.

TABLE 12

OPERATIONS AND SUPPORT
DATA INPUTS FOR FORTRAN LCC MODEL
SAMPLE OF TABLE 4 SHOWING INPUT VALUES
(Cont'd)

Register No.	LCCM Cost Elem.	Data Description	Data Source	Input Value
R077		Equipment Code (#)	(Analyst)	2,046.
R078		Iteration Number (#)	(Analyst)	1.
R086		Floor Area Cost ($/yr)	(G)	8.
R089		Maintenance Work Area (ft^2/yr)	(C/G)	534.
R092		Maint. of Software Center ($/yr)	(G)	0.
R200 [3]		R&D Estimate ($)	(C)	0.
R312 [3]		Peculiar Support Equipment ($)	(C)	0.
R320 [3]		Other N-R Production Costs ($)	(C/G)	0.
R331 [3]		Common Support Equipment ($)	(C/G)	0.
R343 [3]		Other Recurring Products ($)	(C/G)	0.
R012		Number of New FSN (#)	(C)	
		Under $5,000	(C)	90.
		$5,000 - $49,999	(C)	10.
		$50,000 - $500,000	(C)	0.
		Over $500,000	(C)	0.

[1] These inputs are not required if the Appendix D, Military personnel and Training Costs (MP & TC) portion of the model is used. (See Table 11 for inputs to MP & TC portions of model.)

[2] If data is to be input for R076, R086, and R089, an input is not required for R053.

[3] These inputs are required only if not previously input.

TABLE 12

OPERATIONS AND SUPPORT
DATA INPUTS FOR FORTRAN LCC MODEL
SAMPLE OF TABLE 4 SHOWING INPUT VALUES

Register No.	LCCM Cost Elem.	Data Description	Data Source	Input Value
R009		Equipment Quantity (#)	(G)	1,000.
R018		Unit Production Cost Est. ($)	(G)	14,408.
R019		Quantity Used for UPC Est. (#)	(G)	1,000.
R020		Learning Curve Slope (%)	(G)	.86
R010 [1]		No. Operators/Equipment (#)	(C/G)	0.
R011 [1]		Operator Cost ($/hr)	(G)	0.
R109 [1]		No. Software Personnel (#)	(G)	0.
R110 [1]		Software Personnel Costs ($/hr)	(G)	0.
R057		No. Depot Personnel (#)	(C/G)	10.
R075		Depot Personnel Cost ($/hr)	(G)	16.75
R026 [1]		Org. Level Maint. Pers. Cost ($/hr)	(G)	0.
R028 [1]		Int. Level Maint. Pers. Cost ($/hr)	(G)	0.
R013		Equipment Weight (lbs)	(C)	75.
R061		Avg. Weight of LRU (lbs)	(C)	6.
R062		Avg. Weight of Repair Parts (lbs)	(C)	1.
R014		Avg. Replacement Ass. (LRU) Cost ($)	(C)	1,200.
R015		Avg. MTTR (Org. Level) (hrs)	(C)	.5
R017		Avg. MTTR (Int. Level) (hrs)	(C)	1.1
R046		Avg. MTTR (Depot Level) (hrs)	(C)	.8
R016		Avg. MTBF (hrs)	(C)	2,500.
R027		Discard Rate (%)	(C)	.22
R071		P2 (% of ALL failed LRU's to be repaired/discarded at Int. Level) (%)	(C)	.42
R072		P3 (% of ALL failed LRU's to be repaired/discarded at Depot Level) (%)	(C)	.58
R079		Avg. Depot Level Repair Rate (%)	(C)	.85
R021		Avg. Power Rating (kw)	(C)	.3
R022		Avg. Preventative Maint. (hr/yr)	(C)	5.
R024		Avg. Material Consumpation Rate (units/yr/equip)	(C)	10,000.
R025		Avg Material Cost ($/unit)	(C)	.05
R029		Tech. Data Mgmt Costs ($/page)	(G)	6.80
R047		No. Page in Set of Tech Data (pages)	(C)	990.
R050	314	Operational Facilities Cost ($)	(G)	50,000.
R051	315	Equipment Leaseholds Cost ($)	(G)	0.
R052	317	Other Operating Costs ($)	(G/C)	0.
R053 [2]	321.2	Maintenance Facilities ($)	(G)	0.
R054	321.4	Contractor Services ($)	(C)	36,100.
R055	322.4	Supply Facilities ($)	(G)	0.
R056	323	Other Logistic Support Costs ($)	(C/G)	0.
R076 [2]		Support Equipment Area (ft^2/yr)	(C/G)	2.

TABLE 13

MILITARY PERSONNEL & TRAINING COSTS
DATA INPUTS FOR FORTRAN LCC MODEL
SAMPLE OF TABLE 5 SHOWING INPUT VALUES

Data Description		Choice of Values
1.	Service	A (Army), N (Navy), MC (Marine Corps), AF (Air Force)
2.	Level	OPR (Operator), SWP (Software Personnel), OLM (Org. Level Maint.), ILM (Intermediate Level Maint.)
3.	MOS	See TTO-ORT-032-76A-V3-APD
4.	Pay Grade	E 1 - E 9
5.	Number	Number of personnel at level in MOS and Pay Grade (99 or less)

Input Values For

Service N

*** LEVEL ***,	***MOS***,	***PAY GRADE***,	***NUMBER***,***
OPR			
SWP			
OLM	E7-1411	E3	01
ILM	E7-1411	E5	01

HICAP-FOR-90C-78