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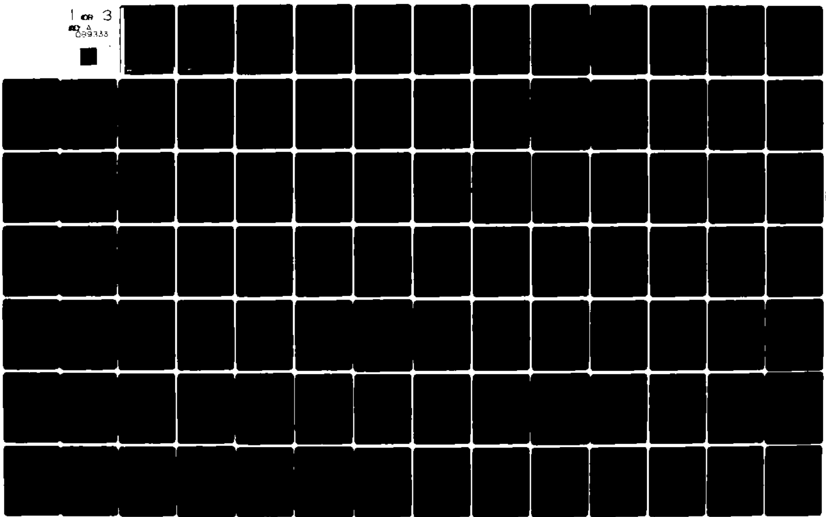

LEVEL II

Final Report *April 1980*

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ADVANCED NAVAL SUPPLY BASE COST MODEL (ABCOMO)

By: R. H. MONAHAN W. SCHUBERT

Prepared for:

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This report describes a computerized model that provides estimates of the resources required to construct and operate an advanced permanent naval supply base to support Navy and Marine forces in overseas areas of operations over prolonged periods of time. The model determines the necessary facilities, personnel, and equipment required for such a base, including estimates of the initial investment and recurring annual costs to construct and operate the base. In addition to providing a detailed mathematical description of the model, the report also describes the mechanics of setting up a model run, using a realistic

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sample problem for illustrative purposes. A complete listing of the program is included as an appendix to the report.

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PREFACE

This report documents the analysis and findings of a research project conducted for the David W. Taylor Naval Ship Research and Development Center (DTNSRDC), Bethesda, Maryland. The sponsor and technical monitor was M. J. Zubkoff, Code 187, of DTNSRDC. The work was performed under Contract N00014-78-C-0138, administered by the Office of Naval Research.

The research was performed in the Center for Defense Analysis (CDA) of the Systems Research and Analysis Division (SRAD) of SRI International. J. Naar is Director of CDA; D. D. Elliott is Executive Director of SRAD.

R. H. Monahan was project leader and principal investigator. He was assisted by W. Schubert, who performed most of the cost and supply base configuration analyses associated with this project. G. T. Smith provided the majority of the computer programming. D. L. Harvey also provided technical assistance in the conduct of this research.

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I MODEL OVERVIEW

A. Introduction

The objective of the research described in this report was the development of a computerized model that provides estimates of the resources required to construct and operate an advanced permanent naval supply base to support Navy and Marine forces in overseas areas of operations over prolonged periods of time. In today's global environment of continual political turmoil within and among various nations of the world, the requirement of positioning U.S. operational forces in widely dispersed and sometimes remote locations throughout the world becomes increasingly more important for the security of U.S. interests at home and abroad. Providing adequate supplies for these forces is a monumental task, and reliance on existing overseas bases and ports of call in areas of political upheaval compound the problem. Thus, it will be beneficial to Navy supply planners to have analytical tools available to determine future requirements for the establishment of overseas bases in the more settled areas around the globe. The Advanced Base Cost Model (ABCOMO) described in this report represents one such tool.

The ABCOMO model represents a major revision of the ABLE model (see Item 1 of the Bibliography) developed several years ago by DTNSRDC. The basic structure of ABCOMO is similar to the ABLE model, but most of the subroutines have been significantly modified and expanded to accommodate the requirements imposed on the present model. Nevertheless, much of the basic concepts underlying the ABLE model, such as the use of drivers, pacing facilities, ripple factors, and so on, have been retained in ABCOMO.

The ABLE model was designed to predict the amount of facilities and personnel required for an expeditionary-type advanced supply base to support Navy and Marine forces in contingency operations. The ABCOMO model, on the other hand, is designed to determine the necessary facilities, personnel, and equipment required for an advanced permanent supply base to support Navy and Marine forces over prolonged periods of operations, including estimates of the initial investment and recurring annual costs to construct and operate such a base. Some of the significant revisions required to construct ABCOMO included the following:

- The temporary facilities in the ABLE model were supplanted by permanent major facilities with attendant minor facilities, including initial outfitting of major equipments and supplies.
- Additional base functions, such as long-range radio communications facilities, were added to support and sustain the supply base over an extended time period.
- Family support facilities, such as family housing, commissary, Navy exchange, and so on, were added to the base.
- Provisions for estimating the initial investment and recurring annual costs for the base were added, as well as for estimating the costs of transporting supplies to the base for the supported operational forces.

In the remainder of this chapter, a brief overview of the model concept, structure, and usage is presented. Chapter II describes the mechanics of setting up a model run, using a realistic sample problem, and portrays the various outputs of the model. A detailed mathematical description of the model is presented in Chapter III. In Chapter IV, several limitations of the model are discussed and possible improvement options are identified. Appendix A provides a description of the criteria used to establish an input data base for representing the various functional components of the hypothetical supply base, including a component-by-component delineation of the associated model inputs and requirement equations. A complete listing of the ABCOMO computer program, as programmed for the CDC 6400 computer, is then presented as Appendix B to this report.

B. Supply Base Composition

The supply base represented by the ABCOMO model is a permanent advanced supply base that is designed to provide prolonged support to Navy and Marine forces deployed in an overseas area of operations. This hypothetical supply base is structured as an autonomous entity, providing support to the operating forces as well as its own self-support. It is assumed that the base stocks are replenished on a periodic basis through MAC, MSC, and commercial shipments from major CONUS supply points. Base operations are conducted by Naval personnel on three year tours of duty, with the exception that many of the family support operations (commissary, dependent school, bank, etc.) utilize on-base military dependents. The supply base is assumed to be composed of 49 functional components, each of which includes the facilities, personnel, and equipment to perform a distinct function necessary to the operation of the base. These components are listed in Table I-1. The amount of facilities, personnel, and equipment required by each component is a direct function of the size and configuration of the peak forces to be supported by the base. Associated with each component is a facing facility--i.e., a facility whose size can be directly related to the supported force composition, and from which can be scaled the amount and associated costs of facilities, personnel, and equipment required by the total component. These relationships include consideration of the so-called "ripple effect" for personnel requirements where, as support personnel are assigned to the base, additional personnel are required to provide base support for these personnel and hence increase the requirements imposed on the base components which, in turn, impose additional personnel requirements for base support, and so on. The supply base is assumed to normally operate under peacetime conditions. However, provisions are made for storage of wartime reserves of supplies, fuel and ammunition, and components associated with the receiving, handling and shipping of fuel and ammunition are sized utilizing projected wartime consumption rates.

C. Model Structure

The general structure of the model is presented in Figure I-1. The model inputs are delineated in detail in Section B of Chapter III. These inputs include various operating characteristics of possible elements of the supported operational forces, logistic planning data, functional component requirements data, operational planning numbers, supported force composition definitions, and costing inputs, some of which are geographically dependent.

Table I-1

SUPPLY BASE COMPONENTS

Component ID	Component Description	Component ID	Component Description
A3	Administration Office, Post Office	F1	Cargo Handling Battalion
A4	Data Processing Facility	G2	Hospital
A5	Electronic Maintenance	G9	Dispensary
A7	Shore Patrol Headquarters	G28	Dental Clinic
BB	Waterfront Safety Facilities	HA	Airfield Operations Support
B5A	Boat Pool	H9J	*Aircraft Maintenance Facilities*
B13C	Port Services Office	J3A	Ammunition Depot
C3A	Naval Station Communications	J3D	Ordnance Support Facilities
C7	Visual Station, Operating Base	J4	Explosive Ordnance Disposal
C13	Internal Communications	NA	Family Support
C27J	Direction Finder Station	NB	Enlisted Personnel Support
C32A	Air Traffic Control Component	NC	Officer Personnel Support
DA	Container Operations (non-ammunition)	ND	Personal Services (all personnel)
D3A1	Tank Farm, Ship Fuel	NE	Recreational Facilities (all personnel)
D3A2	Tank Farm, Jet Engine Fuel	N10B	Military Training and Education
D4C1	Tank Farm, Base Supply MOGAS	N14	Chapel
D4C2	Tank Farm, Base Supply, Diesel	N16	Officers' Recreation
D4C3	Tank Farm, Base Heating Fuel	N17	Enlisted Recreation
D26	Disbursing Office	P5	Public Works Unit
D24A	Ships Store Facility	P5A	Automotive Maintenance
D29A	Air Cargo Terminal	P12A	Fire Protection
D31A	Supply Storage and Administration	P15	Base Power Plant
D31E	Supply Support Facilities	P16	Waste Management
D32A	Refrigerated Storage	P18	Water System
D33A	Materials Handling Facilities		

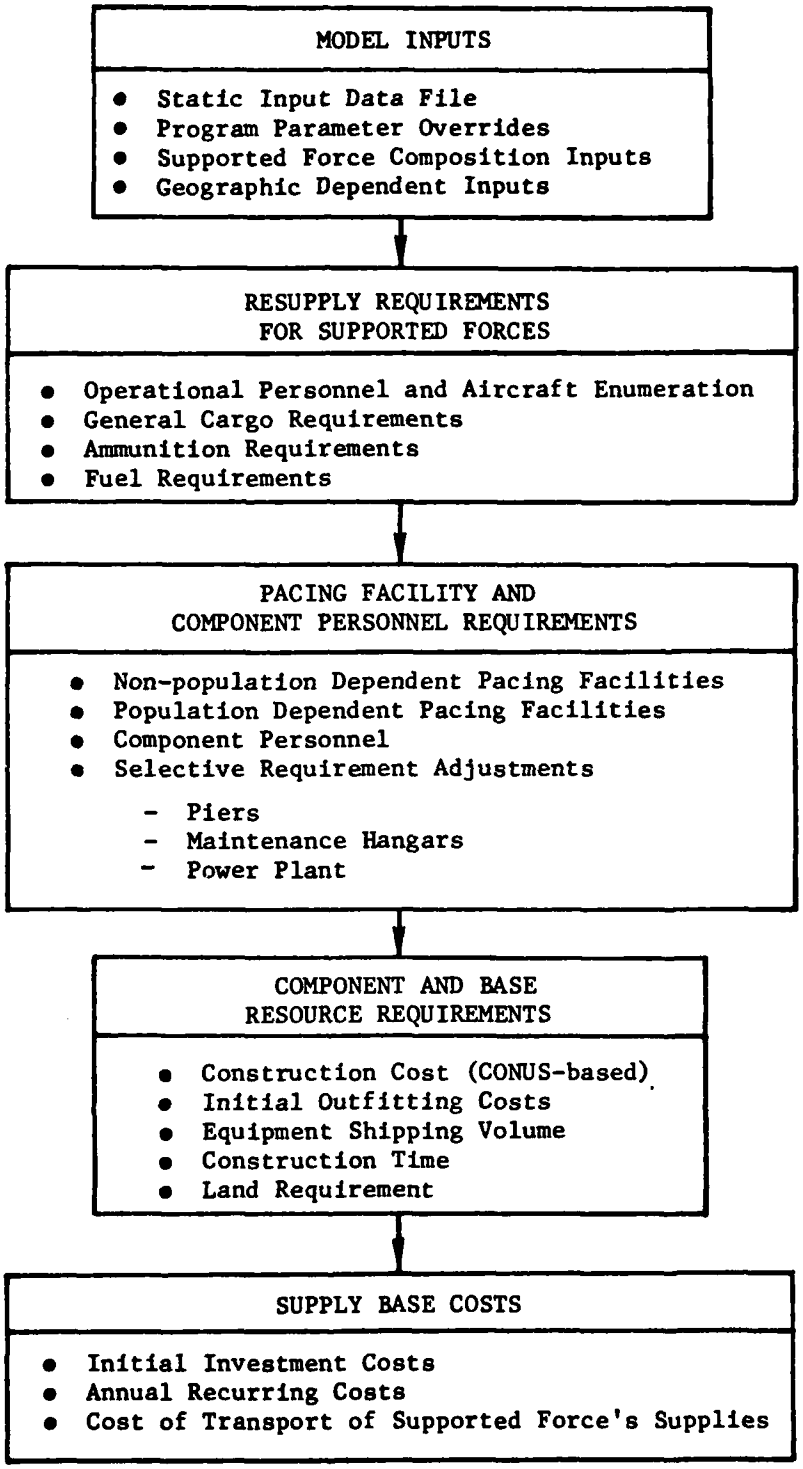

FIGURE I-1 GENERAL STRUCTURE OF ABCOMO MODEL

The first function of the model is to determine the resupply requirements for the peak force that the supply base is designed to support. These requirements include an enumeration of the numbers of personnel, aircraft, and ships in the force, as well as the daily consumption rates that they will generate for the various classes of supply. The model separates the supply classes into three major categories: bulk fuel, ammunition, and general cargo, where the latter consists of all supply items except bulk fuel and ammunition.

These resupply requirements provide the basis for establishing the required sizes of the various functional components comprising the base. For each functional component of the supply base, one of its facilities has been selected as the pacing facility for that component--i.e., a facility whose size can be directly related to the supported force composition and from which can be scaled the amount and associated costs of facilities, personnel, and equipment required by the entire component. These pacing facilities are divided into two categories, depending on whether or not the pacing facility size, and hence that of the entire component, is dependent upon the as yet unknown population of the base. For the non-population-dependent pacing facilities, the pacing facility requirements are computed directly from the pacing facility requirement equations that have been developed for the various functional components. For the population dependent pacing facilities, the computations must include consideration of the population "ripple effect." This terminology is adopted from the earlier ABLE model documentation and refers to the damping process where, as support personnel are assigned to the base, additional personnel are required to provide base support for these personnel and hence increase the requirements imposed on the population-dependent components, which, in turn, impose additional personnel requirements for base support, and so on. This rippling of personnel requirements eventually converges to a fixed set of personnel requirements for the various base functional components. The manner by which these pacing facility requirements are determined is adopted, in principle, from the ABLE model and involves the solution of a set of simultaneous equations relating personnel requirements to pacing facility requirements. Once the pacing facility requirements are established, the model then determines the number of personnel required by each functional component and performs selective facility requirement adjustments such as requiring pier lengths to be specified in multiples of cargo ship lengths as opposed to the required raw feet of berthing determined by the solution procedure.

The model next establishes the component resource requirements which include construction costs (CONUS-based), initial outfitting costs, shipping volume of equipment and supplies, construction times, and land requirements. These computations are based on component estimating relationship equations, developed for this model, that linearly relate component resource requirements to pacing facility requirements. These component resource requirements are then accumulated to establish the associated resource requirements for the entire base.

The final function of the model is to compute the costs related to the construction and operation of the overseas supply base, which represent the primary model outputs. These costs are dependent on the specific geographical area under consideration and the model is structured so that any number of different geographical areas can be considered without having to recompute any of the previous computations. The supply base costs are divided into three groups: Initial Investment Costs, Annual Recurring Costs, and Cost of Transport of supported forces supplies. The initial investment costs are those incurred in the construction and setting-up of the base for sustained operations. Specifically, these are the base construction cost; the base initial outfitting cost; the costs to transport from CONUS the initial base equipment and supplies, personnel and dependents, and their personal belongings; and the land acquisition cost, if applicable. The actual construction of the supply base is assumed to be performed by private contractors and the construction costs generated by the model include consideration of all construction factors such as building materials, construction workers, shipment of materials, and so on.

The annual recurring costs are those incurred in the annual operation and maintenance of the supply base. The associated costs generated by the model are the annual personnel billet cost; annual cost to the Navy of general supplies and equipment, including base fuel; the annual costs incurred in transporting from CONUS the base supplies and fuel, rotational personnel (both ways), and their personal belongings; and the annual land lease cost, if applicable.

Although not directly related to the cost of construction and operation of the supply base itself, the cost of transporting (from CONUS to the base) the supplies, equipment, fuel and ammunition required by the supported forces will be useful in application of the model. The computation of these transport costs represent the final function of the model.

D. Sample Case

As an illustration of the use of the model, a sample case was set up and run. In this sample case, two different supported force compositions are postulated and two different geographic locations are considered. The first force composition (FC1) includes two carrier task groups, an ASW group, and an amphibious group, all assumed stationed at sea. The specific composition of these operational groups is as follows:

Task Group 1:	1 attack aircraft carrier (CV) 4 guided missile frigates (FFG) 1 fast combat support ship (AOE) 1 carrier air wing (CAW) (24 F-14, 24 A-7, 10 A-6, 10 S-3, 4 E-2)
Task Group 2:	1 attack aircraft carrier (CV) 4 guided missile frigates (FFG) 1 fast combat support ship (AOE) 1 carrier air wing (CAW) (same composition as in Task Group 1)
ASW Group:	4 frigates (FF)

Amphibious Group: 4 amphibious transport docks (LPD)
1 amphibious assault ship (helicopter) (LPH)
1 amphibious assault ship (general purpose) (LHA)
2 dock landing ships (LSD)
1 tank landing ship (LST)
8 guided missile frigates (FFG)
1 frigate (FF)
1 oiler (AO)
1 combat store ship (AFS)
1 ammunition ship (AE)
1 air complement (16 CH-46, 6 CH-53, 4 UH-1)

The second force composition (FC2) maintains the two carrier task groups and ASW group, stationed at sea, but does not include the amphibious group. In place of the amphibious group, FC2 assumes that an amphibious air complement of 16 CH-46, 6 CH-53, and 4 UH-1 is stationed at the supply base, together with a marine detachment consisting of 100 officers and 1000 enlisted men.

The two geographical areas of consideration are the Indian Ocean Area and the South Atlantic Area. The choice of the geographical area can affect the base construction costs, land acquisition and lease costs, and all transport costs. A complete listing of the sample case inputs and outputs are presented in Chapter II. A summary of the primary outputs are listed in Table I-2.

The dollar cost differentials, for both force compositions, between the Indian Ocean Area and South Atlantic Area are roughly 300 million for the Initial Investment Costs and 5 million for Annual Recurring Costs, the lower costs being associated with the base located in the South Atlantic Area. These cost differentials are attributable to a 2.2 construction cost multiplier for the Indian Ocean Area versus a 1.6 construction cost multiplier for the South Atlantic Area (construction costs are initially computed for a CONUS-based base) and to lower transport costs because the South Atlantic Area is closer to CONUS than the Indian Ocean Area.

In comparing the supply bases that support the two different force compositions, the base supporting Force Composition 2 turns out to be larger and more costly to operate even though the number of operational

Table I-2

SAMPLE CASE PRIMARY OUTPUTS

Output Factor	Force Composition 1		Force Composition 2	
	Indian Ocean Area	South Atlantic Area	Indian Ocean Area	South Atlantic Area
Personnel				
Operational Personnel	24,350	24,350	17,298	17,298
Base Support Personnel	3,544	3,544	3,552	3,552
Base Dependents	3,255	3,255	3,251	3,251
Total	31,149	31,149	24,101	24,101
Initial Investment Costs (thousands of dollars)				
Facility Construction	1,102,386	801,735	1,128,062	820,409
Initial Outfitting	45,924	45,924	45,084	45,084
Transport of Equipment	5,455	3,731	5,357	3,664
Transport of Personnel	3,379	1,672	3,380	1,673
Transport of Personal Belongings	6,753	4,619	6,753	4,619
Land Acquisition	0	0	0	0
Total	1,163,897	857,682	1,188,637	875,449
Annual Recurring Costs (thousands of dollars)				
Personnel Billets	94,178	94,178	93,800	93,800
Supplies and Equipment	26,182	26,182	26,240	26,240
Transport of Supplies and Equipment	3,938	2,693	3,940	2,694
Base Fuel	33,474	33,474	39,739	39,739
Transport of Base Fuel	3,339	1,725	3,965	2,049
Transport of Rotational Personnel	2,253	1,115	2,254	1,115
Transport of Personal Belongings	4,502	3,079	4,502	3,079
Land Lease	7,746	7,746	7,252	7,252
Total	175,611	170,193	181,690	175,968
Supported Forces Annual Transport Costs (thousands of dollars)				
Supplies and Equipment	14,104	9,646	10,019	6,853
Ship Fuel (peacetime)	18,429	9,522	9,579	4,940
Aircraft Fuel (peacetime)	5,967	3,083	5,967	3,083
Ship Ammunition (peacetime)	36	25	19	13
Aircraft Ammunition (peacetime)	138	95	138	95

personnel supported by this base is about 20% less than the number supported by the base supporting Force Composition 1. This is due to the requirement for base facilities to accommodate some 1500 operational personnel stationed at the base for the second force composition as compared with none for the first force composition. However, the Supported Force Annual Transport Costs are higher in all cases for Force Composition 1 than for Force Composition 2.

These results have been presented to illustrate the model outputs and should not be construed to be true representations of actual expected costs. Many of the inputs that would be supplied by the user were arbitrarily assigned values by project team personnel and would require a more precise definition for the model results to be truly representative of expected supply base costs.

II MODEL USAGE

A. Introduction

The purpose of this chapter is to provide the necessary instructions that will allow a user to set up and run the computer program that implements the ABCOMO model. Although a knowledge of the mathematical details underlying the model is not necessary for the capability of using the model, it is assumed that the user is familiar with the model concept and logic. If he is not, he can obtain this familiarity through a reading of Chapter III of this report. Section B of this chapter presents the input requirements, including data file formats and the order in which the data is read in to the program. The program output report numbering description is discussed in Section C. Section D then provides a copy of the output generated for the sample problem discussed at the end of the previous chapter.

B. Input Specifications*

The program inputs are segregated into four input groupings: Static Input Data File, Program Parameter Overrides, Supported Force Composition Inputs, and Geographic-Dependent inputs. The Static Input Data File consists of those data that will remain constant, for the most part, in routine applications of the model. The Program Parameter Overrides refer to two sets of numerical parameters that are built into the model, but that can be altered at the user's discretion. The Supported Force Composition Inputs refer to those inputs required to describe the composition of the peak force to be supported by the supply base. In a given program run, a number of different such force compositions can be processed in turn. The Geographic-Dependent Inputs refer to those specific inputs that are dependent on the geographical location of the postulated supply base. For each supported force composition,

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*Much of the program input for the ABCOMO model coincides with that required by the ABLE model. Thus, some of the input description discussed in this section is taken directly from Item 1 of the Bibliography.

any number of geographical locations can be considered by specifying a set of these inputs for each such geographical location. Within each input grouping, there are subsets of data inputs that, in general, can contain a variable number of inputs. For these data sets, an ABCOMO end-of-file (EOF) mark, which is a card with six asterisks punched in the first six columns, is required to terminate the reading of inputs in that particular data set. In a couple of cases, the EOF card also contains additional data. The exceptions to the EOF card requirement are the data sets contained in a single card such as base fuel unit costs, fuel and ammunition specific volumes, and base personnel input parameters. For those data sets that may be empty (e.g., operational planning factor overrides), the EOF card must still be inserted to indicate to ABCOMO that that data set contains no information. Figure II-1 shows a sample data deck setup.

1. Static Input Data File

This data file is broken down into seven distinct data sets: Aircraft Static Parameters, Ship Static Parameters, Ripple Factors, Component Estimating Relationship Parameters, General Cargo Parameters, Fuel Specific Volume Factors, and Base Personnel Input Parameters.

a. Aircraft Static Parameters

This data set defines the operational characteristics of all relevant aircraft types. Entries in this set consist of an aircraft type and its associated physical characteristics. Only aircraft types that appear in this file are valid for inclusion in a supported force composition.

The first card of the set is a header card. This card contains the date in Columns 1-12 and user comments in Columns 14-72. The second card of the set is an output option card with a 0 or 1 in the first column. If 0 is entered, all of the input data is listed in the program output. If a 1 is entered, then all of the Static Input Data is suppressed in the output report except the Base Personnel Input Parameters. All other cards in the file are aircraft static data cards. Any aircraft may be entered in the file by punching a card following the format given in Table II-1 and specifying the aircraft model, aircraft mission type code (1 = TACTICAL, 2 = PATROL, 3 = CARGO, 4 = ROTARY WING), wingspan, length, fuel wartime consumption rate, th

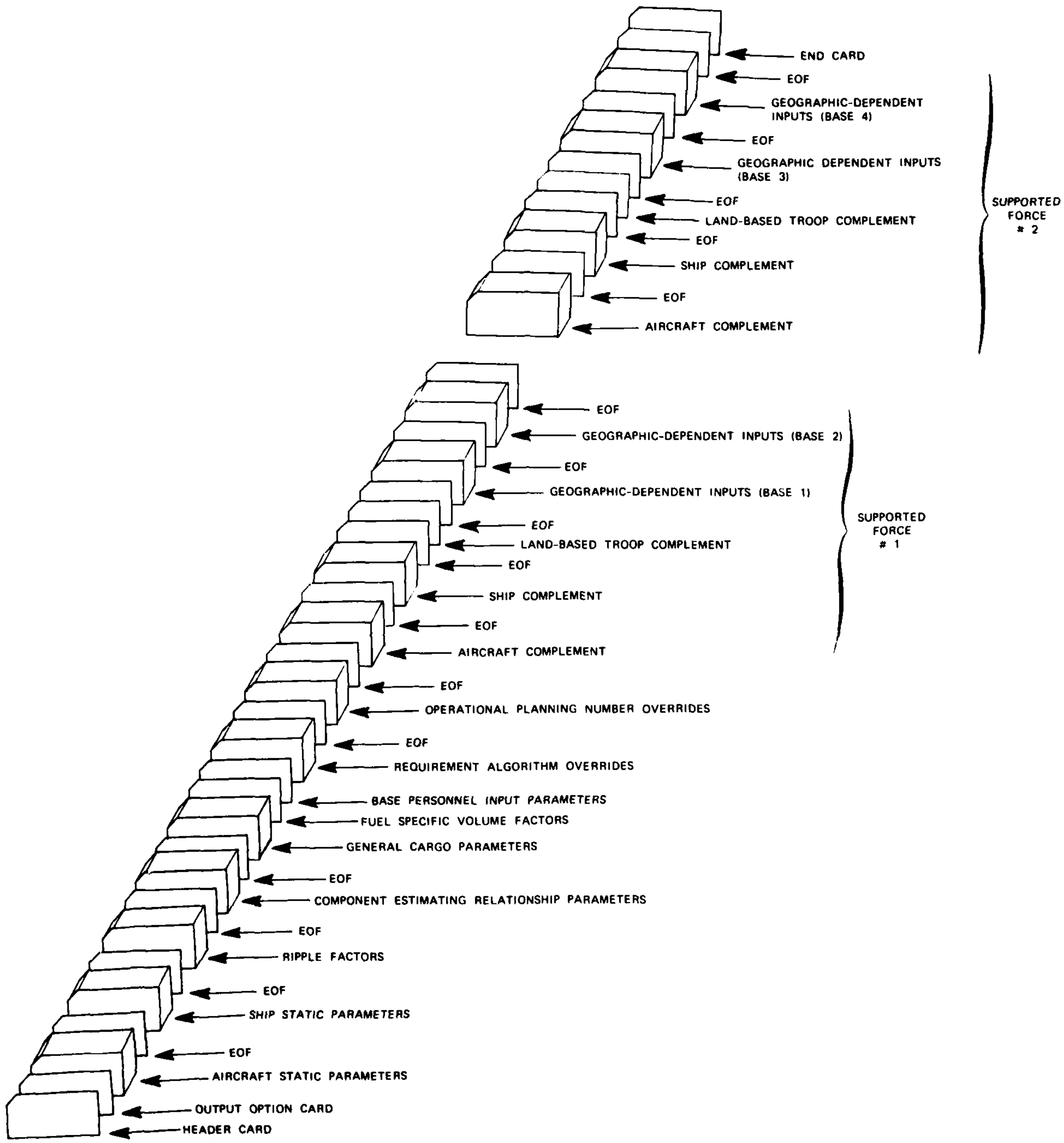

FIGURE II-1 SAMPLE DECK SETUP

Table II-1

AIRCRAFT STATIC PARAMETER CARD FORMAT

Card Columns	Description	FORTRAN Format
1-8	Aircraft Type	A8
10	Mission Type Code	I1
12-14	Wingspan (feet)	F3.0
16-18	Length (feet)	F3.0
20-23	Fuel Consumption Rate (gallons/day)	F4.0
25-26	Number per squadron	I2
28-29	Crew--Officers	I2
31-32	Crew--Enlisted	I2
34-38	Maintenance Personnel--Officers	F5.2
40-44	Maintenance Personnel--Enlisted	F5.2
46	Fuel Code	I1
48-53	Ammunition Consumption Rate (lb/day)	F6.0

number of aircraft per squadron, crew and maintenance complements, fuel code (0 = AVGAS, 1 = JET), and ammunition wartime consumption rate. It should be noted that the ammunition wartime consumption rate is clearly a function of the type of action that could be expected and should be entered accordingly. Two operational planning factor inputs identify peacetime-to-wartime ratios for fuel and ammunition consumption that are used by the model to determine consumption rates for peacetime operations. An EOF card is required at the end of this data set.

b. Ship Static Parameters

This data set contains the operational characteristics of all relevant ship types. The information necessary for entering a ship in this set is the ship type, officer complement, fuel wartime consumption rate, and ammunition wartime consumption rate. Fuel wartime consumption rates and ammunition wartime consumption rates must take into account the type of operation in which the ship is engaged. Two operational planning factor inputs identify peacetime-to-wartime ratios for fuel and ammunition consumption that are used by the model to determine consumption rates for peacetime operations. The format for these cards is given in Table II-2. An EOF card is required at the end of this data set.

Table II-2

SHIP STATIC PARAMETER CARD FORMAT

Card Columns	Description	FORTRAN Format
1-8	Ship Class	A8
10-13	Crew--Officers	I4
15-18	Crew--Enlisted	I4
20-25	Fuel Wartime Consumption Rate (barrels/day)	F6.0
27-32	Ammunition Wartime Consumption Rate (lb/day)	F6.0

c. Ripple Factors

A complete list of component ID designators for all valid components is maintained internally in ABCOMO. However, the user must supply certain information associated with each component. This data set contains some of this information. Each component card in this data set contains a component ID designator; a description of the pacing facility associated with that component; a unit of measure for the requirements imposed on the pacing facility; and the officer, enlisted, and electric power ripple factors for that component. The manner in which these ripple factors were developed is described in Appendix A. The format for the component ripple factor cards is given in Table II-3. An EOF card is required at this end of this data set.

Table II-3

COMPONENT RIPPLE FACTOR CARD FORMAT

Card Columns	Description	FORTRAN Format
1-6	Component ID	A6
8-31	Name of Associated Pacing Facility	4A6
33-36	Units of Measure of Pacing Facility Requirement	A4
38-47	Officer Ripple Factor	F10.9
49-58	Enlisted Ripple Factor	F10.9
60-69	Power Ripple Factor	F10.9

d. Component Estimating Relationship Parameters

This data set provides the remaining information required for each supply base component. Two cards must be supplied for each supply base component. These two cards contain the parameters required for the component estimating relationships that determine CONUS-based construction cost, initial outfitting equipment cost, shipping volume of this equipment, construction time, and land requirement for that component. The estimating relationship equations used by the model are all of the following format:

$$Y = b + mX$$

where Y is the applicable component resource factor, X is the pacing facility requirement, b is the relationship constant parameter and m is the relationship coefficient. The manner by which these component estimating relationship parameters were developed is described in Appendix A. The format for the required data cards is given in Table II-4. An EOF card is required at the end of this data set.

Table II-4

COMPONENT ESTIMATING RELATIONSHIP PARAMETER CARD FORMAT

Card Columns	Description	FORTRAN Format
	First Card	
1-4	Component ID	A4
5-36	Component Description	4A8
38-45	Construction Cost Constant Factor	E8.1
47-54	Construction Cost Coefficient	E8.1
56-63	Equipment Cost Constant Factor	E8.1
65-72	Equipment Cost Coefficient	E8.1
	Second Card	
20-27	Equipment Shipping Volume Constant Factor	E8.1
29-36	Equipment Shipping Volume Coefficient	E8.1
38-45	Construction Time Constant Factor	E8.1
47-54	Construction Time Coefficient	E8.1
56-63	Required Land Constant Factor	E8.1
65-72	Required Land Coefficient	E8.1

e. General Cargo Parameters

This data set provides daily consumption estimates, specific volumes, and unit costs for the various classes of supply. Ten cards are required for this data set. The first eight cards provide the above data for the following eight supply classes, specified in the proper sequence: I--Subsistence, II--Clothing, Tools, Etc.,III--Packaged POL, IV--Construction Material, VI--Personal Demand Items, VII--Major End Items, VIII--Medical Material, and IX--Repair Parts. Included on these cards is a Navy-funded consumption input that refers to daily consumption of items that are not normally included in personnel billet costs--i.e., such items as subsistence, clothing, and personal demand items are assumed to be included in the billet costs, and their consumption rates are therefore not included in this category. Also, the unit cost input for subsistence refers to nonrefrigerated subsistence items. Applicable data for refrigerated subsistence items are specified on the ninth card of this set. The tenth card provides unit costs for base fuel items. The format for these cards is presented in Table II-5. An EOF card is not required at the end of this data set, although an EOF mark is required on Card 9.

Table II-5

GENERAL CARGO PARAMETER CARD FORMAT

Card Columns	Description	FORTRAN Format
	Cards 1-8 One for each supply class listed in the text	
1-8	(Blank)	A8
9-18	Daily Consumption Rate (lb/man/day)	F10.6
19-28	Average Specific Volume (cu. ft./lb)	F10.6
29-38	Average Unit Cost ($/lb)	F10.6
39-48	Navy-Funded Daily Consumption Rate (lb/man/day)	F10.6
	Card 9	
1-6	EOF mark (six asterisks)	A6
9-18	Proportion of Subsistence That is Refrigerated	F10.6
19-28	(Not used--enter .0)	F10.6
29-38	Refrigerated Subsistence Average Unit Cost ($/lb)	F10.6
39-48	(Not used--enter .0)	F10.6
	Card 10	
1-10	Motor Gasoline Unit Cost ($/bbl)	F10.6
11-20	Diesel Fuel Unit Cost ($/bbl)	F10.6
21-30	Heating Fuel Unit Cost ($/bbl)	F10.6

f. Fuel Specific Volume Factors

This data set consists of one card that provides the specific volume factors for motor gasoline, diesel fuel, heating fuel, ship fuel (DFM), and aircraft fuel (JET). The card format is given in Table II-6. An EOF card is not required after this card.

Table II-6

FUEL SPECIFIC VOLUME FACTORS CARD FORMAT

Card Columns	Description	FORTRAN Format
1-10	Motor Gasoline Specific Volume (bbl/LT)	F10.6
12-21	Diesel Fuel Specific Volume (bbl/LT)	F10.6
23-32	Heating Fuel Specific Volume (bbl/LT)	F10.6
34-43	Ship Fuel (DFM) Specific Volume (bbl/LT)	F10.6
45-54	Aircraft Fuel (JP-5) Specific Volume (bbl/LT)	F10.6

g. Base Personnel Input Parameters

This data set consists of one card that provides required inputs associated with base support personnel. These inputs, separated by officer and enlisted categories, cover billet costs, fraction of personnel that will bring families overseas, number of dependents per married person, and personal belongings allowances. The format for this card is given in Table II-7. An EOF card is not required after this card.

Table II-7

BASE PERSONNEL INPUT PARAMETERS CARD FORMAT

Card Columns	Description	FORTRAN Format
1-7	Officer Billet Cost (Thousands of dollars)	F7.3
9-15	Enlisted Man Billet Cost (Thousands of dollars)	F7.3
17-21	Fraction Officers with Families Overseas	F5.3
23-27	Fraction Enlisted Men with Families Overseas	F5.3
29-33	Number of Dependents per Married Officer	F5.2
35-39	Number of Dependents per Married Enlisted Man	F5.2
41-48	Personal Belongings Allowance - Unmarried Officers (cu. ft.)	F8.1
50-57	Personal Belongings Allowance - Married Officers (cu.ft.)	F8.1
59-66	Personal Belongings Allowance - Unmarried EM (cu. ft.)	F8.1
68-75	Personal Belongings Allowance - Married EM (cu. ft.)	F8.1

2. Program Parameter Overrides

Built into the program are two sets of numerical parameters: Pacing Facility Requirements Algorithm Parameters and Operational Planning Numbers. Although these sets of parameters have specified default values (the value used if no override is requested) within the program, the user has the option of overriding the default values of any subset of these parameter sets.

a. Requirement Algorithm Overrides

Because the criteria for pacing facility requirements are subject to constant review and change, a mechanism has been provided for limited modification of the pacing facility planning factors in the requirement algorithms through the use of override cards. Each override card contains an identification (Component ID) field, an index field, and a new-value field in the format shown in Table II-8. The index field (which is actually an array subscript) is used to indicate the particular value it is desired to override. Table III-3 of Chapter III contains a list of the components, the requirements factors associated with those components, and their indices. The manner in which these values are used to calculate pacing facility and personnel requirements in the ABCOMO Model is fully described in Chapter III. An EOF card is required at the end of this data set, even if there are no override cards.

Table II-8

REQUIREMENT ALGORITHM OVERRIDE CARD FORMAT

Card Columns	Description	FORTRAN Format
1-8	Identification	A8
10-12	Index Field	I3
14-23	New Value	F10.3

b. Operational Planning Number Overrides

Because the criteria for base operations may vary from time to time, the override mechanism is available to the user to alter the program default values for these data. The specific operational planning factors, their default values, and their indices are listed in Table III-4 of Chapter III. These planning factors cover requirements for days of supply (both for wartime reserves and operating stocks) for storage purposes and these may be different for general cargo, aircraft fuel, ship fuel, base fuel, and ammunition. Since the fuel and ammunition consumption inputs for the ships and aircraft of the supported forces are specified in terms of wartime consumption, other planning numbers include peacetime-to-wartime consumption ratios for ship and aircraft fuel and ammunition consumption. The remaining planning factors designate the fractions of general cargo and ammunition that will be containerized, the fraction of at-sea men that will require facilities ashore, and the fraction of break-bulk cargo to be delivered by air. The override card format is the same as indicated in Table II-8. Again, an EOF card is required at the end of this data set, even if there are no override cards.

3. Supported Force Composition Inputs

The program allows for a number of different supported force compositions to be processed, in turn, during a given execution run. The supported force is defined by specifying the aircraft complement, ship complement, and land-based troop complement. Each of these represent a specific data set.

a. Aircraft Complement

The cards in this data set specify the numbers and types of aircraft that will be loaded onto or supported by a base. Each card contains three items of information. The first eight columns of the card contain the aircraft type. The only aircraft types that may be loaded onto a base are those for which a static data card has been entered. The manner in which the aircraft type is punched on an aircraft complement card must correspond exactly to the manner in which it was entered on the corresponding static data card. The second item on this card represents the number of aircraft of this type that will be loaded on the base. This number is an integer that is right-adjusted in Columns 10-12. The third field on the card indicates, if blank, that the aircraft are land-based and, if non-blank, that they are carrier-based. (Any alphanumeric character(s) may be used.) Table II-9 shows the card format.

Table II-9

AIRCRAFT COMPLEMENT CARD FORMAT

Columns	Description	FORTRAN Format
1-8	Aircraft Type	A8
10-12	Number of Aircraft of that Type	F3.0
14-21	Carrier Flag	A8

There is no limit to the number of complement cards that may specify any particular aircraft type. If more than one card is input for a particular type, the sum of the numbers on each card is used in calculations. For example, it is possible to load 20 F-4s on a base, 10 land-based and 10 carrier-based, by punching two cards. One card would specify 10 land-based F4s and the other would specify 10 carrier-based F4s. The total of 20 would be used. The distinction between carrier-based and land-based aircraft is important because carrier-based aircraft are assumed to have no impact on land airfield requirements. However, they contribute to total requirements for such items as fuel storage, ammunition storage, etc. An EOF card is required at the end of this data set, even if there are no aircraft complement cards.

b. Ship Complement

This data set contains cards specifying the numbers and types (given by ship class designations) of ships supported by the base. The format for these cards is shown by Table II-10. The ship name must be punched on the complement card in the identical manner in which the corresponding static data card was punched, and only ship types with an entry in the ship static file are valid inputs.

Table II-10

SHIP COMPLEMENT CARD FORMAT

Card Columns	Description	FORTRAN Format
1-8	Ship/Class Designation	A8
10-12	Number of ships of this Class	F3.0

This file is terminated by a case ID and supported force ID end-of-file card. In addition to the asterisks in Columns 1-6 required in the EOF cards, this EOF card contains a case ID descriptor (8 alphanumeric characters in Columns 14-21) and a supported force ID descriptor for this supported force (4 alphanumeric characters in Columns 22-25). These two items may appear anywhere in their respective fields and either field may be left blank if desired. Table II-11 shows the format of these EOF cards.

Table II-11

CASE ID AND SUPPORTED FORCE ID EOF CARD FORMAT

Card Columns	Description	FORTRAN Format
1-6	EOF Mark (six asterisks)	A6
14-21	Case ID Descriptor	A8
22-25	Supported Force ID Descriptor	A4

c. Land-Based Troop Complement

It is possible to preload a base with operational personnel. This may be desired when other force elements such as Marine or Army units will be stationed at the base. These personnel must always be in excess of those required to operate and maintain the ships, aircraft, and physical plant associated with the base. They are entered by punching a card with the number of additional officers as an integer right justified in Columns 1-5, and the number of enlisted men as an integer right justified in Columns 7-11. This card follows the ship complement file and must always contain only one card punched as shown in Table II-12. This card must be followed by an EOF card.

Table II-12

LAND BASED TROOP COMPLEMENT CARD FORMAT

Card Columns	Description	FORTRAN Format
1-5	Additional Officer Personnel	F5.0
7-11	Additional Enlisted Personnel	F5.0

4. Geographic-Dependent Inputs

For each supported force composition, the model allows for bases located in any number of different geographical areas as specified by a different set of geographic-dependent inputs to be processed. These inputs provide for a descriptor of the geographical area, a construction cost multiplier for that geographical area (construction costs are computed initially in the model in terms of a CONUS-based supply base), various transport costs for personnel, equipment, supplies, fuel and ammunition, and land-related inputs designating the proportion of required land that may be purchased outright, with the remainder leased, and the costs associated with land purchase and lease. The card format for each set of geographic-dependent inputs is given in Table II-13. An EOF card is required at the end of this data set.

Table II-15

GEOGRAPHIC-DEPENDENT INPUTS

Card Columns	Description	FORTRAN Format
Card 1		
1-32	Geographic Area Descriptor	4A8
Card 2		
1-6	Construction Cost Multiplier	F6.3
8-14	Transport Cost--Nonrefrigerated Cargo ($/MT)	F7.2
16-22	Transport Cost--Refrigerated Cargo ($/MT)	F7.2
24-30	Transport Cost--Personnel ($/man)	F7.2
32-38	Transport Cost--Bulk POL ($/LT)	F7.2
40-46	Transport Cost--Ammunition ($/MT)	F7.2
48-52	Proportion of Land Requirement Purchased	F5.3
54-60	Land Purchase Cost ($/acre)	F7.1
62-68	Annual Land Lease Cost ($/acre)	F7.1

5. Run Termination and Recycle Option

As mentioned previously, more than one base can be processed in a single computer run by stacking different sets of supported force composition cards and geographic-dependent cards. A deck setup may thus consist of any number of these card sets. For a given run, values in the static data files, including the requirement algorithm and operational planning numbers, remain constant for a given run. Figure II-2 illustrates the logic of program operating sequence. At the end of the input data deck, a termination card is required with the word END punched in Columns 1-3. This causes the program to terminate execution.

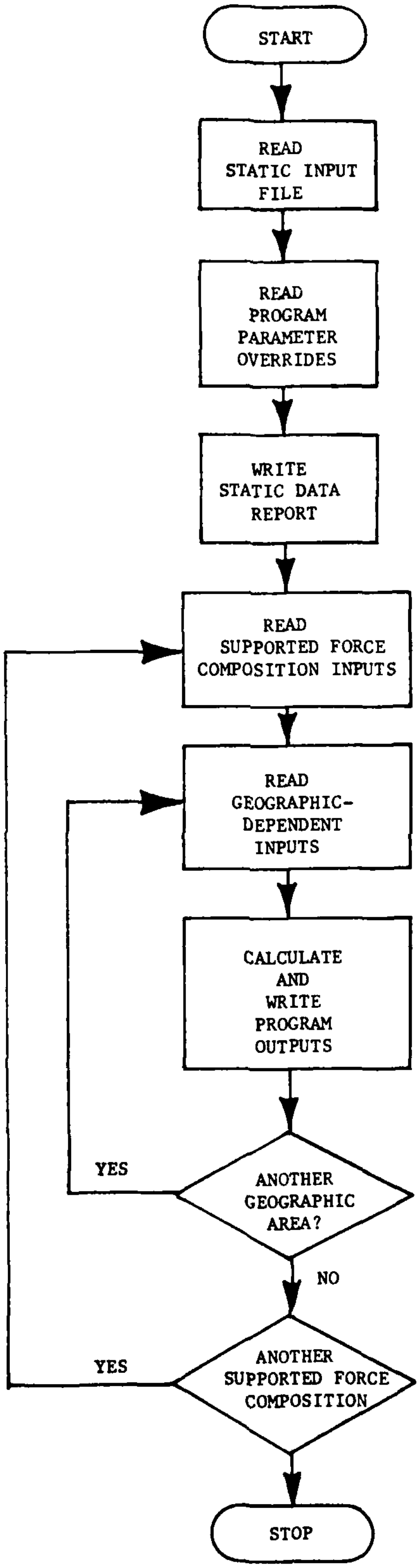

FIGURE II-2 PROGRAM OPERATING SEQUENCE

C. Output Description and Report Numbering

The output from ABCOMO consists of a static data input report followed by a series of output reports for the different bases. Each report is given a unique number.

The static data report, number 1-1-1, summarizes all the static data inputs, specifies the base operational planning factors in effect, and lists any algorithm overrides that may have been input. The user has the option of suppressing much of the printout included in the static data report if he so desires.

The output reports follow the static data report, and give the base loading, the base component requirements and resource factors, and the cost factors associated with each base processed. These reports are numbered sequentially by case ID, supported force composition ID, and geographical area for that base. The report number consists of four numbers. The first number is "2", which signifies that this is an output report. The second number is a case ID counter. If the case ID designator for the supported force being processed is different than the previous one processed, then this second number is incremented ahead by one. The third number is a counter for the number of supported forces included in a single case ID sequence. The fourth number is a counter for the number of different geographical areas processed for the given supported force. For example, the report number 2-3-1-4 means that this is an output report (2) for the third (3) case considered, that this is the first (1) supported force considered in that case, and that this is the fourth (4) different geographical area considered for this supported force. For coherent report numbering, successive supported force card sets should be properly ordered and grouped together.

A complete listing of a sample output is presented in the next section.

D. Sample Program Output Listing

A complete listing of the inputs and outputs obtained from the sample problem discussed at the end of the previous chapter is presented on the remaining pages of this chapter. The output report addresses only one case ID, two different supported forces, and two different geographical areas for each supported force. The majority of inputs were obtained from numerous source documents, listed in the Bibliography of this report. The component ripple factors and estimating relationship parameters were derived by project team members, as described in Appendix A. Some of the input data that would be provided by the user were postulated by the project team members.

AIRCRAFT STATIC DATA FILE

AIRCRAFT	TYPE CODE	WINGSPAN (FT)	LENGTH (FT)	FUEL CONSUMPTION (GAL/DAY)	NO./ SQUAD	CREW COMPLEMENT OFF	CREW COMPLEMENT ENL	MAINTENANCE COMPLEMENT OFF	MAINTENANCE COMPLEMENT ENL	FUEL CODE	AMMO CONSUMPTION (LBS/DAY)
A-6	1	53.	56.	1596.	12	2	0	1.00	22.30	1	4000.
A-7	1	39.	47.	1470.	12	1	0	.75	20.25	1	4000.
AH-1	4	44.	54.	210.	18	1	1	2.75	6.00	1	3000.
AV-8B	1	26.	47.	1092.	20	1	0	.75	19.00	1	2000.
CH-46	4	51.	85.	336.	18	2	1	1.50	14.00	1	100.
CH-53	4	73.	89.	546.	21	2	1	1.50	14.00	1	100.
COD	3	81.	57.	1050.	8	2	1	1.50	19.62	1	100.
E-2	2	81.	58.	1008.	4	3	3	4.00	33.25	1	100.
EA-3	1	60.	76.	2562.	13	2	1	2.67	26.44	1	100.
EA-6B	1	53.	60.	2184.	4	2	2	4.00	47.00	1	100.
F-4	1	39.	59.	2100.	12	2	0	.92	20.00	1	5000.
F-14	1	65.	63.	2394.	12	2	0	.92	22.08	1	5000.
F-18	1	41.	56.	1428.	12	1	0	.58	15.42	1	5000.
HH-2	4	44.	53.	336.	10	2	1	2.00	13.00	1	100.
HS(X)-L	4	54.	65.	336.	10	2	1	1.33	10.80	1	100.
KA-6	3	53.	56.	2016.	4	2	0	1.00	19.00	1	100.
OV-10	1	40.	40.	294.	12	1	1	2.00	10.00	1	1000.
RA-5	1	53.	76.	2774.	7	2	0	3.00	56.75	1	100.
RH-53	4	73.	89.	630.	17	2	1	1.48	21.67	1	100.
S-3	2	69.	54.	1050.	10	3	1	2.00	25.87	1	100.
SH-2	4	44.	53.	210.	10	2	1	1.54	10.80	1	100.
SH-3	4	62.	73.	336.	8	2	1	1.33	21.87	1	100.
UH-1	4	48.	58.	210.	21	2	1	1.00	10.00	1	1000.

TYPE CODE

1 = TACTICAL
2 = PATROL
3 = CARGO
4 = ROTARY WING

FUEL CODE

0 = AVGAS
1 = JET

SHIP STATIC DATA FILE

SHIP	COMPLEMENT		CONSUMPTION RATES	
	OFF	ENL	FUEL (BBL/DAY)	AMMO (LBS/DAY)
AD	39	848	246.	500.
AE	17	283	177.	500.
AFS	27	227	191.	500.
AGF	14	180	229.	500.
AO	15	285	280.	500.
AOE	23	553	680.	500.
AR	35	840	297.	500.
CG	64	957	629.	1500.
CGN	71	964	500.	1500.
CVA/CV	140	2903	1771.	5000.
CVN	144	3250	0.	5000.
DD	18	270	486.	5000.
DDG	19	320	560.	5000.
FF	30	350	349.	5000.
FFG	24	380	400.	5000.
LCC	50	505	486.	500.
LHA	30	300	411.	6000.
LKA	30	330	411.	100.
LPD	28	435	629.	100.
LPH	47	641	343.	3000.
LSD	18	300	497.	3000.
LST	10	170	314.	3000.
MCS	28	465	400.	800.
MSO	6	67	40.	200.
PG	4	26	40.	200.
PHM	5	30	40.	200.

RIPPLE FACTOR TABLE

COMPONENT ID	PACING FACILITY	UNITS	OFFICER RIPPLE	ENLISTED RIPPLE	POWER RIPPLE
A3	ADMINISTRATIVE OFFICE	SF	.002600000	.016900000	.008680000
A4	DATA PROCESSING CENTER	SF	.002080000	.011800000	.006250000
A5	OFFICE EQUIP-APPLNCE RP.	SF	.013300000	.091700000	.208000000
A7	CORRECTIONAL FACILITY	SF	.000600000	.008900000	.009000000
B8	DREDGING	CY	0.000000000	0.000000000	0.000000000
B5A	WATERFRONT OPS. BLDG.	SF	.001390000	.084700000	.015300000
B13C	PORT CONTROL OFFICE	SF	.001460000	.005420000	.005000000
C3A	COMMUNICATION CENTER	SF	.001970000	.024600000	.065800000
C7	VISUAL STATION	SF	0.000000000	.044600000	.067000000
C13	CENTRAL TELEPHONE OFF.	SF	0.000000000	.036600000	.013900000
C27J	RECEIVER BUILDING	SF	.001040000	.012500000	.062500000
C32A	AIRCRAFT OPS. BUILDING	SF	.011400000	.108000000	.009850000
DA	SUPPLY CONTAINER HDLG PR	FB	0.000000000	0.000000000	.550000000
D3A1	SHIP FUEL STORAGE	BL	.000006250	.000081300	.000225000
D3A2	JET ENGINE FUEL STORAGE	BL	.000006250	.000081300	.000225000
D4C1	MOGAS STORAGE	BL	.000033000	.000370000	.000700000
D4C2	DIESEL FUEL STORAGE	BL	.000033000	.000370000	.000700000
D4C3	ACT. HTNG. FUEL STORAGE	BL	.000033000	.000370000	.000700000
D20	DISBURSING OFFICE	SF	.000750000	.006250000	.006250000
D24A	EXCHANGE LAUNDRY PLANT	SF	.000375000	.007750000	.034400000
D29A	AIR CARGO TERMINAL	SF	.000071400	.001090000	.000214000
D31A	GENERAL PURPOSE WAREHSE	SF	.000115000	.000800000	.001250000
D31E	SUPPLY PIER	FB	0.000000000	0.000000000	.549000000
D32A	COLD STORAGE WAREHOUSE	SF	0.000000000	.000862000	.030800000
D33A	AUTOMOTIVE MAINT. SHOP	SF	.000500000	.017500000	.010800000
F1	ADMINISTRATION (MIN.)	SF	.006410000	.144000000	.010700000
G2	HOSPITAL	SF	.000289000	.001070000	.002080000
G9	OUTPATIENT CLINIC	SF	.000208000	.002080000	.003130000
G28	DENTAL CLINIC	SF	.002600000	.005470000	.011700000
HA	AIRCRAFT RUNWAY	SY	0.000000000	.000108000	.001320000
H9J	MAINT. HANGER (HI-BAY)	SF	.000135000	.001760000	.015200000
J3A	HIGH EXPLOSIVE MAGAZINE	SF	.000047000	.000747000	.001410000
J3D	AMMUNITION PIER	FB	0.000000000	0.000000000	.637000000
J4	EXPLO. ORD. DISPOSL BLDG	SF	.001040000	.003130000	.011500000
NA	FAMILY HOUSING	SF	.000001350	.000011300	.005070000
NB	BACHELOR ENLIST. QTRS.	SF	0.000000000	.000667000	.005860000
NC	BACHELOR OFFICERS QTRS.	SF	0.000000000	.000135000	.005500000
ND	EXCHANGE SERVICE STATION	SF	0.000000000	.001844000	.031600000
NE	SPECIAL SERVICES OFFICE	SF	.000190000	.001330000	.144000000
N10B	APPLIED INSTRUCTION BLDG	SF	.000122000	.000365000	.009160000
N14	CHAPEL	SF	.000750000	.000750000	.001560000
N16	COMM. OFF. MESS (OPEN)	SF	.000125000	.001250000	.005250000

RIPPLE FACTOR TABLE

COMPONENT ID	PACING FACILITY	UNITS	OFFICER RIPPLE	ENLISTED RIPPLE	POWER RIPPLE
N17	EM CLUB, PO MESS (OPEN)	SF	.000179000	.002210000	.004900000
P5	PUBLIC WORKS SHOP	SF	.000875000	.033800000	.058300000
P5A	AUTOMOTIVE MAINT. SHOP	SF	.000062500	.002500000	.014000000
P12A	FIRE STATION	SF	0.000000000	.008700000	.006960000
P15	ELECTRIC POWER STATION	KW	0.000000000	9.000000000	0.000000000
P16	SEWAGE TREATMENT PLANT	KG	0.000000000	.027500000	.200000000
P18	WATER TREATMENT FACILITY	KG	0.000000000	.005730000	.200000000

COMPONENT ESTIMATING RELATIONSHIP(E.R.) PARAMETERS

COMP.	CONSTRUCTION COST E.R.		EQUIPMENT COST E.R.		EQUIPMENT VOLUME E.R.		CONSTRUCTION TIME E.R.		REQUIRED LAND E.R.	
ID	CONSTANT	COEFF.	CONSTANT	COEFF.	CONSTANT	COEFF.	CONSTANT	COEFF.	CONSTANT	COEFF.
A3	0.	.183E+03	0.	.146E+02	0.	.611E+00	0.	.295E+00	0.	.391E-03
A4	0.	.155E+03	0.	.311E+02	0.	.565E+00	0.	.208E+00	0.	.278E-03
A5	0.	.788E+03	0.	.162E+03	0.	.331E+01	0.	.920E+00	0.	.217E-02
A7	0.	.127E+03	0.	.564E+01	0.	.200E+00	0.	.181E+00	0.	.350E-03
B8	0.	.995E+01	0.	0.	0.	0.	0.	.223E-02	0.	0.
B5A	0.	.370E+03	0.	.505E+04	0.	.370E+03	0.	.353E+00	0.	.556E-03
B13C	0.	.725E+02	0.	.240E+02	0.	.157E+01	0.	.103E+00	0.	.833E-04
C3A	0.	.144E+03	0.	.315E+03	0.	.640E+01	0.	.208E+00	0.	.219E-01
C7	0.	.436E+03	0.	.135E+03	0.	.297E+01	0.	.487E+00	0.	.112E-02
C13	0.	.211E+04	0.	.148E+02	0.	.430E+00	0.	.207E+00	0.	.174E-02
C27J	0.	.616E+03	0.	.175E+03	0.	.538E+01	0.	.348E+00	0.	.781E-01
C32A	0.	.806E+03	0.	.210E+04	0.	.175E+02	0.	.400E+00	0.	.114E-01
DA	0.	.105E+05	0.	.120E+03	0.	.502E+01	0.	.746E+00	0.	.206E-01
D3A1	0.	.218E+02	0.	.165E+01	0.	.169E+00	0.	.487E-01	0.	.108E-03
D3A2	0.	.325E+02	0.	.165E+01	0.	.169E+00	0.	.487E-01	0.	.110E-03
D4C1	0.	.478E+02	0.	.642E+01	0.	.420E+00	0.	.169E+00	0.	.230E-03
D4C2	0.	.484E+02	0.	.651E+01	0.	.427E+00	0.	.172E+00	0.	.240E-03
D4C3	0.	.830E+02	0.	.642E+01	0.	.420E+00	0.	.169E+00	0.	.230E-03
D20	0.	.731E+02	0.	.973E+01	0.	.627E+00	0.	.120E+00	0.	.225E-03
D24A	0.	.156E+03	0.	.212E+02	0.	.117E+01	0.	.197E+00	0.	.350E-03
D29A	0.	.418E+02	0.	.150E+02	0.	.714E+00	0.	.500E-01	0.	.700E-04
D31A	0.	.377E+02	0.	.151E+01	0.	.441E+00	0.	.483E-01	0.	.120E-03
D31E	0.	.696E+04	0.	.120E+03	0.	.501E+01	0.	.745E+00	0.	.426E-02
D32A	0.	.107E+03	0.	.650E+00	0.	.122E+00	0.	.634E-01	0.	.157E-04
D33A	0.	.756E+02	0.	.559E+03	0.	.274E+02	0.	.144E+00	0.	.100E-03
F1	0.	.257E+03	0.	.292E+04	0.	.840E+02	0.	.276E+00	0.	.267E-02
G2	0.	.125E+03	0.	.283E+01	0.	.312E+00	0.	.125E+00	0.	.726E-04
G9	0.	.116E+03	0.	.872E+01	0.	.905E+00	0.	.118E+00	0.	.208E-03
G28	0.	.127E+03	0.	.252E+02	0.	.148E+01	0.	.703E-01	0.	.234E-03
HA	0.	.752E+02	0.	.103E+01	0.	.592E-01	0.	.151E-01	0.	.413E-03
H9J	0.	.239E+03	0.	.442E+01	0.	.950E+00	0.	.978E-01	0.	.243E-03
J3A	0.	.126E+03	0.	.107E+02	0.	.584E+00	0.	.136E+00	0.	.117E-01
J3D	0.	.147E+05	0.	.120E+03	0.	.502E+01	0.	.744E+00	0.	.422E-02
J4	0.	.492E+03	0.	.204E+03	0.	.788E+01	0.	.349E+00	0.	.333E+00
NA	0.	.725E+02	0.	.155E+00	0.	.775E-01	0.	.129E+00	0.	.482E-04
NB	0.	.114E+03	0.	.352E+01	0.	.625E+00	0.	.128E+00	0.	.474E-04
NC	0.	.109E+03	0.	.929E+00	0.	.126E+00	0.	.120E+00	0.	.440E-04
ND	0.	.900E+03	0.	.160E+02	0.	.195E+01	0.	.641E+00	0.	.369E-02
NE	0.	.275E+04	0.	.430E+02	0.	.891E+01	0.	.248E+01	0.	.642E-02
N10B	0.	.160E+03	0.	.290E+01	0.	.373E+00	0.	.147E+00	0.	.130E-02

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COMPONENT ESTIMATING RELATIONSHIP(E.R.) PARAMETERS

COMP.	CONSTRUCTION COST E.R.		EQUIPMENT COST E.R.		EQUIPMENT VOLUME E.R.		CONSTRUCTION TIME E.R.		REQUIRED LAND E.R.	
ID	CONSTANT	COEFF.	CONSTANT	COEFF.	CONSTANT	COEFF.	CONSTANT	COEFF.	CONSTANT	COEFF.
N14	0.	.180E+03	0.	.585E+01	0.	.709E+00	0.	.120E+00	0.	.225E-03
N16	0.	.171E+03	0.	.592E+01	0.	.124E+01	0.	.120E+00	0.	.150E-03
N17	0.	.942E+02	0.	.276E+01	0.	.788E+00	0.	.858E-01	0.	.621E-02
P5	0.	.213E+03	0.	.637E+03	0.	.249E+02	0.	.371E+00	0.	.163E-02
P5A	0.	.933E+02	0.	.374E+02	0.	.136E+01	0.	.162E+00	0.	.388E-03
P12A	0.	.634E+02	0.	.476E+02	0.	.213E+01	0.	.111E+00	0.	.870E-04
P15	0.	.575E+03	0.	.185E+02	0.	.305E+01	0.	.144E+00	0.	.333E-03
P16	0.	.547E+04	0.	.289E+03	0.	.290E+02	0.	.204E+01	0.	.420E-01
P18	0.	.195E+04	0.	0.	0.	0.	0.	.869E+00	0.	.287E-01

GENERAL CARGO PARAMETERS

CLASS OF SUPPLY AND DESCRIPTION		CONSUMPTION (LBS/MAN/DAY)	SPECIFIC VOLUME (CU.FT/LB)	UNIT COST (DOLLARS/LB)	NAVY FUNDED CONSUMPTION (LBS/MAN/DAY)
I	SUBSISTENCE	6.223000	.036600	.930000	0.000000
II	CLOTHING,TOOLS,ETC	4.100500	.041600	4.570000	3.706700
III	PACKAGED POL	.451800	.025400	.530000	.451800
IV	CONSTRUCT. MATERIAL	.657000	.051000	.416000	.657000
VI	PERSONAL DEMAND	4.799000	.042600	2.260000	0.000000
VII	MAJOR END ITEMS	.432000	.067200	2.290000	.432000
VIII	MEDICAL MATERIAL	.134200	.065000	1.150000	.134200
IX	REPAIR PARTS	.718900	.061800	2.290000	.718900

REEFER PROPORTION OF SUBSISTENCE = .660
REEFER UNIT COST = 1.42 DOLLARS PER POUND
MOGAS UNIT COST = 52.92 DOLLARS PER BARREL
DIESEL UNIT COST = 54.18 DOLLARS PER BARREL
HEATING FUEL UNIT COST = 54.18 DOLLARS PER BARREL

FUEL AND AMMUNITION SPECIFIC VOLUME FACTORS
MOGAS = 8.599000 BARRELS PER LONG TON
DIESEL = 7.582000 BARRELS PER LONG TON
HEATING FUEL = 6.495000 BARRELS PER LONG TON
SHIP FUEL(DFM) = 7.582000 BARRELS PER LONG TON
AIRCRAFT FUEL(JET) = 7.809000 BARRELS PER LONG TON
AMMUNITION = 1.070000 MEASUREMENT TONS PER SHORT TON

SUMMARY OF ALGORITHM OVERRIDES

CATEGORY CODE	INDEX	OLD VALUE	NEW VALUE
A7	5	2500.00	2000.00
D31E	27	685.00	700.00
J3D	49	1.07	1.01

SUMMARY OF PARAMETER OVERRIDES

ITEM	INDEX	OLD VALUE	NEW VALUE
FC	15	.30	.20
FA	16	.20	.30

DAYS OF SUPPLY

	OPERATING STOCKS	RESERVES
CARGO	30	90
AIRCRAFT FUEL	30	90
SHIP FUEL	30	90
BASE FUEL	30	90
AMMUNITION	30	90

PEACETIME-TO-WARTIME RATIOS

AIRCRAFT FUEL	.5000
SHIP FUEL	.5000
AIRCRAFT AMMUNITION	.0100
SHIP AMMUNITION	.0100

OTHER PLANNING FACTORS

FRACTION CARGO CONTAINERIZED = .2000
FRACTION AMMO CONTAINERIZED = .3000
FRACTION AT-SEA MEN WITH IMPACT ASHORE = .0300
FRACTION BREAK-BULK CARGO DELIVERED BY AIR = .1000

BASE PERSONNEL INPUT PARAMETERS

OFFICER BILLET COST -	64.789	THOUSANDS OF DOLLARS
ENLISTED MAN BILLET COST -	23.569	THOUSANDS OF DOLLARS
FRACTION OFFICERS WITH FAMILIES OVERSEAS -	.620	
FRACTION ENLISTED MEN WITH FAMILIES OVERSEAS -	.320	
NUMBER OF DEPENDENTS PER MARRIED OFFICER -	2.73	
NUMBER OF DEPENDENTS PER MARRIED ENLISTED MAN -	2.68	
PERSONAL BELONGINGS ALLOWANCES		
UNMARRIED OFFICERS -	1573.0	CUBIC FEET
MARRIED OFFICERS -	1573.0	CUBIC FEET
UNMARRIED ENLISTED MEN -	1001.0	CUBIC FEET
MARRIED ENLISTED MEN -	1001.0	CUBIC FEET

SUMMARY OF BASE LOADING
CASE 1D-TEST 1 FORCE 1D-1

AIRCRAFT COMPLEMENT

TYPE	LAND BASED	CARRIER BASED	TOTAL
A-6	0	20	20
A-7	0	48	48
CH-46	0	16	16
CH-53	0	6	6
E-2	0	8	8
F-14	0	48	48
S-3	0	20	20
UH-1	0	4	4

SHIP COMPLEMENT

TYPE	TOTAL
AE	1
AFS	1
AO	1
AOE	2
CVA/CV	2
FF	5
FFG	16
LHA	1
LPD	4
LPH	1
LSD	2
LST	1

SUPPLY CONSUMPTION RATES
CASE ID-TEST 1 FORCE ID-1

GENERAL CARGO PER DAY

CLASS OF SUPPLY AND DESCRIPTION		SHORT TONS	MEASUREMENT TONS
I	SUBSISTENCE		
	REFRIGERATED	50	92
	NON-REFRIGERATED	26	47
II	CLOTHING,TOOLS,ETC	50	104
III	PACKAGED POL	6	7
IV	CONSTRUCT. MATERIAL	8	20
VI	PERSONAL DEMAND	58	124
VII	MAJOR END ITEMS	5	18
VIII	MEDICAL MATERIAL	2	5
IX	REPAIR PARTS	9	27

- -

	SHORT TONS	MEASUREMENT TONS
TOTAL GENERAL CARGO		
REFRIGERATED	50	92
NON-REFRIGERATED	164	352

- -

TOTAL FUEL AND AMMUNITION		
SHIP FUEL (DIESEL FUEL,MARINE)	18	THOUSANDS OF BARRELS PER DAY
AIRCRAFT FUEL (JET)	6	THOUSANDS OF BARRELS PER DAY
AMMUNITION	328	SHORT TONS PER DAY

DAILY CONSUMPTION RATES

TOTAL GENERAL CARGO	17.516400	LBS/MAN/DAY
REFRIGERATED GENERAL CARGO	4.107180	LBS/MAN/DAY

MANPOWER

	LAND-BASED AIRCRAFT PERSONNEL	SEA-BASED AIRCRAFT PERSONNEL	SHIP PERSONNEL	OTHER FORCE ELEMENTS	BASE OPS PERSONNEL	BASE DEPENDENTS	TOTAL PERSONNEL
OFFICERS	0	529	1154	0	259	438	2380
ENLISTED	0	3679	18988	0	3285	2817	28769
TOTAL	0	4208	20142	0	3544	3255	31149

SUMMARY OF PROJECTED REQUIREMENT
CASE ID-TEST 1 FORCE ID-1

COMPONENT ID	PACING FACILITY	COMPONENT BASE OPS PERSONNEL OFFICERS	ENLISTED	PACING FACILITY REQUIREMENT	
A3	ADMINISTRATIVE OFFICE	10.0	65.0	3846.8	SF
A4	DATA PROCESSING CENTER	3.0	17.0	1440.0	SF
A5	OFFICE EQUIP-APPLNCE RP.	7.2	49.7	541.9	SF
A7	CORRECTIONAL FACILITY	5.3	77.9	8757.5	SF
BB	DREDGING	0.0	0.0	1333333.0	CY
B5A	WATERFRONT OPS. BLDG.	2.0	122.0	1440.0	SF
B13C	PORT CONTROL OFFICE	17.4	64.7	11942.5	SF
C3A	COMMUNICATION CENTER	9.0	112.2	4560.0	SF
C7	VISUAL STATION	0.0	19.9	446.2	SF
C13	CENTRAL TELEPHONE OFF.	0.0	35.4	968.1	SF
C27J	RECEIVER BUILDING	1.0	12.0	960.0	SF
C32A	AIRCRAFT OPS. BUILDING	15.0	142.6	1320.0	SF
DA	SUPPLY CONTAINER HDLG PR	0.0	0.0	2050.0	FB
D3A1	SHIP FUEL STORAGE	12.0	156.0	1918665.0	BL
D3A2	JET ENGINE FUEL STORAGE	4.0	52.0	639870.0	BL
D4C1	MOGAS STORAGE	4.5	50.1	135523.9	BL
D4C2	DIESEL FUEL STORAGE	.7	7.6	20516.0	BL
D4C3	ACT. HTNG. FUEL STORAGE	1.7	18.6	50234.2	BL
D20	DISBURSING OFFICE	1.3	10.7	1709.7	SF
D24A	EXCHANGE LAUNDRY PLANT	2.8	58.3	7521.8	SF
D29A	AIR CARGO TERMINAL	.9	13.9	12709.2	SF
D31A	GENERAL PURPOSE WAREHSE	46.1	320.8	401059.4	SF
D31E	SUPPLY PIER	0.0	0.0	1400.0	FB
D32A	COLD STORAGE WAREHOUSE	0.0	95.1	110339.3	SF
D33A	AUTOMOTIVE MAINT. SHOP	5.3	186.6	10663.7	SF
F1	ADMINISTRATION (MIN.)	8.3	186.3	1293.8	SF
G2	HOSPITAL	32.5	120.5	112577.2	SF
G9	OUTPATIENT CLINIC	1.6	16.3	7839.8	SF
G28	DENTAL CLINIC	7.5	15.8	2891.2	SF
HA	AIRCRAFT RUNWAY	0.0	24.0	222222.0	SY
H9J	MAINT. HANGER (HI-BAY)	.1	1.9	1056.4	SF
J3A	HIGH EXPLOSIVE MAGAZINE	25.0	398.0	532842.2	SF
J3D	AMMUNITION PIER	0.0	0.0	2050.0	FB
J4	EXPLO. ORD. DISPOSL BLDG	1.0	3.0	960.0	SF
NA	FAMILY HOUSING	2.2	18.2	1614978.2	SF
NB	BACHELOR ENLIST. QTRS.	0.0	229.3	343838.9	SF
NC	BACHELOR OFFICERS QTRS.	0.0	11.8	87164.5	SF
ND	EXCHANGE SERVICE STATION	0.0	5.8	3131.1	SF

SUMMARY OF PROJECTED REQUIREMENT
CASE ID-TEST 1 FORCE ID-1

COMPONENT ID	PACING FACILITY	COMPONENT BASE OPS PERSONNEL OFFICERS	ENLISTED	PACING FACILITY REQUIREMENT	
NE	SPECIAL SERVICES OFFICE	.7	5.2	3902.4	SF
N10B	APPLIED INSTRUCTION BLDG	3.6	10.9	29738.4	SF
N14	CHAPEL	9.9	9.9	13186.5	SF
N16	COMM. OFF. MESS (OPEN)	1.4	13.8	11048.2	SF
N17	EM CLUB, PO MESS (OPEN)	5.4	67.1	30382.3	SF
P5	PUBLIC WORKS SHOP	9.3	361.2	10685.4	SF
P5A	AUTOMOTIVE MAINT. SHOP	.6	23.8	9530.2	SF
P12A	FIRE STATION	0.0	40.2	4615.3	SF
P15	ELECTRIC POWER STATION	0.0	9.0	23251.1	KW
P16	SEWAGE TREATMENT PLANT	0.0	20.7	752.9	KG
P18	WATER TREATMENT FACILITY	0.0	4.3	752.9	KG

SUMMARY OF COMPONENT REQUIREMENT
CASE ID-TEST 1   FORCE ID-1

COMP. ID	COMPONENT DESCRIPTION	CONSTRUCTION COST (THOUSANDS OF DOLLARS)	EQUIPMENT COST (THOUSANDS OF DOLLARS)	EQUIPMENT CUBE (MEASUREMENT TONS)	CONSTRUCTION TIME (MAN-DAYS)	LAND REQMT (ACRES)
A3	ADMIN. OFFICE, POST OFFICE	703	56	59	1135	2
A4	DATA PROCESSING FACILITY	223	45	20	300	0
A5	ELECTRONIC MAINTENANCE	427	88	45	499	1
A7	SHORE PATROL HEADQUARTERS	1111	49	44	1582	3
B8	WATERFRONT SAFETY FACILITIES	13267	0	0	2973	0
B5A	BOAT POOL	533	7278	13328	508	1
B13C	PORT SERVICES OFFICE	866	286	468	1230	1
C3A	NAVAL STATION COMMUNICATIONS	655	1435	729	948	100
C7	VISUAL STATION OPERATING BASE	194	60	33	217	0
C13	INTERNAL COMMUNICATIONS	2047	14	10	200	2
C27J	DIRECTION FINDER STATION	591	168	129	334	75
C32A	AIR TRAFFIC CONTROL COMPONENT	1064	2767	577	528	15
DA	CONTAINER OPERATIONS (NON-AMMO)	21581	246	257	1529	42
D3A1	TANK FARM, SHIP FUEL	41827	3166	8106	93439	207
D3A2	TANK FARM, JET ENGINE FUEL	20783	1056	2703	31162	70
D4C1	TANK FARM, BASE SUPPLY MOGAS	6481	870	1423	22904	31
D4C2	TANK FARM, BASE SUPPLY DIESEL	993	134	219	3529	5
D4C3	TANK FRM, BASE HEATING FUEL	4170	323	527	8490	12
D20	DISBURSING OFFICE	125	17	27	205	0
D24A	SHIPS STORE FACILITY	1175	159	220	1482	3
D29A	AIR CARGO TERMINAL	531	191	227	635	1
D31A	SUPPLY STORAGE AND ADMINISTRATN	15140	606	4422	19371	48
D31E	SUPPLY SUPPORT FACILITIES	9744	158	175	1043	6
D32A	REFRIGERATED STORAGE	11860	72	337	6995	2
D33A	MATERIALS HANDLING FACILITIES	807	5966	7294	1536	1
F1	CARGO HANDLING BATTALION	333	3782	2717	357	3
G2	HOSPITAL	14058	318	878	14072	8
G9	DISPENSARY	909	68	177	925	2
G28	DENTAL CLINIC	368	73	107	203	1
HA	AIRFIELD OPERATIONS SUPPORT	16716	229	329	3356	92
H9J	AIRCRAFT MAINTENANCE FACILITIES	253	5	25	103	0
J3A	AMMUNITION DEPOT	67167	5682	7779	72467	6234
J3D	ORDNANCE SUPPORT FACILITIES	30169	246	257	1525	9
J4	EXPLOSIVE ORDNANCE DISPOSAL	473	196	189	335	320
NA	FAMILY SUPPORT	117118	250	3129	208332	78
NB	ENLISTED PERSONNEL SUPPORT	39297	1210	5372	44011	16
NC	OFFICER PERSONNEL SUPPORT	9490	81	275	10460	4
ND	PERSONAL SRVCS (ALL PERSONNEL)	2818	50	153	2007	12

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SUMMARY OF COMPONENT REQUIREMENT
CASE ID-TEST 1 FORCE ID-1

COMP. ID	COMPONENT DESCRIPTION	CONSTRUCTION COST (THOUSANDS OF DOLLARS)	EQUIPMENT COST (THOUSANDS OF DOLLARS)	EQUIPMENT CUBE (MEASUREMENT TONS)	CONSTRUCTION TIME (MAN-DAYS)	LAND REQMT (ACRES)
NE	RECREATIONAL FAC. (ALL PERS.)	10716	168	869	9669	25
N10B	MILITARY TRAINING AND EDUCATION	4763	86	277	4371	39
N14	CHAPEL	2377	77	234	1582	3
N16	OFFICERS RECREATION	1893	65	344	1326	2
N17	ENLISTED RECREATION	2861	84	599	2607	189
P5	PUBLIC WORKS UNIT	2273	6811	6642	3964	17
P5A	AUTOMOTIVE MAINTENANCE	889	357	325	1544	4
P12A	FIRE PROTECTION	292	220	246	512	0
P15	BASE POWER PLANT	13369	430	1772	3348	8
P16	WASTE MANAGEMENT	4117	218	546	1539	32
P18	WATER SYSTEM	1465	0	0	654	22
	TOTAL FOR BASE	501085	45924	74622	592046	7746

FOOTNOTE - CONSTRUCTION COSTS NOT MODIFIED TO REFLECT GEOGRAPHIC COST MULTIPLIERS

INDIAN OCEAN AREA
CASE ID-TEST 1 FORCE ID-1

GEOGRAPHIC DEPENDENT INPUTS

CONSTRUCTION COST MULTIPLIER -	2.200	
TRANSPORT COSTS		
GENERAL CARGO -	73.10	DOLLARS PER MEASUREMENT TON
REEFER CARGO -	140.40	DOLLARS PER MEASUREMENT TON
PERSONNEL -	497.00	DOLLARS PER PERSON
BULK POL -	41.90	DOLLARS PER LONG TON
AMMUNITION -	144.10	DOLLARS PER MEASUREMENT TON
PROPORTION LAND REQUIREMENT PURCHASED -	0.000	
LAND PURCHASE COST -	0.0	DOLLARS PER ACRE
LAND LEASE COST -	1000.0	DOLLARS PER ACRE

BASE INITIAL INVESTMENT COSTS

(COSTS IN THOUSANDS OF DOLLARS)

BASE FACILITY CONSTRUCTION -	1102386
INITIAL OUTFITTING (EQUIPMENT AND SUPPLIES) -	45924
TRANSPORT OF EQUIPMENT AND SUPPLIES -	5455
TRANSPORT OF BASE PERSONNEL AND DEPENDENTS -	3379
TRANSPORT OF PERSONAL BELONGINGS -	6753
LAND ACQUISITION -	0
TOTAL BASE INITIAL INVESTMENT COST -	1163897

INDIAN OCEAN AREA
CASE ID-TEST 1 FORCE ID-1

BASE ANNUAL RECURRING COSTS

(COSTS IN THOUSANDS OF DOLLARS)

PERSONNEL BILLETS -	94178
SUPPLIES AND EQUIPMENT -	26182
TRANSPORT OF SUPPLIES AND EQUIPMENT -	3938
BASE FUEL -	33474
TRANSPORT OF BASE FUEL -	3339
TRANSPORT OF ROTATIONAL PERSONNEL AND DEPENDENTS -	2253
TRANSPORT OF PERSONAL BELONGINGS -	4502
LAND LEASE -	7746
TOTAL BASE ANNUAL RECURRING COST -	175611

SUPPORTED FORCES ANNUAL TRANSPORT COSTS - CONUS TO FORWARD BASE

(COSTS IN THOUSANDS OF DOLLARS)

SUPPLIES AND EQUIPMENT -	14104
SHIP FUEL -	18429
AIRCRAFT FUEL -	5967
SHIP AMMUNITION -	36
AIRCRAFT AMMUNITION -	138

SOUTH ATLANTIC AREA
CASE ID-TEST 1 FORCE ID-1

GEOGRAPHIC DEPENDENT INPUTS

CONSTRUCTION COST MULTIPLIER -	1.600	
TRANSPORT COSTS		
GENERAL CARGO -	50.00	DOLLARS PER MEASUREMENT TON
REEFER CARGO -	96.00	DOLLARS PER MEASUREMENT TON
PERSONNEL -	246.00	DOLLARS PER PERSON
BULK POL -	21.65	DOLLARS PER LONG TON
AMMUNITION -	98.60	DOLLARS PER MEASUREMENT TON
PROPORTION LAND REQUIREMENT PURCHASED -	0.000	
LAND PURCHASE COST -	0.0	DOLLARS PER ACRE
LAND LEASE COST -	1000.0	DOLLARS PER ACRE

BASE INITIAL INVESTMENT COSTS

(COSTS IN THOUSANDS OF DOLLARS)

BASE FACILITY CONSTRUCTION -	801735
INITIAL OUTFITTING (EQUIPMENT AND SUPPLIES) -	45924
TRANSPORT OF EQUIPMENT AND SUPPLIES -	3731
TRANSPORT OF BASE PERSONNEL AND DEPENDENTS -	1672
TRANSPORT OF PERSONAL BELONGINGS -	4619
LAND ACQUISITION -	0
TOTAL BASE INITIAL INVESTMENT COST -	857682

SOUTH ATLANTIC AREA
CASE ID-TEST 1 FORCE ID-1

BASE ANNUAL RECURRING COSTS

(COSTS IN THOUSANDS OF DOLLARS)

PERSONNEL BILLETS -	94178
SUPPLIES AND EQUIPMENT -	26182
TRANSPORT OF SUPPLIES AND EQUIPMENT -	2693
BASE FUEL -	33474
TRANSPORT OF BASE FUEL -	1725
TRANSPORT OF ROTATIONAL PERSONNEL AND DEPENDENTS -	1115
TRANSPORT OF PERSONAL BELONGINGS -	3079
LAND LEASE -	7746
TOTAL BASE ANNUAL RECURRING COST -	170193

SUPPORTED FORCES ANNUAL TRANSPORT COSTS - CONUS TO FORWARD BASE

(COSTS IN THOUSANDS OF DOLLARS)

SUPPLIES AND EQUIPMENT -	9646
SHIP FUEL -	9522
AIRCRAFT FUEL -	3083
SHIP AMMUNITION -	25
AIRCRAFT AMMUNITION -	95

SUMMARY OF BASE LOADING
CASE ID-TEST 1 FORCE ID-2

AIRCRAFT COMPLEMENT

TYPE	LAND BASED	CARRIER BASED	TOTAL
A-6	0	20	20
A-7	0	48	48
CH-46	16	0	16
CH-53	6	0	6
E-2	0	8	8
F-14	0	48	48
S-3	0	20	20
UH-1	4	0	4

SHIP COMPLEMENT

TYPE	TOTAL
AOE	2
CVA/CV	2
FF	4
FFG	8

SUPPLY CONSUMPTION RATES
CASE ID-TEST 1 FORCE ID-2

GENERAL CARGO PER DAY

CLASS OF SUPPLY AND DESCRIPTION	SHORT TONS	MEASUREMENT TONS
I SUBSISTENCE		
REFRIGERATED	36	65
NON-REFRIGERATED	18	33
II CLOTHING,TOOLS,ETC	35	74
III PACKAGED POL	4	5
IV CONSTRUCT. MATERIAL	6	14
VI PERSONAL DEMAND	42	88
VII MAJOR END ITEMS	4	13
VIII MEDICAL MATERIAL	1	4
IX REPAIR PARTS	6	19

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TOTAL GENERAL CARGO		
REFRIGERATED	36	65
NON-REFRIGERATED	116	250

- -

TOTAL FUEL AND AMMUNITION		
SHIP FUEL (DIESEL FUEL,MARINE)	9	THOUSANDS OF BARRELS PER DAY
AIRCRAFT FUEL (JET)	6	THOUSANDS OF BARRELS PER DAY
AMMUNITION	296	SHORT TONS PER DAY

DAILY CONSUMPTION RATES

TOTAL GENERAL CARGO	17.516400	LBS/MAN/DAY
REFRIGERATED GENERAL CARGO	4.107180	LBS/MAN/DAY

MANPOWER

	LAND-BASED AIRCRAFT PERSONNEL	SEA-BASED AIRCRAFT PERSONNEL	SHIP PERSONNEL	OTHER FORCE ELEMENTS	BASE OPS PERSONNEL	BASE DEPENDENTS	TOTAL PERSONNEL
OFFICERS	89	440	638	100	245	415	1927
ENLISTED	374	3305	11352	1000	3307	2836	22174
TOTAL	463	3745	11990	1100	3552	3251	24101

SUMMARY OF PROJECTED REQUIREMENT
CASE ID-TEST 1 FORCE ID-2

COMPONENT ID	PACING FACILITY	COMPONENT BASE OPS PERSONNEL OFFICERS	ENLISTED	PACING FACILITY REQUIREMENT	
A3	ADMINISTRATIVE OFFICE	13.1	85.0	5027.9	SF
A4	DATA PROCESSING CENTER	3.0	17.0	1440.0	SF
A5	OFFICE EQUIP-APPLNCE RP.	8.6	59.3	646.9	SF
A7	CORRECTIONAL FACILITY	6.5	96.4	10832.3	SF
BB	DREDGING	0.0	0.0	1333333.0	CY
B5A	WATERFRONT OPS. BLDG.	2.0	122.0	1440.0	SF
B13C	PORT CONTROL OFFICE	13.8	51.1	9426.6	SF
C3A	COMMUNICATION CENTER	9.0	112.2	4560.0	SF
C7	VISUAL STATION	0.0	15.7	352.2	SF
C13	CENTRAL TELEPHONE OFF.	0.0	43.5	1188.5	SF
C27J	RECEIVER BUILDING	1.0	12.0	960.0	SF
C32A	AIRCRAFT OPS. BUILDING	15.0	142.6	1320.0	SF
DA	SUPPLY CONTAINER HDLG PR	0.0	0.0	2050.0	FH
D3A1	SHIP FUEL STORAGE	6.2	81.1	997290.0	BL
D3A2	JET ENGINE FUEL STORAGE	4.0	52.0	639870.0	BL
D4C1	MOGAS STORAGE	5.2	58.9	159061.4	BL
D4C2	DIESEL FUEL STORAGE	.9	9.9	26815.3	BL
D4C3	ACT. HTNG. FUEL STORAGE	1.9	21.8	58958.8	BL
D20	DISBURSING OFFICE	1.7	14.0	2234.6	SF
D24A	EXCHANGE LAUNDRY PLANT	3.1	64.3	8296.0	SF
D29A	AIR CARGO TERMINAL	.8	12.7	11639.3	SF
D31A	GENERAL PURPOSE WAREHSE	35.7	248.2	310277.6	SF
D31E	SUPPLY PIER	0.0	0.0	1400.0	FH
D32A	COLD STORAGE WAREHOUSE	0.0	73.2	84918.1	SF
D33A	AUTOMOTIVE MAINT. SHOP	4.2	147.3	8417.1	SF
F1	ADMINISTRATION (MIN.)	6.5	147.1	1021.7	SF
G2	HOSPITAL	27.8	102.9	96153.2	SF
G9	OUTPATIENT CLINIC	1.8	17.7	8566.7	SF
G28	DENTAL CLINIC	8.8	18.6	3393.3	SF
HA	AIRCRAFT RUNWAY	0.0	24.0	222222.0	SY
H9J	MAINT. HANGER (HI-BAY)	.1	1.4	35422.4	SF
J3A	HIGH EXPLOSIVE MAGAZINE	23.1	367.4	491818.9	SF
J3D	AMMUNITION PIER	0.0	0.0	2050.0	FH
J4	EXPLO. ORD. DISPOSL BLDG	1.0	3.0	960.0	SF
NA	FAMILY HOUSING	2.2	18.2	1612849.0	SF
NB	BACHELOR ENLIST. QTRS.	0.0	319.7	479335.5	SF
NC	BACHELOR OFFICERS QTRS.	0.0	24.9	184245.3	SF
ND	EXCHANGE SERVICE STATION	0.0	7.0	3816.2	SF

SUMMARY OF PROJECTED REQUIREMENT
CASE ID-TEST 1 FORCE ID-2

COMPONENT ID	PACING FACILITY	COMPONENT BASE OPS PERSONNEL OFFICERS	ENLISTED	PACING FACILITY REQUIREMENT	
NE	SPECIAL SERVICES OFFICE	.9	6.3	4730.2	SF
N10B	APPLIED INSTRUCTION BLDG	4.7	14.0	38401.9	SF
N14	CHAPEL	11.3	11.3	15051.2	SF
N16	COMM. OFF. MESS (OPEN)	1.5	15.3	12246.4	SF
N17	EM CLUB, PO MESS (OPEN)	6.4	79.0	35737.5	SF
P5	PUBLIC WORKS SHOP	12.2	472.1	13966.3	SF
P5A	AUTOMOTIVE MAINT. SHOP	.8	31.2	12469.1	SF
P12A	FIRE STATION	0.0	47.1	5416.9	SF
P15	ELECTRIC POWER STATION	0.0	9.0	24513.2	KW
P16	SEWAGE TREATMENT PLANT	0.0	24.3	883.7	KG
P18	WATER TREATMENT FACILITY	0.0	5.1	883.7	KG

SUMMARY OF COMPONENT REQUIREMENT
CASE ID-TEST 1 FORCE ID-2

COMP. ID	COMPONENT DESCRIPTION	CONSTRUCTION COST (THOUSANDS OF DOLLARS)	EQUIPMENT COST (THOUSANDS OF DOLLARS)	EQUIPMENT CUBE (MEASUREMENT TONS)	CONSTRUCTION TIME (MAN-DAYS)	LAND REQMT (ACRES)
A3	ADMIN. OFFICE, POST OFFICE	919	73	77	1483	2
A4	DATA PROCESSING FACILITY	223	45	20	300	0
A5	ELECTRONIC MAINTENANCE	510	105	54	595	1
A7	SHORE PATROL HEADQUARTERS	1375	61	54	1957	4
BB	WATERFRONT SAFETY FACILITIES	13267	0	0	2973	0
B5A	BOAT POOL	533	7278	13328	508	1
B13C	PORT SERVICES OFFICE	683	226	370	971	1
C3A	NAVAL STATION COMMUNICATIONS	655	1435	729	948	100
C7	VISUAL STATION OPERATING BASE	153	47	26	171	0
C13	INTERNAL COMMUNICATIONS	2515	18	13	246	2
C27J	DIRECTION FINDER STATION	591	168	129	334	75
C32A	AIR TRAFFIC CONTROL COMPONENT	1064	2767	577	528	15
DA	CONTAINER OPERATIONS (NON-AMMO)	21581	246	257	1529	42
D3A1	TANK FARM, SHIP FUEL	21741	1646	4214	48568	108
D3A2	TANK FARM, JET ENGINE FUEL	20783	1056	2703	31162	70
D4C1	TANK FARM, BASE SUPPLY MOGAS	7606	1021	1670	26881	37
D4C2	TANK FARM, BASE SUPPLY DIESEL	1298	175	286	4612	6
D4C3	TANK FRM, BASE HEATING FUEL	4895	379	619	9964	14
D20	DISBURSING OFFICE	163	22	35	268	1
D24A	SHIPS STORE FACILITY	1296	176	243	1634	3
D29A	AIR CARGO TERMINAL	486	175	208	582	1
D31A	SUPPLY STORAGE AND ADMINISTRATN	11713	469	3421	14986	37
D31E	SUPPLY SUPPORT FACILITIES	9744	168	175	1043	6
D32A	REFRIGERATED STORAGE	9128	55	259	5384	1
D33A	MATERIALS HANDLING FACILITIES	637	4709	5757	1212	1
F1	CARGO HANDLING BATTALION	263	2984	2144	282	3
G2	HOSPITAL	12007	272	750	12019	7
G9	DISPENSARY	986	74	192	1004	2
G28	DENTAL CLINIC	432	85	126	239	1
HA	AIRFIELD OPERATIONS SUPPORT	16716	229	329	3356	92
H9J	AIRCRAFT MAINTENANCE FACILITIES	8471	157	841	3464	9
J3A	AMMUNITION DEPOT	61996	5244	7181	66887	5754
J3D	ORDNANCE SUPPORT FACILITIES	30169	246	257	1525	9
J4	EXPLOSIVE ORDNANCE DISPOSAL	473	196	189	335	320
NA	FAMILY SUPPORT	116964	250	3125	208058	78
NB	ENLISTED PERSONNEL SUPPORT	54783	1687	7490	61355	23
NC	OFFICER PERSONNEL SUPPORT	20059	171	580	22109	8
ND	PERSONAL SRVCS (ALL PERSONNEL)	3435	61	186	2446	14

SUMMARY OF COMPONENT REQUIREMENT
CASE ID-TEST 1 FORCE ID-2

COMP. ID	COMPONENT DESCRIPTION	CONSTRUCTION COST (THOUSANDS OF DOLLARS)	EQUIPMENT COST (THOUSANDS OF DOLLARS)	EQUIPMENT CUBE (MEASUREMENT TONS)	CONSTRUCTION TIME (MAN-DAYS)	LAND REQMT (ACRES)
NE	RECREATIONAL FAC. (ALL PERS.)	12990	203	1053	11721	30
N10B	MILITARY TRAINING AND EDUCATION	6150	111	358	5645	50
N14	CHAPEL	2713	88	267	1806	3
N16	OFFICERS RECREATION	2099	72	381	1470	2
N17	ENLISTED RECREATION	3366	99	704	3066	222
P5	PUBLIC WORKS UNIT	2971	8903	8682	5181	23
P5A	AUTOMOTIVE MAINTENANCE	1163	466	425	2020	5
P12A	FIRE PROTECTION	343	258	289	601	0
P15	BASE POWER PLANT	14095	453	1869	3530	8
P16	WASTE MANAGEMENT	4834	255	641	1807	37
P18	WATER SYSTEM	1720	0	0	768	25
	TOTAL FOR BASE	512756	45084	73282	579537	7252

FOOTNOTE - CONSTRUCTION COSTS NOT MODIFIED TO REFLECT GEOGRAPHIC COST MULTIPLIERS

INDIAN OCEAN AREA
CASE ID-TEST 1 FORCE ID-2

GEOGRAPHIC DEPENDENT INPUTS

CONSTRUCTION COST MULTIPLIER -	2.200	
TRANSPORT COSTS		
GENERAL CARGO -	73.10	DOLLARS PER MEASUREMENT TON
REEFER CARGO -	140.40	DOLLARS PER MEASUREMENT TON
PERSONNEL -	497.00	DOLLARS PER PERSON
BULK POL -	41.90	DOLLARS PER LONG TON
AMMUNITION -	144.10	DOLLARS PER MEASUREMENT TON
PROPORTION LAND REQUIREMENT PURCHASED -	0.000	
LAND PURCHASE COST -	0.0	DOLLARS PER ACRE
LAND LEASE COST -	1000.0	DOLLARS PER ACRE

BASE INITIAL INVESTMENT COSTS

(COSTS IN THOUSANDS OF DOLLARS)

BASE FACILITY CONSTRUCTION -	1128062
INITIAL OUTFITTING (EQUIPMENT AND SUPPLIES) -	45084
TRANSPORT OF EQUIPMENT AND SUPPLIES -	5357
TRANSPORT OF BASE PERSONNEL AND DEPENDENTS -	3380
TRANSPORT OF PERSONAL BELONGINGS -	6753
LAND ACQUISITION -	0
TOTAL BASE INITIAL INVESTMENT COST -	1188637

INDIAN OCEAN AREA
CASE ID-TEST 1 FORCE ID-2

BASE ANNUAL RECURRING COSTS

(COSTS IN THOUSANDS OF DOLLARS)

PERSONNEL BILLETS -	93800
SUPPLIES AND EQUIPMENT -	26240
TRANSPORT OF SUPPLIES AND EQUIPMENT -	3940
BASE FUEL -	39739
TRANSPORT OF BASE FUEL -	3965
TRANSPORT OF ROTATIONAL PERSONNEL AND DEPENDENTS -	2254
TRANSPORT OF PERSONAL BELONGINGS -	4502
LAND LEASE -	7252
TOTAL BASE ANNUAL RECURRING COST -	181690

SUPPORTED FORCES ANNUAL TRANSPORT COSTS - CONUS TO FORWARD BASE

(COSTS IN THOUSANDS OF DOLLARS)

SUPPLIES AND EQUIPMENT -	10019
SHIP FUEL -	9579
AIRCRAFT FUEL -	5967
SHIP AMMUNITION -	19
AIRCRAFT AMMUNITION -	138

SOUTH ATLANTIC AREA
CASE ID-TEST 1 FORCE ID-2

GEOGRAPHIC DEPENDENT INPUTS

CONSTRUCTION COST MULTIPLIER -	1.600	
TRANSPORT COSTS		
GENERAL CARGO -	50.00	DOLLARS PER MEASUREMENT TON
REEFER CARGO -	96.00	DOLLARS PER MEASUREMENT TON
PERSONNEL -	246.00	DOLLARS PER PERSON
BULK POL -	21.65	DOLLARS PER LONG TON
AMMUNITION -	98.60	DOLLARS PER MEASUREMENT TON
PROPORTION LAND REQUIREMENT PURCHASED -	0.000	
LAND PURCHASE COST -	0.0	DOLLARS PER ACRE
LAND LEASE COST -	1000.0	DOLLARS PER ACRE

BASE INITIAL INVESTMENT COSTS

(COSTS IN THOUSANDS OF DOLLARS)

BASE FACILITY CONSTRUCTION -	820409
INITIAL OUTFITTING (EQUIPMENT AND SUPPLIES) -	45084
TRANSPORT OF EQUIPMENT AND SUPPLIES -	3664
TRANSPORT OF BASE PERSONNEL AND DEPENDENTS -	1673
TRANSPORT OF PERSONAL BELONGINGS -	4619
LAND ACQUISITION -	0
TOTAL BASE INITIAL INVESTMENT COST -	875449

SOUTH ATLANTIC AREA
CASE ID-TEST 1 FORCE ID-2

BASE ANNUAL RECURRING COSTS

(COSTS IN THOUSANDS OF DOLLARS)

PERSONNEL BILLETS -	93800
SUPPLIES AND EQUIPMENT -	26240
TRANSPORT OF SUPPLIES AND EQUIPMENT -	2694
BASE FUEL -	39739
TRANSPORT OF BASE FUEL -	2049
TRANSPORT OF ROTATIONAL PERSONNEL AND DEPENDENTS -	1115
TRANSPORT OF PERSONAL BELONGINGS -	3079
LAND LEASE -	7252
TOTAL BASE ANNUAL RECURRING COST -	175968

SUPPORTED FORCES ANNUAL TRANSPORT COSTS - CONUS TO FORWARD BASE

(COSTS IN THOUSANDS OF DOLLARS)

SUPPLIES AND EQUIPMENT -	685[illegible]
SHIP FUEL -	4950
AIRCRAFT FUEL -	3083
SHIP AMMUNITION -	13
AIRCRAFT AMMUNITION -	95

III MODEL DESCRIPTION

A. Introduction

This chapter presents a detailed description of the logic and mathematics that form the basis of the ABCOMO model. As indicated previously, the model is designed to determine the necessary facilities, personnel, and equipment required for an advanced permanent supply base to support Navy and Marine forces over prolonged periods of operation, and to provide estimates of the initial investment and recurring annual costs to construct and operate such a base within different geographical regions of the world.

The supply base represented by the model is assumed composed of 49 functional components, each of which includes the facilities, personnel, and equipment to perform a distinct function necessary to the operation of the base. These components are listed in Table III-1. The amount of facilities, personnel, and equipment required by each component is a direct function of the size and configuration of the peak forces to be supported by the base. Associated with each component is a facing facility--i.e., a facility whose size can be directly related to the supported force composition, and from which can be scaled the amount and associated costs of facilities, personnel, and equipment required by the total component. These relationships include consideration of the ripple effect for personnel requirements where, as supported personnel are assigned to the base, additional personnel are required to provide base support for these personnel and hence increase the requirements imposed on the base components, which in turn impose additional personnel requirements for base support, and so on. The supply base is assumed to normally operate under peacetime conditions. However, provisions are made for storage of wartime reserves of supplies, fuel and ammunition; and components associated with the receiving, handling, and shipping of fuel and ammunition are sized utilizing projected wartime consumption rates.

Table III-1

SUPPLY BASE COMPONENTS

Component ID	Component Description	Component ID	Component Description
A3	Administration Office, Post Office	F1	Cargo Handling Battalion
A4	Data Processing Facility	G2	Hospital
A5	Electronic Maintenance	G9	Dispensary
A7	Shore Patrol Headquarters	G28	Dental Clinic
BB	Waterfront Safety Facilities	HA	Airfield Operations Support
B5A	Boat Pool	H9J	Aircraft Maintenance Facilities
B13C	Port Services Office	J3A	Ammunition Depot
C3A	Naval Station Communications	J3D	Ordnance Support Facilities
C7	Visual Station, Operating Base	J4	Explosive Ordnance Disposal
C13	Internal Communications	NA	Family Support
C27J	Direction Finder Station	NB	Enlisted Personnel Support
C32A	Air Traffic Control Component	NC	Officer Personnel Support
DA	Container Operations (non-ammunition)	ND	Personal Services (all personnel)
D3A1	Tank Farm, Ship Fuel	NE	Recreational Facilities (all personnel)
D3A2	Tank Farm, Jet Engine Fuel	N10B	Military Training and Education
D4C1	Tank Farm, Base Supply MOGAS	N14	Chapel
D4C2	Tank Farm, Base Supply, Diesel	N16	Officers' Recreation
D4C3	Tank Farm, Base Heating Fuel	N17	Enlisted Recreation
D20	Disbursing Office	P5	Public Works Unit
D24A	Ships Store Facility	P5A	Automotive Maintenance
D29A	Air Cargo Terminal	P12A	Fire Protection
D31A	Supply Storage and Administration	P15	Base Power Plant
D31E	Supply Support Facilities	P16	Waste Management
D32A	Refrigerated Storage	P18	Water System
D33A	Materials Handling Facilities		

The general structure of the model is presented in Figure III-1. In the sections that follow, each box in the figure is sequentially addressed in detail.

B. Model Inputs

The model inputs are segregated into four groupings: Static Input Data File, Program Parameter Overrides, Supported Force Composition Inputs, and Geographic-Dependent Inputs.

1. Static Input Data File

The input data file consists of data that will remain constant, for the most part, in routine applications of the model. This data file itself can be broken down into seven input groupings: Aircraft Static Parameters, Ship Static Parameters, Ripple Factors, Component Estimating Relationship Parameters, General Cargo Parameters, Fuel Specific Volume Factors, and Base Personnel Input Parameters. Table III-2 lists and defines the generic inputs that are included in each of these groupings.

2. Program Parameter Overrides

Built into the program are two sets of numerical parameters: Pacing Facility Requirement Algorithm Parameters and Operational Planning Numbers. Although these sets of parameters have specific default values within the program, the user has the option of overriding the default values of any subset of either of these parameter sets for a given model run. The Pacing Facility Requirement Algorithm Parameters are defined in Table III-3, together with their associated default values which are used by the model if no override value is specified. (The algorithms themselves are listed in Tables III-7 and III-8 which appear, respectively, in Sections D-1 and D-2 later in this chapter.) The Operational Planning Number definitions and associated default values are as indicated in Table III-4.

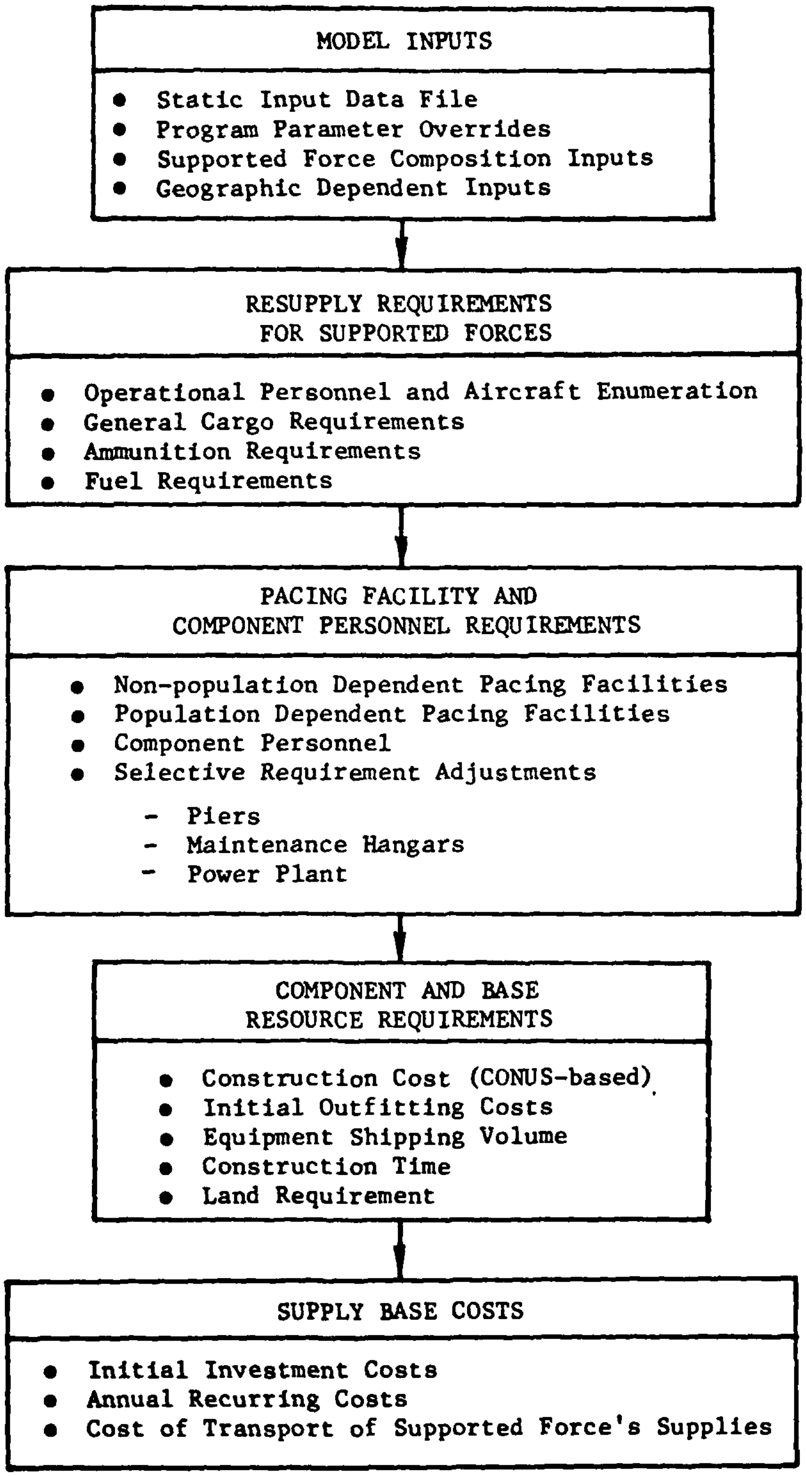

FIGURE III-1 GENERAL STRUCTURE OF ABCOMO MODEL

Table III-2

STATIC INPUT DATA FILE

Aircraft Static Parameters (One Set for Each Aircraft Type Included in the File)	
i	Aircraft type designator (alphanumeric)
TC_i	Mission type code for aircraft type i (1 - Tactical, 2 - Patrol, 3 - Cargo, 4 - Rotary wing)
WS_i	Wingspan of aircraft type i (ft)*
L_i	Length of aircraft type i (ft)
FP_i	Daily wartime fuel consumption for aircraft type i (gal/day)
SQ_i	Number of aircraft per squadron for aircraft type i*
O_{pi}	Officer crew complement per aircraft of type i
E_{pi}	Enlisted crew complement per aircraft of type i
O_{mi}	Officer maintenance complement per aircraft of type i
E_{mi}	Enlisted maintenance complement per aircraft of type i
FC_i	Fuel code for aircraft type i (0 - AVGAS, 1 - JP-5)*
AP_i	Daily wartime ammunition consumption for aircraft type i (lb/day)

Ship Static Parameters (One Set for Each Ship Type Included in the File)	
i	Ship type designator (alphanumeric)
O_{si}	Officer crew complement per ship of type i
E_{si}	Enlisted crew complement per ship of type i
FS_i	Daily wartime fuel consumption for ship type i (bbl/day)
AS_i	Daily wartime ammunition consumption for ship type i (lb/day)

Table III-2 (Continued)

Ripple Factors (One Set for Each Base Functional Component)	
i	Functional component designator (alphanumeric)
R_{oi}	Officer ripple factor for component i (officers/PFRU†)
R_{ei}	Enlisted ripple factor for component i (enlisted men/PFRU†)
R_{pi}	Power ripple factor for component i (kW/PFRU†)
Component Estimating Relationship (ER) Parameters (One Set for Each Base Functional Component)	
i	Functional component designator (alphanumeric)
b_{ci}	Construction cost constant factor for component i (dollars)
m_{ci}	Construction cost coefficient for component i (dollars/PFRU†)
b_{ei}	Equipment cost constant factor for component i (dollars)
m_{ei}	Equipment cost coefficient for component i (dollars/PFRU†)
b_{vi}	Equipment shipping volume constant factor for component i (cu ft)
m_{vi}	Equipment shipping volume coefficient for component i (cu ft/PFRU†)
b_{ti}	Construction time constant factor for component i (man-days)
m_{ti}	Construction time coefficient for component i (man-days/PFRU†)
$b_{\ell i}$	Required land constant factor for component i (acres)
$m_{\ell i}$	Required land coefficient for component i (acres/PFRU†)

Table III-2 (Continued)

General Cargo Parameters (One Set for Each Supply Class Except Bulk POL and Ammunition)	
i	Supply class designator
C_i	Daily consumption factor for supply class i (lb/man/day)
SV_i	Specific volume for supply class i (cu ft/lb)
UC_i	Unit cost for supply class i (dollars/lb) ∓
NC_i	Navy-funded daily consumption for supply class i (lb/man/day)
Additional General Cargo Parameters	
P_r	Percent of daily subsistence that is refrigerated
UC_r	Unit cost of refrigerated subsistence (dollars/lb)
UC_m	Unit cost of motor gasoline (dollars/bbl)
UC_d	Unit cost of diesel fuel (dollars/bbl)
UC_h	Unit cost of heating fuel (dollars/bbl)
Fuel Specific Volume Factors	
SV_m	Specific volume of motor gasoline (bbl/LT)
SV_d	Specific volume of diesel fuel (bbl/LT)
SV_h	Specific volume of heating fuel (bbl/LT)
SV_s	Specific volume of ship fuel (DFM) (bbl/LT)
SV_p	Specific volume of aircraft fuel (JP-5) (bbl/LT)

Table III-2 (Concluded)

Base Personnel Input Parameters	
BC_O	Officer average annual billet cost (thousands of dollars)
BC_E	Enlisted man average annual billet cost (thousands of dollars)
P_{mo}	Fraction of officers accompanied by their families
P_{me}	Fraction of enlisted men accompanied by their families
D_{mo}	Number of dependents per married officer
D_{me}	Number of dependents per married enlisted man
PBL_{uo}	Personal belongings allowance--unmarried officers (cu ft)
PBL_{mo}	Personal belongings allowance--married officers (cu ft)
PBL_{ue}	Personal belongings allowance--unmarried enlisted men (cu ft)
PBL_{me}	Personal belongings allowance--married enlisted men (cu ft)

* These aircraft static parameters are carryovers from the ABLE model, but are not used in the present ABCOMO model. However, they are maintained in case future revisions warrant their use.

† PFRU = Pacing facility requirement unit.

‡ For supply class I, unit cost refers to nonrefrigerated subsistence (subsistence unit costs normally will not be required, since these are assumed included in annual billet costs).

Table III-3

ALGORITHM PARAMETER
DEFAULT VALUES AND INDICES

Component	Index	Default Value	Description
A3	1	0.9	Administration Office (SF/man)
A4	2	1,440.	Data Processing Center Requirement (SF)
A5	3	200.	Repair Shop--Constant Requirement (SF)
	4	0.08	Repair Shop--Variable Requirement (SF/man)
A7	5	2,500.	Correctional Facility--Constant Requirement (SF)
	6	1.581	Correctional Facility--Variable Requirement (SF/man)
BB	7	1,333,333.	Dredging Requirement (CY)
B5A	8	1,440.	Waterfront Operations Building Requirement (SF)
B13C	9	7.2	Port Control Office (SF/MT/day)
C3A	10	4,560.	Communications Center Requirement (SF)
C7	11	0.269	Visual Station (SF/MT/day)
C13	12	250.	Telephone Office--Constant Requirement (SF)
	13	0.168	Telephone Office--Variable Requirement (SF/man)
C27J	14	960.	Receiver Building Requirement (SF)
C32A	15	1,320.	Aircraft Operations Building Requirement (SF)
DA	16	1,025.	Minimum Supply Container Berth (FB)
	17	.084	Supply Container Berth Length Factor (FB/MT)
D4C1	18	0.15	MOGAS Storage (BL/man/day)
D4C2	19	0.04	Diesel Fuel Storage (BL/man/day)
D4C3	20	0.0556	Heating Fuel Storage (BL/man/day)
D20	21	0.4	Disbursing Office Requirement (SF/man)
D24A	22	5,000.	Exchange Laundry Plant--Constant Requirement (SF)
	23	0.59	Exchange Laundry Plant--Variable Requirement (SF/man)
D29A	24	8,000.	Air Cargo Terminal--Constant Requirement (SF)
	25	104.	Air Cargo Terminal--Variable Requirement (SF/MT/day)
D31A	26	7.448	General Purpose Warehouse Storage (SF/MT)
D31E	27	685.	Minimum Supply Berth (FB)
	28	.274	Supply Berth Length Factor (FB/MT)
D32A	29	7.84	Reefer Storage (SF/MT)
D33A	30	6.429	Automotive Maintenance Shop Requirement (SF/MT/day)
F1	31	0.78	Cargo Handling Administration Office Requirement (SF/MT/day)
G2	32	40,000.	Hospital--Constant Requirement (SF)
	33	2.33	Hospital--Variable Requirement (SF/man)
G9	34	4,000.	Outpatient Clinic--Constant Requirement (SF)
	35	0.51	Outpatient Clinic--Variable Requirement (SF/man)
G28	36	0.0	Dental Clinic--Constant Requirement (SF)
	37	0.384	Dental Clinic--Variable Requirement (SF/man)
HA	38	222,222.	Runway Requirement (SY)
H9J	39	23.33	Hangar Requirement--Transient Cargo Aircraft (SF/MT/day)
	40	1,331.	Hangar Requirement--(SF/Type 1 Aircraft)
	41	3,173.	Hangar Requirement--(SF/Type 2 Aircraft)
	42	1,997.	Hangar Requirement--(SF/Type 3 Aircraft)

[illegible]	Index	Default Area	[illegible]
[illegible]	[illegible]	14.	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
8A	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible] quarters [illegible]
[illegible]	[illegible]	[illegible]	[illegible] quarters [illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	8,000.	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	Fire Station [illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	Water Treatment [illegible]

Table III-4

OPERATIONAL PLANNING NUMBERS,
DEFAULT VALUES, AND INDICES

Identifier	Index	Default Value	Description
DOS_c	1	30.	Days of Supply--Cargo (Operating Stocks)
DOS_{cr}	2	90.	Days of Supply--Cargo (Reserves)
DOS_p	3	30.	Days of Supply--Aircraft Fuel (Operating Stocks)
DOS_{pr}	4	90.	Days of Supply--Aircraft Fuel (Reserves)
DOS_s	5	30.	Days of Supply--Ship Fuel (Operating Stocks)
DOS_{sr}	6	90.	Days of Supply--Ship Fuel (Reserves)
DOS_b	7	30.	Days of Supply--Base Fuel (Operating Stocks)
DOS_{br}	8	90.	Days of Supply--Base Fuel (Reserves)
DOS_a	9	30.	Days of Supply--Ammunition (Operating Stocks)
DOS_{ar}	10	90.	Days of Supply--Ammunition (Reserves)
PC_{af}	11	.5	Ratio of Peacetime-to-Wartime Aircraft Fuel Consumption
PC_{sf}	12	.5	Ratio of Peacetime-to-Wartime Ship Fuel Consumption
PC_{aa}	13	.01	Ratio of Peacetime-to-Wartime Aircraft Ammunition Consumption
PC_{sa}	14	.01	Ratio of Peacetime-to-Wartime Ship Ammunition Consumption
F_c	15	.3	Fraction Cargo Containerized
F_a	16	.2	Fraction Ammunition Containerized
g	17	.03	Fraction at-Sea Men with Impact Ashore
F_{ac}	18	.1	Fraction Break-Bulk Cargo Delivered by Air

3. Supported Force Composition Inputs

The model allows for a number of different supported force compositions to be processed in turn during a given model run. For each force composition, as indicated in Table III-5, aircraft must be identified by type, number per type, and carrier-based indicator; ships must be identified by type and number per type; and land-based* troops must be identified by total numbers of officers and enlisted men.

4. Geographic-Dependent Inputs

For each supported force composition, the model allows for bases located in any number of different geographical areas as specified by a different set of geographic-dependent inputs to be processed. As will be described later in this chapter, the model determines all the requirements of the supply base without considering geography (the bulk of the computations for a given supported force composition), and then applies the geographic-dependent inputs to those results to obtain the ultimate base costs considering the geographical location. Table III-6 identifies the specific geographic-dependent inputs required for the model.

C. Resupply Requirements for Supported Forces

The first computational function of the model is to establish the resupply requirements for the operational forces supported by the supply base. In the performance of these computations, several auxiliary computations are also performed to determine values of some of the associated variables that will be required in subsequent model computations. The computations discussed in this section fall under the following four broad headings: Operational Personnel and Aircraft Enumeration, General Cargo Requirements, Ammunition Requirements, and Fuel Requirements.

*"Land-based," as used in the model, refers to operational personnel and aircraft located at the supply base and not at some other land location.

Table III-5

SUPPORTED FORCE COMPOSITION INPUTS

For Each Supported Force Composition to be Processed, One Set of the Following Input Specifications	
Aircraft Complement (One or More Sets for Each Aircraft Type Included in the Force)	
i	Aircraft type designator*
NP_i	Number of type i aircraft in this group
IC_i	Carrier-based indicator (0 - land-based; 1 - carrier-based)
Ship Complement (One or More Sets for Each Ship Type Included in the Force)	
i	Ship type designator*
NS_i	Number of type i ships in this group
Land-Based Troop Complement	
O_T	Number of officers in the land-based troop complement
E_T	Number of enlisted men in the land-based troop complement

* Aircraft and ship type designators must agree with one of the respective designators appearing in the static input data file.

For Each sup[illegible]
[illegible]

[illegible]	Construction [illegible]
[illegible]TS	Transport cost [illegible] Hart [illegible]
TR	Transport cost [illegible]
[illegible]TF	Transport [illegible]
[illegible]	Transport cost [illegible]
[illegible]TA	Transport [illegible]
PCF	Proporti[illegible]
[illegible]FA	Land [illegible]
[illegible]LA	Land [illegible]

1. Operational Personnel and Aircraft Enumeration

The most dominant force in determining the size of the supply base is the numbers of personnel to be supported. Most of the components that are allowed to vary in size are, in one way or another, related to the personnel, both operational and base support, served by the base. The operational personnel served by the base are strictly a function of the support force composition and thus the model accumulates the numbers of these personnel, segregating them by commission status and location for subsequent model use. The principal personnel variables enumerated are the following:

O_L = Number of officers in the land-based operational forces

O_S = Number of officers in the sea-based operational forces

E_L = Number of enlisted men in the land-based operational forces

E_S = Number of enlisted men in the sea-based operational forces

M_L = Number of military personnel in the land-based operational forces

M_S = Number of military personnel in the sea-based operational forces

The manner by which these variables are computed is given by the following six equations, where the first four are derived from input values and the latter two are then functions of the first four:

$$O_L = O_T + \sum_{i=1}^{N_p} \left(NP_i \cdot (1 - IC_i)(O_{pi} + O_{mi}) \right) \qquad \text{(III-1)}$$

$$O_S = \sum_{i=1}^{N_s} (NS_i \cdot O_{si}) + \sum_{i=1}^{N_p} \left(NP_i \cdot IC_i \cdot (O_{pi} + O_{mi}) \right) \qquad \text{(III-2)}$$

$$E_L = E_T + \sum_{i=1}^{N_p} \left(NP_i \cdot (1 - IC_i)(E_{pi} + E_{mi}) \right) \qquad \text{(III-3)}$$

$$E_S = \sum_{i=1}^{N_s} (NS_i \cdot E_{si}) + \sum_{i=1}^{N_p} \left(NP_i \cdot IC_i \cdot (E_{pi} + E_{mi}) \right) \qquad \text{(III-4)}$$

$$M_L = O_L + E_L \quad \text{(III-5)}$$

$$M_S = O_L + E_S \quad \text{(III-6)}$$

In the above equations, N_p and N_s denote, respectively, the number of aircraft and ship types in the Static Input Data File, and for aircraft and ship types not included in the force composition, NP_i and NS_i are assumed equal to zero, respectively.

In addition to these personnel enumerations, the model also enumerates the numbers of land-based aircraft in accordance with their maintenance hangar requirements. For maintenance hangar requirements, as derived in this model, fixed wing aircraft of lengths equal to or less than 85 ft and rotary wing aircraft are considered as Type 1 aircraft and the remaining aircraft are considered as Type 2 aircraft, where the latter require more hangar space per aircraft than the former. (In NAVFAC planning documents, the number of aircraft per squadron is also considered in determining hangar requirements, but for the purposes of this model, the above criterion is assumed sufficient). In equation form, then,

$$NA_{L1} = \sum_{i=1}^{N_p} \left(NP_i \cdot (1 - IC_i)\right) \text{for all i such that } TC_i = 4 \text{ or } L_i \leq 85 \text{ ft} \quad \text{(III-7)}$$

$$NA_{L2} = \sum_{i=1}^{N_p} \left(NP_i \cdot (1 - IC_i)\right) \text{ for all i such that } TC_i \neq 4 \text{ and } L_i > 85 \text{ ft} \quad \text{(III-8)}$$

2. General Cargo Requirements

The term "general cargo," in the context of this model, refers to the combined nine classes of supply excepting bulk POL and ammunition. Thus the following supply classes are included in the definition of general cargo: I--Subsistence; II--Clothing, Tools, etc.; III--Packaged POL; IV--Construction Material; VI--Personnel Demand Items; VII--Major End Items; VIII--Medical Material; and IX--Repair Parts. For each general cargo supply class, the model computes the total daily consumption for the supported forces in terms of both weight and cube. These computations are persormed in accordance with the following two equations:

$$W_i = C_i \cdot (M_L + M_S)/2000 \qquad \text{(III-9)}$$

$$V_i = SV_i \cdot W_i/40 \qquad \text{(III-10)}$$

where

W_i = Total supported force daily consumption by weight (ST) of Supply Class i items

V_i = Total supported force daily consumption by cube (MT) of Supply Class i items.

The total daily consumption of all general cargo in terms of weight (W_T) and cube (V_T) is then obtained as follows:

$$W_T = \sum_{i=1}^{IX} W_i \qquad \text{(III-11)}$$

$$V_T = \sum_{i=1}^{IX} V_i \; . \qquad \text{(III-12)}$$

For subsistence items (Supply Class I), the model also computes the total supported force daily consumption of refrigerated items in terms of both weight (W_r) and cube (V_r) as follows:

$$W_r = p_r W_I \qquad \text{(III-13)}$$

$$V_r = SV_I \cdot W_r \; . \qquad \text{(III-14)}$$

For subsequent model use, certain general cargo specific volumes are required. These are:

SV_c = Average specific volume (MT/ST) of all general cargo items

SV_r = Average specific volume (MT/ST) of refrigerated general cargo items

SV_{nr} = Average specific volume of nonrefrigerated general cargo items.

These factors are computed as follows:

$$SV_c = V_T/W_T \qquad \text{(III-15)}$$

$$SV_r = V_r/W_r \qquad \text{(III-16)}$$

$$SV_{nr} = (V_T - V_r)/(W_T - W_r). \qquad \text{(III-17)}$$

Two additional paramenters required later in the model are the following:

C_{gc} = Daily consumption rate per man (lb/man/day) of all general cargo items

P_r = Proportion (by weight) of daily general cargo consumption that requires refrigeration.

These are computed as follows:

$$C_{gc} = 2000\ W_T/(M_L + M_S) \qquad \text{(III-18)}$$

$$P_r = W_r/W_T. \qquad \text{(III-19)}$$

3. Ammunition Requirements

The total daily wartime ammunition requirements for the supported forces are directly derivable from the aircraft and ship input data. For subsequent model use, it is convenient to first compute the total daily ammunition requirements of the land-based aircraft and that of combined sea-based aircraft and ships. Let

A_L = Total daily wartime ammunition requirement (lb/day) for land based aircraft

A_{Sp} = Total daily wartime ammunition requirement (lb/day) for sea-based aircraft

A_{Ss} = Total daily wartime ammunition requirement (lb/day) for ships.

Then,

$$A_L = \sum_{i=1}^{N_p} \left(NP_i \cdot (I - IC_i) \cdot AP_i \right) \qquad \text{(III-20)}$$

$$A_{Sp} = \sum_{i=1}^{N_p} (NP_i \cdot IC_i \cdot AP_i) \qquad \text{(III-21)}$$

$$A_{Ss} = \sum_{i=1}^{N_s} (NS_i \cdot AS_i) \qquad \text{(III-22)}$$

Since the supply base is to be configured to handle ammunition shipments and transshipments during wartime periods, the daily average ammunition throughput for the base to be used for sizing the ammunition piers and handling components must be based on expected wartime throughput. Daily throughput refers to the average amount of supplies coming in and leaving the supply base each day. If we let X_A denote the daily average poundage of ammunition arriving at the base, and Q_A denote the daily average poundage of ammunition leaving the base, both under wartime conditions, then

$$X_A = A_L + A_{Sp} + A_{Ss} \qquad \text{(III-23)}$$

$$Q_A = A_{Sp} + A_{Ss} \qquad \text{(III-24)}$$

The total daily average ammunition throughput is then the sum of X_A and Q_A.

4. Fuel Requirements

The total daily fuel consumption for the forces under wartime conditions is also directly derivable from the aircraft and ship input data. Let F_s and F_p denote the total daily wartime fuel consumption (BBL/day) for ships and aircraft respectively; then

$$F_s = \sum_{i=1}^{N_s} (NS_i \cdot FS_i) \qquad \text{(III-25)}$$

$$F_p = \sum_{i=1}^{N_p} (NP_i \cdot FP_i)/42 \qquad \text{(III-26)}$$

where the division by 42 in the second equation converts gallons per day to barrels per day.

D. Pacing Facility and Component Personnel Requirements

For each functional component of the supply base, one of its facilities has been selected as the pacing facility for that component--i.e., a facility whose size can be directly related to the supported force composition and from which can be scaled the amount and associated costs of facilities, personnel, and equipment required by the total component. The next step in the model process is to determine the size of these pacing facilities.

The pacing facilities can be divided into two categories, depending on whether or not the pacing facility size, and hence that of the total component, is population-dependent. For example, the requirement for ship fuel storage is strictly a function of the fuel consumption characteristics of the ships in the supported forces, and does not depend on the number of personnel in the supply base population. On the other hand, the requirement for bachelor enlisted quarters depends on both the number of land-based operational enlisted men and the number of enlisted men in the base support force. Thus, the former pacing facility (ship fuel storage) is non-population dependent, while the latter pacing facility (bachelor enlisted quarters) is population-dependent.

The manner by which the model calculates the pacing facility requirements differs, depending on the population dependency of the pacing facility.

These computations are thus discussed separately in the next two subsections. Following this, the procedure for computing the component personnel requirements is described. Also, there are several adjustments that have to be made to the pacing facility requirements after the component personnel requirements are determined. These are discussed at the end of this section.

1. Non-Population-Dependent Pacing Facilities

There are twelve pacing facilities (components) whose size is independent of the supply base population. These are listed in Table III-7, together with the equations used by the model to compute their size requirements. All variables listed in the table have been identified previously in this chapter, either as an input parameter or as one of the factors computed earlier in the model. The numerical values occurring in the equation, with the exception of unit conversion factors such as 2000 pounds per short ton, are pacing facility requirement algorithm parameters whose values are built into the model but that can be changed by user option through specifying a parameter override as input (see Section B-2 of this chapter). After these equations are used to compute the required sizes of the non-population-dependent pacing facilities, the model then computes the numbers of officers and enlisted men that will be required by each associated component to perform that component's function within the operation of the supply base. These computations make use of the input-specified officer and enlisted men ripple factors (R_{oi} and R_{ei} respectively) for the various supply base components. If R_i denotes the size requirement for the pacing facility associated with the i^{th} component, then the numbers of officers (O_i) and enlisted men (E_i) required by that component are determined as follows:

$$O_i = R_{oi} \cdot R_i \qquad \text{(III-27)}$$

$$E_i = R_{ei} \cdot R_i . \qquad \text{(III-28)}$$

Table III-7

NON-POPULATION-DEPENDENT COMPONENTS REQUIREMENT EQUATIONS

Component ID	Pacing Facility		Req. Units	Requirement Equation
	Category Code	Description		
A4	610-20	Data Processing Center	SF	One 1440 SF Facility per Base
BB	165-10	Dredging	CY	Average of 1,333,333 CY per Base
B5A	159-64	Waterfront Operations Building	SF	One 1440 SF Facility per Base
C3A	131-15	Communications Center	SF	One 4560 SF Facility per Base
C27J	131-35	Receiver Building	SF	One 960 SF Facility per Base
C32A	141-40	Aircraft Operations Building	SF	One 1320 SF Facility per Base
D3A1	411-10	Ship Fuel Storage	BL	$(DOS_{sr}+PC_{sf}\cdot DOS_r)\cdot \sum_{i=1}^{N_s}(FS_i\cdot NS_i)$
D3A2	411-50	Jet Engine Fuel Storage	BL	$(DOS_{pr}+PC_{af}\cdot DOS_p)\cdot \sum_{i=1}^{N_p}(FP_i\cdot NP_i)/42$
HA	111-10	Aircraft Runway	SY	One 222,222 SY Runway per Base
J3A	421-22	High Explosive Magazine	SF	$(19\ SF/ST)\cdot(DOS_{ar}+PC_{aa}\cdot DOS_a)\cdot \sum_{i=1}^{N_p}(AP_i\cdot NP_i)/2000$
				$+(14\ SF/ST)\cdot(DOS_{ar}+PC_{sa}\cdot DOS_a)\cdot \sum_{i=1}^{N_s}(AS_i\cdot NS_i)/2000$
J3D	151-10	Ammunition Pier	FB	$[(.090FB/ST)\cdot X_a\cdot F_a+(.243\ FB/ST)\cdot((1-F_a)\cdot X_a+Q_a)]/2000$
J4	143-20	Explosive Ordnance Disposal Building	SF	One 960 SF Facility per Base

One component (P15--Base Power Plant) is assumed to have a fixed basic cadre of officers and enlisted men, given by its associated ripple factors $R_{o,P15}$ and $R_{e,P15}$, although the size of the component is population-dependent. It is assumed that additional personnel required are provided by other base functional components. The model next accumulates the numbers of officers and enlisted men required by these pacing facilities as follows:

$$R_o = \sum_i O_i + R_{o,P15} \qquad \text{(III-29)}$$

$$R_e = \sum_i E_i + R_{e,P15} \qquad \text{(III-30)}$$

where R_o and R_e denote, respectively, the total number of officers and enlisted men required by the non-population-dependent components, and the sums in the above equation are taken over these components only.

2. Population-Dependent Pacing Facilities

The computations for the pacing facility requirements for the population-dependent components must include consideration of the so-called "ripple effect". This terminology is adopted from the earlier ABLE model documentation and refers to the damping process where, as support personnel are assigned to the base, additional personnel are required to provide base support for these personnel and hence increase the requirements imposed on the population-dependent components which, in turn, impose additional personnel requirements for base support, and so on. This rippling of personnel requirements eventually converges to a fixed set of personnel requirements for the various base components. The manner in which the pacing facility requirements for the population-dependent components is determined is adopted, in principle, from the ABLE model, and this involves the solution of a set of simultaneous equations relating personnel requirements and pacing facility requirements.

The basic equations for the pacing facility requirements for the population-dependent components are presented in Table III-8. In these equations, the variables whose principal designator is C, M, O, or E refer, respectively, to civilians, military personnel, officers, and enlisted men. The associated subscripts B, L, and S refer to base support personnel, land-based operational personnel, and sea-based operational personnel, respectively. Civilians refer to dependents of base support personnel, and this variable can be expressed in terms of the variables O_B and E_B as follows:

$$C = P_{mo} \cdot D_{mo} \cdot O_B + P_{me} \cdot D_{me} \cdot E_B \cdot \qquad \text{(III-31)}$$

With this representation of C, all the equations in Table III-8 can be written as follows:

$$R_i = C_{oi} \cdot O_B + C_{ei} \cdot E_B + K_i \qquad \text{(III-32)}$$

where i refers to each of the 36 population-dependent components,* C_{oi} and C_{ei} are the respective coefficients for the base officer and enlisted man variables derived from the equation in Table III-8 for the component i, and K_i represents the summation of the constant terms appearing in component i's equation. For example, consider Component G2, Hospital. The associated equation in Table III-8 for this component can be expressed as above with

$$C_{oi} = (2.33 \text{ SF/man}) \cdot (1 + P_{mo} \cdot D_{mo}) \qquad \text{(III-33)}$$

$$C_{ei} = (2.33 \text{ SF/man}) \cdot (1 + P_{me} \cdot D_{me}) \qquad \text{(III-34)}$$

and

$$K_i = 40000 \text{ SF} + (2.33 \text{ SF/man}) \cdot (M_L + M_S) \cdot \qquad \text{(III-35)}$$

*The requirement for the one remaining component, P15-Base Power Plant, is computed subsequently in the model as described in the next subsection.

Table III-8

POPULATION-DEPENDENT COMPONENTS REQUIREMENT EQUATIONS

Component ID	Pacing Facility		Req. Units	Requirement Equation
	Category Code	Description		
A3	610-10	Administrative Office	SF	$(0.9\ SF/man)\cdot(M_B+M_L+gM_S)$
A5	218-70	Office Equipment/Appliance Repair Shop	SF	$200\ SF+(0.08\ SF/man)\cdot(M_B+M_L+gM_S)$
A7	730-15	Correctional Facility	SF	$2500\ SF+(1.581\ SF/man)\cdot(M_B+M_L+gM_S)$
B13C	137-40	Port Control Office	SF	$(7.2\ SF/MT/day)\cdot[SV_c\cdot C_{gc}\cdot(C+M_B+M_L+M_S+(1-g)M_S)$ $+(1.07\ MT/ST)\cdot(X_a+Q_a)]/2000$
C7	137-40	Visual Station	SF	$(0.269\ SF/MT/day)\cdot[SV_c\cdot C_{gc}\cdot(C+M_B+M_L+M_S+(1-g)M_S)$ $+(1.07\ MT/ST)\cdot(X_a+Q_a)]/2000$
C13	135-20	Central Telephone Office	SF	$250\ SF+(0.168\ SF/man)\cdot(M_B+M_L+gM_S)$
DA	151-61	Supply Container Handling Pier	FB	$(0.084\ FB/MT)\cdot SV_c\cdot F_c\cdot C_{gc}\cdot(C+M_B+M_L+M_S)/2000$
D4C1	411-40	Motor Gasoline Storage	BL	$(0.15\ BL/man/day)\cdot(C+M_B+M_L+gM_S)\cdot(DOS_b+DOS_{br})$
D4C2	411-30	Diesel Fuel Storage	BL	$(0.04\ BL/man/day)\cdot(M_B+M_L+gM_S)\cdot(DOS_b+DOS_{br})$
D4C3	124-65	Activity Heating Fuel Storage	BL	$(0.0556\ BL/man/day)\cdot(C+M_B+M_L+gM_S)\cdot(DOS_b+DOS_{br})$
D20	610-10	Disbursing Office	SF	$(0.4\ SF/man)\cdot(M_B+M_L+gM_S)$
D24A	740-13	Exchange Laundry Plant	SF	$5000\ SF+(0.59\ SF/man)\cdot(M_B+M_L+gM_S)$
D29A	141-12	Air Cargo Terminal	SF	$8000\ SF+(104\ SF/MT/day)\cdot F_{ac}\cdot SV_c\cdot(1-F_c)\cdot C_{gc}\cdot(C+M_B+M_L+M_S)/2000$
D31A	441-10	General Purpose Warehouse	SF	$(7.448\ SF/MT)\cdot SV_{nr}\cdot(1-P_r)\cdot C_{gc}\cdot(C+M_B+M_L+M_S)\cdot(DOS_c+DOS_{cr})/2000$
D31E	151-60	Supply Pier	FB	$(0.274\ FB/MT)\cdot SV_c\cdot C_{gc}\cdot[(1-F_c)\cdot(C+M_B+M_L+M_S)+(1-g)M_S]/2000$

Table III-8 (Continued)

Component ID	Pacing Facility		Req. Units	Requirement Equation
	Category Code	Description		
D32A	431-10	Cold Storage Warehouse	SF	$(7.84\ SF/MT)\cdot SV_r\cdot P_r\cdot C_{gc}\cdot(C+M_B+M_L+M_S)\cdot(DOS_c+DOS_{cr})/2000$
D33A	214-20	Automotive Maintenance Shop	SF	$(6.429\ SF/MT/day)\cdot[SV_c\cdot C_{gc}\cdot(C+M_B+M_L+M_S+(1-g)M_S)$ $+(1.07\ MT/ST)\cdot(X_a+Q_a)]/2000$
F1	610-10	Administration Office (minimum)	SF	$(0.78\ SF/MT/day)\cdot[SV_c\cdot C_{gc}\cdot(C+M_B+M_L+M_S+(1-g)M_S)$ $+(1.07\ MT/ST)\cdot(X_a+Q_a)]/2000$
G2	510-10	Hospital	SF	$40000\ SF+(2.33\ SF/man)\cdot(C+M_g+M_L+M_S)$
G9	530-10	Outpatient Clinic	SF	$4000\ SF+(0.51\ SF/man)\cdot(C+M_B+M_L+gM_S)$
G28	540-10	Dental Clinic	SF	$(0.384\ SF/man)\cdot(C+M_B+M_L+gM_S)$
H9J	211-05	Maintenance Hangar (Hi-Bay)	SF	$(23.33\ SF/MT/day)\cdot F_{ac}\cdot SV_c\cdot(1-F_c)\cdot C_{gc}\cdot(C+M_B+M_L+M_S)/2000$ $+[(1331\ SF/AC)\cdot NA_{L1}+(3173\ SF/AC)\cdot NA_{L2}]^{\dagger}$
NA	711-20	Family Housing	SF	$(1333\ SF/man)(P_{mo}\cdot O_B+P_{me}\cdot E_B)$
NB	721-11	Bachelor Enlisted Quarters	SF	$(118\ SF/man)[(1-P_{me})\cdot E_B+E_L+gE_S]$
NC	724-00	Bachelor Officers' Quarters	SF	$(586\ SF/man)[(1-P_{mo})\cdot O_B+O_L+gO_S]$
ND	740-30	Exchange Service Station	SF	$900\ SF+(0.522\ SF/man)\cdot(M_B+M_L+gM_S)$
NE	740-37	Special Services Office	SF	$1000\ SF+(0.631\ SF/man)\cdot(.1C+M_B+M_L+gM_S)$

Table III-8 (Concluded)

Component ID	Pacing Facility		Req. Units	Requirement Equation
	Category Code	Description		
N10B	171-20	Applied Instruction Building	SF	$(7.5\ SF/man)\cdot(E_B+E_L+gE_S)$
N14	740-10	Chapel	SF	$2450\ SF+(1.426\ SF/man)\cdot(C+M_B+M_L+gM_S)$
N16	740-60	Commissioned Officers' Mess (open)	SF	$8000\ SF+(7.832\ SF/man)\cdot[(1+.5P_{mo})\cdot O_B+O_L+gO_S]$
N17	740-66	EM Club, PO Mess (open)	SF	$12000\ SF+(4.636\ SF/man)(E_B+E_L+gE_S)$
P5	219-10	Public Works Shop	SF	$(2.5\ SF/man)\cdot(M_B+M_L+gM_S)$
P5A	214-20	Automotive Maintenance Shop	SF	$2900\ SF+(1.871\ SF/man)\cdot(M_B+M_L)$
P12A	730-10	Fire Station	SF	$(0.613\ SF/man)\cdot(C+M_B+M_L+gM_S)$
P16	831-10	Sewage Treatment Plant	KG	$(0.1\ KG/man)\cdot(C+M_B+M_L+gM_S)$
P18	841-09	Water Treatment Facility	KG	$(0.1\ KG/man)\cdot(C+M_B+M_L+gM_S)$

+The amount of hangar space requirement for maintenance activities for land-based operational aircraft [bracketed term in equation] is not used to establish personnel requirements since the aircraft squadrons have prespecified organic maintenance complements.

In addition to the 36 independent equations of the form of Eq. (III-32), two additional and independent equations expressing, respectively the total numbers of officers (O_B) and enlisted men (E_B) in the base support force can be written as follows, using the input-specified officer and enlisted men ripple factors (R_{oi} and R_{ei}) and pacing facility requirement variables (R_i):

$$O_B = \sum_i (R_{oi} \cdot R_i) + R_o \qquad \text{(III-36)}$$

$$E_B = \sum_i (R_{ei} \cdot R_i) + R_e \qquad \text{(III-37)}$$

where R_o and R_e are the total numbers of officers and enlisted men, respectively, required by the non-population-dependent components.

The set of equations given by Eqs. (III-32), (III-36), and (III-37) then represent a set of 38 simultaneous equations in 38 unknown variables (O_B, E_B, and R_i, where i ranges over the 36 population-dependent components). These equations can be represented in matrix form as follows:

$$A\tilde{A} \cdot \tilde{X} = \tilde{B} \cdot \qquad \text{(III-38)}$$

The structure of AA matrix and the vectors X and B are indicated in Figure III-2, where the population-dependent components are assumed numbered sequentially from 1 to 36. This set of equations is solved within the model by the same Gauss-Jordan solution procedure that was used in the original ABLE model.

The solution vector X provides the values for the pacing facility requirements of the 36 components and the total complement of officers and enlisted men for the base support force.

3. Component Personnel

Once the pacing facility requirements have been established, the model next computes the numbers of officers and enlisted men associated with each of the population-dependent functional components. These

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$$
A\tilde{X} = \begin{bmatrix}
C_{o1} & C_{e1} & -1 & 0 & \cdots & \\
C_{o2} & C_{e2} & 0 & -1 & \cdots & 0 \\
C_{o3} & C_{e3} & 0 & 0 & \cdots & 0 \\
\cdot & \cdot & \cdot & \cdot & & \cdot \\
\cdot & \cdot & \cdot & \cdot & & \cdot \\
\cdot & & & \cdot & & \cdot \\
C_{o36} & C_{e36} & 0 & 0 & \cdots & -1 \\
1 & 0 & R_{o1} & R_{o2} & \cdots & R_{o36} \\
0 & 1 & R_{e1} & R_{e2} & \cdots & R_{e36}
\end{bmatrix}
$$

$$
\tilde{X} = \begin{bmatrix} O_B \\ E_B \\ R_1 \\ R_2 \\ R_3 \\ \vdots \\ R_{36} \end{bmatrix}
\qquad
\tilde{B} = \begin{bmatrix} K_1 \\ K_2 \\ K_3 \\ \vdots \\ K_{36} \\ R_O \\ R_E \end{bmatrix}
$$

FIGURE III-2 ELEMENTS OF MATRIX EQUATION computations are simply the individual terms in the summations in Eqs. (III-36) and (III-37). That is,

$$O_i = R_{oi} \cdot R_i \cdot \qquad \text{(III-39)}$$

$$E_i = R_{ei} \cdot R_i \qquad \text{(III-40)}$$

The personnel requirements for the other components were computed prior to the simultaneous equation solution and were discussed in Section D-1 of this chapter.

4. Selective Requirement Adjustments

Components DA--Container Operations, D31E--Support Facilities, and J3D--Ordnance Support Facilities, have piers as their pacing facilities and the requirements generated by the described solution procedure are in terms of raw feet of berthing. These have to be adjusted because piers must be constructed in sufficient lengths to accomodate the largest cargo ship anticipated to dock alongside the pier. In addition, maintenance hangar space (Component H9J) must be provided for land-based operational aircraft (this was not included in the solution procedure because these aircraft have already been assigned maintenance complenents and inclusion would have resulted in duplication of the aircraft maintenance personnel requirements). Finally, the requirement on the size of the base power plant (Component P15) can now be derived as a function of the other component size requirements. The means by which the model performs these adjustments are described in the following subsections.

a. Piers

In the ABCOMO model for non-ammunition supplies, container operations and non-container supply operations are represented by separate components, each having a pier as its pacing facility. Thus, unlike the ABLE model where a container pier can serve dually as a supply pier, this model assumes separate pier space for each of these operations. As mentioned above, the requirements generated for each type of pier are in terms of raw feet of berthing. The procedure for adjusting these requirements to establish pier lengths in multiples of cargo ship lengths is given as follows:

$$R'_i = R_i - \text{AMOD}(R_i, 2P_{i-min}) + 2P_{i-min} \cdot m'_i \qquad \text{(III-41)}$$

where

R'_i = Adjusted feet of berthing requirement for component i (i = DA or D31E)

P_{i-min} = Minimum berth length for component i (i = DA or D31E)

$\text{AMOD}(R_i, 2P_{i-min})$ = Modulus of R_i relative to $2P_{i-min}$--that is, the difference between R_i and the largest multiple of $2P_{i-min}$ that is equal to or less than R_i

and

$$m'_i = \begin{cases} 0 \text{ if AMOD}(R_i, 2P_{i-min}) = 0 \\ 1 \text{ otherwise.} \end{cases} \qquad \text{(III-42)}$$

For ammunition supply operations, Component J3D includes both the container supply piers and non-container supply piers. In this case, the model allows dual use of the container supply piers. The model first computes the requirement for the ammunition container supply pier feet of berthing as in Eq. (III-41), with ℓ'_c and ℓ_c replacing R'_i and R_i, respectively, and P_{i-min} being the minimum container supply berth length (as in Component DA), where

ℓ'_c = Adjusted ammunition container supply pier feet of berthing requirement (III-43)

ℓ_c = (.090 FB/ST) $X_a \cdot F_a$/2000 $\cdot$

For the ammunition non-container supply pier, the requirement is computed as in Eq. (III-41), this time with ℓ'_s and ℓ_s replacing R'_i and R_i, respectively, P_{i-min} being the minimum supply berth length (as in Component D31E), and m_i = 0 if AMOD $(\ell_s, 2P_{i-min}) \leq \ell'_c - \ell_c$ and unity otherwise, where

ℓ'_s = Adjusted ammunition supply pier feet of berthing requirement

and

$$\ell_s = (.243FB/ST) \cdot (X_s \cdot (1 - F_a) + Q_a)/2000 \qquad \text{(III-44)}$$

The change in the value of m_i^* infers that there is a possibility that an ammunition container pier can be used in a dual role for both container operations and non-container operations. The total feet of berthing requirement for the ammunition pier, which is the pacing facility for Component J3D is then computed as follows:

$$R'_{J3D} = \ell'_c + \ell'_s \quad . \qquad \text{(III-45)}$$

b. Maintenance Hangars

An indicated in Table III-8, the term in brackets in the equation for Component H9J is not included in the pacing facility requirements solution procedure since this term covers the requirement for maintenance hangar space for land-based operational aircraft whose maintenance personnel are already included in the land-based operational forces. After determining the base support personnel requirements, this portion of the maintenance hangar requirement equation is added to the base maintenance hangar requirement (which supports the air cargo function) to establish the total base and operational force maintenance hangar requirement.

c. Power Plant

As indicated previously in Section D-1 of this chapter, the Base Power Plant (Component P15) is assumed to have a basic cadre and draws any remaining personnel requirements from other base components. As such, its pacing facility size requirement was not included in the solution process although its requirement is dependent on the sizes of the other components. After making the above described pacing facility requirement adjustments, the model next computes the Electric Power Source size requirement using the input-specified power ripple factors (R_{pi}) and the pacing facility requirements for the other components. The applicable equation is as follows:

$$R_{P15} = \sum_{i=1}^{N_{comp}} (R_i \cdot R_{pi}) \cdot \qquad \text{(III-46)}$$

E. Component and Base Resource Requirements

Having determined the pacing facility requirements for each of the functional components of the base, the model next determines the component resource requirements. In addition to personnel and power requirements already discussed in the previous sections, these resource requirements include construction cost, initial outfitting cost (supplies and equipment), equipment shipping volume, construction time, and land requirement. These resource requirements are computed in accordance with component estimating relationship equations which are linear scalings on the pacing facility requirements. The constant factors and coefficients of these estimating relationship equations are model inputs (see Table III-2). The manner in which they were derived, together with the previous used ripple factors, is described in detail in Appendix A to this report. The resulting equations are indicated below. It should be noted that the component construction costs determined by Eq. (III-47) below represent a CONUS-based construction cost. Subsequent model computations apply a geographic-dependent construction cost multiplier factor to determine estimates of overseas construction costs. The equations are as follows:

$$C_{ci} = (b_{ci} + m_{ci} \cdot R_i)/1000 \qquad \text{(III-47)}$$

$$C_{ei} = (b_{ei} + m_{ei} \cdot R_i)/1000 \qquad \text{(III-48)}$$

$$V_{ei} = (b_{vi} + m_{vi} \cdot R_i)/40 \qquad \text{(III-49)}$$

$$T_{ci} = b_{ti} + m_{ti} \cdot R_i \tag{III-50}$$

$$L_{ri} = b_{\ell i} + m_{\ell i} \cdot R_i \tag{III-51}$$

where

C_{ci} = Construction cost (CONUS-based) of component i (thousands of dollars)

C_{ei} = Initial outfitting cost for component i (thousands of dollars)

V_{ei} = Shipping volume for initial supplies and equipment for component i (measurement tons)

T_{ci} = Construction time for component i (man-days)

L_{ri} = Land requirement for component i (acres).

The model next computes the total resource requirements for the base by summing over all the components for each resource requirement. That is,

$$C_c = \sum_{i=1}^{N_{comp}} C_{ci} \tag{III-52}$$

$$C_e = \sum_{i=1}^{N_{comp}} C_{ei} \tag{III-53}$$

$$V_e = \sum_{i=1}^{N_{comp}} V_{ei} \tag{III-54}$$

$$T_c = \sum_{i=1}^{N_{comp}} T_{ci} \tag{III-55}$$

$$L_r = \sum_{i=1}^{N_{comp}} L_{ri} \tag{III-56}$$

where

C_c = Base construction cost (CONUS-based)(thousands of dollars)

C_e = Base initial outfitting cost (thousands of dollars)

V_e = Total shipping volume for initial base supplies and equipment (measurement tons)

T_c = Base construction time (man-days)

L_r = Base land requirement (acres)

F. Overseas Supply Base Costs

The final model computations which represent the primary model outputs are concerned with determining the costs related to the construction and operation of the overseas supply base. These costs are dependent upon the specific geographic area under consideration and the model is structured so that any number of different geographical areas can be considered at this point, for a given supported force composition without having to re-compute any of the previously described computations. The supply base costs are divided into three groups: Initial Investment Costs, Annual Recurring Costs, and Cost of Transport of Supported Force's Supplies. The associated computations are described separately in the following three subsections.

1. Initial Investment Costs

The initial investment costs are those incurred in the construction and setting up of the base for sustained operations. The specific costs included in this category are the following, where the costs are all expressed in thousands of dollars:

C_B = Base facility construction cost

C_O = Base initial outfitting (equipment and supplies) cost

C_{TE} = Cost to transport initial equipment and supplies (CONUS to base)

C_{TP} = Base personnel and dependents transport cost (CONUS to base)

C_{BL} = Cost to transport personal belongings of base personnel (CONUS to base)

C_{LA} = Land acquisition cost

C_{II} = Base initial investment cost.

These cost estimates are computed in accordance with the following equations, where the parameters (here and in the following subsections) subscripted with "geo" or "land" are geographic-dependent inputs and the remaining factors are either model inputs or results of prior computations:

$$C_B = CF_{geo} \cdot C_c \qquad \text{(III-57)}$$

$$C_O = C_e \qquad \text{(III-58)}$$

$$C_{TE} = CTS_{geo} \cdot V_e/1000 \qquad \text{(III-59)}$$

$$C_{TP} = CTP_{geo} \cdot \left[(1 + P_{mo} \cdot D_{mo}) \cdot O_B + (1 + P_{me} D_{me}) \cdot E_B\right]/1000 \qquad \text{(III-60)}$$

$$C_{BL} = CTS_{geo} \cdot \left[(PBL_{uo} \cdot (1 - P_{mo}) + PBL_{mo} \cdot P_{mo}) \cdot O_B + (PBL_{ue} \cdot (1 - P_{me}) + PBL_{me}) \cdot E_B\right]/40000 \qquad \text{(III-61)}$$

$$C_{LA} = CPA_{land} \cdot PCP_{land} \cdot L_r/1000 \qquad \text{(III-62)}$$

$$C_{II} = C_B + C_O + C_{TE} + C_{TP} + C_{BL} + C_{LA} \cdot \qquad \text{(III-63)}$$

2. Annual Recurring Costs

The annual recurring costs are those incurred in the annual operations and maintenance of the base. The specific costs included in this category are the following, where the costs are all expressed in thousands of dollars:

A_P = Annual personnel billet cost

A_S = Annual cost of general supplies and equipment (Navy funded items only)

A_{TS} = Annual cost of transporting supplies and equipment (CONUS to base)

A_F = Annual cost of base fuel

A_{TF} = Annual cost of transporting base fuel (CONUS to base)

A_{RP} = Annual cost of transporting rotational personnel and their dependents (between CONUS and base)

A_{BL} = Annual cost of transporting rotational personnel's personal belongings (between CONUS and base)

A_{LL} = Annual lease cost of non-purchased land

A_R = Base annual recurring cost.

These cost estimates are computed in accordance with Eqs. (III-64) through (III-72) below. In these equations it is assumed that one-third of the base support personnel are rotated each year. In the computation of the annual cost of general supplies and equipment, supplies included in personnel billet costs such as subsistence, clothing, and personal demand items are not normally included; that is, the input values of the Navy-funded consumption inputs (NC) are normally either equal to zero or reduced accordingly to account for these non-funded items.

$$A_P = (BC_O \cdot O_B + BC_E \cdot E_B)/1000 \qquad \text{(III-64)}$$

$$A_S = 365 \cdot \left[UC_I \cdot NC_I \cdot (1 - p_r) + UC_r \cdot NC_I \cdot p_r + \sum_{i=II}^{IX} (UC_i \cdot NC_i)\right] \cdot M_B/1000 \qquad \text{(III-65)}$$

$$A_{TS} = 365 \cdot \left[CTR_{geo} \cdot C_I \cdot SV_I \cdot p_r + CTS_{geo} \cdot \left(C_I \cdot SV_I \cdot (1 - p_r) + \sum_{i=II}^{IX} (C_i \cdot SV_i)\right)\right] \cdot M_B/4000 \qquad \text{(III-66)}$$

$$A_F = 365 \cdot (UC_m \cdot R_{D4C1} + UC_d \cdot R_{D4C2} + UC_h \cdot R_{D4C3})/\left[1000 \cdot (DOS_b + DOS_{br})\right] \quad \text{(III-67)}$$

$$A_{TF} = 365 \cdot CTF_{geo} \cdot (R_{D4C1}/SV_m + R_{D4C2}/SV_d + R_{D4C3}/SV_h)/\left[1000 \cdot (DOS_b + DOS_{br})\right] \quad \text{(III-68)}$$

$$A_{RP} = 2 \cdot CTP_{geo} \cdot M_B/3000 \quad \text{(III-69)}$$

$$A_{BL} = 2 \cdot CTS_{geo} \cdot \left[(PBL_{uo} \cdot (1 - P_{mo}) + PBL_{mo} \cdot P_{mo}) \cdot O_B + (PBL_{ue} \cdot (1 - P_{me}) + PBL_{me}) \cdot E_B\right]/120000 \quad \text{(III-70)}$$

$$A_{LL} = CLA_{land} \cdot (1 - PCP_{land}) \cdot L_r/1000 \quad \text{(III-71)}$$

$$A_R = A_P + A_S + A_{TS} + A_F + A_{TF} + A_{RP} + A_{BL} + A_{LL} \cdot \quad \text{(III-72)}$$

3. Cost of Transport of Supported Force's Supplies

Although not directly related to the cost of the construction and operation of the supply base itself, the cost of transporting from CONUS to the base the supplies and equipment, fuel, and ammunition required by the supported forces will be useful in applications of the model results. Thus, these computations are performed by the model. The specific cost estimates provided are the following, where the transport costs are expressed in thousands of dollars and the fuel and ammunition transport costs are based on peacetime consumption rates only:

T_{SE} = Annual transport cost (CONUS to base) of general supplies and equipment for the supported forces

T_{SF} = Annual transport cost (CONUS to base) of ship fuel for the supported forces

T_{PF} = Annual transport cost (CONUS to base) of aircraft fuel for the supported forces

T_{SA} = Annual transport cost (CONUS to base) of ship ammunition for the supported forces

T_{PA} = Annual transport cost (CONUS to base) of aircraft ammunition for the supported forces.

These transport costs are computed in accordance with the following equations:

$$T_{SE} = 365 \cdot \left[CTR_{geo} \cdot C_I \cdot SV_I \cdot p_r + CTS_{geo} \cdot \left(C_I \cdot SV_I \cdot (1 - p_r) + \sum_{i=1}^{IX} (C_i \cdot SV_i) \right) \right] \cdot (M_L + M_S)/40000 \qquad \text{(III-73)}$$

$$T_{SF} = 365 \cdot CTF_{geo} \cdot PC_{sf} \cdot F_s/(1000 \cdot SV_s) \qquad \text{(III-74)}$$

$$T_{PF} = 365 \cdot CTF_{geo} \cdot PC_{af} \cdot F_p/(1000 \cdot SV_p) \qquad \text{(III-75)}$$

$$T_{SA} = 365 \cdot (1.07 \text{ MT/ST}) \cdot CTA_{geo} \cdot PC_{sa} \cdot (A_{Ss}/2000)/1000 \qquad \text{(III-76)}$$

$$T_{PA} = 365 \cdot (1.07 \text{ MT/ST}) \cdot CTA_{geo} \cdot PC_{aa} \cdot \left[(A_L + A_{Sp})/2000 \right] /1000 \cdot \qquad \text{(III-77)}$$

IV MODEL LIMITATIONS AND IMPROVEMENT OPTIONS

A number of basic limitations are presently built into the ABCOMO model design that could be eliminated, at least in part, through future improvements to the model. In addition, the input data base and pacing facility requirement equations are, in many cases, based on the engineering judgment of the SRI project team and should be reviewed in detail by cognizant Navy Department personnel. It is recommended that this data base review be performed before any significant use of the model is made. In this chapter, a number of the more significant model limitations are identified and possible improvement options are discussed.

A. Land Use

In the present model, the land required by the base is estimated and the cost of the land (either through purchase or lease or both) is based on this land requirement. This assumes that the land use efficiency is 100%. In some cases, this may be nearly so, but in others such as in hilly or rugged terrain, a considerably lower efficiency factor could well be the case. Thus, it is recommended that a land use efficiency factor be included in the geographic-dependent model inputs and applied appropriately to the base's basic land requirement to arrive at a more appropriate requirement on the amount of land to be purchased or leased.

B. Use of Existing Facilities

The ABCOMO model presently assumes that all facilities must be constructed in toto and thus does not allow for the use of any existing facilities at the intended base location. Although there is sufficient model output to allow a user to perform the necessary computations to account for these existing facilities, this could become a rather tedious exercise. It would be possible to specify another set of model inputs that identify the amount of existing facilities (in terms of pacing facility requirements) for each functional component, and the component construction cost could then be reduced accordingly. Since it is quite likely that some renovation of the existing facilities will be required, a renovation cost factor could be specified as input and applied to the existing facility requirements to account for this added cost of renovation.

C. Use of Military Construction Groups

The present ABCOMO assumes that all construction is performed by private contractors. In some instances, it may be beneficial for some of the construction to be performed by military construction groups such as Naval Construction Battalions (SeaBees) or the Corps of Engineers. To allow for this in the model would require, first, the specification of those components, or portions thereof, that would be constructed by the military. In addition, additional inputs and model computations would be required for estimating military construction costs, including personnel costs, construction materials cost, costs to transport construction materials to the base, and so on.

D. Use of Civilian Personnel

In the present model, all personnel employed at the supply base are either military personnel or civilian dependents of military personnel. No allowance is made for employing non-dependent civilians, either U.S. or host country. Since many foreign land use agreements stipulate the use of some host country inhabitants, it may be desired to include this option in the model. One way to address this problem is to specify as input the proportion of the base support personnel to be supplied by the host nation. This would reduce the requirements for base support facilities such as housing, commissary, etc. Thus, many of the pacing facility algorithms would require modification to account for the use of these local inhabitants. The allowance for use of non-dependent U.S. civilians as base support personnel could also be accomplished in the same manner.

E. Use of Variable Consumption Data

The present ABCOMO model assumes that the daily consumption rates for operational and base support personnel are the same. Since consumption ashore differs significantly from consumption afloat, this should be accounted for in some future model revision. This would require additional consumption input data and also some significant computational changes within the model itself.

F. Other Limitations

Some of the other significant model limitations include the following: (1) the supply base is constructed with no consideration for base defense, (2) pier requirements are based on an average daily throughput rate and do not consider peak joint arrivals of cargo ships, (3) berthing for transient ships, other than cargo ships, has not been considered, and (4) time phasing of the actual base construction, which would allow for partial base use during construction, is not included. These limitations are significant and could be addressed through future model revisions. However, the manner by which they would be addressed would require additional analysis beyond the scope of this present effort.

Appendix A

SUPPLY BASE COMPONENT REQUIREMENTS CRITERIA

Appendix A

SUPPLY BASE COMPONENT REQUIREMENTS CRITERIA

1. Supply Base Composition

The supply base represented by the ABCOMO model is a permanent advanced supply base that is designed to provide prolonged support to Navy and Marine forces deployed in an overseas area of operations. This hypothetical supply base is structured as an autonomous entity, providing support to the operating forces as well as its own self-support. It is assumed that the base stocks are replenished on a periodic basis through MAC, MSC, and commercial shipments from major CONUS supply points. Base operations are conducted by Naval personnel on three-year tours of duty, with the exception that many of the family support operations (commissary, dependent school, bank, etc.) utilize on-base military dependents.

The supply base assumed is composed of 49 functional components, each including one or more individual facilities serving that function. These components are summarily identified in Table A-1 and described in greater detail in Section III of this appendix. These components, with their associated facilities, were chosen on the bases of project team experience, the Master Plan for Adak,[12*] and the Navy's Real Property Inventory for the Marine Supply Base at Barstow, California.[13] The components chosen comprised those considered applicable from OPNAV's Table of Advanced Base Functional Components[2] (which are further detailed in NAVFAC's Facilities Planning Guide[3]), plus additional ones formulated by SRI to complete the functional structure of a hypothetical permanent base. The Table of Advanced Base Functional Components is set up primarily for planning of expeditionary advanced bases and thus does include functional components for such functions as family support,

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*Superscripts refer to data sources listed at the end of this appendix.

Table A-1

SUPPLY BASE COMPONENTS

Component ID	Component Description	Component ID	Component Description
A3	Administration Office, Post Office	F1	Cargo Handling Battalion
A4	Data Processing Facility	G2	Hospital
A5	Electronic Maintenance	G9	Dispensary
A7	Shore Patrol Headquarters	G28	Dental Clinic
BB	Waterfront Safety Facilities	HA	Airfield Operations Support
B5A	Boat Pool	H9J	Aircraft Maintenance Facilities
B13C	Port Services Office	J3A	Ammunition Depot
C3A	Naval Station Communications	J3D	Ordnance Support Facilities
C7	Visual Station, Operating Base	J4	Explosive Ordnance Disposal
C13	Internal Communications	NA	Family Support
C27J	Direction Finder Station	NB	Enlisted Personnel Support
C32A	Air Traffic Control Component	NC	Officer Personnel Support
DA	Container Operations (non-ammunition)	ND	Personal Services (all personnel)
D3A1	Tank Farm, Ship Fuel	NE	Recreational Facilities (all personnel)
D3A2	Tank Farm, Jet Engine Fuel	N10B	Military Training and Education
D4C1	Tank Farm, Base Supply MOGAS	N14	Chapel
D4C2	Tank Farm, Base Supply, Diesel	N16	Officers' Recreation
D4C3	Tank Farm, Base Heating Fuel	N17	Enlisted Recreation
D20	Disbursing Office	P5	Public Works Unit
D24A	Ships Store Facility	P5A	Automotive Maintenance
D29A	Air Cargo Terminal	P12A	Fire Protection
D31A	Supply Storage and Administration	P15	Base Power Plant
D31E	Supply Support Facilities	P16	Waste Management
D32A	Refrigerated Storage	P18	Water System
D33A	Materials Handling Facilities		

personal services, recreation, and so on. Furthermore, the facilities listed in those tables are temporary in nature and hence had to be permanentized for the purposes of this work.

2. Requirements Determination Procedure

For each of the components, one of its subsidiary facilities was chosen as the "pacing facility" for that component--i.e., the most important facility in terms of size or cost, and one whose size could be expected to vary in some predictable way with the tonnage throughput of the supply base or some other appropriate factor. Each pacing facility was then given a "basic size" (in units of barrels, square feet, cubic yards, kilowatts, or kilogallons per day) appropriate to its particular function. Where a basic size was indicated for a pacing facility in the Table of Advanced Base Functional Components, that figure was adopted. Otherwise, the SRI project team assumed a basic size using engineering judgment. In those instances where the pacing facility was considered population-dependent (such as a chapel), the basic size was taken to be that required to support a military population arbitrarily set at a level of 500 officers and 4380 enlisted men, using the ratio of 8.76 enlisted men per officer that was employed in the Advanced Base Logistic Envelope (ABLE) model.[1] The calculations of basic size of facilities were governed also by the provisions of NAVFAC's Facility Planning Factors,[4] which sets standards--for example, the square feet of chapel building that are allowed for various levels of population served.

Once the basic size of all necessary facilities (and thus of their parent components) had been established, the resource requirements for each component were calculated. The resources of interest included: numbers of officers and enlisted men required to operate the component, number of vehicles required, acres of land required, kilowatts of electrical power required, construction time in man-days, shipping volume of supplies and equipment for initial startup of the facilities in cubic feet (the assumption was made that the shipping volumes associated with facility construction would be the responsibility of the construction contractor and the costs would be covered by his contract), and startup dollar costs for each of the various cognizant Systems Commands. The principal source of manpower and vehicle requirements, shipping volumes of supplies and equipment, and non-NAVFAC startup costs was the Table of Advanced Base Functional Components. The principal source of acreage, electrical power and construction time requirements, and NAVFAC startup costs was NAVFAC's Facilities Planning Guide in conjunction with the unit costs of permanent facilities given in NAVFAC P-438.[5] For those components not addressed in the above references, other sources of data had to be exploited. Vehicle procurement costs were derived from the Army Force Planning Cost Handbook.[6] Some unit construction costs were taken from Means Cost Data[7] and from a personal communication with Wheatly Associates, Palo Alto, California.[8] In some cases where no directly applicable cost data could be found, the project team estimated costs using analogy between similar types of facilities.

After the resource requirements were calculated for a basic size component, these values were divided by the basic size value of the component's pacing facility, resulting in the establishment of ripple factors and component estimating relationship parameters* that could be used to determine resource requirements for component sizes different than the basic size. The values used for the components' basic sizes, ripple factors and component estimating relationship parameters are specified in the next section of this appendix.

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*In the model, officer, enlisted, and power requirements are computed in accordance with the relationship $Y = mX$, where m is the associated ripple factor and X is the pacing facility requirement. For the other resource requirements, the relationship $Y = b+mX$ is used, where b is a constant, m is an estimating coefficient, and X is the pacing facility requirement. However, in the present data base, the constant b is assumed as zero for all components.

3. Component Descriptions and Requirements

Tables A-2 and A-3 summarize the component ripple factors and estimating relationship parameters that are inputs for the ABCOMO computer program. Table A-4 presents a list of the nomenclature used in the pacing facility requirement equations.

In the pages that follow Table A-4, each component used in the supply base configuration is identified and the various resource requirement parameters and the pacing facility requirement equation for that component are specified. A brief statement of mission is also included and the configuration source is identified, where ABFC refers to a component defined in the Table of Advanced Base Functional Components (but with its facilities permanentized), SRI refers to a component that was completely defined by the SRI project team, and ABFC/SRI refers to an SRI modified component listed in the Table of Advanced Base Functional Components. The data sources used are also identified on each component page, where the numerical values refer to the data sources listed at the end of this appendix.

Table A-2

COMPONENT RIPPLE FACTORS

Component ID	Pacing Facility		Req. Units	Officer Ripple	EM Ripple	Power Ripple
	Category Code	Description				
A3	610-10	Administrative Office	SF	.0026	.0169	.00868
A4	610-20	Data Processing Center	SF	.00208	.0118	.00625
A5	218-70	Office Equipment/Appliance Repair	SF	.0133	.0917	.208
A7	730-15	Correctional Facility	SF	.0006	.0089	.009
BB	165-10	Dredging	CY	0.0	0.0	0.0
B5A	159-64	Waterfront Operations Building	SF	.00139	.0847	.0153
B13C	137-40	Port Control Office	SF	.00146	.00542	.005
C3A	131-15	Communication Center	SF	.00197	.0246	.0658
C7	137-40	Visual Station	SF	0.0	.0446	.067
C13	135-20	Central Telephone Office	SF	0.0	.0366	.0139
C27J	131-35	Receiver Building	SF	.00104	.0125	.0625
C32A	141-40	Aircraft Operations Building	SF	.0114	.108	.00985
DA	151-61	Supply Container Handling Pier	FB	0.0	0.0	.55
D3A1	411-10	Ship Fuel Storage	BL	.00000625	.0000813	.000225
D3A2	411-50	Jet Engine Fuel Storage	BL	.00000625	.0000813	.000225
D4C1	411-40	MOGAS Storage	BL	.000033	.00037	.0007
D4C2	411-30	Diesel Fuel Storage	BL	.000033	.00037	.0007
D4C3	124-65	Activity Heating Fuel Storage	BL	.000033	.00037	.0007
D20	610-10	Disbursing Office	SF	.00075	.00625	.00625
D24A	740-13	Exchange Laundry Plant	SF	.000375	.00775	.0344
D29A	141-12	Air Cargo Terminal	SF	.0000714	.00109	.000214
D31A	441-10	General Purpose Warehouse	SF	.000115	.0008	.00125
D31E	151-60	Supply Pier	FB	0.0	0.0	.549
D32A	431-10	Cold Storage Warehouse	SF	0.0	.000862	.0308

Table A-2 (Concluded)

Component ID	Pacing Facility		Req. Units	Officer Ripple	EM Ripple	Power Ripple
	Category Code	Description				
D33A	214-20	Automotive Maintenance Shop	SF	.0005	.0175	.0108
F1	610-10	Administration (minimum)	SF	.00641	.144	.0107
G2	510-10	Hospital	SF	.000289	.00107	.00208
G9	530-10	Outpatient Clinic	SF	.000208	.00208	.00313
G28	540-10	Dental Clinic	SF	.0026	.00547	.0117
HA	111-10	Aircraft Runway	SY	0.0	.000108	.00132
H9J	211-05	Maintenance Hangar (hi-bay)	SF	.000135	.00176	.0152
J3A	421-22	High Explosive Magazine	SF	.000047	.000747	.00141
J3D	151-10	Ammunition Pier	FB	0.0	0.0	.637
J4	143-20	Explosive Ordnance Disposal Building	SF	.00104	.00313	.0115
NA	711-20	Family Housing	SF	.00000135	.0000113	.00507
NB	721-11	Bachelor Enlisted Quarters	SF	0.0	.000667	.00586
NC	724-00	Bachelor Officers' Quarters	SF	0.0	.000135	.0055
ND	740-30	Exchange Service Station	SF	0.0	.001844	.0316
NE	740-37	Special Services Office	SF	.00019	.00133	.144
N10B	171-20	Applied Instruction Building	SF	.000122	.000365	.00916
N14	740-10	Chapel	SF	.00075	.00075	.0015
N16	740-60	Commissioned Officers' Mess (open)	SF	.000125	.00125	.00525
N17	{740-63 740-66	EM Club/PO Mess (open)	SF	.000179	.00221	.0049
P5	219-10	Public Works Shop	SF	.000875	.0338	.0583
P5A	214-20	Automotive Maintenance Shop	SF	.0000625	.0025	.014
P12A	730-10	Fire Station	SF	0.0	.0087	.00696
P15	811-00	Electric Power Source	KW	0.0 1/	9.0 1/	0.0
P16	831-10	Sewage Treatment Plant	KG	0.0	.0275	.2
P18	841-09	Water Treatment Facility	KG	0.0	.00573	.2

1/ For Electric Power Plant, a basic complement of nine EM is assumed. Other required personnel are furnished by other base components. In the model, these parameters are constants and not ripple factors.

Table A-3

COMPONENT ESTIMATING RELATIONSHIP PARAMETERS

Component ID	Component Description	Construction Cost (dollars)		Equipment Cost (dollars)		Equipment Volume (cu ft)		Construction Time (man days)		Required Land (acres)	
		Const.	Coeff.	Const.	Coeff.	Const.	Coeff.	Const.	Coeff.	Const.	Coeff.
A3	Administration Office, Post Office	0.0	182.78	0.0	14.61	0.0	.611	0.0	.295	0.0	.000391
A4	Data Processing Facility	0.0	154.87	0.0	31.14	0.0	.565	0.0	.208	0.0	.000278
A5	Electronic Maintenance	0.0	787.69	0.0	162.44	0.0	3.308	0.0	.92	0.0	.00217
A7	Shore Patrol Headquarters	0.0	126.913	0.0	5.644	0.0	.1999	0.0	.1807	0.0	.00035
BB	Waterfront Safety Facilities	0.0	9.95	0.0	0.0	0.0	0.0	0.0	.00223	0.0	0.0
B5A	Boat Pool	0.0	370.34	0.0	5054.44	0.0	370.21	0.0	.353	0.0	.000556
B13C	Port Services Office	0.0	72.50	0.0	23.96	0.0	1.568	0.0	.103	0.0	.0000833
C3A	Naval Station Communications	0.0	143.57	0.0	314.75	0.0	6.395	0.0	.208	0.0	.0219
C7	Visual Station, Operating Base	0.0	435.87	0.0	134.81	0.0	2.969	0.0	.487	0.0	.00112
C13	Internal Communications	0.0	2114.91	0.0	14.76	0.0	.430	0.0	.207	0.0	1.059
C27J	Direction Finder Station	0.0	615.91	0.0	175.34	0.0	5.384	0.0	.348	0.0	.0781
C32A	Air Traffic Control Component	0.0	806.16	0.0	2095.92	0.0	17.48	0.0	.4	0.0	.0114
DA	Container Operations (non-ammunition)	0.0	10527.51	0.0	120.06	0.0	5.02	0.0	.746	0.0	.0206
D3A1	Tank Farm, Ship Fuel	0.0	21.8	0.0	1.65	0.0	.169	0.0	.0487	0.0	.000108
D3A2	Tank Farm, Jet Engine Fuel	0.0	32.48	0.0	1.65	0.0	.169	0.0	.0487	0.0	.00011
D4C1	Tank Farm, Base Supply MOGAS	0.0	47.82	0.0	6.42	0.0	.420	0.0	.169	0.0	.00023
D4C2	Tank Farm, Base Supply, Diesel	0.0	48.39	0.0	6.51	0.0	.427	0.0	.172	0.0	.00024
D4C3	Tank Farm, Base Heating Fuel	0.0	83.02	0.0	6.42	0.0	.420	0.0	.169	0.0	.00023
D20	Disbursing Office	0.0	73.05	0.0	9.73	0.0	.627	0.0	.12	0.0	.000225
D24A	Ships Store Facility	0.0	156.25	0.0	21.16	0.0	1.17	0.0	.197	0.0	.00035
D29A	Air Cargo Terminal	0.0	41.79	0.0	15.03	0.0	.714	0.0	.050	0.0	.00007
D31A	Supply Storage and Administration	0.0	37.75	0.0	1.51	0.0	.441	0.0	.0483	0.0	.00012
D31E	Supply Support Facilities	0.0	6960.16	0.0	119.9	0.0	5.01	0.0	.745	0.0	.00426
D32A	Refrigerated Storage	0.0	107.49	0.0	.650	0.0	.122	0.0	.0634	0.0	.0000157
D33A	Materials Handling Facilities	0.0	75.64	0.0	559.43	0.0	27.36	0.0	.144	0.0	.0001

Table A-3 (Concluded)

Component ID	Component Description	Construction Cost (dollars)		Equipment Cost (dollars)		Equipment Volume (cu ft)		Construction Time (man days)		Required Land (acres)	
		Const.	Coeff.	Const.	Coeff.	Const.	Coeff.	Const.	Coeff.	Const.	Coeff.
F1	Cargo Handling Battalion	0.0	257.42	0.0	2922.48	0.0	84.	0.0	.276	0.0	.00267
G2	Hospital	0.0	124.878	0.0	2.827	0.0	.312	0.0	.125	0.0	.0000726
G9	Dispensary	0.0	115.95	0.0	8.72	0.0	.905	0.0	.118	0.0	.000208
G28	Dental Clinic	0.0	127.27	0.0	25.17	0.0	1.485	0.0	.0703	0.0	.000234
HA	Airfield Operations Support	0.0	75.222	0.0	1.032	0.0	.0592	0.0	.0151	0.0	.000413
H9J	Aircraft Maintenance Facilities	0.0	239.139	0.0	4.420	0.0	.950	0.0	.0978	0.0	.00024[illegible]
J3A	Ammunition Depot	0.0	126.054	0.0	10.663	0.0	.584	0.0	.136	0.0	.0117
J3D	Ordnance Support Facilities	0.0	14716.49	0.0	1507.08	0.0	440.584	0.0	48.26	0.0	.00422
J4	Explosive Ordnance Disposal	0.0	492.31	0.0	203.79	0.0	7.881	0.0	.349	0.0	.333
NA	Family Support	0.0	72.52	0.0	.155	0.0	.0775	0.0	.129	0.0	.0000482
NB	Enlisted Personnel Support	0.0	114.29	0.0	3.519	0.0	.625	0.0	.128	0.0	.0000474
NC	Officer Personnel Support	0.0	108.87	0.0	.929	0.0	.126	0.0	.120	0.0	.000044
ND	Personal Services (all personnel)	0.0	900.13	0.0	16.01	0.0	1.950	0.0	.641	0.0	.00369
NE	Recreational Facilities (all personnel)	0.0	2746.28	0.0	42.95	0.0	8.906	0.0	2.478	0.0	.00642
N10B	Military Training and Education	0.0	160.15	0.0	2.901	0.0	.373	0.0	.147	0.0	.00130
N14	Chapel	0.0	180.25	0.0	5.847	0.0	.709	0.0	.12	0.0	.000225
N16	Officers' Recreation	0.0	171.37	0.0	5.917	0.0	1.244	0.0	.12	0.0	.00015
N17	Enlisted Recreation	0.0	94.18	0.0	2.76	0.0	.788	0.0	.0858	0.0	.00621
P5	Public Works Unit	0.0	212.70	0.0	637.48	0.0	24.865	0.0	.371	0.0	.00163
P5A	Automotive Maintenance	0.0	93.28	0.0	37.41	0.0	1.363	0.0	.162	0.0	.000388
P12A	Fire Protection	0.0	63.38	0.0	47.62	0.0	2.134	0.0	.111	0.0	.000087
P15	Base Power Plant	0.0	575.	0.0	18.49	0.0	3.049	0.0	.144	0.0	.000333
P16	Waste Management	0.0	5467.86	0.0	288.9	0.0	28.99	0.0	2.044	0.0	.042
P18	Water System	0.0	1945.83	0.0	0.0	0.0	0.0	0.0	.869	0.0	.0287

Table A-4

NOMENCLATURE FOR PACING FACILITY REQUIREMENT EQUATIONS

Variable	Definition	Units
AP_i	Daily wartime ammunition consumption for aircraft of type i	lb/day
AS_i	Daily wartime ammunition consumption for ships of type i	lb/day
C	Number of civilians on base	men
C_{gc}	Daily consumption of general cargo items per man	lb/man/day
DOS_a	Days of supply for ammunition (operating stocks)	days
DOS_{ar}	Days of supply for ammunition (wartime reserves)	days
DOS_b	Days of supply for base fuel (operating stocks)	days
DOS_{br}	Days of supply for base fuel (wartime reserves)	days
DOS_c	Days of supply for general cargo (operating stocks)	days
DOS_{cr}	Days of supply for general cargo (wartime reserves)	days
DOS_p	Days of supply for aircraft fuel (operating stocks)	days
DOS_{pr}	Days of supply for aircraft fuel (wartime reserves)	days
DOS_s	Days of supply for ship fuel (operating stocks)	days
DOS_{sr}	Days of supply for ship fuel (wartime reserves)	days
E_B	Number of enlisted men in base support force	men
E_L	Number of enlisted men in land-based operational force	men
E_S	Number of enlisted men in sea-based operational force	men
F_a	Fraction of ammunition that is containerized	
F_{ac}	Fraction of break-bulk cargo that is delivered by air	
F_c	Fraction of cargo that is containerized	
FP_i	Daily wartime fuel consumption for aircraft of type i	bbl/day
FS_i	Daily wartime fuel consumption for ships of type i	bbl/day
g	Fraction of at-sea men with impact ashore	
M_B	Number of military personnel in base support force	men
M_L	Number of military personnel in land-based operational force	men
M_S	Number of military personnel in sea-based operational force	men

Table A-4 (Concluded)

Variable	Definition	Units
NA_{L1}	Number of land-based rotary wing aircraft and other aircraft of length equal to or less than 85 ft assigned to the base	aircraft
NA_{L2}	Number of land-based fixed wing aircraft of length greater than 85 ft assigned to the base	aircraft
N_{comp}	Number of functional components in base configuration	components
N_p	Number of aircraft types	types
NP_i	Number of aircraft of type i	aircraft
N_s	Number of ship types	types
NS_i	Number of ships of type i	ships
O_B	Number of officers in base support force	men
O_L	Number of officers in land-based operational force	men
O_S	Number of officers in sea-based operational force	men
PC_{aa}	Ratio of peacetime-to-wartime aircraft ammunition consumption	
PC_{af}	Ratio of peacetime-to-wartime aircraft fuel consumption	
PC_{sa}	Ratio of peacetime-to-wartime ship ammunition consumption	
PC_{sf}	Ratio of peacetime-to-wartime ship fuel consumption	
P_{me}	Proportion of enlisted men accompanied by their families	
P_{mo}	Proportion of officers accompanied by their families	
P_r	Proportion of subsistence material that is refrigerated	
Q_a	Daily wartime ammunition transhipped through base	lb/day
R_i	Pacing facility requirement for component of type i	component dependent
R_{pi}	Power requirement for component of type i	kW
SV_c	Specific volume of general cargo	MT/ST
SV_{nr}	Specific volume of non-refrigerated cargo	MT/ST
SV_r	Specific volume of refrigerated cargo	MT/ST
X_a	Daily wartime ammunition shipped to base	lb/day

Component ID	Description	Configuration Source
A3	Administrative Office and Post Office	ABFC/SRI

Mission:
Provides facilities and personnel for the direction, administration, and coordination of base activities; includes base post office.

Pacing Facility	610-10 Administrative Office
Other Principal Facilities	740-33 Post Office

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
6.0	39.0	0.9	20	679	1408

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$421,121	$33,662	2034 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.0026	.0169	.00868

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	182.78	14.61	.611	.295	.000391

Pacing Facility Requirement Equation:

$$(0.9\ SF/man)\cdot(M_B+M_L+gM_S)$$

Data Sources Used: 1,2,3,5,6

Component ID	Description	Configuration Source
A4	Data Processing Facility	SRI

Mission:
Provides direct data processing support to administrative functions such as personnel, fiscal, supply, and others.

Pacing Facility	610-20 Data Processing Center
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
3.0	17.0	0.4	9	299	813

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$223,006	$44,844	1440 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00208	.0118	.00625

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	154.87	31.14	.565	.208	.000278

Pacing Facility Requirement Equation:

One 1440 SF Facility per Base

Data Sources Used: 3,5

Component ID	Description	Configuration Source
A5	Electronic Maintenance	SRI

Mission:
Performs maintenance and repair of office equipment, small appliances, and electronics/communications equipment.

Pacing Facility	218-70 Office Equipment/Appliance Repair Shop
Other Principal Facilities	217-10 Electronics/Communications Maintenance Shop

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
8.0	55.0	1.3	125	552	1985

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$472,616	$97,463	600 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.0133	.0917	.208

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	787.69	162.44	3.308	.92	.00217

Pacing Facility Requirement Equation:

$$200 \text{ SF} + (0.08 \text{ SF/man}) \cdot (M_B + M_L + gM_S)$$

Data Sources Used: 2,3,4,5,8

Component ID	Description	Configuration Source
A7	Shore Patrol Headquarters	ABFC/SRI

Mission:
Houses the shore patrol and military and civilian police forces for the base, and provides holding cells for imprisonment of criminals and suspects.

Pacing Facility	730-15 Correctional Facility
Other Principal Facilities	730-20 Police Station 730-25 Gate/Sentry House

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
6.0	89.0	3.5	90	1807	1999

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,269,132	$56,440	10,000 SF

MODEL PARAMETFRS

Ripple Factors	Officers	Enlisted	Power
	.00060	.0089	.0090

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	126.913	5.644	.1999	.1807	.00035

Pacing Facility Requirement Equation:

$$2500\ SF+(1.581\ SF/man)\cdot(M_B+M_L+gM_S)$$

Data Sources Used: 2,3,4,5,6

Component ID	Description	Configuration Source
BB	Waterfront Safety Facilities	SRI

Mission:
Provides protected channel and harbor for visiting ships.

Pacing Facility	165-10 Dredging
Other Principal Facilities	154-30 Seawalls 163-10 Mooring Dolphins 164-10 Breakwater

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	0	0	0	2970	0

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$13,267,142	0	1,333,333 CY

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	0	0

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	9.95	0	0	.00223	0

Pacing Facility Requirement Equation:

Average of 1,333,333 CY per Base

Data Sources Used: 3,4,7

Component ID	Description	Configuration Source
B5A	Boat Pool	ABFC

Mission:
Provides waterfront and harbor services to visiting ships.

Pacing Facility	159-64 Waterfront Operations Building
Other Principal Facilities	151-20 Dock for Boat Pool 163-20 Moorings

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
2.0	122.0	0.8	22	509	533,109

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$533,296	$7,278,395	1440 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00139	.0847	.0153

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	370.34	5054.44	370.21	.353	.000556

Pacing Facility Requirement Equation:

One 1440 SF Facility per Base

Data Sources Used: 2,5,6

Component ID	Description	Configuration Source
B13C	Port Services Office	ABFC

Mission:
The operational headquarters for assigning ship berthing spaces, providing pilotage, and coordinating logistic support and harbor services for visiting ships.

Pacing Facility	137-40 Port Control Office
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
7.0	26.0	0.4	24	493	7527

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$348,020	$115,018	4800 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00146	.00542	.005

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	72.50	23.96	1.568	.103	.0000833

Pacing Facility Requirement Equation:

$$(7.2\ SF/MT/day) \cdot [SV_c \cdot C_{gc} \cdot (C+M_B+M_L+M_S+(1-g)M_S)+(1.07\ MT/ST) \cdot (X_a+Q_a)]/2000$$

Data Sources Used: 2,3,4,5,6

Component ID	Description	Configuration Source
C3A	Naval Station Communications	ABFC

Mission:
Provides operational and control functions for the base radio communications system.

Pacing Facility	131-15 Communications Center
Other Principal Facilities	131-35 Receiver Building 131-50 Transmitter Building 132-10 Antenna, Communications

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
9.0	112.0	100	300	949	29,160

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$654,685	$1,435,262	4560 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00197	.0246	.0658

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	143.57	314.75	6.395	.208	.0219

Pacing Facility Requirement Equation:

One 4560 SF Facility per Base

Data Sources Used: 2,5,6

Component ID	Description	Configuration Source
C7	Visual Station Operating Base	ABFC/SRI

Mission:
Provides operational space and equipment for visual communications with fleet units.

Pacing Facility	137-40 Visual Station
Other Principal Facilities	169-10 Visual signal tower

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	20.0	0.5	30	218	1330

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$195,268	$60,394	448 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.0446	.067

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	435.87	134.81	2.969	.487	.00112

Pacing Facility Requirement Equation:

$$(0.269\ SF/MT/day)\cdot[SV_c\cdot C_{gc}\cdot(C+M_B+M_L+M_S+(1-g)M_S)+(1.07\ MT/ST)\cdot(X_a+Q_a)]/2000$$

Data Sources Used: 2,3,5

Component ID	Description	Configuration Source
C13	Internal Communications	ABFC/SRI

Mission:
Provides internal telephone communications between offices, shops, and family housing on the base.

Pacing Facility	135-20 Central Telephone Office
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	21.0	1.0	8	119	247

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,213,961	$8,473	574 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.0366	.0139

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	2114.91	14.76	.430	.207	.00174

Pacing Facility Requirement Equation:

$250\ SF+(0.168\ SF/man)\cdot(M_B+M_L+gM_S)$

Data Sources Used: 2,3,4,5,6

Component ID	Description	Configuration Source
C27J	Direction Finder Station	ABFC/SRI

Mission:
Provides personnel and equipment for operation of a high frequency radio direction finder station with TACAN capabilities.

Pacing Facility	131-35 Receiver Building
Other Principal Facilities	131-50 Transmitter Building 133-25 TACAN Building 133-35 UHF Homer Beacon Building

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
1.0	12.0	75	60	334	5169

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$591,277	$168,324	960 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00104	.0125	.0625

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	615.91	175.34	5.384	.348	.0781

Pacing Facility Requirement Equation:

One 960 SF Facility per Base

Data Sources Used: 2,3,4,5,6,8

Component ID	Description	Configuration Source
C32A	Air Traffic Control Component	ABFC/SRI

Mission:
Provides facilities for the administration of flight operational activities including navigation, flight control, communications and weather service.

Pacing Facility	141-40	Aircraft Operations Building
Other Principal Facilities	141-70	Control Tower
	218-20	Equipment Maintenance Shop
	441-12	Storage/out-of-stores
	441-35	General Storage

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
15.0	142.0	15	13	528	23073

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,064,133	$2,766,614	1320 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.0114	.108	.00985

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	806.16	2095.92	17.48	.4	.0114

Pacing Facility Requirement Equation:

One 1320 SF Facility per Base

Data Sources Used: 2,3,4,5,6

Component ID	Description	Configuration Source
DA	Container Operations (Non-ammunition)	SRI

Mission:

Provides specially-equipped pier(s), storage yards, shops, and offices for the handling, storage, repair, and operational control of non-ammunition cargo containers.

Pacing Facility	151-61 Supply Container Handling Pier
Other Principal Facilities	149-82 Container Holding Yard (Loaded) 152-61 Supply Container Handling Wharf 153-30 Container Operations Building 218-10 Container Repair and Test Building 425-20 Container Holding Yard (Empty)

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	0	18.5	495	671	4519

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$9,474,763	$108,054	900 FB

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	0	.55

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	10527.51	120.06	5.02	.746	.0206

Pacing Facility Requirement Equation:

$$(0.084\ FB/MT) \cdot SV_c \cdot F_c \cdot C_{gc} \cdot (C+M_B+M_L+M_S)/2000$$

Data Sources Used: 1,4,5

Component ID	Description	Configuration Source
D3A1	Tank Farm, Ship Fuel	ABFC/SRI

Mission:

Provides on base storage of ship fuels and facilities for transferring fuels to and from visiting ships.

Pacing Facility	411-10	Ship Fuel Storage
Other Principal Facilities	125-10	POL Pipeline
	125-16	Pump Station
	143-75	POL Testing Building
	163-20	Tanker Mooring
	411-82	Contaminated Fuel Storage

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0.75	9.75	13	27	5838	20266

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$2,615,418	$197,951	120,000 BL

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00000625	.0000813	.000225

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	21.8	1.65	.169	.0487	.000108

Pacing Facility Requirement Equation:

$$(DOS_{sr}+PC_{sf}\cdot DOS_{r})\cdot\sum_{i=1}^{N_s}(FS_i\cdot NS_i)$$

Data Sources Used: 1,2,3,4,5,6

Component ID	Description	Configuration Source
D3A2	Tank Farm, Jet Engine Fuel	ABFC/SRI

Mission:
Provides on base storage of aircraft jet fuel and facilities for transferring fuels to and from visiting ships and aircraft

Pacing Facility	411-50 Jet Engine Fuel Storage
Other Principal Facilities	121-20 Aircraft Truck Fueling Facility 125-10 POL Pipeline 125-16 Pump Station 143-75 POL Testing Building 163-20 Tanker Mooring 411-82 Contaminated Fuel Storage

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0.25	3.25	4.4	9	1946	6755

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,299,212	$65,983	40,000 BL

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00000625	.0000813	.000225

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	32.48	1.65	.169	.0487	.00011

Pacing Facility Requirement Equation:

$$(DOS_{pr} + PC_{af} \cdot DOS_{p}) \cdot \sum_{i=1}^{N_p} (FP_i \cdot NP_i)/42$$

Data Sources Used: 1,2,3,4,5,6

Component ID	Description	Configuration Source
D4C1	Tank Farm, Base Supply MOGAS	ABFC/SRI

Mission:
Provides on base storage of motor gasoline to supply land based equipment and harbor craft, and facilities for transferring fuel from tanker to storage.

Pacing Facility	411-40	Motor Gasoline Storage
Other Principal Facilities	122-20	Small Craft Fueling Pier
	125-10	POL Pipeline
	125-16	Pump Station
	143-75	POL Testing Building
	163-20	Tanker Mooring
	411-82	Contaminated Fuel Storage

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0.33	3.7	2.3	7	1693	4203

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$478,223	$64,168	10,000 BL

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000033	.00037	.0007

Estimating Relationship Parameter	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	47.82	6.42	.420	.169	.00[illegible]

Pacing Facility Requirement Equation:

$$(0.15\ \text{BL/man/day}) \cdot (C+M_B+M_L+gM_S) \cdot (DOS_b+DOS_{br})$$

Data Sources Used: 1,2,3,4,5,6

Component ID	Description	Configuration Source
D4C2	Tank Farm, Base Supply Diesel Fuel	ABFC/SRI

Mission:
Provides on base storage of diesel fuel to supply land based equipment and harbor craft, and facilities for transferring fuel from tanker to storage.

Pacing Facility	411-30 Diesel Fuel Storage
Other Principal Facilities	122-20 Small Craft Fueling Pier 125-10 POL Pipeline 125-16 Pump Station 143-75 POL Testing Building 163-20 Tanker Mooring 411-82 Contaminated Fuel Storage

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0.66	7.3	4.8	14	3438	8534

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$967,782	$130,282	20,000 BL

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000033	.00037	.0007

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	48.39	6.51	.427	.172	.00024

Pacing Facility Requirement Equation:

$$(0.04 \text{ BL/man/day})\cdot(M_B+M_L+gM_S)\cdot(DOS_b+DOS_{br})$$

Data Sources Used: 1,2,3,4,5,6

Component ID	Description	Configuration Source
D4C3	Tank Farm, Base Supply Heating Fuel	ABFC/SRI

Mission:
Provides on base storage of heating fuel for base use, and facilities for transferring fuel from tanker to storage

Pacing Facility	124-65 Activity Heating Fuel Storage
Other Principal Facilities	125-10 POL Pipeline 125-16 Pump Station 143-75 POL Testing Building 163-20 Tanker Mooring 411-82 Contaminated Fuel Storage

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0.33	3.7	2.3	7	1693	4203

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$830,223	$64,168	10,000 BL

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000033	.00037	.0007

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	83.02	6.42	.420	.169	.00023

Pacing Facility Requirement Equation:

$$(0.0556\ \mathrm{BL/man/day}) \cdot (C + M_B + M_L + gM_S) \cdot (DOS_b + DOS_{br})$$

Data Sources Used: 1,2,3,4,5,6

Component ID	Description	Configuration Source
D20	Disbursing Office	ABFC

Mission:

Provides complete disbursing facilities including buildings, equipment, and personnel for handling financial accounts of base personnel

Pacing Facility	610-10 Disbursing Office
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
3.0	25.0	0.9	25	480	2507

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$292,208	$38,931	4000 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00075	.00625	.00625

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	73.05	9.73	.627	.12	.000225

Pacing Facility Requirement Equation:

$$(0.4 \text{ SF/man}) \cdot (M_B + M_L + gM_S)$$

Data Sources Used: 2,3,5,6,8

Component ID	Description	Configuration Source
D24A	Ship's Store Facility	ABFC

Mission:

A small department store selling personal goods to all base personnel.

Pacing Facility	740-13	Exchange Laundry Plant
Other Principal Facilities	740-01	Navy Exchange Ships Store
	740-05	Snack Bar
	740-09	Tailor/Cobbler/Barber Shop
	821-50	Steam Plant

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
3.0	62.0	2.8	275	1577	9362

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,250,024	$169,273	8000 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000375	.00775	.0344

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	156.25	21.16	1.17	.197	.00035

Pacing Facility Requirement Equation:

$5000 \text{ SF} + (0.59 \text{ SF/man}) \cdot (M_B + M_L + gM_S)$

Data Sources Used: 2,3,4,5,6

Component ID	Description	Configuration Source
D29A	Air Cargo Terminal	ABFC

Mission:
Provides facilities to process air freight to and from the base.

Pacing Facility	141-12 Air Cargo Terminal
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
5.0	76.0	4.9	15	3469	49947

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$2,925,548	$1,052,129	70,000 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.0000714	.00109	.000214

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	41.79	15.03	.714	.050	.00007

Pacing Facility Requirement Equation:

$$8000 \text{ SF} + (104 \text{ SF/MT/day}) \cdot F_{ac} \cdot SV_c \cdot (1-F_c) \cdot C_{gc} \cdot (C+M_B+M_L+gM_S)/2000$$

Data Sources Used: 2,3,4,5,6

Component ID	Description	Configuration Source
D31A	Supply Storage and Administration	ABFC

Mission:

Comprises the personnel, storage, and office space to perform the tasks of a supply facility, <u>excluding</u> cold storage, transportation, materials handling, and waterfront operations.

Pacing Facility	441-10 General Warehouse
Other Principal Facilities	610-10 Office Building

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
23.0	160.0	24	252	9659	88177

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$7,549,054	$301,621	200,000 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000115	.0008	.00125

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	37.75	1.51	.441	.0483	.00012

Pacing Facility Requirement Equation:

$$(7.448\ \text{SF/MT}) \cdot SV_{nr} \cdot (1-P_r) \cdot C_{gc} \cdot (C+M_B+M_L+M_S) \cdot (DOS_c+DOS_{cr})/2000$$

Data Sources Used: 1,2,3,4,5,6

Component ID	Description	Configuration Source
D31E	Supply Support Facilities	SRI

Mission:
Provides specially equipped Pier(s) storage areas, and storage sheds for the handling, storage, and operational control of non-ammunition break-bulk cargo.

Pacing Facility	151-60 Supply Pier
Other Principal Facilities	152-60 Supply Wharf 153-10 Cargo Staging Area 153-20 Waterfront Transit Shed 441-30 Hazardous and Flammables Storehouse 451-10 Open Storage Area

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	0	6.6	851	1154	7772

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$10,788,254	$185,852	1550 FB

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	0	.549

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	6960.16	119.9	5.01	.745	.00426

Pacing Facility Requirement Equation:

$$(0.274\ FB/MT) \cdot SV_c \cdot C_{gc} \cdot [(1-F_c) \cdot (C+M_B+M_L+M_S)+(1-g)M_S]/2000$$

Data Sources Used: 1,5

Component ID	Description	Configuration Source
D32A	Refrigerated Storage	ABFC

Mission:
Comprises the buildings, refrigerating units, and personnel necessary to receive, store, and issue refrigerated stores; includes technical personnel to perform minor repairs to refrigeration units.

Pacing Facility	431-10 Cold Storage Warehouse
Other Principal Facilities	610-10 Administrative Office

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	22.0	0.4	786	1620	3122

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$2,744,972	$16,603	25,536 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.000862	.0308

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	107.49	.650	.122	.0634	.0000157

Pacing Facility Requirement Equation:

$$(7.84\ SF/MT) \cdot SV_r \cdot P_r \cdot C_{gc} \cdot (C+M_B+M_L+M_S) \cdot (DOS_c+DOS_{cr})/2000$$

Data Sources Used: 1,2,3,4,5

Component ID	Description	Configuration Source
D33A	Materials Handling Facilities	ABFC

Mission:
Provides materials handling and automotive equipment plus organizational and field maintenance for materials handling equipment.

Pacing Facility	214-20 Equipment Maintenance Shop
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
2.0	70.0	0.4	43	575	109,456

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$302,544	$2,237,712	4000 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.0005	.0175	.0108

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	75.64	559.43	27.36	.144	.0001

Pacing Facility Requirement Equation:

$$(6.429 \text{ SF/MT/day}) \cdot [SV_c \cdot C_{gc} \cdot (C+M_B+M_L+M_S+(1-g)M_S)+(1.07 \text{ MT/ST}) \cdot (X_a+Q_a)]/2000$$

Data Sources Used: 2,3,5,6

Component ID	Description	Configuration Source
F1	Cargo Handling Battalion	ASFC

Mission:
Provides personnel and equipment to load and offload general cargo and ammunition from visiting ships and aircraft.

Pacing Facility	610-10 Administration office
Other Principal Facilities	210-50 Battery Shop

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
12.0	270.0	5	20	516	157,245

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$481,897	$5,470,881	1872 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00641	.144	.0107

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	257.42	2922.48	84	.276	.002[illegible]7

Pacing Facility Requirement Equation:

$$(0.78\ SF/MT/day) \cdot [SV_c \cdot C_{gc} \cdot (C+M_B+M_L+M_S+(1-g)M_S)+(1.07\ MT/ST) \cdot (X_a+Q_a)]/2000$$

Data Sources Used: 2,3,5,6

Component ID	Description	Configuration Source
G2	Hospital	ABFC/SRI

Mission:
Provides hospital services to all personnel on base.

Pacing Facility	510-10	Hospital
Other Principal Facilities	143-10	Ambulance Garage
	219-10	Public Works Shop
	431-10	Cold Storage Warehouse
	441-10	General Warehouse
	610-10	Administrative Office
	722-10	Galley-Mess
	724-30	Mess Hall
	730-40	Laundry
	821-50	Steam Plant

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
108.0	400.0	27.1	777	46,546	116,362

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$46,624,271	$1,055,556	373,360

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000289	.00107	.00208

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	124.878	2.827	.312	.125	.0000726

Pacing Facility Requirement Equation:

$$40000\ SF + (2.33\ SF/man) \cdot (C + M_B + M_L + M_S)$$

Data Sources Used: 2,3,4,5,6,8

Component ID	Description	Configuration Source
G9	Dispensary	ABFC/SRI

Mission:

Provides sick call and emergency dispensary in-patient care where hospital facilities are available near by.

Pacing Facility	530-10 Clinic, Outpatient
Other Principal Facilities	610-10 Administrative Office

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
1.0	10.0	1	15	567	4345

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$556,542	$41,837	4800 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000208	.00208	.00313

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	115.95	8.72	.905	.118	.000208

Pacing Facility Requirement Equation:

$4000 \text{ SF} + (0.51 \text{ SF/man}) \cdot (C + M_B + M_L + gM_S)$

Data Sources Used: 2,3,4,5,6

Component ID	Description	Configuration Source
G28	Dental Clinic	ABFC

Mission:
Provides facilities for the dental care of all base personnel.

Pacing Facility	540-10 Dental Clinic
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
10.0	21.0	0.9	45	270	5703

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$488,711	$96,666	3840 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.0026	.00547	.0117

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	127.27	25.17	1.485	.0703	.000234

Pacing Facility Requirement Equation:

$$(0.384\ \text{SF/man}) \cdot (C+M_B+M_L+gM_S)$$

Data Sources Used: 2,3,5,6

Component ID	Description	Configuration Source
HA	Airfield Operations Support	SRI

Mission:
Provides runway, taxiway, parking, fueling, and safety facilities for visiting aircraft.

Pacing Facility	111-10 Runway, Fixed Wing
Other Principal Facilities	111-20 Helicopter Landing Pad 112-10 Taxiway 113-20 Aircraft Parking Apron 116-45 Line Vehicle Parking 121-10 Aircraft Direct Fueling Station 124-30 Aircraft Ready Fuel Storage 134-62 Wind Direction Indicator 134-64 Runway Distance Markers 136-10 Approach Lighting 136-20 Parking and Service Area Lighting 136-30 Runway Edge Lighting 136-50 Taxiway Lighting 136-65 Heliport Pad Lighting 141-20 Aircraft Fire and Rescue Station

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	24.0	91.8	294	3356	13,157

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$16,715,930	$229,355	222,222 SY

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.000108	.00132

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	75.222	1.032	.0592	.0151	.000413

Pacing Facility Requirement Equation:

One 222,222 SY Runway per Base

Data Sources Used: 1,3,4,5,6,7

Component ID	Description	Configuration Source
H9J	Aircraft Maintenance Facilities	SRI

Mission:
Provides maintenance services for visiting aircraft and their on-board flight safety equipment.

Pacing Facility	211-05	Maintenance Hangar, OH Space (Hi-Bay)
Other Principal Facilities	211-06	Maintenance Hangar, 01 Space (Crew/Equipment)
	211-07	Maintenance Hangar, 02 Space (Administrative)
	211-34	Parachute and Survival Equipment Shop

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
3.0	39.0	5.4	337	2173	21,103

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$5,311,526	$98,177	22,211 SF

MODEL PARAMETERS

	Officers	Enlisted	Power
Ripple Factors	.000135	.00176	.0152

	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
Estimating Relationship Parameters	239.139	4.420	.950	.0978	.000243

Pacing Facility Requirement Equation:

$$(23.33\ SF/MT/day) \cdot F_{ac} \cdot SV_c \cdot (1-F_c) \cdot C_{gc} \cdot (C+M_B+M_L+M_S)/2000$$

$$+[(1331\ SF/AC) \cdot NA_{L1} + (3173\ SF/AC) \cdot NA_{L2}]$$

Note: The amount of hangar space requirement representing space for maintenance activities for land-based operational aircraft [bracketed term in equation above] is not used to establish personnel requirements since these aircraft squadrons have pre-specified organic maintenance complements.

Data Sources Used: 1,4,5,6

Component ID	Description	Configuration Source
J3A	Ammunition Depot	ABFC

Mission:
Provides facilities and personnel for storing, maintaining, issuing, and reworking all types of ammunition.

Pacing Facility	421-22	High Explosive Magazine
Other Principal Facilities	214-20	Equipment Maintenance Shop
	216-10	Projectile Assembly Shop
	610-10	Administrative Office
	890-09	Utility Building

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
10.0	159.0	2480	299	28,836	124,221

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$26,816,318	$2,268,451	212,736 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000047	.000747	.00141

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	126.054	10.663	.584	.136	.0117

Pacing Facility Requirement Equation:

$$(19\ SF/ST)\cdot(DOS_{ar}+PC_{aa}\cdot DOS_{a})\cdot\sum_{i=1}^{N_p}(AP_i\cdot NP_i)/2000$$

$$+(14\ SF/ST)\cdot(DOS_{ar}+PC_{sa}\cdot DOS_{a})\cdot\sum_{i=1}^{N_s}(AS_i\cdot NS_i)/2000$$

Data Sources Used: 1,2,3,5,6

Component ID	Description	Configuration Source
J3D	Ordnance Support Facilities	SRI

Mission:
Provides pier(s), rework, and special ordnance storage facilities for ordnance materials. Supports Component J3A, Ammunition Depot

Pacing Facility	151-10 Ammunition Pier
Other Principal Facilities	151-70 Ordnance Container Handling Pier 152-10 Ammunition Wharf 152-70 Ordnance Container Handling Wharf 212-10 Ordnance Component Rework Building 421-32 Inert Storehouse 421-42 Smokedrum Storehouse 421-48 Small Arms/Pyrotechnics Magazine 421-62 Special Weapons Magazine (Nuclear) 421-72 Missile Magazine 425-10 Open Ammunition Storage Pad

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	0	3.8	573	670	4,515

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$13,244,844	$107,979	900 FB

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	0	.637

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	14716.49	120.00	5.02	.744	.00422

Pacing Facility Requirement Equation:

$$[(.084\ FB/MT)\cdot X_a \cdot F_a + (.228\ FB/MT)\cdot((1-F_a)\cdot X_a + Q_a)]/2000$$

Data Sources Used: 1,4,5

Component ID	Description	Configuration Source
J4	Explosive Ordnance Disposal	ABFC

Mission:
Provides personnel and equipment to render safe and dispose of unusable explosive ordnance.

Pacing Facility	143-20 Explosive Ordnance Disposal Building
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
1.0	3.0	320	11	335	7,566

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$472,618	$195,635	960 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00104	.00313	.0115

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	492.31	203.79	7.881	.349	.333

Pacing Facility Requirement Equation:

One 960 SF Facility per Base

Data Sources Used: 2,3,5,6

Component ID	Description	Configuration Source
NA	Family Support	SRI

Mission:
Provides housing, schools, commissary, and child care services to families on base.

Pacing Facility	711-20 Family Housing
Other Principal Facilities	730-45 Dependent School 740-23 Commissary 740-74 Child Care Center

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
3.0	25.0	107	11255	287,297	172,152

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$161,156,507	$344,886	2,222,111 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00000135	.0000113	.00507

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	72.52	.155	.0775	.129	.0000482

Pacing Facility Requirement Equation:

$(1333\ SF/man) \cdot (P_{mo} \cdot O_B + P_{me} \cdot E_B)$

Data Sources Used: 4,5,8,9

Component ID	Description	Configuration Source
NB	Enlisted Personnel Support	SRI

Mission:
Provides living quarters, messing, and uniform shop facilities for bachelor enlisted personnel on base.

Pacing Facility	721-11 Bachelor Enlisted Quarters
Other Principal Facilities	722-10 Enlisted Dining Facility (Detached) 730-13 Issue/Retail Clothing and Uniform Center

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	238.0	16.9	2090	45,606	223,023

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$40,757,032	$1,254,802	356,619 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.000667	.00586

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	114.29	3.519	.625	.128	.0000474

Pacing Facility Requirement Equation:

$$(118 \text{ SF/man}) \cdot [(1-P_{me}) \cdot E_B + E_L + gE_S]$$

Data Sources Used: 2,4,5,6,8

Component ID	Description	Configuration Source
NC	Officer Personnel Support	SRI

Mission:

Provides living quarters for bachelor officers on the base (without messing facilities).

Pacing Facility	724-00 Bachelor Officers' Quarters
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	15.0	4.9	612	13,360	14,022

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$12,121,658	$103,421	111,340 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.000135	.0055

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	108.87	.929	.126	.120	.000044

Pacing Facility Requirement Equation:

$$(586 \text{ SF/man}) \cdot [(1-P_{mo}) \cdot O_B + O_L + gO_S]$$

Data Sources Used: 2,4,5,8

Component ID	Description	Configuration Source
ND	Personal Services (all personnel)	SRI

Mission:

Provides bakery, banking, family services, filling station, and parking facilities for all base personnel.

Pacing Facility	740-30 Exchange Service and Auto Repair Station
Other Principal Facilities	730-30 Bakery 740-18 Bank 740-25 Personal Family Services Center 740-86 Exchange Installation Warehouse 852-10 Parking Areas

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	9.0	18	154	3129	9518

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$4,752,634	$78,144	4880 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.001844	.0316

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	900.13	16.01	1.950	.641	.00369

Pacing Facility Requirement Equation:

$$900\ SF+(0.522\ SF/man)\cdot(M_B+M_L+gM_S)$$

Data Sources Used: 4,5,6,7,8

Component ID	Description	Configuration Source
NE	Recreational Facilities (all personnel)	SRI

Mission:
Provides sports, hobby, theater, and library facilities for all base personnel.

Pacing Facility	740-37 Special Services Issue and Office
Other Principal Facilities	740-36 Hobby Shop (Arts and Crafts) 740-38 Hobby Shop (Automotive) 740-40 Bowling Alley 740-43 Gymnasium 740-55 Youth Center 740-56 Theater 740-76 Library 750-20 Playing Fields 750-30 Outdoor Swimming Pool 750-40 Golf Course

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
1.0	7.0	33.8	760	13,040	46,872

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$14,653,670	$226,071	5263 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00019	.00133	.144

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	2746.28	42.95	8.906	2.478	.00642

Pacing Facility Requirement Equation:

$$1000\ SF+(0.631\ SF/man)\cdot(.1C+M_B+M_L+gM_S)$$

Data Sources Used: 4,5,6,8

Component ID	Description	Configuration Source
N10B	Military Training and Education	SRI

Mission:
Provides instruction classrooms, small arms firing range, drill field, and educational/training counseling services to base military personnel.

Pacing Facility	171-20	Applied Instruction Building
Other Principal Facilities	179-40	Small Arms Range-Outdoor
	179-60	Parade and Drill Field
	740-88	Educational Services Office

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
4.0	12.0	42.8	301	4,820	12,265

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$5,260,890	$95,286	32,850 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000122	.000365	.00916

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	160.15	2.901	.373	.147	.00130

Pacing Facility Requirement Equation:

$$(7.5\ SF/man)\cdot(E_B+E_L+gE_S)$$

Data Sources Used: 4,5,6,8

Component ID	Description	Configuration Source
N14	Chapel	ABFC

Mission:
Provides religious worship and counseling services to all base personnel.

Pacing Facility	740-10 Chapel
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
3.0	3.0	0.9	6	480	2834

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$720,993	$23,389	4000 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.00075	.00075	.0015

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	180.25	5.847	.709	.12	.000225

Pacing Facility Requirement Equation:

$$2450\ SF+(1.426\ SF/man)\cdot(C+M_B+M_L+gM_S)$$

Data Sources Used: 2,3,4,5,6,8

Component ID	Description	Configuration Source
N16	Officers' Recreation	ABFC

Mission:
Provides social recreation and messing facilities for officers on the base and their dependents.

Pacing Facility	740-60 Commissioned Officers' Mess (Open)
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
2.0	20.0	2.4	84	1920	19,909

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$2,741,863	$94,676	16,000 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000125	.00125	.00525

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	171.37	5.917	1.244	.12	.00015

Pacing Facility Requirement Equation:

$$8000\ SF+(7.382\ SF/man)\cdot[(1+.5P_{mo})\cdot O_B+O_L+gO_S)$$

Data Sources Used: 2,3,4,5,8

Component ID	Description	Configuration Source
N17	Enlisted Recreation	ABFC

Mission:

Provides social recreation for enlisted men on the base, and their dependents.

Pacing Facility	740-63 Enlisted Mens' Club 740-66 Petty Officers' Mess (Open)
Other Principal Facilities	

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
3.0	37.0	104	82	1436	13,191

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,576,172	$46,212	16,736 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000179	.00221	.0049

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	94.18	2.76	.788	.0858	.00621

Pacing Facility Requirement Equation:

$12000\ SF+(4.636\ SF/man)(E_B+E_L+gE_S)$

Data Sources Used: 2,3,4,5

Component ID	Description	Configuration Source
P5	Public Works Unit	ABFC/SRI

Mission:

Provides technically trained personnel and equipment required for the maintenance and operation of public works and utilities on the base.

Pacing Facility	219-10	Public Works Shop
Other Principal Facilities	214-20	Equipment Maintenance Shop
	214-55	Vehicle Wash Platform
	219-25A	Public Works Shops Store
	610-10	Administrative Office

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
.0	270.0	13	466	2968	198,923

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,701,593	$5,099,817	8000 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.000875	.0338	.0583

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	212.70	637.48	24.865	.371	.00163

Pacing Facility Requirement Equation:

$(2.5\ SF/man)\cdot(M_B+M_L+gM_S)$

Data Sources Used: 1,2,3,4,5,6

Component ID	Description	Configuration Source
P5A	Automotive Maintenance	ABFC

Mission:

Provides personnel, tools, and equipment for organizational and field maintenance of Navy-owned automotive, and weight handling equipment (excludes materials handling and construction equipment).

Pacing Facility	214-20 Automotive Vehicle Maintenance Shop
Other Principal Facilities	123-10 Fuel Dispensing Station 214-55 Vehicle Wash Platform 441-10 Office/Storage/Outfitting Building

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
1.0	40.0	6.2	224	2586	21,803

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,492,447	$598,563	16,000 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	.0000625	.0025	.014

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	93.28	37.41	1.363	.162	.000388

Pacing Facility Requirement Equation:

$$2900\ \text{SF} + (1.871\ \text{SF/man}) \cdot (M_B + M_L)$$

Data Sources Used: 2,3,4,5,6

Component ID	Description	Configuration Source
P12A	Fire Protection-Structural and Oil	ABFC

Mission:

Provides the capability for fighting structural, brush, and grass fires, as well as fires at the fuel tank farms on the base.

Pacing Facility	730-10 Fire Station
Other Principal Facilities	730-11 Fire Hose Drying Structure

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	40.0	0.4	32	512	9,815

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$291,525	$219,074	4600 SF

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.0087	.00696

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	63.38	47.62	2.134	.111	.000087

Pacing Facility Requirement Equation:

$(0.613\ SF/man) \cdot (C+M_B+M_L+gM_S)$

Data Sources Used: 2,3,4,5,6

Component ID	Description	Configuration Source
P15	Base Power Plant	ABFC

Mission:
Provides generator station, transmission lines, and transformer stations to supply electrical power to all base activities.

Pacing Facility	811-00	Electric Power Plant
Other Principal Facilities	812-12 812-30	Transformer Station Electrical Distribution System

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	9.0	1	0	431	9,146

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,725,000	$55,465	3000 KW

MODEL PARAMETERS

	Officers*	Enlisted*	Power
Ripple Factors	0	9.0	0

	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
Estimating Relationship Parameters	575	18.49	3.049	.144	.000333

Pacing Facility Requirement Equation:

$$\sum_{i=1}^{N_{comp}} (R_i \cdot R_{pi})$$

Data Sources Used: 2,3,4,6,10

*For the Electric Power Plant, a basic complement of nine enlisted men is assumed. Other required personnel are furnished by other base components. In the model, these parameters are constants and not ripple factors.

Component ID	Description	Configuration Source
P16	Waste Management	SRI

Mission:

Provides sewage and waste treatment, outfall sewage disposal, and sanitary cut-fill disposal for base waste.

Pacing Facility	831-10 Combination Sewage and Industrial Waste Treatment Plant
Other Principal Facilities	831-20 Outfall Sewer Line 833-15 Sanitary Cut-fill Disposal Area

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	24.0	36.6	174	1782	25,279

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$4,767,972	$251,920	872 KG

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.0275	.2

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	5467.86	288.9	28.99	2.044	.042

Pacing Facility Requirement Equation:

$(0.1 \text{ KG/man})\cdot(C+M_B+M_L+gM_S)$

Data Sources Used: 5,6,7,8,11

Component ID	Description	Configuration Source
P18	Water System	SRI

Mission:
Provides water wells, water treatment and water distribution services for the base.

Pacing Facility	841-09 Water Treatment Facility
Other Principal Facilities	841-20 Supply Mains and Pumping Facilities 841-50 Water Wells

BASIC SIZE COMPONENT

Personnel		Land (acres)	Power (KW)	Construction Time (man-days)	Equipment Shipping Vol. (cu. ft.)
Officers	EM				
0	5.0	25	174	758	0

Construction Cost	Initial Outfitting Cost (Supplies & Equipment)	Pacing Facility Basic Size
$1,696,763	0	872 KG

MODEL PARAMETERS

Ripple Factors	Officers	Enlisted	Power
	0	.00573	.2

Estimating Relationship Parameters	Construction Cost	Equipment Cost	Equipment Shipping Volume	Construction Time	Land
	1945.83	0	0	.869	.0287

Pacing Facility Requirement Equation:

$(0.1 \text{ KG/man}) \cdot (C+M_B+M_L+gM_S)$

Data Sources Used: 1,5,7,8,11

DATA SOURCES

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2. "Table of Advanced Base Functional Components, With Abridged Initial Outfitting Lists," OPNAV 41P3A, January 1978.
3. "Facilities Planning Guide," Volume 2, NAVFAC P-437, February 1979.
4. "Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations," NAVFAC P-80, August 1974.
5. Draft copy NAVFAC P-438, Construction Cost Data (computer printout), January 20, 1979, in two volumes.
6. "Army Force Planning Cost Handbook," Directorate of Cost Analysis, Office of the Comptroller of the Army, July 1973.
7. "Building Construction Cost Data, 1979," 37th Annual Edition, Robert Snow Means Company, Inc., Duxbury, Massachusetts, 1978.
8. Private communication with Wheatley Associates, contractors, Palo Alto, California.
9. DoD Military Construction Cost Review Guide for FY78 and FY79, NAVFACENGCOM.
10. "A Feasibility Study of Windpower for the New England Area," Final Report, SRI International, October 1979.
11. U.S. Budget, FY 1980.
12. "Regional Master Plan, Naval Complex, Adak, Alaska," Western Division, Naval Facilities Engineering Command, San Bruno, California (undated).
13. "Detailed Inventory of Naval Shore Facilities: MARCORPS Supply Center, Barstow, California," 30 June 1973.

Appendix B

ABCOMO COMPUTER PROGRAM LISTING

Appendix B

ABCOMO COMPUTER PROGRAM LISTING

This appendix presents a complete listing of the ABCOMO computer program. The program is written in the FORTRAN Extended language (version 3.0) for the CONTROL DATA 6400 computer. The listing presents first the program execution routine PROGRAM MAIN. The applicable subroutines are then listed in alphabetical order.

PROGRAM MAIN TRACE CDC 6700 FTN V3.0-355F OPT=0 80/05/29. 09.28.48.

```
      PROGRAM MAIN(INPUT,OUTPUT,TAPE5      ,TAPE6=OUTPUT)
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      CALL INIT
      CALL REINIT
      CALL INPUT
   10 CALL AIRCFT
      CALL SHIPS
      IF(IERR.NE.0)GO TO 20
      CALL IAMMO
      CALL FIG1(RO,RE)
      CALL FIG2(RO,RE)
      CALL CPIERS
      CALL APIERS
      CALL RIPPLE
      CALL FIG3
      CALL COMPON
      CALL COSTS
   20 CONTINUE
      CALL REINIT
      GO TO 10
      END
```

```
      SUBROUTINE AIRCFT
C
C     THIS ROUTINE READS AIRCRAFT COMPLEMENT CARDS AND PERFORMS
C     PRELIMINARY CALCULATIONS FOR USE BY OTHER ROUTINES
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,IPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSB,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK4/ IBIG,DO,DE,HSQUAD,TACAC,CARAC,PATAC,HELOS,
     A              HSLTAC,HSLCAR,HSLPAT,HSLHEL
      COMMON /BLK5/ JX(100),KX(100),LX(100),X1(100),X2(100),X3(100),
     A              X4(100),X5(100),X(100)
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
      DATA EOF /6H******/,BLANK/1H /,END/3HEND/
C
C     READ AIRCRAFT COMPLEMENT
C
   20 READ(5,1006)Z,Y,CODE
 1006 FORMAT(A8,1X,F3.0,1X,A8)
      IF(Z.NE.END)GO TO 30
      WRITE(6,1000)
 1000 FORMAT(1H1)
      STOP
   30 CONTINUE
      J=Y+.1
C
C     TEST FOR END OF AIRCRAFT
C
      IF(Z.EQ.EOF)GO TO 71
      IF(J.LT.0)CALL IERROR(12,Z)
C
C     SET CARRIER BASED FLAG
C
      ISHP=1
      IF(CODE.EQ.BLANK)ISHP=0
C
C     SET AIRCRAFT FLAG
C
      IAFLG=1
C
C     DETERMINE AIRCRAFT TYPE
C
      DO 40 I=1,NOAC
      IF(Z.EQ.X(I))GO TO 60
   40 CONTINUE
C
C     IF ILLEGAL A/C TYPE, STOP PROGRAM
C
      CALL IERROR(2,Z)
```

```
SUBROUTINE  AIRCFT    TRACE                    CDC 6700 FTN V3.0-355F OPT=0  80/05/29. 09.26.48.
      60 CONTINUE
C
C        INCREMENT NUMBER PER TYPE
C
         IANUML(I)=IANUML(I)+J*(1-ISHP)
         IANUM(I)=IANUM(I)+J
C
C        INCREMENT OFFICERS AND ENLISTED MEN DUE TO THIS DRIVER INPUT
C
         DO=DO+Y*X1(I)*(1-ISHP)
         DE=DE+Y*X2(I)*(1-ISHP)
         DSO=DSO+Y*X1(I)*ISHP
         DSE=DSE+Y*X2(I)*ISHP
         DAO=DAO+Y*X1(I)*ISHP
         DAE=DAE+Y*X2(I)*ISHP
C
C        INCREMENT TEMPORARY AMMO
C
         TEMAMO=TEMAMO+AAMMO(I)*Y*ISHP
C
C        INCREMENT TOTAL AMMO
C
         IF(ISHP.EQ.0)GO TO 10
         XA=XA+AAMMO(I)*Y
         GO TO 15
      10 XA=XA+AAMMO(I)*Y
      15 CONTINUE
C
C        COMPUTE TYPES 1 AND 2 AIRCRAFT COUNTS
C
         IF(JX(I).EQ.4)GO TO 80
         IF(A4(I).LE.85.)GO TO 80
         TYPE2=TYPE2+Y*(1-ISHP)
         GO TO 90
      80 TYPE1=TYPE1+Y*(1-ISHP)
      90 CONTINUE
C
C        READ NEXT DRIVER INPUT
C
         GO TO 20
      71 CONTINUE
         RETURN
         END
```

```
SUBROUTINE  APIERS    TRACE                         CDC 6700 FTN V3.0-355F OPT=0  80/05/29. 09.26.48.

                SUBROUTINE APIERS
          C
          C     THIS ROUTINNE CALCULATES ROUNDED PIER AND WHARF REQUIREMENTS
          C     FROM THE RAM REQUIREMENTS M1A,M2A,M3A
          C
                COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
               A              IEND,IFRONT,LAST,NOAC,NUS,IERR,P(75),PP(23),ROF,REF,
               B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
                COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
               A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
               B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
                COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSB,DOSBR,
               A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
               B              TYPE1,TYPE2,TYPE3,TEMAMO
                REAL LA,LAP,LC,LCF,M1A,M2A,M3A,M4A,M1,M2,M3
          C
          C     COMPUTE AMMO CONTAINER PIER REQUIREMENTS
          C
                AMOD1A=AMOD(M1A,2.*P(45))
                M1APRM=0
                IF(AMOD1A.NE.0.)M1APRM=1
                FB1A=2.*P(45)*M1APRM-AMOD1A
                FBCONA=M1A-AMOD1A+2.*P(45)*M1APRM
          C
          C     COMPUTE AMMO BREAK BULK PIER REQUIREMENTS
          C
                AMOD2A=AMOD(M2A,2.*P(46))
                FB2A=M2A-AMOD2A
                M2APRM=1
                IF(AMOD2A.LT.FB1A)M2APRM=0
                FBSUPA=FB2A+2.*P(46)*M2APRM
          C
          C     COMPUTE AMMO TOTAL FB REQUIREMENTS
          C
                A(11)=FBCONA+FBSUPA
                RETURN
                END
```

```
      SUBROUTINE COMPON
C
C     THIS ROUTINE COMPUTES COMPONENT REQUIREMENTS AND PRINTS OUT
C     REQUIREMENTS REPORTS
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSH,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK6/ IDAY,IGEOCT,ILINES,IDPLUS,IPAGE,IBUF(12),IGEO,
     A              ERF(100),ORF(100),ITITLE(4),LNCT,NGEO
      COMMON /BLK9/ CTABLE(100,15),CONSTR,EQUIP,EVOL,CONTIM,FLAND,
     A              CFGEO,CSCTOT
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
      INTEGER OS,ES,AMMO,FUEL
C
C     SET UP REQUIREMENTS TITLE
C
      ITITLE(1)=8HSUMMARY
      ITITLE(2)=8HOF PROJE
      ITITLE(3)=8HCTED REQ
      ITITLE(4)=8HUIREMENT
      CALL HEADER
      ILINES=ILINES+6
      WRITE(6,1001)
C
C     WRITE REQUIREMENTS REPORT
C
      DO 10 I=1,LAST
      ILINES=ILINES+1
      IF(ILINES.LE.LNCT)GO TO 919
      CALL HEADER
      WRITE(6,1001)
      ILINES=ILINES+7
  919 CONTINUE
      WRITE(6,1002)(TABLE(I,J),J=1,5),ORF(INDEX(I)),ERF(INDEX(I)),
     A              A(INDEX(I)),TABLE(I,6)
   10 CONTINUE
 1001 FORMAT(T69,9HCOMPONENT,T89,15HPACING FACILITY/T21,9HCOMPONENT,
     A       T40,15HPACING FACILITY,T64,18HBASE OPS PERSONNEL,
     B       T91,11HREQUIREMENT/T25,2HID,T63,
     C       21HOFFICERS      ENLISTED/)
 1002 FORMAT(T25,A8,T35,4A6,T65,F6.1,T77,F6.1,T88,F10.1,2X,A4)
C
C     SET UP COMPONENT TITLE
C
      ITITLE(1)=8HSUMMARY
      ITITLE(2)=8HOF COMPO
      ITITLE(3)=8HNENT REQ
      ITITLE(4)=8HUIREMENT
```

```
      CALL HEADER
      ILINES=ILINES+6
      WRITE(6,1003)
 1003 FORMAT(T6,5HCOMP.,T24,9HCOMPONENT,T48,12HCONSTRUCTION,T65,
     A       9HEQUIPMENT,T81,9HEQUIPMENT,T96,12HCONSTRUCTION,T112,
     B       4HLAND/T7,2HID,T23,11HDESCRIPTION,T52,4HCOST,T67,
     C       4HCOST,T83,4HCUBE,T100,4HTIME,T112,5HREQMT/T47,
     D       10H(THOUSANDS,T63,10H(THOUSANDS,T79,12H(MEASUREMENT,
     E       T97,10H(MAN-DAYS),T111,7H(ACRES)/T48,11HOF DOLLARS),
     F       T64,11HOF DOLLARS),T83,5HTONS)/)
C
C     COMPUTE AND WRITE COMPONENT REPORT
C
      CONSTR=0.
      EQUIP=0.
      EVOL=0.
      CONTIM=0.
      FLAND=0.
      DO 20 I=1,LAST
      IA=A(INDEX(I))+.5
      IF(IA.LE.0)GO TO 15
      FCO=(CTABLE(I,6)+CTABLE(I,7)*IA)/1000.
      FE=(CTABLE(I,8)+CTABLE(I,9)*IA)/1000.
      FV=(CTABLE(I,10)+CTABLE(I,11)*IA)/40.
      FCOT=CTABLE(I,12)+CTABLE(I,13)*IA
      FLAN=CTABLE(I,14)+CTABLE(I,15)*IA
      GO TO 18
   15 CONTINUE
      FCO=0.
      FE=0.
      FV=0.
      FCOT=0.
      FLAN=0.
   18 CONTINUE
      I1=FCO+.5
      J1=FE+.5
      K1=FV+.5
      L1=FCOT+.5
      M11=FLAN+.5
      ILINES=ILINES+1
      IF(ILINES.LE.LNCT)GO TO 925
      CALL HEADER
      WRITE(6,1003)
      ILINES=ILINES+7
  925 CONTINUE
      WRITE(6,1004)(CTABLE(I,J),J=1,5),I1,J1,K1,L1,M11
 1004 FORMAT(5X,A4,2X,4A8,5X,3(I9,7X),I9,5X,I6)
      CONSTR=CONSTR+FCO
      EQUIP=EQUIP+FE
      EVOL=EVOL+FV
      CONTIM=CONTIM+FCOT
      FLAND=FLAND+FLAN
   20 CONTINUE
      I1=CONSTR+.5
      J1=EQUIP+.5
```

```
SUBROUTINE  COMPON    TRACE                  CDC 6700 FTN V3.0-355F OPT=0  80/05/29. 09.28.48.
          K1=EVOL+.5
          L1=CONTIM+.5
          M11=FLAND+.5
          WRITE(6,1005)I1,J1,K1,L1,M11
     1005 FORMAT(T5,113(1H-)/T28,14HTOTAL FOR BASE,4(7X,I9),5X,I6)
          WRITE(6,1006)
     1006 FORMAT(//T5,48HFOOTNOTE - CONSTRUCTION COSTS NOT MODIFIED TO RE,
         A       33HFLECT GEOGRAPHIC COST MULTIPLIERS//)
          RETURN
          END
```

```
      SUBROUTINE COSTS
C
C     THIS SUBROUTINE COMPUTES THE INITIAL INVESTMENT COSTS
C     FOR THE BASE CONSTRUCTION AND INITIAL OUTFITTING. THE
C     RECURRING ANNUAL OPERATIONS AND SUPPORT COSTS FOR THE BASE.
C     AND THE ANNUAL TRANSPORT COSTS FOR THE SUPPORTED FORCES SUPPLIES.
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSB,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FL,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK6/ IDAY,IGEOCT,ILINES,IDPLUS,IPAGE,IBUF(12),IGEO,
     A              ERF(100),ORF(100),ITITLE(4),LNCT,NGEO
      COMMON /BLK8/ GC,PR,SUBR,PPMPD(10),CPP(13),
     A              XPLMT,XAMTP,ZMSTR,ZMSTNR,ZMSTC,PR1,XPSMT,XPAMT
      COMMON /BLK9/ CTABLE(100,15),CONSTR,EQUIP,EVOL,CONTIM,FLAND,
     A              CFGEO,CSCTOT
      COMMON /BLK11/ SCPP(12),CTPGEO,CTSGEO,CTRGEO,CPO,CPE,
     A               PPMNAV(10),DENS(5)
      COMMON /BLK12/ PCMO,PCME,DEPPMO,DEPPME,BLOU,BLOM,BLEU,BLEM,
     A               PCPLAN,CPALAN,CLALAN
      DATA IEOF/6H******/
      CPERS=(CPO*OBAS+CPE*EBAS)
      TBAS=OBAS+EBAS
      CSUP=SCPP(1)*PPMNAV(1)*(1.-PPMPD(9))+SCPP(9)*PPMNAV(1)*PPMPD(9)
      BSPV=CPP(1)*PPMPD(1)*(1.-PPMPD(9))
      DO 10 I=2,8
      CSUP=CSUP+SCPP(I)*PPMNAV(I)
      BSPV=BSPV+CPP(I)*PPMPD(I)
   10 CONTINUE
      CSUP=CSUP*TBAS*0.365
      BSPV=BSPV*9.125
      BSPVR=PPMPD(1)*CPP(1)*PPMPD(9)*9.125
      SFSPV=BSPV*TPERS
      SFSPVR=BSPVR*TPERS
      SFSFU=365.*A(7)*PCSF/(DOSSR+PCSF*DOSS)
      SFAFU=365.*A(8)*PCAF/(DOSPR+PCAF*DOSP)
      SFSFU=SFSFU/DENS(4)
      SFAFU=SFAFU/DENS(5)
      EPERS=(1.+PCMO*DEPPMO)*OBAS+(1.+PCME*DEPPME)*EBAS
      BSPV=BSPV*EPERS
      BSPVR=BSPVR*EPERS
      BLVOL=((BLOU*(1.-PCMO)+BLOM*PCMO)*OBAS+(BLEU*(1.-PCME)+
     A      BLEM*PCME)*EBAS)/40.
      WBFUEL=0.
      CBFUEL=0.
      DO 15 I=1,3
      CBFUEL=CBFUEL+A(93-I)*SCPP(I+9)*365./(DOSB+DOSBR)
      WBFUEL=WBFUEL+A(93-I)*365./((DOSB+DOSBR)*DENS(I))
   15 CONTINUE
      CBFUEL=CBFUEL/1000.
   20 CONTINUE
C
```

```
C     READ AND WRITE GEOGRAPHIC DEPENDENT INPUTS
C
      READ(5,1500)(ITITLE(I),I=1,4)
 1500 FORMAT(4A8)
      IF(ITITLE(1).EQ.IEOF)GO TO 30
      NGEO=NGEO+1
      CALL HEADER
      READ(5,2000)CFGEO,CTSGEO,CTRGEO,CTPGEO,CTFGEO,CTAGEO,PCPLAN,
     A          CPALAN,CLALAN
 2000 FORMAT(F6.3,1X,5(F7.2,1X),F5.3,1X,2(F7.1,1X))
      WRITE(6,2001)CFGEO,CTSGEO,CTRGEO,CTPGEO,CTFGEO,CTAGEO,PCPLAN,
     A          CPALAN,CLALAN
 2001 FORMAT(T39,27HGEOGRAPHIC DEPENDENT INPUTS//T33,14HCONSTRUCTION C,
     A       16HOST MULTIPLIER -,2X,F6.3/
     C       T37,15HTRANSPORT COSTS/T48,
     D       15HGENERAL CARGO -,1X,F7.2,2X,24HDOLLARS PER MEASUREMENT ,
     E       3HTON/T49,14HREEFER CARGO -,1X,F7.2,2X,15HDOLLARS PER MEA,
     F       12HSUREMENT TON/T52,11HPERSONNEL -,1X,F7.2,2X,9HDOLLARS P,
     G       9HER PERSON/T53,10HBULK POL -,1X,F7.2,2X,10HDOLLARS PE,
     H       10HR LONG TON/T51,12HAMMUNITION -,1X,F7.2,2X,9HDOLLARS P,
     I       18HER MEASUREMENT TON/T24,27HPROPORTION LAND REQUIREMENT,
     J       11H PURCHASED ,
     K       1H-,3X,F5.3/T43,20HLAND PURCHASE COST -,1X,F7.1,2X,
     L       16HDOLLARS PER ACRE/T46,17HLAND LEASE COST -,1X,F7.1,2X,
     M       16HDOLLARS PER ACRE)
      WRITE(6,500)
  500 FORMAT(/////T50,29HBASE INITIAL INVESTMENT COSTS//)
C
C     COMPUTE AND WRITE BASE INITIAL INVESTMENT COSTS
C
      CONSR=CONSTR*CFGEO
      TEQUIP=(CTSGEO*EVOL)/1000.
      TPERS=EPERS*CTPGEO/1000.
      TPERBL=(CTSGEO*BLVOL)/1000.
      CILAND=PCPLAN*FLAND*CPALAN/1000.
      TOTINV=CONSR+EQUIP+TEQUIP+TPERS+TPERBL+CILAND
      I=CONSR+.5
      I1=EQUIP+.5
      J=TEQUIP+.5
      J1=TPERS+.5
      K=TPERBL+.5
      K1=CILAND+.5
      L=TOTINV+.5
      WRITE(6,1000)I,I1,J,J1,K,K1,L
 1000 FORMAT(T49,31H(COSTS IN THOUSANDS OF DOLLARS)///T47,9HBASE FACI,
     A       19HLITY CONSTRUCTION -,I7/
     B       T30,38HINITIAL OUTFITTING (EQUIPMENT AND SUPP,
     C       7HLIES) -,I7/T38,37HTRANSPORT OF EQUIPMENT AND SUPPLIES -,
     D       I7/T31,44HTRANSPORT OF BASE PERSONNEL AND DEPENDENTS -,I7/
     E       T41,34HTRANSPORT OF PERSONAL BELONGINGS -,I7/T57,6HLAND A,
     F       12HCQUISITION -,I7/T31,51(1H-)/T39,19HTOTAL BASE INITIAL ,
     G       17HINVESTMENT COST -,I7)
      CALL HEADER
C
C     COMPUTE BASE ANNUAL RECURRING COSTS
```

```
C
      CTHFUE=CTFGEO*WHFUEL/1000.
      CTSUP=(CTSGEO*HSPV+CTRGEO*HSPVR)/1000.
      CTPERS=2.*EPERS*CTPGEO/3000.
      CTPBL=2.*CTSGEO*BLVOL/3000.
      CLLAND=(1.-PCPLAN)*FLAND*CLALAN/1000.
      TOTUAS=CPERS+CSUP+CTSUP+CTPERS+CTPBL+CLLAND+CTHFUE+CHFUEL
      I=CPERS+.5
      I1=CSUP+.5
      J=CTSUP+.5
      J3=CBFUEL+.5
      J2=CTHFUE+.5
      J1=CTPERS+.5
      K=CTPBL+.5
      K1=CLLAND+.5
      L=TOTOAS+.5
      WRITE(6,1003)
 1003 FORMAT(//////T51,27HBASE ANNUAL RECURRING COSTS//)
      WRITE(6,1001)I,I1,J,J3,J2,J1,K,K1,L
 1001 FORMAT(T49,31H(COSTS IN THOUSANDS OF DOLLARS)///T56,9HPERSONNEL,
     A      10H BILLETS -,I7/T51,24HSUPPLIES AND EQUIPMENT -,I7/T38,
     B    37HTRANSPORT OF SUPPLIES AND EQUIPMENT -,I7/T64,8HBASE FUE,
     C      3HL -,I7/T51,24HTRANSPORT OF BASE FUEL -,I7/T25,7HTRANSPO,
     D      43HRT OF ROTATIONAL PERSONNEL AND DEPENDENTS -,I7/T41,
     E      34HTRANSPORT OF PERSONAL BELONGINGS -,I7/T63,9HLAND LEAS,
     F      3HE -,I7/T25,57(1H-)/T41,29HTOTAL BASE ANNUAL RECURRING C,
     G      5HOST -,I7)
C
C     COMPUTE SUPPORTED FORCES ANNUAL TRANSPORT
C     COSTS(CONUS TO FORWARD BASE) OF SUPPLIES,
C     EQUIPMENT, POL, AND AMMUNITION
C
      CSFSUP=(CTSGEO*SFSPV+CTRGEO*SFSPVR)/1000.
      CSFSFU=CTFGEO*SFSFU/1000.
      CSFAFU=CTFGEO*SFAFU/1000.
      CSFSAM=CTAGEO*PCSA*XPSMT*.365
      CSFAAM=CTAGEO*PCAA*XPAMT*.365
      I  =CSFSUP+.5
      I1 =CSFSFU+.5
      J  =CSFAFU+.5
      J1 =CSFSAM+.5
      K  =CSFAAM+.5
      WRITE(6,1002)I,I1,J,J1,K
 1002 FORMAT(//////T33,45HSUPPORTED FORCES ANNUAL TRANSPORT COSTS - CON,
     A18HUS TO FORWARD BASE///T49,31H(COSTS IN THOUSANDS OF DOLLARS)///
     BT51,24HSUPPLIES AND EQUIPMENT -,I7/T64,11HSHIP FUEL -,I7/T60,
     C15HAIRCRAFT FUEL -,I7/T58,17HSHIP AMMUNITION -,I7/T54,
     D21HAIRCRAFT AMMUNITION -,I7)
      GO TO 20
   30 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE CPIERS
C
C     THIS ROUTINE CALCULATES ROUNDED PIER AND WHARF REQUIREMENTS
C     FROM THE RAM REQUIREMENNTS M1, M2, M3
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSB,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3,M4
C
C     COMPUTE CARGO CONTAINER PIER REQUIREMENT
C
      AMOD1=AMOD(M1,2.*P(16))
      M1PRM=0
      IF(AMOD1.NE.0.)M1PRM=1
      FBCON=M1-AMOD1+2.*P(16)*M1PRM
      A(93)=FBCON
C
C     COMPUTE CARGO BREAK BULK PIER REQUIREMENT
C
      AMOD2=AMOD(M2,2.*P(27))
      M2PRM=0
      IF(AMOD2.NE.0.)M2PRM=1
      FBSUP=M2-AMOD2+2.*P(27)*M2PRM
      A(85)=FBSUP
      RETURN
      END
```

```
      SUBROUTINE FIG1(RO,RE)
C
C     THIS ROUTINE CALCULATES FACILITY REQUIREMENTS FOR MEN
C     INDEPENDENT FACILITIES
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSH,DOSHR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK4/ IBIG,DO,DE,HSQUAD,TACAC,CARAC,PATAC,HELOS,
     A              HSLTAC,HSLCAR,HSLPAT,HSLHEL
      COMMON /BLK5/ JX(100),KX(100),LX(100),X1(100),X2(100),X3(100),
     A              X4(100),X5(100),X(100)
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
      INTEGER OS,ES
C
C     COMPONENT A4
C
      A(1)=P(2)
C
C     COMPONENT BB
C
      A(2)=P(7)
C
C     COMPONENT B5A
C
      A(3)=P(8)
C
C     COMPONENT C3A
C
      A(4)=P(10)
C
C     COMPONENT C27J
C
      A(5)=P(14)
C
C     COMPONENT C32A
C
      A(6)=P(15)
C
C     COMPONENT D3A1
C
      A(7)=0.
      DO 10 I=1,NOS
   10 A(7)=A(7)+FUEL(I)*ISNUM(I)
      A(7)=A(7)*(DOSSR+PCSF*DOSS)
C
C     COMPONENT D3A2
C
      A(8)=0.
```

```
SUBROUTINE  FIG1       TRACE                    CDC 6700 FTN V3.0-355F OPT=0  80/05/29. 09.26.48.
          DO 20 I=1,NOAC
       20 A(8)=A(8)+IANUM(I)*X5(I)
          A(8)=A(8)*(DOSPR+PCAF*DOSP)/42.
C
C         COMPONENT HA
C
          A(9)=P(38)
C
C         COMPONENT J3A
C
          AP=0.
          DO 30 I=1,NOAC
       30 AP=AP+AAMMO(I)*IANUM(I)
          AS=0.
          DO 40 I=1,NOS
       40 AS=AS+AMMO(I)*ISNUM(I)
          A(10)=(AP*P(43)*(DOSAR+PCAA*DOSA)+AS*P(44)*(DOSAR+PCSA*DOSA))
         A      /2000.
C
C         COMPONENT J3D
C
          A(11)=M1A+M2A
C
C         COMPONENT J4
C
          A(12)=P(50)
C
C         DETERMINE OFFICERS AND ENLISTED GENERATED BY ABOVE COMPONENTS
C
          SO=0.
          DO 50 I=1,IEND
       50 SO=SO+TABLE(IPOINT(I,2),7)*A(I)
          SE=0.
          DO 60 I=1,IEND
       60 SE=SE+TABLE(IPOINT(I,2),8)*A(I)
          RO=SO
          RE=SE
C
C         INCREMENT OFFICERS AND ENLISTED WITH POWER PLANT PERSONNEL
C
          RO=RO+TABLE(IPOINT(100,2),7)
          RE=RE+TABLE(IPOINT(100,2),8)
          RETURN
          END
```

```
      SUBROUTINE FIG2(RO,RE)
C
C     THIS SUBROUTINE SETS THE COEFFICIENTS OF THE MATRIX A AND SETS
C     THE VECTOR B FOR THE SYSTEM OF EQUATIONS AX=B WHERE VECTOR X
C     CONTAINS THE PROJECTIONS FOR COMPONENTS WHOSE REQUIREMENT IS A
C     FUNCTION OF MEN
C     THE FIRST 2 ELEMENTS OF X ARE THE TOTAL NUMBER OF OFFICERS
C     AND ENLISTED IN THE BASE SUPPORT FORCE
C     RO IS THE OFFICER REQUIREMENT FROM OTHER COMPONENTS
C     RE IS THE ENLISTED REQUIREMENT FROM OTHER COMPONENTS
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSB,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK4/ IBIG,DO,DE,HSQUAD,TACAC,CARAC,PATAC,HELOS,
     A              HSLTAC,HSLCAR,HSLPAT,HSLHEL
      COMMON /BLK6/ IDAY,IGEOCT,ILINES,IDPLUS,IPAGE,IBUF(12),IGEO,
     A              ERF(100),ORF(100),ITITLE(4),LNCT,NGEO
      COMMON /BLK7/ X(50)
      COMMON /BLK8/ GC,PR,SUBR,PPMPD(10),CPP(13),
     A              XPLMT,XAMTP,ZMSTR,ZMSTNR,ZMSTC,PR1,XPSMT,XPAMT
      COMMON /BLK12/ PCMO,PCME,DEPPMO,DEPPME,BLOU,BLOM,BLEU,BLEM,
     A               PCPLAN,CPALAN,CLALAN
      INTEGER OS,ES
      DIMENSION B(50),AA(50,50)
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
      COL=PCMO*DEPPMO
      CEL=PCME*DEPPME
      COL1=1.+COL
      CEL1=1.+CEL
C
C     COMPONENT A3
C
      AA(1,1)=  P(1)
      AA(1,2)=  P(1)
C
C     COMPONENT A5
C
      AA(2,1)=P(4)
      AA(2,2)=P(4)
C
C     COMPONENT A7
C
      AA(3,1)=P(6)
      AA(3,2)=P(6)
C
C     CARGO THRUPUT COEFFICIENTS
C
      C1=FC*GC*ZMSTC/2000.
```

```
      C2=(1.-FC)*GC*ZMSTC/2000.
      C3=(1.-G)*GC*ZMSTC/2000.
      C1NR=FC*GC*(1.-PR1)*ZMSTNR/2000.
      C2NR=(1.-FC)*GC*(1.-PR1)*ZMSTNR/2000.
      C3NR=(1.-G)*GC*(1.-PR1)*ZMSTNR/2000.
      C1R=FC*GC*PR1*ZMSTR/2000.
      C2R=(1.-FC)*GC*PR1*ZMSTR/2000.
      C3R=(1.-G)*GC*PR1*ZMSTR/2000.
C
C     COMPONENT B13C
C
      AA(4,1)=COL1*P(9)*(C1+C2)
      AA(4,2)=CEL1*P(9)*(C1+C2)
C
C     COMPONENT C7
C
      AA(5,1)=COL1*P(11)*(C1+C2)
      AA(5,2)=CEL1*P(11)*(C1+C2)
C
C     COMPONENT C13
C
      AA(6,1)=P(13)
      AA(6,2)=P(13)
C
C     COMPONENT DA
C
      AA(7,1)=COL1*P(17)*C1
      AA(7,2)=CEL1*P(17)*C1
C
C     COMPONENT D4C1
C
      AA(8,1)=COL1*P(18)*(DOSB+DOSBR)
      AA(8,2)=CEL1*P(18)*(DOSB+DOSBR)
C
C     COMPONENT D4C2
C
      AA(9,1)= P(19)*(DOSB+DOSBR)
      AA(9,2)= P(19)*(DOSB+DOSBR)
C
C     COMPONENT D4C3
C
      AA(10,1)=COL1*P(20)*(DOSB+DOSBR)
      AA(10,2)=CEL1*P(20)*(DOSB+DOSBR)
C
C     COMPONENT D20
C
      AA(11,1)=P(21)
      AA(11,2)=P(21)
C
C     COMPONENT D24A
C
      AA(12,1)=P(23)
      AA(12,2)=P(23)
C
C     COMPONENT D29A
```

```
C
      AA(13,1)=COL1*P(25)*FAC*C2
      AA(13,2)=CEL1*P(25)*FAC*C2
C
C     COMPONENT D31A
C
      AA(14,1)=COL1*P(26)*(C1NR+C2NR)*(DOSC+DOSCR)
      AA(14,2)=CEL1*P(26)*(C1NR+C2NR)*(DOSC+DOSCR)
C
C     COMPONENT D31E
C
      AA(15,1)=COL1*P(28)*C2
      AA(15,2)=CEL1*P(28)*C2
C
C     COMPONENT D32A
C
      AA(16,1)=COL1*P(29)*(C1R+C2R)*(DOSC+DOSCR)
      AA(16,2)=CEL1*P(29)*(C1R+C2R)*(DOSC+DOSCR)
C
C     COMPONENT D33A
C
      AA(17,1)=COL1*P(30)*(C1+C2)
      AA(17,2)=CEL1*P(30)*(C1+C2)
C
C     COMPONENT F1
C
      AA(18,1)=COL1*P(31)*(C1+C2)
      AA(18,2)=CEL1*P(31)*(C1+C2)
C
C     COMPONENT G2
C
      AA(19,1)=COL1*P(33)
      AA(19,2)=CEL1*P(33)
C
C     COMPONENT G9
C
      AA(20,1)=COL1*P(35)
      AA(20,2)=CEL1*P(35)
C
C     COMPONENT G28
C
      AA(21,1)=COL1*P(37)
      AA(21,2)=CEL1*P(37)
C
C     COMPONENT H9J
C
      AA(22,1)=COL1*P(39)*FAC*C2
      AA(22,2)=CEL1*P(39)*FAC*C2
C
C     COMPONENT NA
C
      AA(23,1)=P(51)*PCMO
      AA(23,2)=P(52)*PCME
C
C     COMPONENT NB
```

```
C
      AA(24,1)=0.
      AA(24,2)=P(53)*(1.-PCME)
C
C     COMPONENT NC
C
      AA(25,1)=P(54)*(1.-PCMO)
      AA(25,2)=0.
C
C     COMPONENT ND
C
      AA(26,1)=P(56)
      AA(26,2)=P(56)
C
C     COMPONENT NE
C
      AA(27,1)=P(58)*(1.+0.1*COL)
      AA(27,2)=P(58)*(1.+0.1*CEL)
C
C     COMPONENT N108
C
      AA(28,1)=0.
      AA(28,2)=P(59)
C
C     COMPONENT N14
C
      AA(29,1)=P(61)*COL1
      AA(29,2)=P(62)*CEL1
C
C     COMPONENT N16
C
      AA(30,1)=P(64)*(1.+.5*PCMO)
      AA(30,2)=0.
C
C     COMPONENT N17
C
      AA(31,1)=0.
      AA(31,2)=P(66)
C
C     COMPONENT P5
C
      AA(32,1)= P(67)
      AA(32,2)= P(67)
C
C     COMPONENT P5A
C
      AA(33,1)=P(69)
      AA(33,2)=P(69)
C
C     COMPONENT P12A
C
      AA(34,1)=COL1*P(70)
      AA(34,2)=CEL1*P(70)
C
C     COMPONENT P16
```

```
C
      AA(35,1)=COL1*P(71)
      AA(35,2)=CEL1*P(71)
C
C     COMPONENT P18
C
      AA(36,1)=COL1*P(72)
      AA(36,2)=CEL1*P(72)
C
C     RIPPLE FACTORS
C
      JJ=101-IFRONT
      II=102-IFRONT
      AA(JJ,1)=1.
      AA(JJ,2)=0.
      AA(II,1)=0.
      AA(II,2)=1.
      JK=JJ+1
      DO 40 I=3,JK
      AA(JJ,I)=-TABLE(IPOINT(102-I,2),7)
      AA(II,I)=-TABLE(IPOINT(102-I,2),8)
   40 CONTINUE
      DO 10 K=1,II
   10 B(K)=0.
C
C     CONSTANT TERMS
C
      DLO=DO+DMO
      DLE=DE+DME
      TOTGA=DLO+DLE+G*(DSO+DSE)
      TOTGO=DLO+G*DSO
      TOTGE=DLE+G*DSE
      TOTA=DLO+DLE+DSO+DSE
      TOTO=DLO+DSO
      TOTE=DLE+DSE
      B(1)=-P(1)*TOTGA
      B(2)=-P(4)*TOTGA-P(3)
      B(3)=-P(6)*TOTGA-P(5)
      B(4)=-P(9)*(C1+C2)*TOTA-P(9)*C3*(DSO+DSE)-P(9)*XAMTP
      B(5)=-P(11)*(C1+C2)*TOTA-P(11)*C3*(DSO+DSE)-P(11)*XAMTP
      B(6)=-P(13)*TOTGA-P(12)
      B(7)=-P(17)*C1*TOTA
      B(8)=-P(18)*TOTGA*(DOSB+DOSBR)
      B(9)=-P(19)*TOTGA*(DOSB+DOSBR)
      B(10)=-P(20)*TOTGA*(DOSB+DOSBR)
      B(11)=-P(21)*TOTGA
      B(12)=-P(23)*TOTGA-P(22)
      B(13)=-P(25)*FAC*C2*TOTA-P(24)
      B(14)=-P(26)*(C1NR+C2NR)*(DOSC+DOSCR)*TOTA
      B(15)=-P(28)*C2*TOTA-P(28)*C3*(DSO+DSE)
      B(16)=-P(29)*(C1R+C2R)*(DOSC+DOSCR)*TOTA
      B(17)=-P(30)*(C1+C2)*TOTA-P(30)*C3*(DSO+DSE)-P(30)*XAMTP
      B(18)=-P(31)*(C1+C2)*TOTA-P(31)*C3*(DSO+DSE)-P(31)*XAMTP
      B(19)=-P(33)*TOTA-P(32)
      B(20)=-P(35)*TOTGA-P(34)
```

AD-A089 333 SRI INTERNATIONAL MENLO PARK CA F/G 15/5

ADVANCED NAVAL SUPPLY BASE COST MODEL (ABCOMO).(U)

APR 78 R H MONAHAN, W SCHUBERT N00014-78-C-0138

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```
      B(21)=-P(37)*TOTGA-P(36)
      B(22)=-P(39)*FAC*C2*TOTA
      B(23)=0.
      B(24)=-P(53)*TOTGE
      B(25)=-P(54)*TOTGO
      B(26)=-P(56)*TOTGA-P(55)
      B(27)=-P(58)*TOTGA-P(57)
      B(28)=-P(59)*TOTGE
      B(29)=-P(61)*TOTGO-P(62)*TOTGE-P(60)
      B(30)=-P(64)*TOTGO-P(63)
      B(31)=-P(66)*TOTGE-P(65)
      B(32)=-P(67)*TOTGA
      B(33)=-P(69)*(DLO+DLE)-P(68)
      B(34)=-P(70)*TOTGA
      B(35)=-P(71)*TOTGA
      B(36)=-P(72)*TOTGA
      B(JJ)=RO
      B(II)=RE
C
C     ENTER -1 DOWN MAIN DIAGONAL OF SUB-MATRIX
C
      JJ=JJ-1
      DO 20 K=1,JJ
      DO 20 J=3,II
      AA(K,J)=0.
      IF(J.EQ.K+2)AA(K,J)=-1.
   20 CONTINUE
C
C     CALL SOLUTION SUBROUTINE
C
      CALL RIP(II,AA,B,X)
C
C     FIX TOTAL OFFICERS AND ENLISTED
C
      I=DO+.5
      J=DAO+.5
      K=DSO-DAO+.5
      L=DMO+.5
      N=X(1)+.5
      OBAS=X(1)
      ODEP=PCMO*DEPPMO*OBAS
      J4=ODEP+.5
      IOTOT=I+J+K+L+N+J4
      I2=DE+.5
      J2=DAE+.5
      K2=DSE-DAE+.5
      L2=DME+.5
      N2=X(2)+.5
      EBAS=X(2)
      EDEP=PCME*DEPPME*EBAS
      K4=EDEP+.5
      IETOT=I2+J2+K2+L2+N2+K4
      I3=I+I2
      J3=J+J2
      K3=K+K2
```

```
      L3=L+L2
      N3=N+N2
      L4=J4+K4
      ITOT=I3+J3+K3+L3+N3+L4
      TPERS=DO+DSO+DMO+DE+DSE+DME
      ILINES=ILINES+8
      IF(ILINES.GT.LNCT)CALL HEADER
C
C     WRITE MANPOWER REPORT
C
      WRITE(6,30)I,J,K,L,N,J4,IOTOT,I2,J2,K2,L2,N2,K4,IETOT,I3,J3,K3,L3,
     A N3,L4,ITOT
   30 FORMAT(//T62,8HMANPOWER//T26,10HLAND-BASED,T39,9HSEA-BASED,T54,
     A        4HSHIP,T64,11HOTHER FORCE,T78,8HBASE OPS,T94,4HBASE,T106,
     B        5HTOTAL/T26,2(8HAIRCRAFT,5X),T52,9HPERSONNEL,T66,
     C        8HELEMENTS,T78,9HPERSONNEL,T91,10HDEPENDENTS,T104,
     D        9HPERSONNEL/T26,2(9HPERSONNEL,4X)///T16,8HOFFICERS,T27,
     E        7(I6,7X)/T16,8HENLISTED,T27,7(I6,7X)/T16,5HTOTAL,T27,
     F        7(I6,7X))
C
C     READ OFF TOTAL REQUIREMENTS THAT ARE A FUNCTION OF MEN
C
      JJ=JJ+2
      DO 50 I=3,JJ
      IF(X(I).LT.0)CALL IERROR(11,DUM)
   50 A(102-I)=X(I)
C
C     SET RAW FEET OF CARGO BERTHING
C
      M1=X(9)
      M2=X(17)
      RETURN
      END
```

```
      SUBROUTINE FIG3
C
C     THIS SUBROUTINE INCREASES MAINT. HANGAR REQUIREMENT TO ACCOUNT
C     FOR LAND-BASED AIRCRAFT AND CALCULATES BASE POWER REQUIREMENTS
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSB,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK7/ X(50)
      INTEGER OS,ES,AMMO,FUEL
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
C
C     INCREASE MAINT. HANGAR REQUIREMENT FOR LAND-BASED A/C
C
      A(78)=A(78)+P(40)*TYPE1+P(41)*TYPE2
C
C     COMPUTE BASE POWER REQUIREMENTS
C
      DO 10 I=1,IEND
   10 A(100)=A(100)+A(I)*TABLE(IPOINT(I,2),9)
      DO 20 I=IFRONT,99
   20 A(100)=A(100)+A(I)*TABLE(IPOINT(I,2),9)
      RETURN
      END
```

```
      SUBROUTINE HEADER
C
C     THIS ROUTINE WRITES REPORT HEADINGS GIVEN THE REPORT NUMBERS.
C     TITLE,CASE NUMBER,SUPPORTED FORCE NUMBER, AND GEOGRAPHICAL
C     AREA NUMBER
C
      COMMON /BLK6/ IDAY,IGEOCT,ILINES,IDPLUS,IPAGE,IBUF(12),IGEO,
     A              ERF(100),ORF(100),ITITLE(4),LNCT,NGEO
      DATA IBLANK/1H /
      IPAGE=IPAGE+1
      IF(NGEO.GT.0)GO TO 116
  115 IF(IGEO.EQ.IBLANK.AND.IDAY.EQ.IBLANK)GO TO 111
      IF(IGEO.EQ.IBLANK)GO TO 112
      IF(IDAY.EQ.IBLANK)GO TO 113
      WRITE(6,1014)IGEOCT,IDPLUS,IPAGE,(IBUF(I),I=1,6),(ITITLE(I),I=1,4)
     A              ,IGEO,IDAY
 1014 FORMAT(1H1,T15,9HREPORT 2-,I2,1H-,I2,T120,4HPAGE,I3/T15,2A6,T30,
     A       4A6//T48,4A8/T48,8HCASE ID-,A8,T67,9HFORCE ID-,A4//)
      ILINES=6
      GO TO 114
  112 WRITE(6,1020)IGEOCT,IDPLUS,IPAGE,(IBUF(I),I=1,6),(ITITLE(I),I=1,4)
     A              ,IDAY
 1020 FORMAT(1H1,T15,9HREPORT 2-,I2,1H-,I2,T120,4HPAGE,I3/T15,2A6,T30,
     A       4A6//T48,4A8/T58,9HFORCE ID-,A4//)
      ILINES=6
      GO TO 114
  113 WRITE(6,1021)IGEOCT,IDPLUS,IPAGE,(IBUF(I),I=1,6),(ITITLE(I),I=1,4)
     A              ,IGEO
 1021 FORMAT(1H1,T15,9HREPORT 2-,I2,1H-,I2,T120,4HPAGE,I3/T15,2A6,T30,
     A       4A6//T48,4A8/T55,8HCASE ID-,A8//)
      ILINES=6
      GO TO 114
  111 WRITE(6,1022)IGEOCT,IDPLUS,IPAGE,(IBUF(I),I=1,6),(ITITLE(I),I=1,4)
 1022 FORMAT(1H1,T15,9HREPORT 2-,I2,1H-,I2,T100,4HPAGE,I3/T15,2A6,T30,
     A       4A6//T48,4A8//)
      ILINES=5
      GO TO 114
  116 WRITE(6,1023)IGEOCT,IDPLUS,NGEO,IPAGE,(IBUF(I),I=1,6),
     A              (ITITLE(I),I=1,4),IGEO,IDAY
 1023 FORMAT(1H1,T15,9HREPORT 2-,I2,1H-,I2,1H-,I2,T117,4HPAGE,I3/
     A       T15,2A6,T30,4A6//T48,4A8/T48,8HCASE ID-,A8,T67,
     B       9HFORCE ID-,A4//)
  114 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE IAMMO
C
C     THIS ROUTINE CALCULATES THE AMMUNITION REQUIREMENTS FOR
C     A BASE LOADING TO THE REQUIREMENTS REPORT.
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSB,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK4/ IBIG,DO,DE,HSQUAD,TACAC,CARAC,PATAC,HELOS,
     A              HSLTAC,HSLCAR,HSLPAT,HSLHEL
      COMMON /BLK5/ JX(100),KX(100),LX(100),X1(100),X2(100),X3(100),
     A              X4(100),X5(100),X(100)
      COMMON /BLK6/ IDAY,IGEOCT,ILINES,IDPLUS,IPAGE,IBUF(12),IGEO,
     A              ERF(100),ORF(100),ITITLE(4),LNCT,NGEO
      COMMON /BLK8/ GC,PR,SUBR,PPMPD(10),CPP(13),
     A              XPLMT,XAMTP,ZMSTR,ZMSTNR,ZMSTC,PR1,XPSMT,XPAMT
      DIMENSION IGCWT(10),IGCMT(10),IDES(30),LINE(100)
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
      NGEO=0
C
C     CALCULATE DAILY AMMO IN SHORT TONS AND MEASUREMENT TONS PER DAY
C
      XPLO=XA/2000.
      IXPLO=XPLO+.5
      XPLMT=P(49)*XPLO
C
C     CALCULATE DAILY AIRCRAFT AMMO REQUIREMENTS
C
  104 AM=XA-SH
      XPSMT=P(49)*SH/2000.
      XPAMT=P(49)*AM/2000.
C
C     CALCULATE DAILY AMMO TRANSHIPPED
C
      QA=XA-(AM-TEMAMO)
C
C     CALCULATE DAILY AMMO THRUPUT IN MEASUREMENT TONS
C
      XAMTP=P(49)*(XA+QA)/2000.
      IF(QA.GE.-1.E-4)GO TO 92
      CALL IERROR(4,DUM)
C
C     WRITE ERROR MESSAGE
C
   92 CONTINUE
C
C     CALCULATE FEET OF BERTHING - CONTAINER AMMO
C
      M1A=P(47)*XA*FA/2000.
```

```
      C
      C     CALCULATE FEET OF BERTHING - GENL AMMO PIER
      C
            M2A=P(48)*((1.-FA)*XA+QA)/2000.
            ICFLG=0
      C
      C     CALCULATE FORCE DEPENDENT PERSONNEL
      C
            FDP=DO+DE+DSO+DSE+DMO+DME
      C
      C     CALCULATE GENERAL CARGO PER DAY IN SHORT TONS AND MEASUREMENT TONS
      C
            ITOTWT=0
            ITOTMT=0
            DO 95 I=1,8
            IGCWT(I)=((PPMPD(I)*FDP)/2000.)+.5
            IGCMT(I)=((CPP(I)*PPMPD(I)*FDP)/40)+.5
            ITOTWT=ITOTWT+IGCWT(I)
            ITOTMT=ITOTMT+IGCMT(I)
         95 CONTINUE
      C
      C     CALCULATE REFRIG. AND NON-REFRIG. DATA
      C
            SUBR=PPMPD(1)*PR
            ISUBR=SUBR*FDP/2000.+.5
            ISUBNR=IGCWT(1)-ISUBR
            IMTR=SUBR*FDP*CPP(1)/40.+.5
            IMTNR=IGCMT(1)-IMTR
            ITWTNR=ITOTWT-ISUBR
            ITMTNR=ITOTMT-IMTR
            ZSUBR=1.*ISUBR
            ZMTR=1.*IMTR
            ZTWTNR=1.*ITWTNR
            ZTMTNR=1.*ITMTNR
            ZMSTNR=ZTMTNR/ZTWTNR
            IF(ZSUBR.LE.0.)GO TO 951
            ZMSTR=ZMTR/ZSUBR
            GO TO 952
        951 ZMSTR=1.
        952 CONTINUE
            ZMSTC=(ZMTR+ZTMTNR)/(ZSUBR+ZTWTNR)
            PR1=ZSUBR/(ZSUBR+ZTWTNR)
      C
      C     CALCULATE TOTAL GENERAL CARGO LBS PER MAN PER DAY
      C
            GC=0
            DO 96 I=1,8
            GC=GC+PPMPD(I)
         96 CONTINUE
      C
      C     CALCULATE SHIP FUEL IN THOUSANDS OF BARRELS PER DAY
      C
            SHFU=0.
            DO 40 I=1,NOS
            SHFU=SHFU+ISNUM(I)*FUEL(I)
```

```
      40 CONTINUE
         ISHFU=SHFU/1000.+.5
C
C        CALCULATE AIRCRAFT JET FUEL IN THOUSANDS OF BARRELS PER DAY
C
         ACFU=0.
         DO 41 I=1,NOAC
         ACFU=ACFU+IANUM(I)*X5(I)
      41 CONTINUE
         IACFU=ACFU/42000.+.5
C
C        SET UP LOADING TITLE FOR HEADER
C
         ITITLE(1)=8H     SUM
         ITITLE(2)=8HMARY OF
         ITITLE(3)=8HBASE LOA
         ITITLE(4)=8HDING
         CALL HEADER
         IF(IAFLG.EQ.0)GO TO 93
         ILINES=ILINES+5
C
C        WRITE AIRCRAFT HEADER
C
         WRITE(6,1023)
    1023 FORMAT(//T55,19HAIRCRAFT COMPLEMENT//T46,4HTYPE,T58,4HLAND,T66,
        A       7HCARRIER,T78,5HTOTAL/T58,5HBASED,T67,5HBASED/)
C
C        WRITE AIRCRAFT COMPLEMENT
C
         DO 97 I=1,NOAC
         IF(IANUM(I).EQ.0)GO TO 97
         ICAR=IANUM(I)-IANUML(I)
C
C        SET FLAG FOR CARRIER BASED AIRCRAFT
C
         IF(ICAR.NE.0)ICFLG=1
         ILINES=ILINES+1
         IF(ILINES.LE.LNCT)GO TO 116
         CALL HEADER
         ILINES=ILINES+1
     116 CONTINUE
         WRITE(6,1011)X(I),IANUML(I),ICAR,IANUM(I)
    1011 FORMAT(T46,A8,T59,I3,T68,I3,T79,I3)
      97 CONTINUE
         IAFLG=0
      93 CONTINUE
         IF(ISFLG.EQ.0)GO TO 94
         ILINES=ILINES+7
         IF(ILINES.LE.LNCT)GO TO 123
         CALL HEADER
         ILINES=ILINES+7
     123 CONTINUE
C
C        WRITE SHIP HEADER
C
```

```
      WRITE(6,1012)
 1012 FORMAT(//T57,15HSHIP COMPLEMENT//T57,4HTYPE,T67,5HTOTAL/)
C
C     WRITE SHIP COMPLEMENT
C
      DO 98 I=1,NOS
      IF(ISNUM(I).EQ.0)GO TO 98
      ILINES=ILINES+1
      IF(ILINES.LE.LNCT)GO TO 122
      CALL HEADER
      ILINES=ILINES+1
  122 CONTINUE
      WRITE(6,1013)STYPE(I),ISNUM(I)
 1013 FORMAT(T57,A8,T68,I3)
   98 CONTINUE
   94 CONTINUE
C
C     SET UP SUPPLY CONSUMPTION RATES TITLE
C
      ITITLE(1)=8H    SUPP
      ITITLE(2)=8HLY CONSU
      ITITLE(3)=8HMPTION R
      ITITLE(4)=8HATES
      IF((ILINES+37).GE.LNCT)CALL HEADER
C
C     WRITE GENERAL CARGO HEADER
C
      WRITE(6,1700)ISUBR,IMTR,ISUBNR,IMTNR
 1700 FORMAT(//,T55,21HGENERAL CARGO PER DAY,//,T35,15HCLASS OF SUPPLY,
     A       T70,5HSHORT,T82,11HMEASUREMENT,/,T35,15HAND DESCRIPTION,
     B       T71,4HTONS,T86,4HTONS,//,T34,16HI     SUBSISTENCE,/,T40,
     C       12HREFRIGERATED,T64,I10,5X,I10,/,T40,16HNON-REFRIGERATED,
     D       T64,I10,5X,I10)
C
C     LOAD GENERAL CARGO DESCRIPTION AND UNDERLINE ARRAYS
C
      IDES(1)=8HII   CLO
      IDES(2)=8HTHING,TO
      IDES(3)=8HOLS,ETC
      IDES(4)=8HIII  PAC
      IDES(5)=8HKAGED PO
      IDES(6)=8HL
      IDES(7)=8HIV   CON
      IDES(8)=8HSTRUCT.
      IDES(9)=8HMATERIAL
      IDES(10)=8HVI   PER
      IDES(11)=8HSONAL DE
      IDES(12)=8HMAND
      IDES(13)=8HVII  MAJ
      IDES(14)=8HOR END I
      IDES(15)=8HTEMS
      IDES(16)=8HVIII MED
      IDES(17)=8HICAL MAT
      IDES(18)=8HERIAL
      IDES(19)=8HIX   REP
```

```
               IDES(20)=8HAIR PART
               IDES(21)=8HS
               DO 42 I=1,50
            42 LINE(I)=2H-
      C
      C        WRITE REMAINING GENERAL CARGO FACTORS
      C
               N=1
               DO 150 I=2,8
               L=N+2
               WRITE(6,1705)(IDES(J),J=N,L),IGCWT(I),IGCMT(I)
          1705 FORMAT(T34,3A8,T64,I10,5X,I10)
               N=N+3
               ILINES=ILINES+1
               IF(ILINES.LE.LNCT)GO TO 150
               CALL HEADER
               ILINES=ILINES+1
           150 CONTINUE
      C
      C        WRITE TOTAL GENERAL CARGO
      C
               WRITE(6,1720)(LINE(I),I=1,28),ISUBR,IMTR,ITWTNR,ITMTNR
          1720 FORMAT(/,T34,28A2,//,T34,19HTOTAL GENERAL CARGO,/,T36,
              A        12HREFRIGERATED,T64,I10,5X,I10,/,T36,16HNON-REFRIGERATED,
              B        T64,I10,5X,I10)
      C
      C        WRITE TOTAL SHIP FUEL, AIRCRAFT JET FUEL, AND AMMUNITION
      C
               WRITE(6,1730)(LINE(I),I=1,28),ISHFU,IACFU,IXPLO
          1730 FORMAT(/,T34,28A2,//,T34,25HTOTAL FUEL AND AMMUNITION,/,T36,
              A        30HSHIP FUEL (DIESEL FUEL,MARINE),T71,I10,3X,11HTHOUSANDS O
              B2HF ,15HBARRELS PER DAY,/,T36,19HAIRCRAFT FUEL (JET),T71,I10,3X,
              C        28HTHOUSANDS OF BARRELS PER DAY,/,T36,10HAMMUNITION,T71,
              D        I10,3X,18HSHORT TONS PER DAY)
      C
      C        WRITE REFRIGERATED AND TOTAL GENERAL CARGO DAILY CONSUMPTION RATES
      C
               WRITE(6,1710)GC,SUBR
          1710 FORMAT(///,T50,23HDAILY CONSUMPTION RATES,//,T34,19HTOTAL GENERAL
              BCARGO, T65,F10.6,3X,11HLBS/MAN/DAY,/,T34,26HREFRIGERATED GENERAL C
              CARGO,  T65,F10.6,3X,11HLBS/MAN/DAY)
      C
      C        CHECK FOR CARRIER BASED PLANES BUT NO SHIPS
      C
               IF(ISFLG.FQ.0.AND.ICFLG.NE.0)CALL IERROR (10,DUM)
               RETURN
               END
```

```
      SUBROUTINE IERROR(N,X)
C
C     THIS ROUTINE PROCESSES DIFFERENT ERROR CONDITION GIVEN AN
C     ERROR CODE
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      IERR=IERR+1
      GO TO (10,20,30,40,50,60,70,80,90,100,110,120,130),N
   10 WRITE(6,1000)X
      RETURN
 1000 FORMAT(5H *** ,A8,25H INVALID COMPONENT ID ***)
   20 WRITE(6,1010)X
      RETURN
 1010 FORMAT(5H *** ,A8,26H INVALID AIRCRAFT TYPE ***)
   30 WRITE(6,1020)X
      RETURN
 1020 FORMAT(5H *** ,A8,22H INVALID SHIP TYPE ***)
   40 WRITE(6,1030)
      STOP
 1030 FORMAT(33H *** INSUFFICIENT AMMO ASHORE ***/
     A       22H *** PROGRAM ABORT ***)
   50 WRITE(6,1040)
      STOP
 1040 FORMAT(24H *** UNDEFINED ERROR ***/
     B       22H *** PROGRAM ABORT ***)
   60 WRITE(6,1050)
      STOP
 1050 FORMAT(24H *** UNDEFINED ERROR ***/
     A       22H *** PROGRAM ABORT ***)
   70 WRITE(6,1060)
      STOP
 1060 FORMAT(24H *** UNDEFINED ERROR ***/
     A       22H *** PROGRAM ABORT ***)
   80 WRITE(6,1070)
      STOP
 1070 FORMAT(24H *** UNDEFINED ERROR ***/
     A       22H *** PROGRAM ABORT ***)
   90 WRITE(6,1080)
      STOP
 1080 FORMAT(24H *** UNDEFINED ERROR ***/
     A       22H *** PROGRAM ABORT ***)
  100 WRITE(6,1090)
      STOP
 1090 FORMAT(42H *** NO SHIPS BUT CARRIER BASED PLANES ***/
     B       22H *** PROGRAM ABORT ***)
  110 WRITE(6,1100)
      STOP
 1100 FORMAT(41H *** NEGATIVE NUMBERS IN ANSWER ARRAY ***/
     B42H*** PROBABLE CAUSE LARGE RIPPLE FACTOR ***/
     B       22H *** PROGRAM ABORT ***)
  120 WRITE(6,1110)
 1110 FORMAT(31H *** NEGATIVE NUMBER PLANES ***)
      RETURN
```

```
SUBROUTINE  IERROR    TRACE                    CDC 6700 FTN V3.0-355F OPT=0  80/05/29. 09.26.48.

          130 WRITE(6,1120)
         1120 FORMAT(30H *** NEGATIVE NUMBER SHIPS ***)
              RETURN
              END
```

```
      SUBROUTINE INIT
C
C     THIS ROUTINE INITIALIZES THE LINKAGE VECTOR IPOINT AND ASSIGNS
C     THE INITIAL VALUES TO THE DEFAULT VECTORS PP AND P.
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSB,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK4/ IBIG,DO,DE,HSQUAD,TACAC,CARAC,PATAC,HELOS,
     A              HSLTAC,HSLCAR,HSLPAT,HSLHEL
      COMMON /BLK6/ IDAY,IGEOCT,ILINES,IDPLUS,IPAGE,IBUF(12),IGEO,
     A              ERF(100),ORF(100),ITITLE(4),LNCT,NGEO
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
      INTEGER OS,ES
      DATA IPOINT/4HA4    ,4HBB   ,4HB5A  ,4HC3A  ,4HC27J,4HC32A,4HD3A1,
     A4HD3A2,4HHA   ,4HJ3A  ,4HJ3D  ,4HJ4   ,51*0,4HP18  ,4HP16  ,4HP12A,
     B4HP5A ,4HP5   ,4HN17  ,4HN16  ,4HN14  ,4HN10B,4HNE   ,4HND   ,4HNC   ,
     C4HNB  ,4HNA   ,4HH9J  ,4HG28  ,4HG9   ,4HG2   ,4HF1   ,4HD33A,4HD32A,
     D4HD31E,4HD31A,4HD29A,4HD24A,4HD20 ,4HD4C3,4HD4C2,4HD4C1,4HDA   ,
     E4HC13 ,4HC7   ,4HB13C,4HA7   ,4HA5   ,4HA3   ,4HP15  ,100*0/
      LNCT=50
C
C     ZERO ANSWER VECTOR
C
      DO 30 I=1,100
   30 INDEX(I)=0
      IEND=12
      IFRONT=64
      P(1)=0.9
      P(2)=1440.
      P(3)=200.
      P(4)=0.08
      P(5)=2500.
      P(6)=1.581
      P(7)=1333333.
      P(8)=1440.
      P(9)=7.2
      P(10)=4560.
      P(11)=0.269
      P(12)=250.
      P(13)=0.168
      P(14)=960.
      P(15)=1320.
      P(16)=1025.
      P(17)=.084
      P(18)=0.15
      P(19)=0.04
      P(20)=0.0556
      P(21)=0.4
```

```
      P(22)=5000.
      P(23)=0.59
      P(24)=8000.
      P(25)=104.
      P(26)=7.448
      P(27)=685.
      P(28)=0.274
      P(29)=7.84
      P(30)=6.429
      P(31)=0.78
      P(32)=40000.
      P(33)=2.33
      P(34)=4000.
      P(35)=0.51
      P(36)=0.0
      P(37)=0.384
      P(38)=222222.
      P(39)=23.33
      P(40)=1331.
      P(41)=3173.
      P(42)=1997.
      P(43)=19.
      P(44)=14.
      P(45)=1025.
      P(46)=685.
      P(47)=0.090
      P(48)=0.243
      P(49)=1.07
      P(50)=960.
      P(51)=1333.
      P(52)=1333.
      P(53)=118.
      P(54)=586.
      P(55)=900.
      P(56)=0.522
      P(57)=1000.
      P(58)=0.631
      P(59)=7.5
      P(60)=2450.
      P(61)=1.426
      P(62)=1.426
      P(63)=8000.
      P(64)=7.832
      P(65)=12000.
      P(66)=4.636
      P(67)=2.5
      P(68)=2900.
      P(69)=1.871
      P(70)=.613
      P(71)=0.1
      P(72)=0.1
      PP(1)=30.
      PP(2)=90.
      PP(3)=30.
      PP(4)=90.
```

SUBROUTINE INIT TRACE   CDC 6700 FTN V3.0-355F OPT=0 80/05/29. 09.28.48.

```
      PP(5)=30.
      PP(6)=90.
      PP(7)=30.
      PP(8)=90.
      PP(9)=30.
      PP(10)=90.
      PP(11)=0.5
      PP(12)=0.5
      PP(13)=0.01
      PP(14)=0.01
      PP(15)=0.3
      PP(16)=0.2
      PP(17)=0.03
      PP(18)=0.1
      RETURN
      END
```

```
      SUBROUTINE INPUT
C
C     THIS ROUTINE READS STATIC DATA DEFAULT OVERRIDES, HEADER
C     INFORMATION, PERFORMS PRELIMINARY CALCULATION AND WRITES THE
C     STATIC DATA REPORT.
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSH,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK4/ IBIG,DO,DE,HSQUAD,TACAC,CARAC,PATAC,HELOS,
     A              HSLTAC,HSLCAR,HSLPAT,HSLHEL
      COMMON /BLK5/ JX(100),KX(100),LX(100),X1(100),X2(100),X3(100),
     A              X4(100),X5(100),X(100)
      COMMON /BLK6/ IDAY,IGEOCT,ILINES,IDPLUS,IPAGE,IBUF(12),IGEO,
     A              ERF(100),ORF(100),ITITLE(4),LNCT,NGEO
      COMMON /BLK8/ GC,PR,SUBR,PPMPD(10),CPP(13),
     A              XPLMT,XAMTP,ZMSTR,ZMSTNR,ZMSTC,PR1,XPSMT,XPAMT
      COMMON /BLK9/ CTABLE(100,15),CONSTR,EQUIP,EVOL,CONTIM,FLAND,
     A              CFGEO,CSCTOT
      COMMON /BLK11/ SCPP(12),CTPGEO,CTSGEO,CTRGEO,CPO,CPE,
     A               PPMNAV(10),DENS(5)
      COMMON /BLK12/ PCMO,PCME,DEPPMO,DEPPME,BLOU,BLOM,BLEU,BLEM,
     A               PCPLAN,CPALAN,CLALAN
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
      DIMENSION IDOC(100),DOM(100),IDEC(100),DEM(100),ITABLE(100,10)
      EQUIVALENCE (TABLE(1,1),ITABLE(1,1))
      INTEGER OS,ES
      DATA EOF/6H******/
C
C     READ HEADER CARD
C
      READ(5,1017)(IBUF(I),I=1,12)
 1017 FORMAT(2A6,1X,10A6)
      IPAGE=1
      ILINES=0
      IGEOCT=0
      IDPLUS=0
C
C     READ OUTPUT OPTION CARD
C
      READ(5,1016)IOPUT
 1016 FORMAT(I1)
      IF(IOPUT.EQ.1)GO TO 948
C
C     WRITE AIRCRAFT HEADER
C
      ILINES=9
      WRITE(6,947)IPAGE,IBUF(1),IBUF(2)
  947 FORMAT(1H1,T15,12HREPORT 1-1-1,T120,4HPAGE,I3,/,T15,2A6/
```

```
            G        T52,25HAIRCRAFT STATIC DATA FILE////
            A        T15,8HAIRCRAFT,T25,4HTYPE,T31,8HWINGSPAN,T41,6HLENGTH,T54,
            B        4HFUEL,T64,4HNO./,T77,4HCREW,T89,11HMAINTENANCE,T105,4HFUEL
            C,T114,4HAMMO/T25,4HCODE,T33,4H(FT),T42,4H(FT),T50,
            D        11HCONSUMPTION,T64,5HSQUAD,T75,10HCOMPLEMENT,T89,
            E        10HCOMPLEMENT,T105,4HCODE,T111,11HCONSUMPTION/T51,
            F        9H(GAL/DAY),T75,10HOFF     ENL,T89,10HOFF     ENL,T112,
            H        9H(LBS/DAY)//)
        948 CONTINUE
      C
      C     READ AIRCRAFT PARAMETER CARD
      C
            DO 5 I=1,101
            READ(5,120)X(I),JX(I),X3(I),X4(I),X5(I),KX(I),IDOC(I),
           A           IDEC(I),DOM(I),DEM(I),IGAS(I),AAMMO(I)
        120 FORMAT(A8,1X,I1,2(1X,F3.0),1X,F4.0,1X,I2,2(1X,I2),
           A        2(1X,F5.2),1X,I1,1X,F6.0)
      C
      C      CHECK FOR END OF AIRCRAFT FILE
      C
            IF(X(I).EQ.EOF)GO TO 7
            IF(IOPUT.EQ.1)GO TO 122
      C
      C     WRITE AIRCRAFT PARAMETER CARD
      C
            ILINES=ILINES+1
            IF(ILINES.LE.LNCT)GO TO 903
            ILINES=9
            IPAGE=IPAGE+1
            WRITE(6,947)IPAGE,IBUF(1),IBUF(2)
        903 CONTINUE
            WRITE(6,121)X(I),JX(I),X3(I),X4(I),X5(I),KX(I),IDOC(I),
           A            IDEC(I),DOM(I),DEM(I),IGAS(I),AAMMO(I)
        121 FORMAT(T15,A8,T27,I1,T33,F4.0,T42,F4.0,T54,F5.0,T66,I2,T75,
           A        I2,5X,I2,T88,F5.2,3X,F5.2,T107,I1,T114,F6.0)
        122 CONTINUE
      C
      C     INCREMENT OFFICERS AND ENLISTED DUE TO THIS DRIVER
      C
            X1(I)=FLOAT(IDOC(I))+DOM(I)
          5 X2(I)=FLOAT(IDEC(I))+DEM(I)
          7 CONTINUE
            IF(IOPUT.EQ.1)GO TO 651
      C
      C     WRITE AIRCRAFT STATIC DATA KEY
      C
            WRITE(6,650)
        650 FORMAT(//T17,9HTYPE CODE,T113,9HFUEL CODE//,T15,12H1 = TACTICAL,
           A        T113,9H0 = AVGAS/T15,10H2 = PATROL,T113,7H1 = JET/
           B        T15,9H3 = CARGO/T15,15H4 = ROTARY WING)
        651 CONTINUE
      C
      C     SET NUMBER OF AIRCRAFT TYPES
      C
            NOAC=I-1
```

```
            IF(IOPUT.EQ.1)GO TO 645
C
C     WRITE SHIP HEADER
C
      ILINES=9
      IPAGE=IPAGE+1
      WRITE(6,646)IPAGE,IBUF(1),IBUF(2)
  646 FORMAT(1H1,T15,12HREPORT 1-1-1,T120,4HPAGE,I3/T15,2A6/
     D       T54,21HSHIP STATIC DATA FILE////
     A       T36,4HSHIP,T54,10HCOMPLEMENT,T73,17HCONSUMPTION RATES/
     B       T52,14HOFF          ENL,T73,17HFUEL          AMMO/T70,
     C       22H(BBL/DAY)     (LBS/DAY))
  645 CONTINUE
C
C     READ SHIP PARAMETER CARD
C
      DO 8 I=1,101
      READ(5,1001)STYPE(I),OS(I),ES(I),FUEL(I),AMMO(I)
 1001 FORMAT(A8,1X,I4,1X,I4,2(1X,F6.0))
C
C     CHECK FOR END OF SHIP FILE
C
      IF(STYPE(I).EQ.EOF)GO TO 9
      IF(IOPUT.EQ.1)GO TO 644
C
C     WRITE SHIP PARAMETER CARD
C
      ILINES=ILINES+1
      IF(ILINES.LE.LNCT)GO TO 904
      IPAGE=IPAGE+1
      ILINES=9
      WRITE(6,646)IPAGE,IBUF(1),IBUF(2)
  904 CONTINUE
      WRITE(6,647)STYPE(I),OS(I),ES(I),FUEL(I),AMMO(I)
  647 FORMAT(T36,A8,T51,I4,T62,I4,T73,F6.0,T86,F6.0)
  644 CONTINUE
    8 CONTINUE
C
C     SET NUMBER OF SHIP TYPES
C
    9 NOS=I-1
      IF(IOPUT.EQ.1)GO TO 907
C
C     WRITE RIPPLE FACTOR HEADER
C
      IPAGE=IPAGE+1
      WRITE(6,908)IPAGE,IBUF(1),IBUF(2)
      ILINES=8
  908 FORMAT(1H1,T15,12HREPORT 1-1-1,T120,4HPAGE,I3/T15,2A6/
     D       T56,19HRIPPLE FACTOR TABLE///T12,
     A        9HCOMPONENT,T30,15HPACING FACILITY,T51,5HUNITS,T61,
     B       7HOFFICER,T76,8HENLISTED,T91,5HPOWER,
     C       /T15,2HID,T61,3(6HRIPPLE,9X)//)
  907 CONTINUE
C
```

```
C      READ RIPPLE FACTOR TABLE ENTRIES
C
       DO 31 I=1,101
       READ(5,101)(TABLE(I,J),J=1,9)
   101 FORMAT(A6,1X,4A6,1X,A4,3(1X,F10.9))
C
C      CHECK FOR END OF RIPPLE FACTOR FILE
C
       IF(TABLE(I,1).EQ.EOF)GO TO 41
       IF(IOPUT.EQ.1)GO TO 910
C
C      WRITE RIPPLE FACTOR CARD
C
       ILINES=ILINES+1
       IF(ILINES.LE.LNCT)GO TO 905
       IPAGE=IPAGE+1
       ILINES=8
       WRITE(6,908)IPAGE,IBUF(1),IBUF(2)
   905 CONTINUE
       WRITE(6,909)(TABLE(I,J),J=1,9)
   909 FORMAT(T15,A6,T25,4A6,T52,A4,T55,3F15.9)
   910 CONTINUE
C
C      CHECK FOR VALID COMPONENT ID
C
       DO 12 J=1,100
       IF(ITABLE(I,1).EQ.IPOINT(J,1))GO TO 21
    12 CONTINUE
C
C      WRITE ERROR MESSAGE
C
       CALL IERROR(1,I)
C
C      SET FORWARD AND BACKWARD POINTER
C
    21 IPOINT(J,2)=I
       INDEX(I)=J
    31 CONTINUE
    41 CONTINUE
C
C      SET COMPONENT COUNT
C
       LAST=I-1
C
C      READ COMPONENT E.R. PARAMETERS
C
       DO 92 I=1,LAST
       READ(5,1510)(CTABLE(I,J),J=1,15)
  1510 FORMAT(A4,1X,4A8,4(1X,E8.1)/19X,6(1X,E8.1))
    92 CONTINUE
       IF(IOPUT.EQ.1)GO TO 90
C
C      WRITE COMPONENT HEADER
C
       IPAGE=IPAGE+1
```

```
      WRITE(6,1511)IPAGE,IBUF(1),IBUF(2)
      ILINES=10
 1511 FORMAT(1H1,T15,12HREPORT 1-1-1,T120,4HPAGE,I3/T15,2A6/
     X        T39,50HCOMPONENT ESTIMATING RELATIONSHIP(E.R.) PARAMETERS,
     A        ///T12,12HCONSTRUCTION,T35,
     B        9HEQUIPMENT,T57,9HEQUIPMENT,T78,12HCONSTRUCTION,T102,
     C        8HREQUIRED/1X,5HCOMP.,T8,9HCOST E.R.,T35,9HCOST E.R.,T56,
     D        11HVOLUME E.R.,T80,9HTIME E.R.,T102,9HLAND E.R./2X,2HID,
     E        5(4X,8HCONSTANT,4X,6HCOEFF.)//)
C
C     WRITE COMPONENT E.R. PARAMETERS
C
      DO 93 I=1,LAST
      ILINES=ILINES+1
      IF(ILINES.LE.LNCT)GO TO 94
      IPAGE=IPAGE+1
      ILINES=10
      WRITE(6,1511)IPAGE,IBUF(1),IBUF(2)
   94 CONTINUE
      WRITE(6,1512)CTABLE(I,1),(CTABLE(I,J),J=6,15)
 1512 FORMAT(1X,A4,1X,10(1X,E10.3))
   93 CONTINUE
   90 CONTINUE
C
C     READ GENERAL CARGO PARAMETERS
C
      DO 91 I=1,9
      READ(5,1500)CHKER,PPMPD(I),CPP(I),SCPP(I),PPMNAV(I)
 1500 FORMAT(A8,4F10.6)
      IF(CHKER.EQ.EOF)PR=PPMPD(I)
   91 CONTINUE
C
C     READ BASE FUEL INPUTS AND SPECIFIC VOLUME FACTORS
C
      READ(5,1501)(SCPP(I),I=10,12)
 1501 FORMAT(3F10.6)
      READ(5,1912)(DENS(I),I=1,5)
 1912 FORMAT(5(F10.6,1X))
      IF(IOPUT.EQ.1)GO TO 901
      IPAGE=IPAGE+1
C
C     WRITE GENERAL CARGO PARAMETER HEADER
C
      WRITE(6,1910)IPAGE,IBUF(1),IBUF(2)
 1910 FORMAT(1H1,T15,12HREPORT 1-1-1,T120,4HPAGE,I3/T15,2A6////
     A T55,24HGENERAL CARGO PARAMETERS///T69,8HSPECIFIC,
     X T101,11HNAVY FUNDED/T20,15HCLASS OF SUPPLY,T50,
     B 11HCONSUMPTION,T70,6HVOLUME,T86,
     C 9HUNIT COST,T101,11HCONSUMPTION/T20,15HAND DESCRIPTION,T49,
     D 13H(LBS/MAN/DAY),T68,10H(CU.FT/LB),T84,12H(DOLLARS/LB),T100,
     E 13H(LBS/MAN/DAY)//)
C
C     WRITE GENERAL CARGO PARAMETERS
C
      WRITE(6,1911)(PPMPD(I),CPP(I),SCPP(I),PPMNAV(I),I=1,8),PPMPD(9),
```

```
      A SCPP(9),(SCPP(I),I=10,12)
 1911 FORMAT(T19,16HI     SUBSISTENCE,T51,4(F10.6,7X)/T19,10HII    CLOTH,
     A13HING,TOOLS,ETC,T51,4(F10.6,7X)/T19,17HIII  PACKAGED POL,T51,
     B4(F10.6,7X)/T19,24HIV    CONSTRUCT. MATERIAL,T51,4(F10.6,7X)/T19,
     C20HVI    PERSONAL DEMAND,T51,4(F10.6,7X)/T19,17HVII  MAJOR END IT,
     D3HEMS,T51,4(F10.6,7X)/T19,21HVIII MEDICAL MATERIAL,T51,4(F10.6,7X)
     E/T19,17HIX    REPAIR PARTS,T51,4(F10.6,7X)/T19,16HREEFER PROPORTIO,
     F18HN OF SUBSISTENCE =,T54,F5.3/T35,18HREEFER UNIT COST =,T54,
     GF6.2,T61,17HDOLLARS PER POUND/T36,17HMOGAS UNIT COST =,T54,
     HF6.2,T61,18HDOLLARS PER BARREL/T35,18HDIESEL UNIT COST =,T54,
     IF6.2,T61,18HDOLLARS PER BARREL/T29,24HHEATING FUEL UNIT COST =,
     JT54,F6.2,T61,18HDOLLARS PER BARREL)
      WRITE(6,1913)(DENS(I),I=1,5),P(49)
 1913 FORMAT(////T19,43HFUEL AND AMMUNITION SPECIFIC VOLUME FACTORS/T46,
     A7HMOGAS =,T54,F10.6,T65,20HBARRELS PER LONG TON/T45,8HDIESEL =,
     BT54,F10.6,T65,20HBARRELS PER LONG TON/T39,14HHEATING FUEL =,T54,
     CF10.6,T65,20HBARRELS PER LONG TON/T37,16HSHIP FUEL(DFM) =,T54,
     DF10.6,T65,20HBARRELS PER LONG TON/T33,20HAIRCRAFT FUEL(JET) =,
     ET54,F10.6,T65,20HBARRELS PER LONG TON/T41,12HAMMUNITION =,T54,
     FF10.6,T65,30HMEASUREMENT TONS PER SHORT TON)
  901 CONTINUE
C
C     READ BASE PERSONNEL INPUT PARAMETERS
C
      READ(5,1523)CPO,CPE,PCMO,PCME,DEPPMO,DEPPME,BLOU,BLOM,BLEU,BLEM
 1523 FORMAT(2(F7.3,1X),2(F5.3,1X),2(F5.2,1X),4(F8.1,1X))
C
C     READ DEFAULT OVER-RIDES FOR ALGORITHM CONSTANTS
C
      ILINES=0
      DO 81 J=1,64
      READ(5,1005)CC,I,DUM
C
C     CHECK FOR END OF ALGORITHM OVER-RIDES
C
      IF(CC.EQ.EOF)GO TO 83
      IF(J.EQ.1)GO TO 106
      ILINES =ILINES+1
      IF(ILINES.LE.LNCT)GO TO 105
  106 IPAGE=IPAGE+1
      ILINES=10
C
C     WRITE OVER-RIDE HEADER
C
      WRITE(6,648)IPAGE,IBUF(1),IBUF(2)
  648 FORMAT(1H1,T15,12HREPORT 1-1-1,T120,4HPAGE,I3/T15,2A6////T41,
     A       30HSUMMARY OF ALGORITHM OVERRIDES//T35,8HCATEGORY,T47,
     B       5HINDEX,T60,3HOLD,T72,3HNEW/T37,4HCODE,T59,5HVALUE,T71,
     C       5HVALUE//)
  105 CONTINUE
      WRITE(6,649)CC,I,P(I),DUM
  649 FORMAT(T35,A8,T47,I4,T56,F9.2,T68,F9.2)
   81 P(I)=DUM
   83 CONTINUE
C
```

```
C     READ DEFAULT OVER-RIDES FOR INPUT PARAMETERS
C
      DO 95 I=1,24
      READ(5,1005)CC,J,DUM
 1005 FORMAT(A8,1X,I3,1X,F10.3)
C
C     CHECK FOR END OF PLANNING NUMBER OVER-RIDES
C
      IF(CC.EQ.EOF)GO TO 96
      IF(I.EQ.1)GO TO 110
      ILINES=ILINES+1
      IF (ILINES.LE.LNCT)GO TO 108
      IPAGE=IPAGE+1
      ILINES=10
C
C     WRITE OVER-RIDE HEADER
C
      WRITE(6,1909)IPAGE,IBUF(1),IBUF(2)
 1909 FORMAT(1H1,T15,12HREPORT 1-1-1,T120,4HPAGE,I3/T15,2A6////
     A        T41,30HSUMMARY OF PARAMETER OVERRIDES//T37,4HITEM,T47,
     B        5HINDEX,T60,3HOLD,T72,3HNEW/T59,5HVALUE,T71,5HVALUE//)
      GO TO 108
  110 CONTINUE
      ILINES=ILINES+15
      IF(ILINES.GT.LNCT)GO TO 109
      WRITE(6,1908)
 1908 FORMAT(////T41,30HSUMMARY OF PARAMETER OVERRIDES//T37,4HITEM,T47,
     A        5HINDEX,T60,3HOLD,T72,3HNEW/T59,5HVALUE,T71,5HVALUE//)
      ILINES=ILINES-10
      GO TO 107
  109 CONTINUE
      IPAGE=IPAGE+1
      ILINES=10
      WRITE(6,1909)IPAGE,IBUF(1),IBUF(2)
  107 CONTINUE
  108 CONTINUE
      WRITE(6,649)CC,J,PP(J),DUM
   95 PP(J)=DUM
C
C     SET PLANNING PARAMETERS
C
   96 DOSC =PP(1)
      DOSCR=PP(2)
      DOSP =PP(3)
      DOSPR=PP(4)
      DOSS =PP(5)
      DOSSR=PP(6)
      DOSB =PP(7)
      DOSBR=PP(8)
      DOSA =PP(9)
      DOSAR=PP(10)
      PCAF =PP(11)
      PCSF =PP(12)
      PCAA =PP(13)
      PCSA =PP(14)
```

```
      FC   =PP(15)
      FA   =PP(16)
      G    =PP(17)
      FAC  =PP(18)
C
C     FIX DAYS OF SUPPLY
C
      K  = DOSC
      KR = DOSCR
      J  = DOSP
      JR = DOSPR
      L  = DOSS
      LR = DOSSR
      M  = DOSB
      MR = DOSBR
      N  = DOSA
      NR = DOSAR
C
C     WRITE DAYS OF SUPPLY
C
      IPAGE=IPAGE+1
      WRITE(6,1018)IPAGE,IBUF(1),IBUF(2)
 1018 FORMAT(1H1,T15,12HREPORT 1-1-1,T120,4HPAGE,I3/T15,2A6////)
      WRITE(6,1007)K,KR,J,JR,L,LR,M,MR,N,NR
 1007 FORMAT(T26,14HDAYS OF SUPPLY//T32,9HOPERATING/T33,6HSTOCKS,T44,
     A 8HRESERVES//T15,5HCARGO,T35,2(I3,9X)/T15,13HAIRCRAFT FUEL,T35,
     B 2(I3,9X)/T15,9HSHIP FUEL,T35,2(I3,9X)/T15,9HBASE FUEL,T35,
     C 2(I3,9X)/T15,10HAMMUNITION,T35,2(I3,9X)////)
C
C     WRITE PEACETIME-TO-WARTIME RATIOS
C
      WRITE(6,1008)PCAF,PCSF,PCAA,PCSA
 1008 FORMAT(T16,27HPEACETIME-TO-WARTIME RATIOS//T16,13HAIRCRAFT FUEL,
     A T36,F6.4/T16,9HSHIP FUEL,T36,F6.4/T16,19HAIRCRAFT AMMUNITION,
     B T36,F6.4/T16,15HSHIP AMMUNITION,T36,F6.4////)
C
C     WRITE OTHER PLANNING FACTORS
C
      WRITE(6,1009)FC,FA,G,FAC
 1009 FORMAT(T31,22HOTHER PLANNING FACTORS//T24,20HFRACTION CARGO CONTA,
     A10HINERIZED =,F6.4/T25,29HFRACTION AMMO CONTAINERIZED =,F6.4/T14,
     B40HFRACTION AT-SEA MEN WITH IMPACT ASHORE =,F6.4/T10,
     C44HFRACTION BREAK-BULK CARGO DELIVERED BY AIR =,F6.4)
C
C     WRITE BASE PERSONNEL INPUT PARAMETERS
C
      IPAGE=IPAGE+1
      WRITE(6,1521)IPAGE,IBUF(1),IBUF(2)
 1521 FORMAT(1H1,T15,12HREPORT 1-1-1,T120,4HPAGE,I3/T15,2A6////)
      WRITE(6,1524)CPO,CPE,PCMO,PCME,DEPPMO,DEPPME,BLOU,BLOM,BLEU,BLEM
 1524 FORMAT(T39,31HBASE PERSONNEL INPUT PARAMETERS//T42,10HOFFICER BI,
     A        11HLLET COST -,2X,F7.3,2X,20HTHOUSANDS OF DOLLARS/T37,
     B        26HENLISTED MAN BILLET COST -,2X,F7.3,2X,14HTHOUSANDS OF D,
     C        6HOLLARS/T21,39HFRACTION OFFICERS WITH FAMILIES OVERSEA,
     D        3HS -,2X,F5.3/T17,36HFRACTION ENLISTED MEN WITH FAMILIES ,
```

```
     X        10HOVERSEAS -,2X,F5.3/T21,9HNUMBER OF,
     E        33H DEPENDENTS PER MARRIED OFFICER -2X,F5.2/T16,7HNUMBER ,
     F        40HOF DEPENDENTS PER MARRIED ENLISTED MAN -,2X,F5.2/T16,
     G        30HPERSONAL BELONGINGS ALLOWANCES/T43,17HUNMARRIED OFFICER,
     H        3HS -,1X,F8.1,2X,10HCUBIC FEET/T45,18HMARRIED OFFICERS -,
     I        1X,F8.1,2X,10HCUBIC FEET/T39,24HUNMARRIED ENLISTED MEN -,
     J        1X,F8.1,2X,10HCUBIC FEET/T41,22HMARRIED ENLISTED MEN -,
     K        1X,F8.1,2X,10HCUBIC FEET////)
C
C     SET CASE NUMBER VARIABLE
C
      IGEUCT=0
      RETURN
      END
```

SUBROUTINE REINIT TRACE CDC 6700 FTN V3.0-355F OPT=0 80/05/29. 09.28.48.

```
      SUBROUTINE REINIT
C
C     THIS ROUTINE RESETS VARIABLES BETWEEN CYCLES
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSB,DOSBR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK4/ IBIG,DO,DE,HSQUAD,TACAC,CARAC,PATAC,HELOS,
     A              HSLTAC,HSLCAR,HSLPAT,HSLHEL
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
      ISFLG=0
      IAFLG=0
      IBIG=0
      TEMAMO=0
      DO=0
      DE=0.
      DAO=0.
      DAE=0.
      DSO=0.
      DSE=0.
      TYPE1=0.
      TYPE2=0.
      XA=0.
      DO 10 I=1,100
      IANUM(I)=0
      ISNUM(I)=0
      IANUML(I)=0
   10 A(I)=0.
      IERR=0
      REF=0.
      ROF=0.
      RETURN
      END
```

```
      SUBROUTINE RIP(N,A,B,X)
C
C     THIS SUBROUTINE USES THE GAUSS-JORDAN PROCESS TO SOLVE A SYSTEM
C     OF LINEAR EQUATIONS OF THE FORM A * X = B.
C     A IS AN N BY N MATRIX.
C     B AND X ARE VECTORS OF LENGTH N.
C     THE VECTOR X CONTAINS THE SOLUTION.
C     THE INPUT VARIABLES N, A, AND B ARE NOT CHANGED.
C
      DIMENSION C(50,50),A(50,50),B(50),X(50)
C
C     COPY A INTO C AND B INTO X.
C
      DO 10 I=1,N
      X(I)=B(I)
      DO 1  J=1,N
   10 C(I,J)=A(I,J)
C
C     BEGIN GAUSS-JORDAN PROCESS
C
      DO 60 K=1,N
C
C     FIND ELEMENT OF LARGEST MAGNITUDE IN COLUMNK, BEGINNING WITH ROW K.
C
      Z1=0.0
      KX=K
      DO 20 J=K,N
      Z2=ABS(C(J,K))
      IF(Z2.LE.Z1)GO TO 20
      Z1=Z2
      KX=J
   20 CONTINUE
      IF(Z1.NE.0.0)GO TO 30
C
C     WRITE ERROR MESSAGE IF THER IS NO SOLUTION.
C
      WRITE(6,25)
   25 FORMAT(43H0***ERROR***      NO UNIQUE SOLUTION EXISTS./)
      STOP
C
C     DECIDE IF ROWS NEED TO BE SWITCHED.
C
   30 IF(KX.EQ.K)GO TO 45
C
C     SWITCH ROWS K AND KX.
C
      DO 40 J=K,N
      Z1=C(K,J)
      C(K,J)=C(KX,J)
   40 C(KX,J)=Z1
      Z1=X(K)
      X(K)=X(KX)
      X(KX)=Z1
   45 Z2=C(K,K)
C
```

```
SUBROUTINE  RIP        TRACE                    CDC 6700 FTN V3.0-355F OPT=0  80/05/29. 09.28.48.
           C     ELIMINATE OFF-DIAGONAL ELEMENTS IN COLUMN K.
           C
                 DO 60 J=1,N
                 IF(J.EQ.K)GO TO 60
                 Z3=C(J,K)/Z2
           C
           C     SUBTRACT Z3 * ROW K FROM ROW J.
           C
                 DO 50 I=K,N
              50 C(J,I)=C(J,I)-Z3*C(K,I)
                 X(J)=X(J)-Z3*X(K)
              60 CONTINUE
           C
           C     DIVIDE BY MAIN DIAGONAL TO OBTAIN RESULT.
           C
                 DO 70 K=1,N
              70 X(K)=X(K)/C(K,K)
                 RETURN
                 END
```

```
SUBROUTINE  RIPPLE    TRACE                     CDC 6700 FTN V3.0-355F OPT=0  80/05/29. 09.26.48.
              SUBROUTINE RIPPLE
        C
        C     THIS ROUTINE CALCULATES THE RIPPLE MEN ASSOCIATED WITH EACH
        C     COMPONENT
        C
              COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
             A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),ROF,REF,
             B              DMO,DME,DAO,DAE,OHAS,EHAS,TPERS
              COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
             A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
             B              M3A,DSO,USE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
              COMMON /BLK6/ IDAY,IGEOCT,ILINES,IDPLUS,IPAGE,IBUF(12),IGEO,
             A              ERF(100),ORF(100),ITITLE(4),LNCT,NGEO
              REAL M1A,M2A,M3A,M1,M2,M3
        C
        C     CALCULATE OFFICERS AND ENLISTED FOR ALL FACILITIES
        C
              DO 20 I=1,99
              ORF(I)=TABLE(IPOINT(I,2),7)*A(I)
           20 ERF(I)=TABLE(IPOINT(I,2),8)*A(I)
        C
        C     CALCULATE OFFICERS AND ENLISTED FOR PIERS
        C
              ORF(11)=(M1A+M2A)*TABLE(IPOINT(11,2),7)
              ERF(11)=(M1A+M2A)*TABLE(IPOINT(11,2),8)
              ORF(85)=M2*TABLE(IPOINT(85,2),7)
              ERF(85)=M2*TABLE(IPOINT(85,2),8)
              ORF(93)=M1*TABLE(IPOINT(93,2),7)
              ERF(93)=M1*TABLE(IPOINT(93,2),8)
        C
        C     SET OFFICERS AND ENLISTED FOR POWER PLANT
        C
              ORF(100)=TABLE(IPOINT(100,2),7)
              ERF(100)=TABLE(IPOINT(100,2),8)
              RETURN
              END
```

```
      SUBROUTINE SHIPS
C
C     THIS ROUTINE READS SHIP COMPLEMENT CARDS AND PERFORMS SOME
C     PRELIMINARY CALCULATIONS
C
      COMMON /BLK1/ A(100),TABLE(100,10),IPOINT(100,2),INDEX(100),
     A              IEND,IFRONT,LAST,NOAC,NOS,IERR,P(75),PP(23),HOF,REF,
     B              DMO,DME,DAO,DAE,OBAS,EBAS,TPERS
      COMMON /BLK2/ IANUM(100),ISNUM(100),OS(100),ES(100),STYPE(100),
     A              AMMO(100),AAMMO(100),FUEL(100),M1,M1A,M2,M2A,M3,
     B              M3A,DSO,DSE,IANUML(100),XA,SH,ISFLG,IAFLG,IGAS(100)
      COMMON /BLK3/ DOSC,DOSCR,DOSP,DOSPR,DOSS,DOSSR,DOSH,DOSHR,
     A              DOSA,DOSAR,PCAF,PCSF,PCAA,PCSA,FC,FA,G,FAC,
     B              TYPE1,TYPE2,TYPE3,TEMAMO
      COMMON /BLK4/ IBIG,DO,DE,HSQUAD,TACAC,CARAC,PATAC,HELOS,
     A              HSLTAC,HSLCAR,HSLPAT,HSLHEL
      COMMON /BLK5/ JX(100),KX(100),LX(100),X1(100),X2(100),X3(100),
     A              X4(100),X5(100),X(100)
      COMMON /BLK6/ IDAY,IGEOCT,ILINES,IDPLUS,IPAGE,IBUF(12),IGEO,
     A              ERF(100),ORF(100),ITITLE(4),LNCT,NGEO
      REAL LA,LAP,LC,LCP,M1A,M2A,M3A,M1,M2,M3
      INTEGER OS,ES
      DATA EOF/6H******/
C
C     READ SHIP COMPLEMENT
C
      SH=0.
   99 READ(5,1007)Z,Y,IGEO,IDAY
 1007 FORMAT(A8,1X,F3.0,1X,A8,A4)
      J=Y+.1
C
C     CHECK FOR END OF SHIPS
C
      IF(Z.EQ.EOF)GO TO 103
      IF(J.LT.0)CALL IERROR(13,Z)
C
C     SET SHIP FLAG
C
      ISFLG=1
C
C     DETERMINE SHIP TYPE
C
      DO 91 I=1,101
      IF(STYPE(I).EQ.Z)GO TO 102
   91 CONTINUE
C
C     IF ILLEGAL SHIP TYPE STOP
C
      CALL IERROR(3,Z)
C
C     INCREMENT AMMO REQUIREMENTS
C
  102 XA=XA+Y*AMMO(I)
C
C     INCREMENT SHIP MUNITIONS
```

```
      C
            SH=SH+Y*AMMO(I)
      C
      C     INCREMENT OFFICERS AND ENLISTED DUE TO THIS DRIVER INPUT
      C
            DSO=DSO+Y*OS(I)
            DSE=DSE+Y*ES(I)
      C
      C     INCREMENT SHIP COUNT BY TYPE
      C
            ISNUM(I)=ISNUM(I)+J
            GO TO 99
        103 CONTINUE
      C
      C     INCREMENT REPORT NUMBERS
      C
            IF(IGEO.EQ.LSTGEO)GO TO 109
            LSTGEO=IGEO
            IGEOCT=IGEOCT+1
            IDPLUS=0
        109 CONTINUE
            IDPLUS=IDPLUS+1
            IPAGE=0
            READ(5,1001)DMO,DME
       1001 FORMAT(2(F5.0,1X)/)
      C
      C     CHECK ERROR COUNT - RETURN IF NON-ZERO AFTER WRITING MESSAGE
      C
            IF(IERR.EQ.0)GO TO 104
            WRITE(6,1016)IERR
       1016 FORMAT(4H ***,I3,32H ERRORS ENCOUNTERED ON INPUT ***/
          A        22H *** PROGRAM ABORT ***)
        104 CONTINUE
            RETURN
            END
```

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