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AUTHOR Goclowski, John C.; And Others

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ABSTRACT

The Reliability, Maintainability, and Cost Model (RMCM) described in this report is an interactive mathematical model with a built-in sensitivity analysis capability. It is a major component of the Life Cycle Cost Impact Model (LCCIM), which was developed as part of the DAIS advanced development program to be used to assess the potential impacts of the DAIS concept of avionics integration on system support requirements and life cycle cost (LCC). This guide for RMCM users contains all information needed for users to interact with the RMCM computer program from a computer terminal. Included are descriptions of the RMCM functions and capabilities, as well as each cost element which it covers and its associated equations; instructions for preparing input data files; a description of the input data format for the cost model data bank; an explanation of the interactive procedures to be used on the computer terminal; and examples of the RMCM batch mode printed outputs. The appendices contain RMCM input cost elements and sources, specific cost element equations, and a list of acronyms. (Author/CHC)

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HUMAN RESOURCES LABORATORY

DIGITAL AVIONICS INFORMATION SYSTEM (DAIS): LIFE CYCLE COST IMPACT MODELING SYSTEM RELIABILITY, MAINTAINABILITY, AND COST MODEL (RMCM) - DESCRIPTION
Users Guide

By

John C. Goclowski
John M. Glasier
Robert H. Kistler
Marjorie A. Bristol

Dynamics Research Corporation
60 Concord Street
Wilmington, Massachusetts 01887

H. Anthony Baran

LOGISTICS AND TECHNICAL TRAINING DIVISION
Wright-Patterson Air Force Base, Ohio 45433

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Final Report

AIR FORCE SYSTEMS COMMAND

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This report has been reviewed by the Office of Public Affairs (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

ROSS L. MORGAN, Technical Director
Logistics and Technical Training Division

RONALD W. TERRY, Colonel, USAF
Commander

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SUMMARY

This report is a guide for the user of the Reliability, Maintainability, and Cost Model (RMCM) portion of the Life Cycle Cost Impact Modeling System (LCCIM). It provides all information necessary to interact with the program from a computer terminal. The second volume contains a printout of the computer program.

The initial application of LCCIM was directed at determining potential impacts of the Digital Avionics Information System (DAIS) concept on system support personnel requirements and life cycle cost (LCC). It is applicable, however, in the development of any new system or the modification of an existing hardware system. The RMCM serves as a powerful tool within the LCCIM for conducting resource requirements, costing, and trade-off analyses. User-oriented, it accepts input data at varying levels of detail during all phases of the weapon system acquisition process. Also, the speed of the interactive RMCM computer program should encourage more trade-off analyses to be conducted early in the design process, where cost avoidance actions are most effective. RMCM data processing takes into account the interaction between support requirements and cost parameters. Outputs provide for the increased visibility of cost drivers and their individual and combined impacts on system ownership.

Included in this users guide are (a) a description of the RMCM functions and capabilities, (b) a description of each cost element which it covers, along with associated equations, (c) instructions for preparing input data files, (d) a description of the input data format for the cost model data bank, (e) an explanation of the interactive procedures to be used on the computer terminal, and (f) examples of the RMCM batch mode printed outputs.

PREFACE

This technical report was prepared under contract no. F33615-75-C-5218, "DAIS Life Cycle Costing Study." The report is part of a series of reports, data banks, and models which constitute its products. Results of this study, in combination with present Air Force capabilities, are to provide the means to assess the life cycle cost impact of the operational implementation of the Digital Avionics Information System (DAIS).

This research effort was directed by the Logistics and Technical Training Division of the Air Force Human Resources Laboratory at Wright-Patterson AFB and is documented under Work Unit 20510001, "DAIS Life Cycle Costing Study." It was performed under Air Force Avionics Laboratory program element 63243F, "Digital Avionics Information System," Project 2051, "Impact of the DAIS on Life Cycle Costs." Project 2051 is jointly sponsored by the Air Force Command (Air Force Human Resources Laboratory and Air Force Avionics Laboratory) and the Air Force Logistics Command. Contract funds were provided by the Air Force Avionics Laboratory. The DAIS program manager is Mr. Terrance A. Brim. The Air Force Human Resources Laboratory project scientist is Mr. H. Anthony Baran. The Air Force Logistics Command project officer is Captain Ronald Hahn. The latter two are DAIS deputy directors. The contractor program manager is Mr. John Goclowski.

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RELIABILITY, MAINTAINABILITY, AND COST MODEL USERS GUIDE

I. GENERAL INFORMATION AND APPLICATION

1.1 INTRODUCTION

The Reliability, Maintainability, and Cost Model (RMCM) described in this report is an interactive mathematical model with a built-in sensitivity analysis capability. It is a major component of the Life Cycle Cost Impact Model (LCCIM). The LCCIM was developed as part of the Digital Avionics Information System (DAIS) advanced development program to be used to assess the potential impacts of the DAIS concept of avionics integration on system support requirements and life cycle cost (LCC). It was designed to be applicable to any new system and to be operable early in the systems acquisition process. To accomplish the assessment for the DAIS baseline, data banks were developed containing parameters that could be used by a designer to characterize a system's manpower and other logistics element requirements. The development of these data banks was accomplished such that they could support an analytic process to evaluate a system's requirements in terms of reliability, maintainability, and resource requirement parameters. The LCCIM was designed as a tool to aid in this process. It was developed for use by system designers and associated specialists (such as reliability engineers, maintainability engineers, logistics engineers).

The process incorporates a methodology for:

1. Conducting requirements, cost, and trade-off analyses during all phases of the weapon system acquisition process.

2. Integrating explicit manpower, personnel, and training assessments in the early phases of the acquisition process and major system modification programs.

A managerial overview of the LCCIM is provided in AFHRL-TR-79-64[1].[1]

The RMCM is a computer program consisting of two models which can be operated interactively with a computer terminal. They are (a) the Reliability and Maintainability (R&M) Model [4,5] and (b) the Cost Model [11]. A third computerized model, the Training Model (TRAMOD), interfaces manually with the RMCM [2,3]. Figure 1.1 depicts the interfaces of the models and their associated data banks.

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[1] Numbers enclosed in square brackets refer to references listed in the back of this volume.

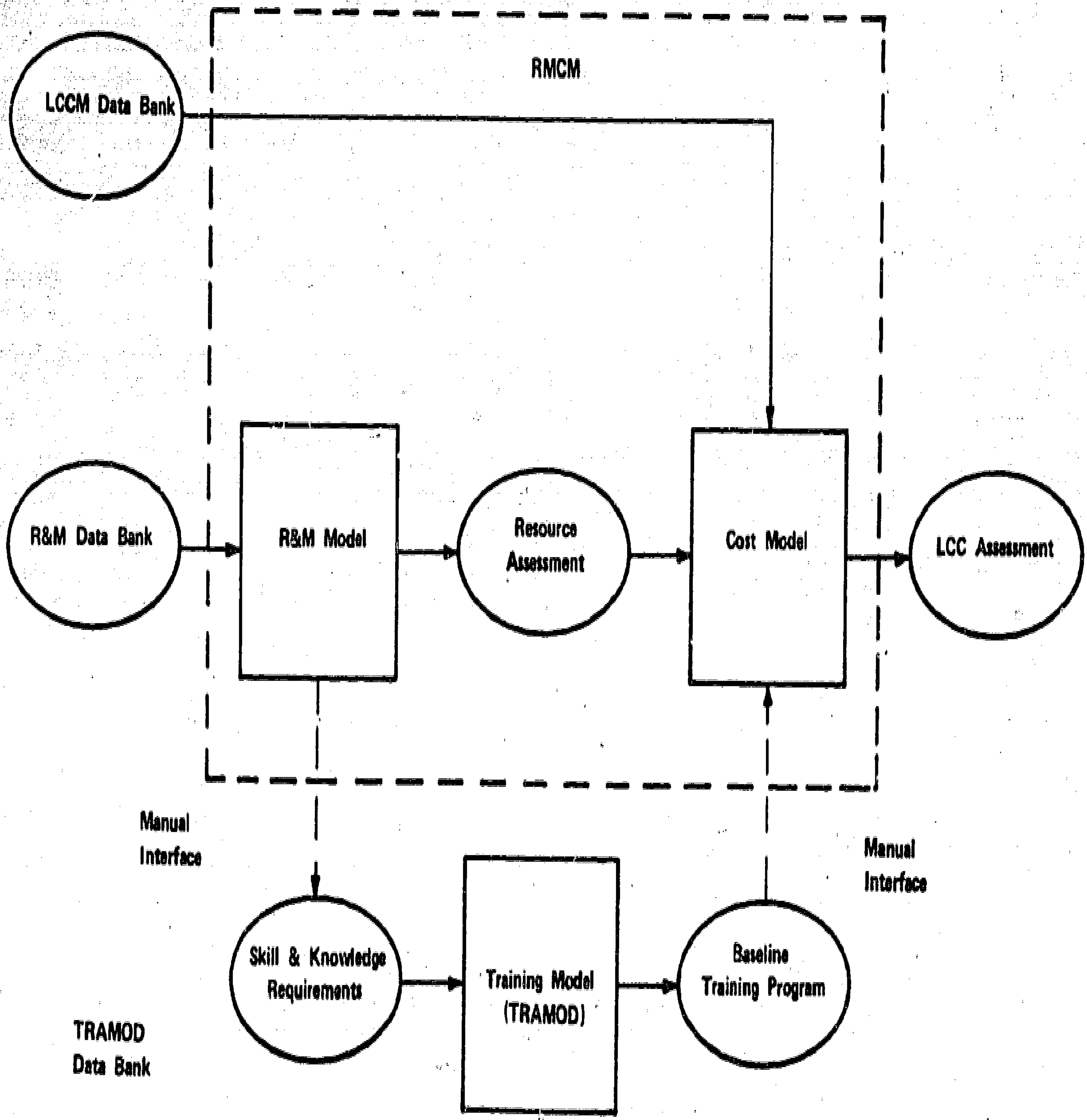

Figure 1.1 RMCM interfaces

The R&M Model is an average value model which aggregates support demands at the line replaceable unit (LRU), subsystem, or system level to assess the total resource requirements. It is used to identify the drivers of high resource consumption and to determine the impact of changes in R&M parameters.

The cost model applies cost factors to the assessed resource values generated by the R&M Model and then combines the results with the other cost elements to estimate LCC. The cost outputs are presented in selective combination or summary form.

1.2 RMCM DESCRIPTION

The RMCM program consists of two main components--the R&M Model and the Cost Model.

Although the development and use of the R&M Model is explained in depth in other reports [4,5], a brief recapitulation of the inputs, outputs, and general capability of the R&M Model is included in this report to facilitate an understanding of its contribution to the RMCM. However, this Users Guide concentrates on a description of the cost model and on how the overall RMCM program functions.

1.2.1 R&M Model Portion of RMCM

The R&M Model operates in conjunction with a computerized data bank containing historical reliability and maintenance data gathered from operational systems. The data are made relevant to new systems by factoring the historical data on the basis of system and subsystem comparability analyses. Inputs to the R&M Model include:

1. The frequency of maintenance actions by subsystem and LRU for both aircraft and support equipment (SE).

2. Within each maintenance action, data concerning each of the task events (such as type event, probability of occurrence, average time to complete, manpower type and skill requirements, and SE requirements).

The computed outputs of this model are point estimates on "expected values" (based on average input values rather than on peak resource demands or operational "constraints" associated with the use of the system under examination. Such constraints, for example, might be caused by queuing or any other nonlinearities inherent in a "real world" situation. (Consideration of them would require a simulation model.) The outputs are principally measures of the average maintenance man-hour resource requirements which may be expected to result under a nominal set of conditions. These conditions are defined by system variables such as equipment configuration, equipment design, and/or the system support maintenance concept. The particulars of these conditions are made available to the model in terms of the R&M input variables. The model uses these inputs to compute the man-hour resources, SE, and spares consumed to satisfy the maintenance demands of each subsystem and its LRUs for both flightline and shop.

The primary purpose of the R&M Model is to provide data as inputs to the cost portion of the RMCM. However, in a stand-alone operation, the R&M Model provides a means of analyzing the R&M impact of changes in various design and support concept parameters. It employs figures of merit (FOM) to aggregate the data which can be used to make comparisons of resources required on a total sytem, subsystem, or LRU basis. The FOMs can also be used to identify "high drivers" or problem areas of high resource requirements.

The FOM analyses within the model may address, for example, maintenance manhours per 1000 flight-hours (measuring design and support planning impacts on maintenance man-hour resource requirements) and service availability (measuring the impact of maintenance requirements on operational readiness). The basic parameters used to calculate the FOMs for each subsystem (broken out for each shop and flightline maintenance task event) are:

1. Probability of occurrence
2. Average time to complete the event
3. Air Force specialty and skill level of required personnel
4. Support equipment

The maintenance action rate for each subsystem is input as mean flight-hours between maintenance actions (MFHBMA).

By making reasonable variations in any of the foregoing input parameters, the model is used to note the effect on the various outputs. In this way, the R&M Model is used alone or in conjunction with the Cost Model portion of the RMCM to conduct sensitivity and trade-off analyses. Thus, after high driver items are identified in terms of resource requirements, combinations of R&M parameters can be perturbed to determine the system sensitivities. Alternatives for achieving reduction in the resources required can thus be identified.

1.2.2 Cost Model Portion of RMCM

The cost model portion of RMCM is an analytical accounting cost model which computes the LCC of any proposed design for a system. This accounting model is a structured and systematic way of adding the cost elements that should be considered when making LCC estimates. The cost element values are obtained from a set of equations which models the development, production, operation, and support costs of the system. Although the associated data bases have been prepared for avionics systems, the model can be easily adapted to any defined system; particularly, military weapons systems.

The cost model consists of cost elements that have been chosen to capture all relevant costs associated with investment, operation, and support of a system. The hierarchical structure of these cost elements in terms of their contributions to the LCC categories used to catalog them is shown in Figure 1.2. The sets of equations that model these cost elements are described in Section III.

Cost elements are aggregated by a major cost category structure best suited for comparing LCCs. There are three principal cost categories.

1. Nonrecurring
2. Recurring
3. System disposal

Note that system disposal is, by definition, a nonrecurring cost. It is useful, however, to break it out and consider it separately.

The equations for the LCC structure that constitute the cost model portion of the RMCM are described in Sections II (higher-level cost categories) and III (lower-level cost elements). Included in Section II is a description of the capability within the RMCM to apply the "time value of money" theory in terms of inflation and discount rates to the LCC categories. Section II also describes the general assumptions inherent in the model.

1.3 INPUT DATA BASE

The RMCM requires a data base that contains at least two data banks: one for the R&M parameters and one for the cost parameter data. The parameter files contained in the R&M and cost data banks are listed in Tables 1.1 and 1.2, respectively.

The choice of values used in these data banks will not be discussed in the Users Guide. However, a typical table has been included as Appendix A which lists each cost element by name and provides a potential value source for each item.

Four data bank files, consisting of two sets of cost and R&M data, were developed for the DAIS application. One set provides two historical data banks containing system specific R&M data and cost data for a non-DAIS baseline configuration of avionics subsystems suitable for a close-air-support (CAS) mission. The second set provides two theoretical data banks providing similar R&M and cost data for a mid-1980s DAIS configuration.

- LCC – Life Cycle Cost
  - NRC – Non-Recurring Cost
    - CRD – Cost of Research & Development
    - CSI – Cost of System Investment
      - CPP – Cost of Procurement
      - CPM – Cost of Project Management
    - COI – Cost of Support Investment
      - CPTI – Cost of Initial Maintenance Personnel Training
      - CSPI – Cost of Spares Investment
      - CDRI – Cost of Initial Depot Support Equipment
      - CSEI – Cost of Base Level Support Equipment Investment
      - CSWI – Cost of Software Acquisition
      - CJGI – Cost of Initial Maintenance Manuals
      - CIMI – Cost of Inventory Management Initial
      - CFAI – Cost of New or Additional Facilities
  - RC – Recurring Cost
    - CO – Cost of Operation
      - COP – Cost of Operations Personnel
      - CFL – Cost of Fuel
    - CS – Cost of Support
      - COM – Cost of On-Equipment Maintenance
      - CSM – Cost of Intermediate Shop Maintenance
      - CPT – Cost of Maintenance Personnel Training
      - CSP – Cost of Replacement Spares
      - CDR – Cost of Depot Maintenance
      - CSE – Cost of Maintaining Support Equipment
      - CSW – Cost of Software Support
      - CJG – Cost of Supporting Maintenance Manuals
      - CIM – Cost of Inventory Management
  - CDP – Cost of System Disposal

Table 1.1 - R&M Parameter Data Bank File Descriptions.

File Name - Type of Data

1. Cross reference-identification code (ID) to work unit code (WUC) for each subsystem and line replaceable unit (LRU) weight per LRU, national stock number, and number of shop replaceable units (SRU) per LRU.
2. Support equipment - flightline
3. Support equipment - shop
4. Manpower specialty - flightline
5. Manpower specialty - shop
6. Task time - flightline
7. Task time - shop
8. Probability of occurrence of each of the maintenance events - on the flightline for each outcome.
9. Probability of occurrence of each of the maintenance events - in the shop for each outcome.
10. Reliability of the subsystem measured in mean flight-hours between maintenance actions (MFHBMA), and an H factor that provides the ratio of shop repair actions to flightline remove-and-replace actions for the LRU.

Table 1.2 Cost Parameter Data Bank File Descriptions.

File Name / Type of Data*

1. Recurring cost elements
2. Nonrecurring cost elements
3. Line replaceable unit (LRU) data
4. Subsystem data
5. Support equipment data
6. Depot support equipment data
7. Aircrew data
8. Personnel training data by AFSC
9. On-Off equipment data by AFSC
10. Single value variables for use in various equations

*Formats for these cost data files are given in Section IV.

These data banks are available as input files to the RMCM as follows.

Call Up File Name	Data Bank Name
N75DATA	Historical Non-DAIS R&M Data Bank Files
COSTND75	Historical Non-DAIS Cost Data Bank Files
DAIS85	Theoretical DAIS R&M Data Bank Files
COSTD85	Theoretical DAIS Cost Data Bank Files

More detailed discussions of the basic DAIS data banks and their development are available in other reports [6-8].

When developing new R&M data banks for another application, users of RMCM should refer to the Digital Avionics Information System DAIS: Reliability and Maintainability Model Users Guide [5]. It provides the formats for the R&M parameter input data files. That technical report should also be used when operating the R&M model portion of the RMCM in a stand-alone mode.

The formats for preparing the cost parameter input data files are contained in Section IV of this volume.

1.4 RMCM OPERATION OVERVIEW

The interactive RMCM program performs five major functions.

1. R&M computation
2. Cost computation
3. Output
4. R&M perturbation
5. Cost perturbation

After preparing the R&M data bank and the cost data bank (as described earlier in this section), the user employs a combination of the functions listed above to exercise the model in one of several operational modes.

The simplest mode of operation is the basic computation of R&M, cost, and output parameters as shown in Figure 1.3. The R&M output parameter values and cost factor values from the cost data bank are used as inputs to the cost equations. All cost outputs are then calculated and made available to the user through the interactive terminal or through the batch print program.

To study the sensitivity of an R&M parameter on LCC, the user may alter an R&M file and create a second "perturbed" R&M file. The cost equations are then evaluated for both configurations simultaneously, with comparative outputs available to the user through the interactive terminal and the batch print program. The functional flow diagram is shown in Figure 1.4 for this mode of operation when the R&M perturbation function is added to the basic computation.

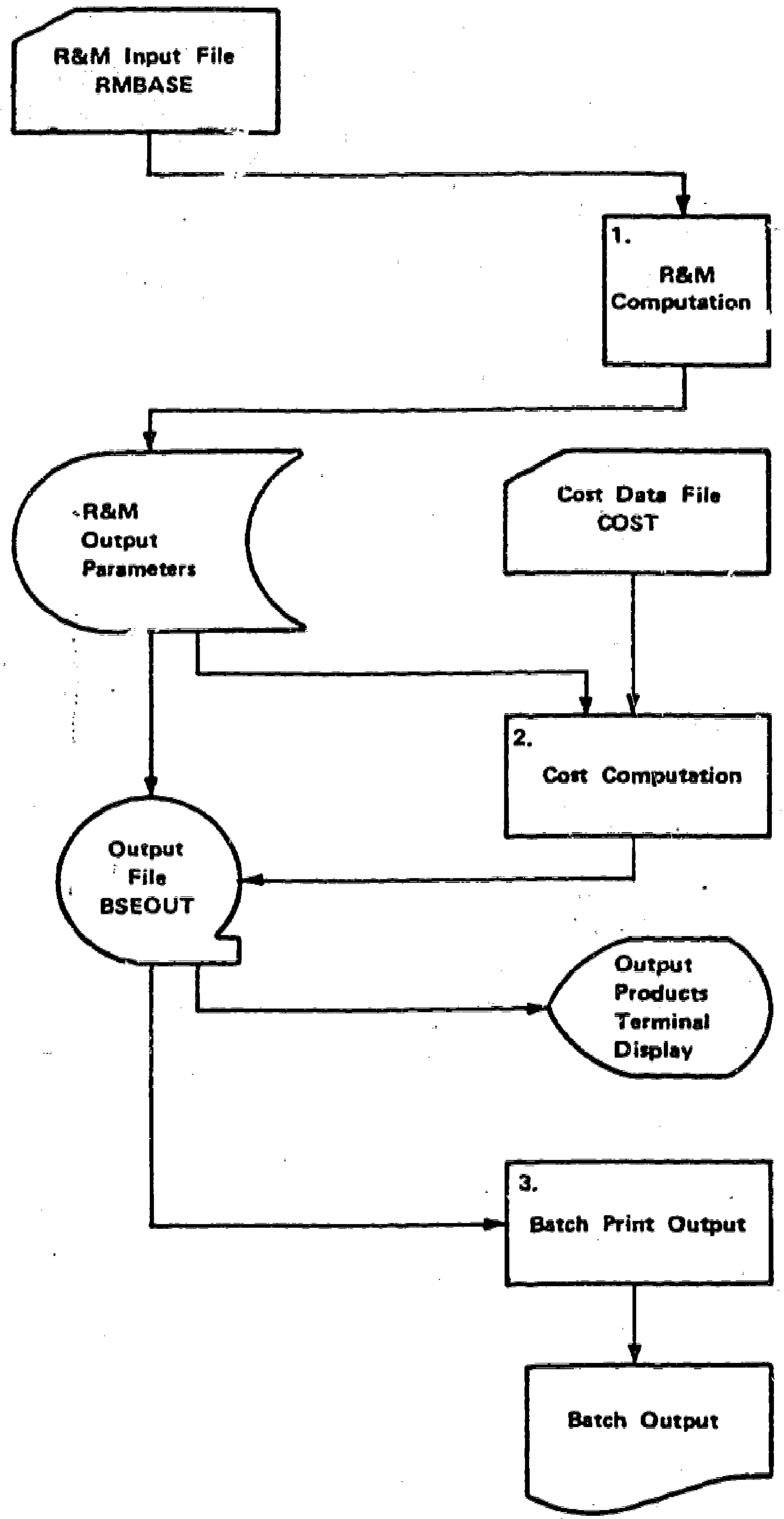

Figure 1.3 — RMCM functional flow diagram: basic computation.

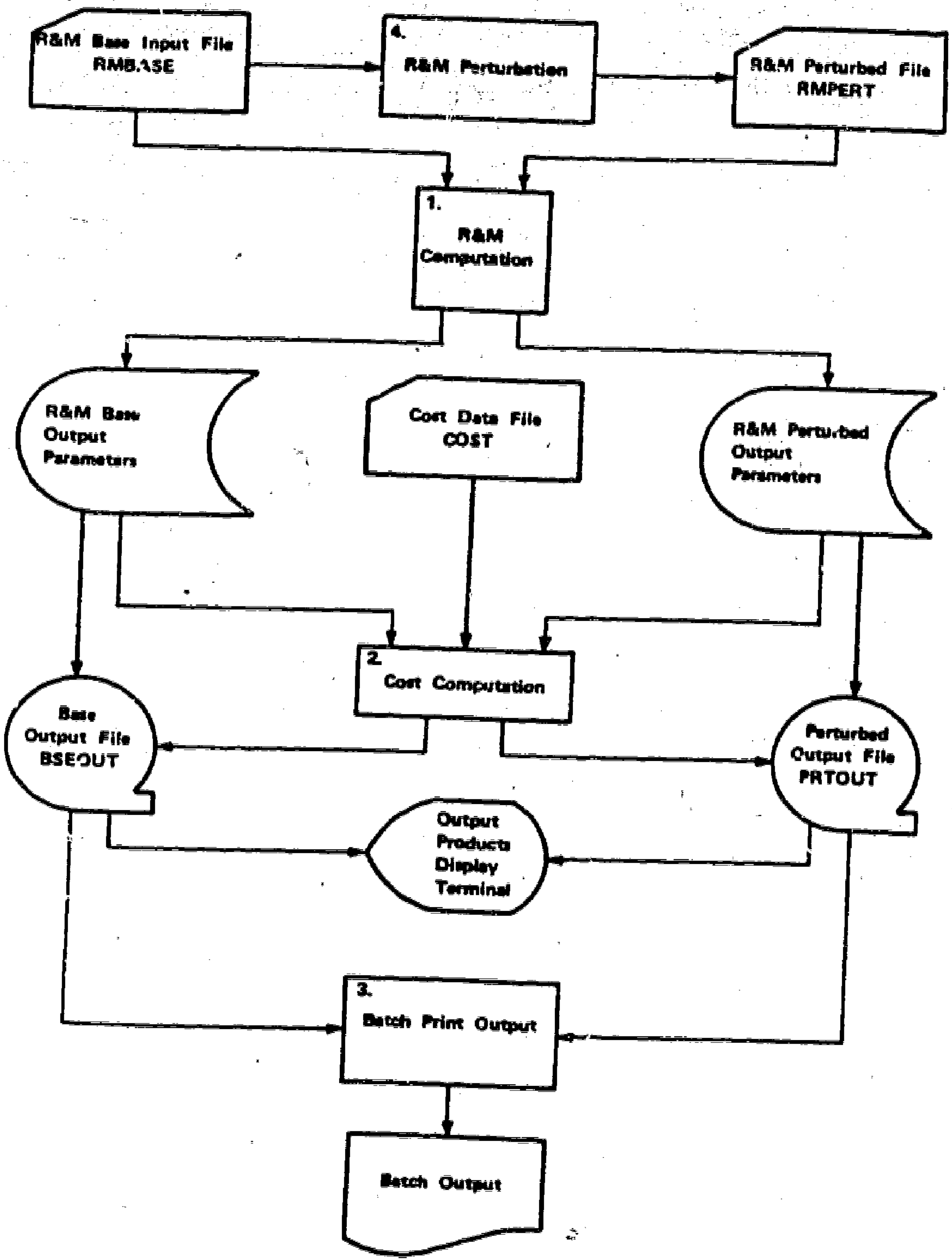

Figure 1.4 – RMCM functional flow diagram: basic computation with R&M perturbation.

Similarly, it is possible to vary only cost parameters in certain trade-off analyses. The functional flow diagram is shown in Figure 1.5 for this mode of operation, such as when the cost perturbation function is added to the basic computation functions. Though no new cost file is created, the user may modify any variable from the cost data file, any output from the R&M computations, or any combination of both prior to calculation of the cost outputs. As before, comparative outputs are available through the interactive terminal or the batch print program.

Finally, both the R&M and the cost files are perturbed when performing sensitivity and trade-off analyses. The functional flow diagram is shown in Figure 1.6 for the mode of operation when all five functions are used. The perturbed outputs reflect the combined effects of changes in both R&M and cost values relative to the base (original data) outputs.

As shown in the functional flow diagrams, the R&M and cost input files are external to the interactive program. These files must be prepared and cataloged prior to using the model. If an R&M parameter is perturbed, a new R&M file is created. This file may be cataloged by the user after the interactive session if additional use with the R&M model is desired. Two interface files are also created by the interactive program, one for each set of costs to be compared. These files should be cataloged for later use by the batch print program. A detailed discussion of the cataloging procedures is given in Section V.

1.5 HOST COMPUTER CONSIDERATIONS

The FORTRAN programming language is used. Run on the CDC-6600, the RMCM operates either in batch or on a remote computer terminal.

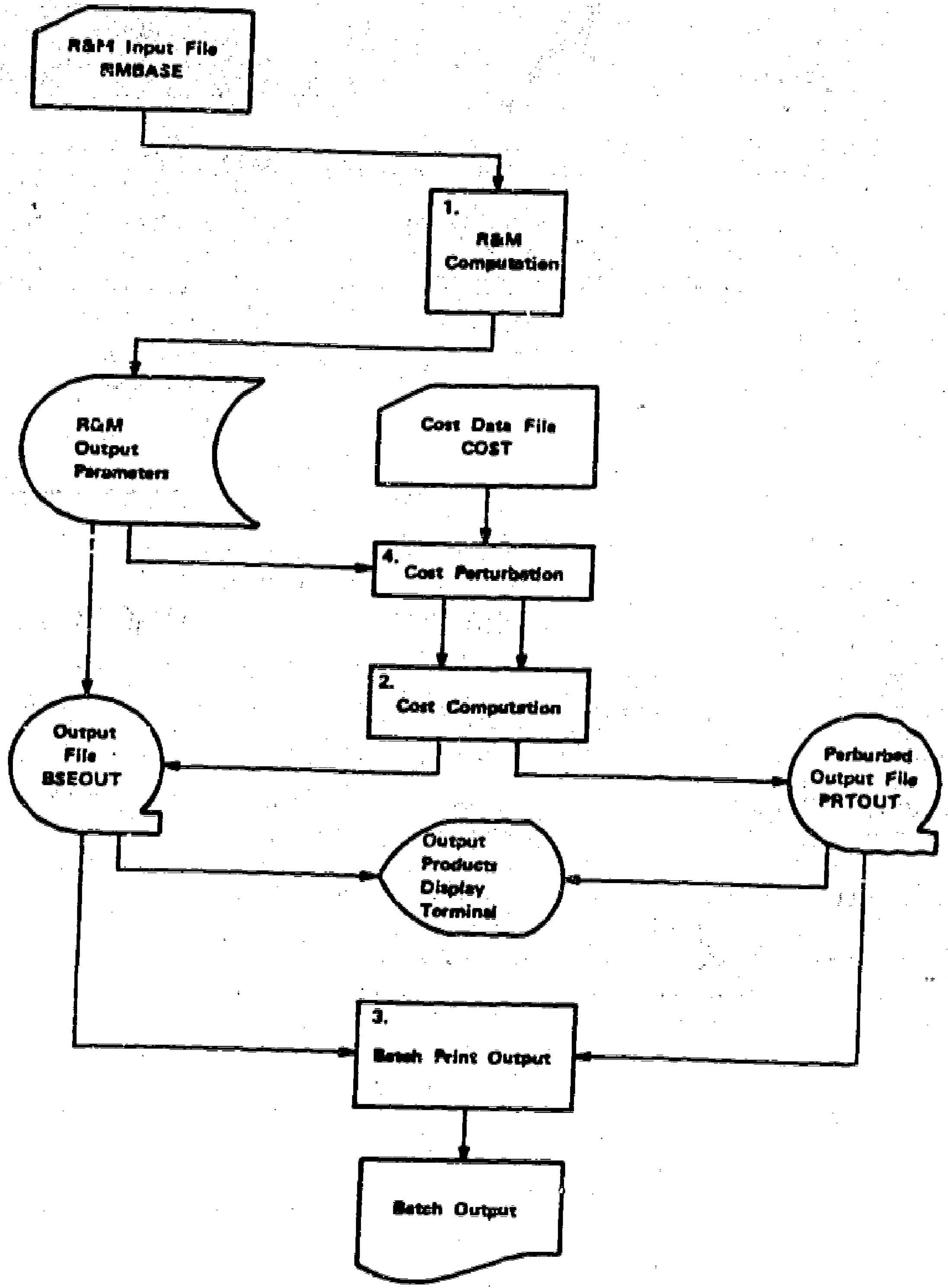

Figure 1.5 -- RMCM functional flow diagram: basic computation with cost perturbation.

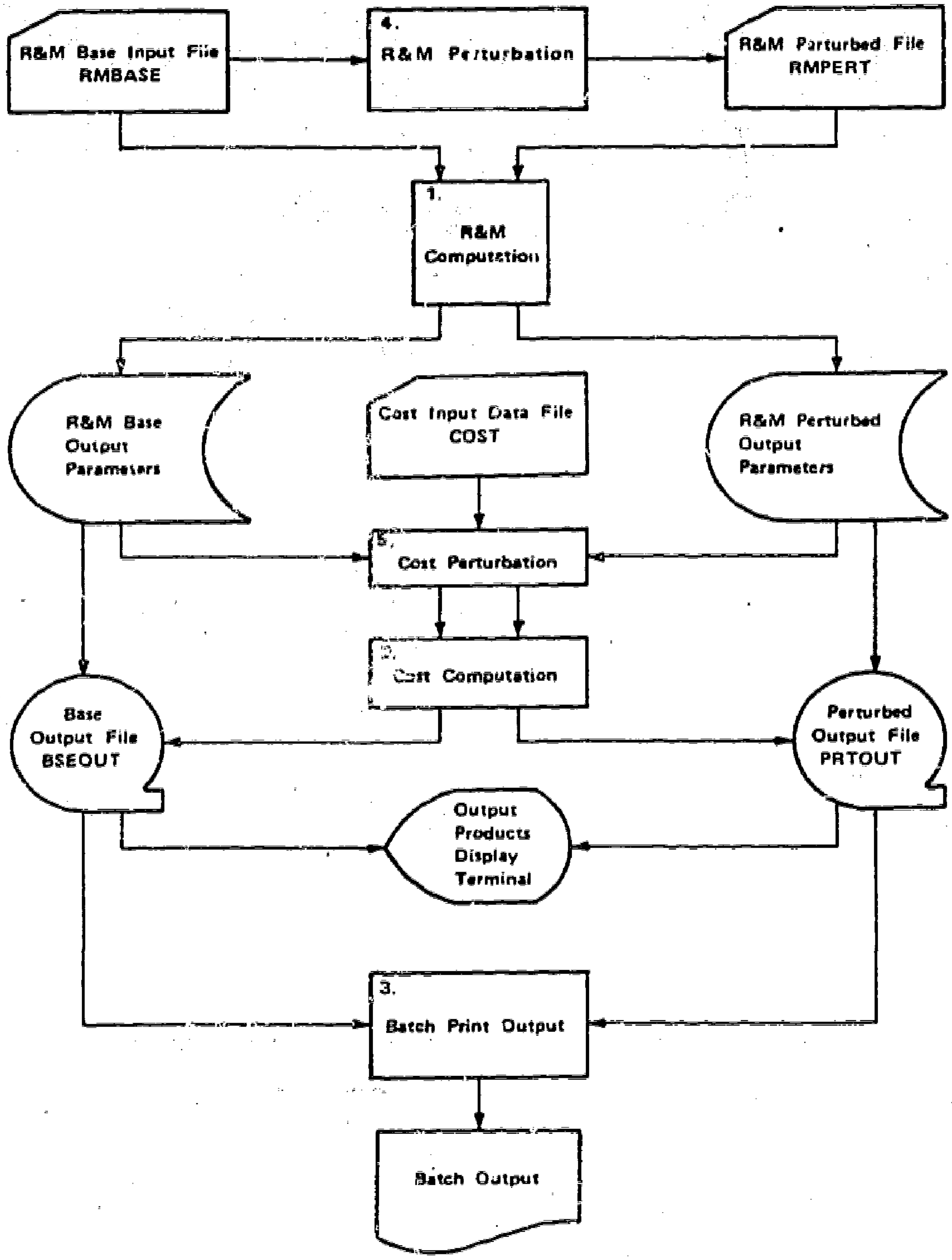

Figure 1.6 – RMCM functional flow diagram: R&M and cost perturbations.

II. RMCM COST EQUATIONS AND ASSUMPTIONS

This section describes the general LCC structure of the RMCM. The equations used to aggregate all the lower-level cost elements that constitute the LCC of a system then are presented. The equations contained in the model that can be used to adjust those LCC values to account for the "time value of money" theory also are explained. Finally, the general assumptions inherent in the RMCM program are addressed.

2.1 LCC STRUCTURE PARTICULARS

The hierarchical structure chosen to catalog all of the cost elements that constitute the total LCC for the RMCM program was shown in Figure 1.2. The three principal categories are:

1. Nonrecurring costs (initial one-time development and investment costs)
2. Recurring costs (annual operation and support costs)
3. Final disposal (gain or loss) costs

The nonrecurring costs are further described by three cost groupings: research and development (R&D), system investment, and support investment. The recurring costs are further described by two cost groupings: cost of operation and cost of support. These cost groupings, along with disposal, contain all of the basic cost elements used to compute the LCC.

The basic cost elements are listed on the right side in Figure 1.2. These cost elements include all of those needed to compute the LCC of a system, including those that are not directly applicable to the DAIS design (such as cost of fuel).

The specific equations used to compute the values for the basic cost elements are described in Section III. The general equations which aggregate these lower-level cost elements into the LCC categories are addressed within this section.

2.2 GENERAL LCC EQUATIONS

The total LCC of a weapon system includes all costs incurred during the entire life span of the weapon system; that is, from its conception to its disposal. Three major cost categories are used to encompass all of the costs that arise during the lifetime of a weapon system. The LCC equation sums these three major categories.

$$LCC = NRC + RC + CDP$$

NRC	Nonrecurring cost total using a baseline year value.
RC	Recurring cost total using a baseline year value.
CDP	Cost of system disposal in constant year dollars of the baseline year.

2.2.1 Nonrecurring Costs (NRC)

The nonrecurring costs incurred by the initiation of a new weapon system involve three cost groupings.

1. Research and development
2. System investment
3. Support investment

The R&D cost group, one of the basic cost elements, encompasses the costs accumulated during the conceptual, validation, and full-scale development phases of the weapon system life cycle. The system and support investment costs reflect the initial investment costs incurred during production and deployment of the system. The nonrecurring cost total, using a baseline year value, is obtained from the following equation.

$$NRC = CRD + CSI + COI$$

CRD	Research and development costs (input).
CSI	System investment costs.
COI	Support investment costs.

2.2.1.1 System Investment Costs (CSI)

The cost of system investment refers to costs associated with the production and procurement of the various subsystem elements required by the new weapon system. This cost group includes values for program management, initial equipment purchases, and testing of production units. System investment costs consist of two cost elements, as expressed in the following equation.

$$CSI = CPP + CPM$$

CPP	Cost of procurement.
CPM	Cost of project management.

2.2.1.2 Support Investment Cost (COI)

The cost of support investment includes all of the costs associated with the logistics support requirements of the weapon system. These costs reflect the initial investment for necessary supplies and services required to support the new weapon system. Support investment costs consist of eight cost elements, as described in the following equation.

COI = CPTI + CSPI + CDRI + CSEI + CSWI + CJGI + CFAI + CIMI	
CPTI	Cost of initial maintenance personnel training.
CSPI	Cost of spares investment.
CDRI	Cost of depot support initial.
CSEI	Cost of support equipment initial.
CSWI	Cost of software acquisition.
CJGI	Cost of maintenance manuals initial.
CIMI	Cost of inventory management initial.
CFAI	Cost of new, modified, or additional facilities.

2.2.2 Recurring Costs (RC)

The recurring cost elements reflect the costs generated during the operation and support phase of the weapon system life cycle. The recurring costs are computed on an annual basis (RCY) as the sum of the operation (CO) and support cost (CS) contributions. These annual values (RCY) are multiplied by the planned inventory usage period (PIUP) to obtain the total weapons system recurring cost contribution to LCC for the operation and support phase. Recurring cost per year in constant year dollars is computed with the following equation.

RCY = CO + CS	
CO	Cost of operation per year.
CS	Cost of supporting the operation of the weapon system per year.

Then the recurring cost total using baseline year values is obtained from the equation below.

RC = (PIUP)(RCY)	
PIUP	Planned inventory usage period (input).
RCY	Recurring cost per year in constant year values.

2.2.2.1 Cost of Operation (CO)

The cost of operation includes the recurring costs that are directly related to the operation of the weapon system. The cost of operation is contained in two cost elements as shown in the following equation.

CO = COP + CFL	
COP	Cost of operations personnel (including their support)
CFL	Cost of fuel.

The cost of operations personnel includes the cost of aircrew (CAC) and the cost of other operations personnel (COO). The aircrew costs should include, but are not limited to, salary, personnel, equipment, and support requirements.[2] The COO term aggregates the cost of paying and supporting such operating personnel as command staff, security personnel, and other deployed personnel not included in the CAC and in the on- and off-equipment maintenance staff elements.

2.2.2.2 Cost of Support (CS)

The cost of supporting the operation of a weapon system includes the cost of the personnel and materials needed to support the deployed units. The type of support required by the weapon system includes organizational level maintenance personnel and equipment, as well as fully equipped and staffed intermediate and depot level maintenance facilities. The cost elements included in the cost of supporting the weapon system operation are given in the following equation.

CS = COM + CSM + CPT + CSP + CDR + CSE + CSW + CJG + CIM	
COM	Cost of on equipment maintenance.
CSM	Cost of intermediate shop maintenance.
CPT	Cost of maintenance personnel training.
CSP	Cost of replacement spares.
CDR	Cost of depot maintenance.
CSE	Cost of maintaining support equipment.
CSW	Cost of supporting the software.
CJG	Cost of supporting maintenance manuals.
CIM	Cost of inventory management.

2 The only limitation on what costs to include in this or any cost parameter is the need for using a value within the study application, the availability of data, and assurance that costs are not duplicated between cost elements.

2.2.3 Disposal Costs (CDP)

The disposal costs (CDP) cover the expenses incurred, as well as any income derived from the termination of a weapon system at the end of its economic life. For example, these costs would include salvage value as well as such costs as "moth ball" storage but are treated as a one-time cost. This CDP term is a basic cost element input as an aggregated cost value.

2.3 TIME VALUE OF MONEY

The values obtained for LCC from the cost equations are in constant year dollars. These constant year dollars are computed using base year cost values that have been input in the data base. The user interactive mode of RMCM operation allows the computation of LCC to be adjusted to consider the future value of money. Two adjustment factors are provided whereby LCC can be computed as a function of average inflation and/or average discount rate. The equations for computing adjusted LCC are given in Figure 2.1. The three principal cost categories (RC, NRC, and CDP) are each multiplied by an annual adjustment factor (AAF) to obtain the values necessary to compute an LCC adjusted by the time value of money theory.

The term AAF is derived from two expressions commonly used to handle inflation and discount rates. The first provides an inflation adjustment factor which converts a proposed expenditure in a future year using a base year cost to the dollar cost at that future year. The expression used for the inflation multiplication factor to obtain future cost is given by $(1 + IR)^t$.

$$\$cost_{future} = \$cost_{present} \ (1 + IR)^t$$

IR	The inflation rate.
t	The number of years after the base year.

The second factor converts the dollar value at the future year into the present dollar value of the base year based upon an average discount rate. The present dollar value represents the amount of money the Government would have to put into an interest-gathering account to have the future dollars available for expenditures occurring at the end of t years. The expression used for this "return on investment" multiplication factor to obtain future costs from base year costs is given by $\left[\frac{1}{1+DR}\right]^t$.

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*LCCADJ(T)
LIFE CYCLE COST ADJUSTED FOR INFLATION AND/OR DISCOUNT RATES OVER
YEARS(T), WHERE (T) IS THE NUMBER OF YEARS AFTER THE BASE YEAR OVER
WHICH THE COSTS ARE TO BE ADJUSTED
LCCADJ(T) = NRCT(T) + RCYT(T) + CDPT(T)
     WHERE:
     NRCT = NON-RECURRING COSTS ADJUSTED FOR INFLATION AND/OR
            DISCOUNT RATES FOR PERIOD (T)
     RCYT = RECURRING COSTS PER YEAR ADJUSTED FOR INFLATION AND/OR
            DISCOUNT RATES FOR PERIOD (T)
     CDPT = DISPOSAL COSTS ADJUSTED FOR INFLATION AND/OR
            DISCOUNT RATES FOR PERIOD (T)
```

```
*NRCT(T)
NON-RECURRING COSTS ADJUSTED FOR INFLATION AND/OR DISCOUNT RATES
FOR PERIOD (T)
NRCT(T) = SUM(T) (AAF(T) * NRC/DPT * (I1(T)))
     WHERE:
     AAF = ANNUAL ADJUSTMENT FACTOR FOR INFLATION & DISCOUNT RATES
     NRC = NON-RECURRING COST TOTAL USING A BASELINE YEAR VALUE
     DPT = DEVELOPMENT & PROCUREMENT PERIOD OVER WHICH THE NRC
           OCCURRED
     I(1)(T) = THE INDICATOR FUNCTION USED TO SET THE LIMITS FOR
           TIME PERIOD (T);
     FOR NRCT(T), I1(T)= 1 WHEN 0<T<=DPT, AND IS 0 OTHERWISE

*RCYT(T)
RECURRING COSTS PER YEAR ADJUSTED FOR INFLATION AND/OR DISCOUNT RATES
FOR PERIOD (T)
RCYT(T) = SUM(T) (AAF(T) * RCY(T) * (I2(T)))
     WHERE:
     AAF = ANNUAL ADJUSTMENT FACTOR FOR INFLATION & DISCOUNT RATES
     RCY = RECURRING COST PER YEAR IN CONSTANT YEAR DOLLARS
     I(2)(T) = THE INDICATOR FUNCTION USED TO SET THE LIMITS FOR
           TIME PERIOD (T);
     FOR RCYT(T),I2(T)= 1 WHEN DPT<T<=DPT+PIUP, AND IS 0 OTHERWISE

*CDPT(T)
DISPOSAL COST ADJUSTED FOR INFLATION AND/OR DISCOUNT RATES
FOR PERIOD (T)
CDPT(T) = SUM(T) (AAF(T) * CDP/POT * (I3(T)))
     WHERE:
     AAF = ANNUAL ADJUSTMENT FACTOR FOR INFLATION & DISCOUNT RATES
     CDP = COST OF SYSTEM DISPOSAL
     POT = PHASEOUT TIME PERIOD FOR DISPOSAL
     I(3)(T) = THE INDICATOR FUNCTION USED TO SET THE LIMITS FOR
           TIME PERIOD (T);
     FOR CDPT(T), I3(T)= 1 WHEN DPT+PIUP<T<=DPT+PIUP+POT
                         AND IS 0 OTHERWISE
```

Figure 2.1 — Equation for computing adjusted life cycle cost.

```
*AAF(T)
AVERAGE ANNUAL ADJUSTMENT FACTOR FOR COMPUTING INFLATION AND DISCOUNT
VALUE OF MONEY FOR YEAR (T)
AAF(T) = (((1+IR)/(1+DR))  ** (T-1) + ((1+IR)/(1+DR)) ** T) /2
     WHERE:
     IR = AVERAGE INFLATION RATE
     DR = AVERAGE DISCOUNT RATE
     T  = THE NUMBER OF YEARS AFTER THE BASE YEAR
EXAMPLES ARE:
(1) WITH DR=0 AND IR= TO THE ANTICIPATED AVERAGE INFLATION RATE, THE
    RESULTANT ADJUSTED LCC EQUATION CONVERTS A FUTURE EXPENDITURE TO
    THE DOLLAR VALUE AT THE FUTURE YEAR USING THE BASE YEAR DOLLAR
    VALUE AS A REFERENCE; (INFLATION ADJUSTED VALUE)
(2) WITH DR= THE ANTICIPATED AVERAGE DISCOUNT RATE FOR MONEY AND
    IR= 0, THE RESULTANT LCC OUTPUTS CONVERTS THE DOLLAR VALUE AT THE
    FUTURE YEAR INTO THE PRESENT VALUE OF THE BASE YEAR WHICH WILL BE
    CALLED THE "DISCOUNTED COSTS"
(3) WITH DR AND IR EACH BEING GIVEN A VALUE, THE RESULTANT OUTPUT WILL
    BE THE "PRESENT VALUE COSTS."
(4) WITHOUT AAF AS MULTIPLIER OF NON-RECURRING & RECURRING COSTS OF
    THE LCC EQUATION, THE RESULT GIVES THE UNADJUSTED (CONSTANT
    DOLLAR)  COST VALUES
```

Figure 2.1 — Equation for computing adjusted life cycle cost (concluded).

$\$cost_{future} = \$cost_{present} \left(\frac{1}{1+DR}\right)^t$	
DR	The average discount rate.
t	The number of years after the base year.

These two expressions assume that the future expenditure occurs at the end of t years. In actuality, the cost would be incurred throughout the year. Therefore, the annual adjustment factor given in Figure 2.1 was developed which combines these two expressions and uses an arithmetic mean over the year. The user of the RMCM interactive routine has the options of using one, both, or neither of the IR and DR factors to complete future costs from base year cost values.

See Appendix B for a detailed explanation of the cost element equations of the RMCM.

2.4 GENERAL ASSUMPTIONS OF THE RMCM

The following general assumptions are inherent in the RMCM. Any other specific assumptions and the justification for their use are presented with their relevant cost element equations in Section III.

1. The model considers a uniform level of system (aircraft) activity (such as flying hours) at each operating base.

2. The spares stock level and pipeline quantities are computed to support the peak level of system (aircraft) activity, peak base flying hours (PBFH), rather than any incremental buildup.

3. The model specifica'' computes only those logistics support costs associated with the weapon system, subsystem, and LRU indenture levels. Components below LRU level (such as SRU) are derived through implicit consideration of their relationship to the repair of a given LRU. For example, average costs of SRU spares are computed based on the failure rates of the LRUs.

4. There are three levels of repairs exclusive of condemnation: (a) on-equipment repair at base level, (b) repair at the intermediate maintenance activity (IMA) on site, and (c) repair at the depot. The decision to ship failed LRUs to the depot is made at the IMA upon receipt and inspection of the equipment, and this probability is obtained from the R&M model. Items designated for depot repair provide the source of the LRUs and SRUs for condemnation.

5. Air bases are assumed to be identical with respect to maintenance manpower levels and consumables.

6. Air bases are assumed to be identical in the RMCM with respect to facilities.

7. Any specified number of base level repair locations or depot repair sites are allowed. However, the recurring depot repair cost factors are predicated on average values for one centralized depot repair location.

8. Air base sites are assumed to be identical with respect to environmental effects on equipment failure rates and logistics support.

9. Inventories of spare LRUs are located at each of the bases, consistent with the demand rate for LRUs at the bases and the variable depot-to-site resupply time interval selected for use in the model. In addition, inventories are also located at the depot consistent with the appropriate LRU demand rates, resupply times, IMA repair cycle time, and depot repair cycle time selected for use in the model.

10. Transportation costs may vary for the sites, but a representative average for overseas and for CONUS sites is employed in the RMCM for the LRU depot repairs. The cost of regular resupply transportation to the sites (such as piece parts and personnel support), which is legitimately a component of LCC when employed in logistics support, is excluded from the RMCM calculations.

11. Forward supply points are not considered. However, the transportation cost of depot reparables for overseas sites is computed in terms of the increased packing and shipping cost, and the proportion of forces overseas.

12. The relation established for determining the required quantities of shop SE assumes a man-hour/machine hour equivalence. This SE demand time supposes that a given piece of SE is occupied during the elapsed time period equivalent to the mean time to perform a shop bench check task event; such as the bench check and repair (W task) cannot duplicate discrepancy (CND task) or the not reparable this site (NRTS task). However, the W task event can be reduced by a factor (KTR) to allow for the repair time portion of the repair process. The downtime for repair of the SE test station is also accounted for when computing SE utilization and is provided by the R&M Model.

13. The RMCM assumes that maintenance personnel at the various bases have the same pattern of skills and need the same training. In particular, maintenance personnel at the bases will be a variety of AFSCs in skill levels 3, 5, and 7. They are assigned to the maintenance events required to support the subsystems as described within the R&M Model data

banks. These maintenance personnel perform the direct maintenance man-hour (DMMH) needed to meet the below depot maintenance requirements of the deployed unit(s). The indirect maintenance labor attributable to supervisors, administrative, and supply personnel is accounted for through the indirect labor cost terms of the appropriate cost equations.

14. Training costs are computed according to the following concept. The Air Force trains a cadre of personnel, usually under contract to the manufacturer. This cadre provides subsequent training of personnel for organizational, intermediate, and depot level maintenance. Initial training is considered to be completed in or before the first year of system operation. Recurring training costs for organizational and IMA personnel are based on average turnover rates for each AFSC. Cost of recurring training for the cadre personnel other than depot are absorbed in their yearly salaries over the lifetime of the system. The recurring costs of training depot personnel are assumed to be in the overhead cost of depot level LRU repair.

15. Software maintenance is performed only at depot level. The model user may include the one-time cost of a software maintenance facility, if one is intended to be used. The RMCM includes provisions for recurring personnel costs associated with the software maintenance facility.

16. There is no special provision in the RMCM for computing the costs of non-maintenance support personnel and their support facilities (barracks, heat, food, and so forth) other than as an input term. These factors are provided for in determining the overhead support cost rate for the maintenance personnel, however [10].

17. All costs input to the RMCM are in constant-year (now-year as inputted) dollars. However, the interactive routine includes a provision to compute and output the LCC cost elements as a function of average inflation and/or average discount rate.

18. The reliability parameter values in the data bases are based on mean flying hours between maintenance actions (MFHBMA). If a different factor is desired (such as operating hours or number of sorties), the model can accept this change. For example, the ratio of this new factor to flying hours can be multiplied by any subsystem MFHBMA value from the computer terminal.

    The maintenance actions inherent in the MFHBMA variable include those brought about by (a) discrepancy actions which cannot be duplicated for both on-equipment LRUs and those removed to the shop for repair, (b) minor maintenance actions performed on the flightline and, (c) the remove-and-replace LRU actions. The remove actions are representative of the MTBF for the LRUs that are repaired in the shop. These repair actions are modeled in the RMCM.

19. Maintenance costs can be computed to include the costs of labor for both corrective (unscheduled) and preventive (scheduled) maintenance at the base level. However, the RMCM input data format has been designed for unscheduled maintenance events, since the scheduled maintenance requirements for avionics equipment are negligible. Therefore, to use the model to compute scheduled resource consumption, these maintenance events must be input as if they were corrective maintenance actions. The reliability value can be computed as a function of the periodicity of the scheduled action in respect to the system operational scenario. Maintenance labor costs at the depot are contained in the average cost per depot repair of an LRU.

III. DATA FILE FORMATS

The operation of the RMCM requires a R&M data bank and a cost data bank. This document provides instructions to establish a cost data bank input file only. For instructions on how to establish a R&M data bank, refer to the Digital Avionics Information System (DAIS): Reliability and Maintainability Model Users Guide [5].

The cost data bank is composed of 23 different types of record cards. The data are preceded by a header card with the data bank title. Each card type will be described in detail including excerpts from the RMCM interactive glossary to define the individual data elements. In addition, a field format table will be provided for each card. These records have a standard format. The input record format, for the key fields, is patterned after the R&M Model input data such that columns 1 and 2 provide the card type code; columns 4 through 10 provide identification of the equipment or manpower (for example, LRU or subsystem identifier, SE code, or Air Force Specialty Code (AFSC)); and columns 11 and 12 contain a dashed sequence number for continuation of data applicable to a specific piece of equipment or AFSC.

The data required in the cost input data banks are assigned to specific locations on one of the 23 different records in columns 17 through 80. Up to eight data items can be assigned per card with each data item being allowed eight columns (such as 17-24, 25-32, . . . , 73-80). The data item is always right-justified with any appropriate decimal point included.

The RMCM does not require that input data cards be arranged in a specific order.

3.1 CARD TYPE VE (-1, -2) RECURRING COST EQUATION CONSTANT VALUES

Recurring costs identified in the RMCM are the operation and support costs of the weapon system. These costs are computed as annual current year dollar values and are then multiplied by the peak inventory usage period (PIUP) to compute the LCC.

The recurring cost equation constant value (VE) cards, with sequence numbers -1 and -2, provide input space for each of the operation and support cost equation totals. These spaces are provided as a convenience for the user who has a value for the equation total and does not desire to use the lower level terms and the embedded equations to compute these values. The card formats are provided in Tables 3.1 and 3.2 and the data elements are defined in Figures 3.1 and 3.2.

On card VE (-1) columns 17-24 provide space for COO (cost of other operations manpower). This item is a direct input and is not computed by the model. Therefore, a value must be assigned to these fields. If no value is available to the user, and a cost of operations personnel (COP) is to be computed, column 24 on VE (-1) must be zero-filled for the model to compute total LCC.

Table 3.1 - Recurring Cost Elements (VE-1).

Column	Title	Length	Type*	Justification**
1-2	Card Type 0 (VE)	2	A	F
3	Blank	1	-	-
4-10	Equation Category - (RECUR)	7	A	L
11-12	Card Sequence (-1)	2	N	F
13-16	Blank	4	-	-
17-24	COO	8	N	R
25-32	CAC	8	N	R
33-40	COP	8	N	R
41-48	CFL	8	N	R
49-56	COM	8	N	R
57-64	CSM	8	N	R
65-72	CPT	8	N	R
73-80	CSP	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

Table 3.2 - Recurring Cost Elements (VE-2).

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VE)	2	A	F
3	Blank	1	-	-
4-10	Equation Category - (RECUR)			
11-12	Card Sequence (-2)	2	N	F
13-16	Blank	4	-	-
17-24	CDR	8	N	R
25-32	CSE	8	N	R
33-40	CSW	8	N	R
41-48	CJG	8	N	R
49-56	CIM	8	N	R
47-80	Blank	24	-	-

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

```
*COO
COST OF OTHER OPERATIONS MANPOWER INCLUDING COMMAND STAFF, SECURITY,
AND OTHER DEPLOYED PERSONNEL (BUT NOT INCLUDING MAINTENANCE PERSONNEL
REQUIREMENTS) (INPUT VE-1,17-24)

*CAC
COST OF AIRCREW           (ALT. INPUT VE-1,25-32)
CAC = NB * NACB * CPA * SUM(P) (COA(P) + OSCY)
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     NACB= NUMBER OF AIRCRAFT PER BASE (INPUT)
     CPA  = NUMBER OF CREWS ASSIGNED PER AIRCRAFT (INPUT)
     COA  = COST OF AN AIRCREW MAN(P) IN WAGES AND ALLOWANCES PER YEAR
            (INPUT)
     OSCY= OVERHEAD SUPPORT COST PER MAN PER YEAR (INPUT)

*COP
COST OF OPERATIONS PERSONNEL    (ALT. INPUT, VE-1, 33-40)
COP = CAC + COO
     WHERE:
     CAC= COST OF AIRCREW
     COO= COST OF OTHER OPERATIONS MANPOWER INCLUDING COMMAND STAFF,
          SECURITY, AND OTHER DEPLOYED PERSONNEL (BUT NOT INCLUDING
          MAINTENANCE PERSONNEL REQUIREMENTS) (INPUT)

*CFL
COST OF FUEL        (ALT. INPUT VE-1,41-48)
CFL = NB * ABFH * FC
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     ABFH= ANNUAL BASE FLYING HOURS
     FC   = FUEL COST PER FLIGHT HOUR (INPUT)

*COM
COST OF ON EQUIPMENT MAINTENANCE  (ALT. INPUT VE-1,49-56)
COM = NB * SUM(N) MURF(N) * (LLR(N)+BMR(N))
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     MURF= LABOR UTILIZATION RATE BY SKILL CATEGORY(N)
           MAINTAINING SPECIFIC SUBSYSTEMS FOR FLIGHT LINE TASKS
     LLR  = LOADED LABOR RATE FOR SKILL LEVEL CATEGORY(N)
     BMR  = BASE CONSUMABLE MATERIAL CONSUMPTION COST RATE PER MANHOUR
           FOR REPAIRING LRUS BY WORKCENTER EMPLOYING AFSC(N) (INPUT)

*CSM
COST OF INTERMEDIATE SHOP MAINTENANCE  (ALT. INPUT VE-1, 57-64)
CSM = NB * SUM(N)(MURS(N)*(LLR(N) + BMR(N)))
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     MURS= LABOR UTILIZATION RATE BY SKILL CATEGORY MAINTAINING
           SPECIFIC GROUP OF LRUS FOR SHOP TASKS
     LLR  = LOADED LABOR RATE FOR SKILL LEVEL CATEGORY (N)
     BMR  = BASE CONSUMABLE MATERIAL CONSUMPTION COST RATE FOR
           REPAIRING LRUS BY WORKCENTER EMPLOYING AFSC(N) (INPUT)
```

Figure 3.1 — Definition to recurring cost elements card VE-1.

```
*CPT
COST OF MAINTENANCE PERSONNEL TRAINING   (ALT. INPUT VE-1, 65-72)
CPT = NB * SUM(N)((1/PIUP + TRS(N)) * MU(N) * TCS(N))
     WHERE:
     NB = NUMBER OF BASES (INPUT)
     TRS= ANNUAL TURNOVER RATE OF AIRMAN IN EACH SKILL CATEGORY
          AND LEVEL (INPUT)
     MU = MANPOWER UTILIZATION BY AFSC (N)
     TCS= COST OF TRAINING AN AIRMAN FOR EACH SKILL CATEGORY & LEVEL
     PIUP= PLANNED INVENTORY USAGE PERIOD (INPUT)

*CSP
COST OF REPLACEMENT SPARES   (ALT. INPUT VE-1, 73-80)
CSP = LRURS + SRURS
     WHERE:
     LRURS = COST OF LRU REPLACEMENT SPARES
     SRURS = COST OF SRU REPLACEMENT SPARES
```

Figure 3.1 -- Definitions to recurring cost elements card VE-1 (concluded).

```
*CDR
COST OF DEPOT MAINTENANCE    (ALT. INPUT VE-2,17-24)
CDR= NB*SUM(I)(ABFH*PN(I)*(DC(I)+TC(I))/MFHBMA(M))+ M*NACB*COS*OHR
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     ABFH = ANNUAL BASE FLYING HOURS
     PN   = PROBABILITY OF LRU(I) ENTERING SHOP BEING SENT TO THE
            DEPOT FOR REPAIR (R&M INPUT)
     DC   = AVERAGE DEPOT REPAIR COST PER LRU AND ITS SRUS (INPUT)
     TC   = ROUND TRIP TRANSPORTATION AND PACKAGING COST PER ITEM
     MFHBMA=MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     COS  = COST OF OVERHAUL PER SYSTEM (INPUT)
     OHR  = OVERHAUL RATE -PORTION OF SYSTEMS OVERHAULED PER YEAR FROM
            EACH BASE (RECIPROCAL OF YEARS BETWEEN SYSTEM OVERHAULS)
            (INPUT)

*CSE
COST OF MAINTAINING SUPPORT EQUIPMENT  (ALT. INPUT VE-2,25-32)
CSE = NB * SUM(J) (MSE(J) * CPUSE(J))
     WHERE:
     NB  = NUMBER OF BASES (INPUT)
     MSE = PROPORTION OF THE SUPPORT EQUIPMENT COST USED AS ESTIMATE
           OF THE NON-PERSONNEL COST OF MAINTAINING SUPPORT EQUIPMENT
           INCLUDING REPLACEMENT PARTS (INPUT)
     CPUSE=COST PER TYPE OF PECULIAR SUPPORT EQUIPMENT (J)

*CSW
COST OF SOFTWARE SUPPORT    (ALT. INPUT VE-2, 33-40)
CSW = PC + SCC
     WHERE:
     PC = SOFTWARE LABOR COST FOR BASE YEAR T
     SCC= SOFTWARE COMPUTER COST

*CJG
COST OF SUPPORTING MAINTENANCE MANUALS.  (ALT. INPUT VE-2,41-48)
CJG = (KPJG)(KCJG)(CJGI)
     WHERE:
     KPJG = FACTOR ESTIMATE OF THE PORTION OF THE MANUALS THAT WILL BE
            CORRECTED AND/OR CHANGED EACH YEAR (INPUT)
     KCJG = FACTOR ESTIMATE OF THE REDUCED COST NECESSARY TO REWRITE
            THE CORRECTIONS AS COMPARED TO THE INITIAL WRITING COSTS
            (INPUT)
     CJGI = COST OF MAINTENANCE MANUALS INITIAL

*CIM
COST OF INVENTORY MANAGEMENT     (ALT. INPUT VE-2,49-56)
CIM = RMC * SUM(I) (NNII(I)) + NB * SA * SUM(I) (BLII(I))
     WHERE:
     RMC  = ANNUAL MANAGEMENT COST TO MAINTAIN A LINE ITEM OF SUPPLY
            (ASSEMBLY OR PIECE PART) IN THE WHOLESALE INVENTORY SYSTEM
     NNII = NUMBER OF NEW INVENTORY ITEMS WITHIN EACH LRU(I)
     NB   = NUMBER OF BASES  (INPUT)
     SA   = ANNUAL BASE SUPPLY LINE ITEM INVENTORY MANAGEMENT COST
     BLII = NUMBER OF BASE LEVEL INVENTORY ITEMS PER LRU(I)
```

Figure 3.2 — Definitions to recurring cost element card VE-2.

3.2 CARD TYPE VE (-3, -4) NONRECURRING COST EQUATION CONSTANT VALUES

The nonrecurring costs are the research and development (R&D) and the initial investment portion of the LCC of a weapon system. The R&D costs are normally accrued during the conceptual, validation, and full-scale development phases. The initial investment costs are normally generated during the production and deployment phases and have been aggregated as system and support investment costs. The cost of system disposal is assigned to this card type because it is considered a one-time expense.

The nonrecurring cost equation constant value (VE) cards, with sequence numbers -3 and -4, provide input space for each of the system and support investment cost equation totals. These spaces are provided, as a convenience, for the user who has a value for the equation total and does not desire to use the lower level terms and the embedded equations to compute these values. The card formats are provided in Tables 3.3 and 3.4 and the data elements are defined in Figures 3.3 and 3.4.

There are three items on card VE (-3) or (-4) that are direct input and are not computed by the model. Therefore a value must be assigned to these fields:

VE (-3) column 17-25 CRD - cost of research and development
VE (-3) column 49-56 CPM - cost of project management
(VE (-4) column 57-64 CDP - cost of system disposal

For any of these values which are not available, the user must enter zero in the appropriate field.

Table 3.3 - Nonrecurring Cost Elements (VE-3).

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VE)	2	A	F
3	Blank	1	-	-
4-10	Equation Category - (NRECUR)	7	N	L
11-12	Card Sequence (-3)	2	N	F
13-16	Blank	4	-	-
17-24	CRD	8	N	R
25-32	CSI	8	N	R
33-40	COI	8	N	R
41-48	CPP	8	N	R
49-56	CPM	8	N	R
57-64	CPTI	8	N	R
65-72	CSPI	8	N	R
73-80	CDRI	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

Table 3.4 - Nonrecurring Cost Elements (VE-4).

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VE)	2	A	F
3	Blank	1	-	-
4-10	Equation Category - (NRECUR)	7	A	L
11-12	Card Sequence (-4)	2	N	F
13-16	Blank	4	-	-
17-24	CSEI	8	N	R
25-32	CSWI	8	N	R
33-40	CJGI	8	N	R
41-48	CIMI	8	N	R
49-56	CFAI	8	N	R
57-64	CDP	8	N	R
65-80	Blank	16	-	-

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left.

3.3 CARD TYPE VI (-1, -2) LINE REPLACEABLE UNIT (LRU) VARIABLES

The LRU variable cards, VI sequences numbers -1, -2, provide input space for those data elements that are required by the RMCM at the LRU level. In some cases, card input space has been provided for alternate inputs. These spaces are provided for the user who has access to the higher level values as opposed to the lower level terms the model is designed to use. In general, the RMCM searches for the lowest level direct input values to compute the higher level values. There are three exceptions to this rule, - UCSRU(I), IC(I), and CALI(I). See Figures 3.5 and 3.6 for definitions. If these values are present, they override the lower level computations normally performed by the RMCM.

The RMCM requires that the cost data base contain one VI (-1) and one VI (-2) card for every LRU defined in the R&M Model data base that the cost data base being developed must correspond to.

> The VI (-1 and -2) cards should be arranged in the same order as the cross reference cards from the R&M data bank.

This will allow for more efficient program operation and make editing easier for the user. The card formats for VI (-1 and -2) are provided in Tables 3.5 and 3.6 and the data elements are defined in Figures 3.5 and 3.6.

```
*CRD
COST OF RESEARCH AND DEVELOPMENT     (INPUT VE-3, 17-24)

*CSI
SYSTEM INVESTMENT COSTS        (ALT. INPUT VE-3, 25-32)
CSI = CPP + CPM
     WHERE:
     CPP = COST OF PROCUREMENT
     CPM = COST OF PROJECT MANAGEMENT (INPUT)

*COI
SUPPORT INVESTMENT COSTS       (ALT.INPUT VE-3,33-40)
COI = CPTI + CSPI + CDRI + CSEI + CSWI + CJGI + CFAI + CIMI
     WHERE:
     CPTI = COST OF INITIAL MAINTENANCE PERSONNEL TRAINING
     CSPI = COST OF SPARES INVESTMENT
     CDRI = COST OF DEPOT SUPPORT EQUIPMENT INITIAL
     CSEI = COST OF SUPPORT EQUIPMENT INITIAL
     CSWI = COST OF SOFTWARE ACQUISITION
     CJGI = COST OF MAINTENANCE MANUALS INITIAL
     CFAI = COST OF NEW OR ADDITIONAL FACILITIES
     CIMI = COST OF INVENTORY MANAGEMENT INITIAL

*CPP
COST OF PROCUREMENT        (ALT. INPUT VE-3, 41-48)
CPP = NB * NACB * SUM(M) (CPINT(M) + CINST(M))
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     NACB = NUMBER OF AIRCRAFT PER BASE
     CPINT(M) = COST OF PRODUCTION AND INTEGRATION PER SUBSYSTEM
     CINST(M) = COST OF INSTALLATION PER SUBSYSTEM

*CPM
COST OF PROJECT MANAGEMENT     (INPUT VE-3, 49-56)

*CPTI
COST OF INITIAL MAINTENANCE PERSONNEL TRAINING (ALT.INPUT VE-3,57-64)
CPTI = CGTE + CGCM + CCIT
     WHERE:
     CGTE = COST OF TRAINING EQUIPMENT (INPUT)
     CGCM = COST OF COURSE MATERIAL PREPARATION (INPUT)
     CCIT = COST OF INITIAL CONTRACTOR PROVIDED TRAINING FOR DEPOT AND
            OTHER PERSONNEL NOT INCLUDED IN ON & OFF EQUIPMENT
            MAINTENANCE (INPUT)
```

Figure 3.3 — Definitions to nonrecurring cost element card VE-3.

```
*CSPI
COST OF SPARES INVESTMENT     (ALT. INPUT VE-3, 65-72)
CSPI = NB*SUM(I)(LRUSS(I)+ LRUDS(I)+SRUSS(I)+SRUDS(I)) +SPRTS + WRMC
     WHERE:
     NB = NUMBER OF BASES (INPUT)
     LRUSS = COST OF LRU(I) SHOP SPARES PER BASE
     LRUDS = COST OF LRU(I) DEPOT PIPELINE SPARES PER BASE
     SRUSS = COST OF SRU SHOP SPARES PER BASE BELONGING TO LRU(I)
     SRUDS = COST OF SRU DEPOT PIPELINE SPARES PER BASE BELONGING TO
             LRU(I)
     SPRTS = COST OF INITIAL LAY-IN OF SPARE PIECE-PARTS AND MATERIAL
     WRMC  = WAR RESERVE MATERIAL COST (INPUT)

*CDRI
COST OF DEPOT SUPPORT INVESTMENT          (ALT. INPUT VE-3,73-80)
CDRI = (ND)*(CDSE)
     WHERE:
     ND  = NUMBER OF DEPOTS (INPUT)
     CDSE= COST OF SUPPORT EQUIPMENT PER DEPOT SITE
```

Figure 3.3 — Definitions of nonrecurring cost element card VE-3 (concluded).

```
*CSEI
COST OF BASE LEVEL SUPPORT EQUIPMENT INVESTMENT (ALT.INPUT VE-4,17-24)
CSEI = SUM(J) (NB*(CPUSE(J)+CSESM(J)+IH(J))+CSU(J)) +NB * OBSEC
     WHERE:
     NB = NUMBER OF BASES  (INPUT)
     CPUSE = COST PER TYPE OF PECULIAR SUPPORT EQUIPMENT AT EACH BASE
     CSESM = COST OF INITIAL SUPPORT EQUIPMENT SPARE MODULES AND
             SPARE PARTS FOR REPAIR OF SHOP SUPPORT EQUIPMENT AT
             BASE LEVEL
     IH    = COST OF INTERCONNECTING HARDWARE TO UTILIZE EXISTING
             AUTOMATIC EQUIPMENT (J) TO TEST NEW SUBSYSTEMS OR LRUS
     CSU   = COST OF SOFTWARE TO UTILIZE EXISTING AUTOMATIC TEST
             EQUIPMENT FOR THE SYSTEM (INPUT)
     OBSEC = OTHER BASE LEVEL SUPPORT EQUIPMENT COSTS

*CSWI
COST OF SOFTWARE ACQUISTION    (ALT. INPUT VE-4, 25-32)
CSWI = SWPC + COC
     WHERE:
     SWPC = SOFTWARE DEVELOPMENT PERSONNEL COSTS
     COC  = COMPUTER OPERATION COST

*CJGI
COST OF MAINTENANCE MANUALS INITIAL  (ALT. INPUT VE-4, 33-40)
CJGI = (1 + FJG)*SUM(M)(CFJG(M) + CSJG(M))
     WHERE:
     FJG  = PROPORTION, AS A FUNCTION OF MAINTENANCE MANUALS OR JOB
            GUIDE TYPE MANUAL, REPRESENTING THE GENERAL MATERIAL FOUND
            IN THAT TYPE MANUAL (INPUT)
     CFJG = COST OF FLIGHT LINE MANUALS, MAINTENANCE PORTION, PER
            SUBSYSTEM
     CSJG = COST OF SHOP MANUAL, MAINTENANCE PORTION, PER SUBSYSTEM

*CIMI
COST OF INVENTORY MANAGEMENT INITIAL (ALT. INPUT VE-4, 41-48)
CIMI = (IMC)* SUM(I)(NNII(I))
     WHERE:
     IMC = INITIAL MANAGEMENT COST TO INTRODUCE A NEW LINE ITEM OF
           SUPPLY (ASSEMBLY OR PIECE-PARTS) INTO THE AIR FORCE
           INVENTORY (INPUT)
     NNII= NUMBER OF NEW INVENTORY ITEMS WITHIN EACH LRU(I)

*CFAI
COST OF NEW OR ADDITIONAL FACILITIES    (ALT.INPUT VE-4, 49-56)
CFAI = NB * (CFB)
     WHERE:
     NB = NUMBER OF BASES (INPUT)
     CFB= COST OF NEW FACILITIES PER BASE (INPUT)

*CDP
COST OF SYSTEM DISPOSAL IN CONSTANT YEAR DOLLARS OF THE BASELINE YEAR
(INPUT VE-4,57-64)
TERM?
```

Figure 3.4 — Definitions to nonrecurring cost elements card VE-4.

Table 3.5 - LRU Data (VI-1).

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VI)	2	A	F
3	Blank	1	-	-
4	Aircraft System	1	A	F
5	Major System	1	A	F
6	Functional Group	1	A	F
7	Operational Function	1	N	F
8	Subsystem	1	N	F
9	Line Replaceable Unit	1	X	F
10	Shop Replaceable Unit	1	N	F
11-12	Card Sequence (-1)	2	N	F
13-16	Blank	4	-	-
17-24	UC_i	8	N	R
25-32	$UCSRU_i$	8	N	R
33-40	FCL_i	8	N	R
41-48	FCS_i	8	N	R
49-56	T_i	8	N	R
57-64	$DRCT_i$	8	N	R
65-72	DC_i	8	N	R
73-80	TC_i	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

Table 3.6 - LRU Data (VI-2).

Column	Title	Length	Type*	Justification**
1-2	Card Type - VI)	2	A	F
3	Blank	1	-	-
4	Aircraft System	1	A	F
5	Major System	1	A	F
6	Functional Group	1	A	F
7	Operational Function	1	N	F
8	Subsystem	1	N	F
9	Line Replaceable Unit	1	X	F
10	Shop Replaceable Unit	1	N	F
11-12	Card Sequence (-2)	2	N	F
13-16	Blank	4	-	-
17-24	PA_i	8	N	R
25-32	PP_i	8	N	R
33-40	SP_i	8	N	R
41-48	IC_i	8	N	R
49-56	$CALI_i$	8	N	R
57-80	Blank	24	-	-

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

```
*UC
EXPECTED UNIT COST OF EACH LRU(I) AT THE TIME OF INITIAL
PROVISIONING   (INPUT VI-1, 17-24)

*UCSRU
AVERAGE UNIT COST OF SRUS WITHIN LRU(I) (ALT.INPUT VI-1,25-32)
UCSRU(I) = UC(I)/NSRU(I)
     WHERE:
     UC   = EXPECTED UNIT COST OF LRU(I) (INPUT)
     NSRU = NUMBER OF UNIQUE SRUS PER LRU

*FCL
PROPORTION OF NRTSED LRU(I) EXPECTED TO RESULT IN CONDEMNATION AT THE
BASE/DEPOT LEVEL (INPUT VI-1,33-40)

*FCS
PROPORTION OF SHOP REPAIRED AND NRTS LRU(I) EXPECTED TO RESULT IN SRU
CONDEMNATION AT THE BASE LEVEL (INCLUDING THROWAWAY)(INPUT VI-1,41-48)

*T
 LRU(I) REPAIR PIPELINE TIME (ALT.INPUT VI-1,49-56)
T(I) = BRCT + PN(I)/PS(I)*(OSTC*(1-OS)+OSTO*(OS)-BRCT)
     WHERE:
     BRCT = BASE REPAIR CYCLE TIME IN YEARS
     PN   = PROBABILITY OF LRU(I) ENTERING SHOP BEING SENT TO THE
            DEPOT (R&M INPUT)
     PS   = PROBABILITY OF SHOP ACTION BEING TAKEN ON LRU(I)-R&M INPUT
     OSTC = AVERAGE ORDER & SHIPPING TIME WITHIN CONUS (IN MONTHS)
     OSTO = AVERAGE ORDER & SHIPPING TIME TO OVERSEAS LOCATIONS-MONTHS
     OS   = PROPORTION OF TOTAL FORCE DEPLOYED TO OVERSEAS LOCATIONS

*DRCT
DEPOT REPAIR CYCLE TIME IN YEARS FOR LRU(I)  (INPUT VI-1,57-64)

*DC
AVERAGE DEPOT REPAIR COST PER LRU AND ITS SRU(S) (INPUT VI-1,65-72)

*TC
ROUND TRIP TRANSPORTATION AND PACKAGING COST PER ITEM
(ALT. INPUT VI-1,73-80)
TC(I)= W(I) * RPUW * 2 *(PSC(1-OS)+PSO * OS)
     WHERE:
     W    = WEIGHT IN POUNDS OF ITEM(I) (R&M INPUT)
     RPUW= RATIO OF PACKED TO UNPACKED WEIGHT (INPUT)
     PSC = AVERAGE PACKING AND SHIPPING COST TO CONUS LOCATIONS -INPUT
     PSO = AVERAGE PACKING AND SHIPPING COST TO OVERSEAS LOCATIONS-INP
     OS  = PROPORTION OF TOTAL FORCE DEPLOYED TO OVERSEAS LOCATIONS -I
```

Figure 3.5 — Definitions to LRU data card (VI-1) terms.

```
*PA
NUMBER OF NEW "P" CODED REPAIRABLE ASSEMBLIES WITHIN THE LRU(I)
(INPUT VI-2,17-24)

*PP
NUMBER OF NEW "P" CODED CONSUMABLE ITEMS WITHIN THE LRU(I)
(INPUT VI-2,25-32)

*SP
NUMBER OF STANDARD (ALREADY STOCKED NSN) PARTS WITHIN THE LRU WHICH
WILL BE MANAGED FOR THE FIRST TIME AT BASES WHERE THIS SYSTEM IS
DEPLOYED (INPUT VS-2,33-40)

*IC
INTEGRATION COST OF EACH LRU INTO THE SUBSYSTEM (ALT.INPUT VI-2,41-48)
IC(I) =(KTS)*(UC(I))
     WHERE:
     KTS = PROPORTION OF UNIT COST (UC(I)) USED TO ESTIMATE THE
           TESTING AND INTEGRATION COSTS (INPUT)
     UC  = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
           PROVISIONING (INPUT)

*CALI
COST PER LRU(I) FOR INSTALLATION  (ALT.INPUT VI-2,49-56)
CALI(I) =KI * (UC(I))
     WHERE:
     KI = PROPORTION OF UNIT COST (UC(I)) USED TO ESTIMATE THE
          INSTALLATION COST PER LRU  (INPUT)
     UC = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
          PROVISIONING (INPUT)
```

Figure 3.6 — Definitions to LRU data card (VI-2) terms.

3.4 CARD TYPE VM (-1) SUBSYSTEM VARIABLES

The subsystem variables data card, VM sequence number -1, provides input space for four alternate input values that could be used by the RMCM at the subsystem level. These alternate input spaces are provided, as a convenience, for the user who has subsystem values and does not wish to use the lower level terms and embedded equations to compute these values. The RMCM first searches for the lower level terms to do the necessary computations and then, if the lower level terms are not found, the model searches this VM (-1) card for the alternate subsystem inputs.

The data base does not need to contain VM (-1) data cards when the lower level terms that will compute these alternate inputs are present in the data base. The card format for VM (-1) is provided in Table 3.7 and the data elements are defined in Figure 3.7.

Table 3.7 - Subsystem Data.

Column	Title	Length	Type*	Justification **
1-2	Card Type - (VM)	2	A	F
3	Blank	1	-	-
4	Aircraft System	1	A	F
5	Major System	1	A	F
6	Functional Group	1	A	F
7	Operational Function	1	N	F
8	Subsystem	1	N	F
9	Line Replaceable Unit	1	X	F
10	Shop Replaceable Unit	1	N	F
11-12	Card Sequence	2	N	F
13-16	Blank	4	-	-
17-24	$CPINT_m$	8	N	R
25-32	$CINST_m$	8	N	R
33-40	$CFJG_m$	8	N	R
41-48	$CSJG_m$	8	N	R
49-80	Blank	32	-	-

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

3.5 CARD TYPE VN (-1) MAINTENANCE PERSONNEL TRAINING VARIABLES

The maintenance personnel training variable card, VN sequence number -', provides data input variables that the RMCM requires to compute CPT (cost of maintenance personnel training). Space has been provided on this card for two alternate input variables: CTTS (cost of technical training school) and TCS (cost of training an airman,

```
*CPINT
COST OF PRODUCTION AND INTEGRATION PER SUBSYSTEM (M)
CPINT(M) = SUM(I) (UC(I) + IC(I))         (ALT. INPUT VM-1,17-24)
     WHERE:
     UC = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
          PROVISIONING (INPUT)
     IC = INTEGRATION COST OF EACH LRU INTO THE SUBSYSTEM (INPUT)
     (I) SUMS OVER THOSE LRUS BELONGING TO SUBSYSTEM(M)

*CINST
COST OF INSTALLATION PER SUBSYSTEM  (ALT. INPUT VM-1,25-32)
CINST(M) = SUM(I) (CALI(I))
     WHERE:
     CALI =  COST PER LRU(I) FOR INSTALLATION
     (I) SUMS OVER THOSE LRUS BELONGING TO SUBSYSTEM(M)

*CFJG
COST OF FLIGHT LINE MANUALS, MAINTENANCE PORTION, PER SUBSYSTEM
(ALT. INPUT VM-1, 33-40)
CFJG(M) = NLRU(M)*(CTFL+CNFL) + NSRU(M)*(CTFS+CNFS) + CTFX + CNFX
     WHERE:
     NLRU = NUMBER OF LRUS PER SUBSYSTEM(M) (INPUT)
     NSRU = NUMBER OF SRUS PER SUBSYSTEM(M) (INPUT)
     CTFL = COST OF FLIGHT LINE TROUBLESHOOTING MAINTENANCE PORTION
            PER LRU OF EACH MANUAL (INPUT)
     CNFL = COST OF FLIGHT LINE NON-TROUBLESHOOTING MAINTENANCE
            PORTION PER LRU OF EACH MANUAL (INPUT)
     CTFS = COST OF FLIGHT LINE TROUBLESHOOTING MAINTENANCE PORTION
            PER SRU OF EACH MANUAL (INPUT)
     CNFS = COST OF FLIGHT LINE NON-TROUBLESHOOTING MAINTENANCE
            PORTION PER SRU OF EACH MANUAL (INPUT)
     CTFX = COST OF FLIGHT LINE TROUBLESHOOTING MAINTENANCE PORTION
            PER SUBSYSTEM OF EACH MANUAL (INPUT)
     CNFX = COST OF FLIGHT LINE NON-TROUBLESHOOTING MAINTENANCE PORTIO
            PER SUBSYSTEM OF EACH MANUAL (INPUT)

*CSJG
COST OF SHOP MANUAL, MAINTENANCE PORTION, PER SUBSYSTEM
(ALT. INPUT VM-1, 41-48)
CSJG(M) = NLRU(M)*(CTSL+CNSL) + NSRU(M)*(CTSS+CNSS) + CTSX + CNSX
     WHERE:
     NLRU = NUMBER OF LRUS PER SUBSYSTEM(M) (INPUT)
     NSRU = NUMBER OF SRUS PER SUBSYSTEM(M) (INPUT)
     CTSL = COST OF SHOP TROUBLESHOOTING MAINTENANCE PORTION PER
            LRU OF  EACH MANUAL (INPUT)
     CNSL = COST OF SHOP NON-TROUBLESHOOTING MAINTENANCE PORTION PER
            LRU OF EACH MANUAL  (INPUT)
     CTSS = COST OF SHOP TROUBLESHOOTING MAINTENANCE PORTION PER
            SRU OF EACH MANUAL  (INPUT)
     CNSS = COST OF SHOP NON-TROUBLESHOOTING MAINTENANCE PORTION PER
            SRU OF EACH MANUAL  (INPUT)
     CTSX = COST OF SHOP TROUBLESHOOTING MAINTENANCE PORTION PER
            SUBSYSTEM OF EACH MANUAL (INPUT)
     CNSX = COST OF SHOP NON-TROUBLESHOOTING MAINTENANCE PORTION PER
            SUBSYSTEM OF EACH MANUAL (INPUT)
```

Figure 3.7 — Definitions to subsystem data card (VM-1) terms.

by skill category and level). These inputs are provided as a convenience to the user who has values for these parameters. The RMCM will not use these alternate input values if all of the necessary lower level terms to compute them are present. When alternate input values are used, the lower level terms necessary to compute these values should then be left blank.

The variables are input by AFSC. One VN (-1) card for each particular AFSC (including grade level as the fourth digit) who is contained in the associated R&M data bank is required for the RMCM to compute CPT for the total configuration. The card format for VN (-1) is provided in Table 3.8 and the data elements are defined in Figure 3.8.

Table 3.8 - Personnel Training Data by AFSC.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VN)	2	A	F
3	Blank	1	-	-
4-10	AFSC ID Code	7	X	L
11-12	Card Sequence (-1)	2	N	F
13-16	Blank	4	-	-
17-24	NWK_n	8	N	R
25-32	ACG_n	8	N	R
33-40	CIC_n	8	N	R
41-48	COT_n	8	N	R
49-56	$CTTS_n$	8	N	R
57-64	$COJT_n$	8	N	R
65-72	TCS_n	8	N	R
73-80	TRS_n	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

3.6 CARD TYPE VN (-2) EQUIPMENT MAINTENANCE VARIABLES

The equipment maintenance data card, VN sequence number -2, provides input variables that are required to compute COM (cost of on-equipment maintenance) and CSM (cost of intermediate shop maintenance). The variables are input by AFSC. The RMCM requires one input card for each particular AFSC (including grade level as the four digit) which is contained in the associated R&M data bank. The card format for VN (-2) is provided in Table 3.9 and the data elements are defined in Figure 3.9.

The VN (-2) card provides input space for two alternate input variables: DLR (direct labor rate) and LLR (loaded labor rate). They are provided for the user who has these values and does not wish to use the lower level terms and the embedded equations to compute them.

```
*NWK
COURSE LENGTH IN WEEKS (INPUT VN-1,17-24)

*ACG
AVERAGE COST PER GRADUATE (N) PER WEEK (INPUT VN-1,25-32)

*CIC
CAPITAL INVESTMENT COST OF TRAINING FACILITIES PRORATED BY AFSC (N)
PER WEEK  (INPUT VN-1, 33-40)

*COT
COST OF TYPE 4 AND OTHER TRAINING NOT INCLUDED IN THE AVERAGE COST PER
GRADUATE (ACG) (INPUT VN-1,41-48)

*CTTS
COST OF TECHNICAL TRAINING SCHOOL PER MAN BY AFSC TO 3 LEVEL
CTTS(N)= NWK(N)*(ACG(N)+CIC(N)) + PTT(N) + COT(N) + CACQ
(ALT.INPUT VN-1,49-56)
     WHERE:
     NWK= COURSE LENGTH IN WEEKS (INPUT)
     ACG= AVERAGE COST PER GRADUATE (N) PER WEEK (INPUT)
     CIC= CAPITAL INVESTMENT COST PRORATED BY AFSC (N) PER WEEK (INPUT
     PTT= PRE TECHNICAL TRAINING SCHOOL PAY AND ALLOWANCE
          PER MAN (INPUT)
     COT= COST OF TYPE 4 AND OTHER TRAINING , NOT INCLUDED IN ACG,
          PER MAN (INPUT)
     CACQ=ACQUISITION COST PER MAN WHICH INCLUDES RECRUITING, INITIAL
          TRAVEL, INITIAL CLOTHING ISSUE, AND TRAINING AT MILITARY
          TRAINING CENTER (INPUT)

*COJT
COST OF ON-THE-JOB TRAINING PER MAN BY AFSC TO 5 LEVEL INCLUDING
NON-PRODUCTIVE WAGES BASED ON A FACTOR OF (1-KM(N)) (INPUT VN-1,57-64)

*TCS
COST OF TRAINING AN AIRMAN FOR EACH SKILL CATEGORY AND LEVEL
TCS(N) = CTTS(N) + COJT(N)          (ALT.INPUT VN-1,65-72)
     WHERE:
     CTTS= COST OF TECHNICAL TRAINING SCHOOL PER MAN BY AFSC TO
           3 LEVEL
     COJT= COST OF ON-THE-JOB TRAINING PER MAN BY AFSC TO 5 LEVEL
           INCLUDING NON-PRODUCTIVE WAGES BASED ON A FACTOR OF
           (1-KM(N)) (INPUT)

*TRS
ANNUAL TURNOVER RATE OF AIRMAN IN EACH SKILL CATEGORY AND LEVEL
(INPUT VN-1,73-80)
```

Figure 3.8 — Definitions for personnel training data (VN-1) terms.

```
*CMPS
COST OF MILITARY PERSONNEL SERVICES PER HOUR (INPUT VN-2,17-24)

*OPF
OTHER PERSONNEL COST FACTORS PER MANHOUR FOR SKILL CATEGORY (N) NOT
PROVIDED FOR IN CMPS (INPUT VN-2,25-32)

*KM
PROPORTION OF DIRECT LABOR MANHOURS DEVOTED TO TASKS VS. OJT;
KM(N)=1 FOR ALL AFSCS OTHER THAN 1 OR 3 LEVEL AND
KM(N)=0.5 FOR ALL 1 OR 3 LEVEL AFSC (INPUT VN-2,33-40)

*DLR
DIRECT LABOR RATE PER MANHOUR (PER SKILL CATEGORY AND LEVEL)
(ALT. INPUT VN-2, 41-48)
DLR(N) = KM(N) *(CMPS(N) + OPF(N))
     WHERE:
     KM  = PROPORTION OF DIRECT LABOR MANHOURS DEVOTED TO TASKS VS.
           OJT; KM(N)=1 FOR ALL AFSCS OTHER THAN 1 OR 3 LEVEL AND
           KM(N)=0.5 FOR ALL 1 OR 3 LEVEL AFSC (INPUT)
     CMPS= COST OF MILITARY PERSONNEL SERVICES PER HOUR (INPUT)
     OPF = OTHER PERSONNEL COST FACTORS PER MANHOUR FOR SKILL CATEGORY
           (N) NOT PROVIDED FOR IN CMPS (INPUT)

*LLR
LOADED LABOR RATE FOR SKILL LEVEL CATEGORY (N) (ALT.INPUT VN-2,49-56)
LLR(N)= DLR(N) + ILR(N) +(OSCY/PMB)
     WHERE:
     DLR = DIRECT LABOR RATE PER MANHOUR (PER SKILL CATEGORY & LEVEL)
     ILR = INDIRECT LABOR RATE PER MANHOUR (SUPERVISORS AND
           ADMINISTRATIVE PERSONNEL)(INPUT)
     OSCY= OVERHEAD SUPPORT COST PER MAN PER YEAR (INPUT)
     PMB = PRODUCTIVE (AVAILABLE) MANHOURS PER MAN PER  YEAR AT
           BASE LEVEL (INPUT)

*BMR
BASE CONSUMABLE MATERIAL CONSUMPTION COST RATE PER MANHOUR FOR
REPAIRING LRUS IN SHOP WORK CENTER UTILIZED BY AFSC(N)
(INPUT VN-2, 57-64)

*ILR
INDIRECT LABOR RATE PER MANHOUR (SUPERVISORS & ADMINISTRATIVE
PERSONNEL) (INPUT VN-2, 65-72)
```

Figure 3.9 – Definitions of equipment maintenance data (VN-2) terms.

Table 3.9 - Equipment Maintenance Data by AFSC.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VN)	2	A	F
3	Blank	1	-	-
4-10	AFSC ID Code	7	X	L
11-12	Card Sequence.(-2)	2	N	F
13-16	Blank	4	-	-
17-24	$CMPS_n$	8	N	R
25-32	OPF_n	8	N	R
33-40	KM_n	8	N	R
41-48	DLR_n	8	N	R
49-56	LLR_n	8	N	R
57-64	BMR_n	8	N	R
65-72	ILR_n	8	N	R
73-80	Blank	8	-	-

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

3.7 CARD TYPE VJ (-1, -2) SUPPORT EQUIPMENT VARIABLES

The SE variables data cards, VJ sequence numbers -1 and -2, provide the input variables that are required to compute CSEI (cost of initial SE) and CSE (cost of maintaining SE). The data are input by type of SE. One VJ (-1) and one VJ (-2) card are required by RMCM for each type of shop SE found in the associated R&M data base. The card formats for VJ (-1 and -2) are shown in Tables 3.10 and 3.11. The data elements are defined in Figure 3.10.

Table 3.10 - Support Equipment Data (VJ-1).

Column	Title	Length	Type*	Justification**
1-2	Card Type - (V[illegible]	2	A	F
3	Blank	1	-	-
4-10	Support Equipme[illegible]D Code	7	X	R
11-12	Card Sequence (-[illegible]	2	N	F
13-16	Blank	4	-	-
17-24	$UCSE_j$	8	N	R
25-32	KIH_j	8	N	R
33-40	KSE_j	8	N	R
41-48	$CPUSE_j$	8	N	R
49-56	$CSESM_j$	8	N	R
57-64	IH_j	8	N	R
65-72	CSU_j	8	N	R
73-80	MSE_j	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

*UCSE
UNIT COST OF PECULIAR SUPPORT EQUIPMENT (INPUT VJ-1,17-24)

*KIH
PROPORTION OF SUPPORT EQUIPMENT UNIT COST USED TO ESTIMATE PROCUREMENT COST FOR INTERFACE HARDWARE (INPUT VJ-1,25-32)

*KSE
PROPORTION OF SUPPORT EQUIPMENT UNIT COST USED AS ESTIMATE TO SATISFY INITIAL SPARING LEVEL REQUIREMENTS FOR MODULES AND PARTS (INPUT VJ-1, 33-40)

*CPUSE
COST PER TYPE OF PECULIAR SUPPORT EQUIPMENT(J) (ALT. INPUT VJ-1,41-48)
CPUSE(J)=(NSER(J) * UCSE(J))
WHERE:
NSER = NUMBER OF PECULIAR SUPPORT EQUIPMENT AT EACH BASE
UCSE = UNIT COST OF PECULIAR SUPPORT EQUIPMENT (INPUT)

*CSESM
COST OF INITIAL SUPPORT EQUIPMENT SPARE MODULES AND SPARE PARTS FOR REPAIR OF SHOP SUPPORT EQUIPMENT AT BASE LEVEL (ALT.INPUT VJ-1, 48-56)
CSESM(J) = KSE(J) * NSER(J) * UCSE(J)
WHERE:
KSE = PROPORTION OF SUPPORT EQUIPMENT UNIT COST USED AS ESTIMATE TO SATISFY INITIAL SPARING LEVEL REQUIREMENTS FOR MODULES AND PARTS (INPUT)
NSER = NUMBER OF PECULIAR SUPPORT EQUIPMENT REQUIRED AT EACH BASE
UCSE = UNIT COST OF PECULIAR SUPPORT EQUIPMENT (INPUT)

*IH
COST OF INTERCONNECTION HARDWARE TO UTILIZE EXISTING AUTOMATIC TEST EQUIPMENT (J) TO TEST NEW SUBSYSTEM/LRUS (ALT. INPUT VJ-1,57-64)
IH(J)= KIH(J)*NSER(J)*UCSE(J)
WHERE:
KIH =PROPORTION OF SUPPORT EQUIPMENT UNIT COST USED TO ESTIMATE PROCUREMENT COST FOR INTERFACE HARDWARE (INPUT)
NSER =NUMBER OF PECULIAR SUPPORT EQUIPMENT REQUIRED AT EACH BASE
UCSE =UNIT COST OF PECULIAR SUPPORT EQUIPMENT (INPUT)

*CSU
COST OF SOFTWARE TO UTILIZE EXISTING AUTOMATIC TEST EQUIPMENT FOR THE SYSTEM (INPUT VJ-1,65-72)

*MSE
PROPORTION OF THE SUPPORT EQUIPMENT COST USED AS ESTIMATE OF THE NON-PERSONNEL COST OF MAINTAINING SUPPORT EQUIPMENT INCLUDING REPLACEMENT PARTS (INPUT VJ-1,73-80)

*KTR
PROPORTION OF SHOP MEAN TIME TO REPAIR THE LRUS THAT REQUIRE THE TEST STATION(J) TO BE USED (INPUT VJ-2,17-24)
TERM?

Figure 3.10 — Definitions of support equipment data (VJ-1,-2) terms.

Table 3.11 - Support Equipment Data (VJ-2).

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VJ)	2	A	F
3	Blank	1	-	-
4-10	Support Equipment ID Code	7	X	R
11-12	Card Sequence (-2)	2	N	F
13-16	Blank	4	-	-
17-24	KTR_j	8	N	R
25-80	Blank	56	-	-

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

The VJ (-1) data card provides space for three alternate input variables: CPUSE(J), CSESM(J), and IH(J), See Figure 3.10 for definitions. These are provided for the user who has these values and does not wish to use the lower level terms and the embedded equations to compute these terms.

3.8 CARD TYPE VD (-1) DEPOT SUPPORT EQUIPMENT VARIABLES

The depot SE data card, VD sequence number -1, provides input space for the two input variables needed by RMCM to compute CDRI (the cost of initial depot SE). The card format for the input data is shown in Table 3.12 and definitions of the terms are found in Figure 3.11.

One data card for each type of SE required by the depot should be prepared to allow RMCM to compute CDRI. If the user decides that this cost is not needed, the data base need not include this card type.

```
*NDSER
NUMBER OF DEPOT SUPPORT EQUIPMENT (D) REQUIRED (INPUT VD-1,17-24)
*UCDSE
UNIT COST OF DEPOT SUPPORT EQUIPMENT (D) (INPUT VD-1,25-32)
```

Figure 3.11 - Definition of depot support equipment data (VD-1) terms.

Table 3.12 - Depot Support Equipment Data.

Column	Title	Length	Type*	Justification**
1-2	Card Type - VD)	2	A	F
3	Blank	1	-	-
4-10	Depot SE ID Code	7	X	L
11-12	Card Sequence (-1)	2	N	F
13-16	Blank	4	-	-
17-24	$NDSER_j$	8	N	R
25-32	$UCDSE_j$	8	N	R
33-80	Blank	48	-	-

*A = alpha, N = numeric, X - alphanumeric
**F = fixed, R = right, L = left

3.9 CARD TYPE VS(-0 to -9) - SINGLE VALUE VARIABLES

The single value variable (SCALAR) data cards, sequence numbers -0 through -9, provide input space for RMCM equation terms that are single valued. One number for each term is constant for the entire data base, but these values can be varied from one data base to the next. The type of terms found on the SCALAR cards are total system dependent costs, average times, proportions or factors, and quantities of particular items.

The values assigned to the SCALAR terms can be established from the operational, environmental, and equipment standards required by the weapon system that the data base is concerned with (refer to Appendix A).

The card formats for the SCALAR cards can be found in Tables 3.13 through 3.22. Definitions of the terms are provided in Figures 3.12 through 3.21 which have been extracted from the RMCM interactive glossary. The SCALAR cards include eight alternate input values. The spaces for these alternate inputs are provided for the convenience of the user who has these terms available and does not wish to use the lower level terms and the embedded equations that the RMCM would primarily use to compute these terms. The alternate inputs are identified in the glossary outputs, Figures 3.12 through 3.21, whereby their definitions will end with the term (ALT.INPUT VS-__).

Table 3-13 - Single Value Variables - Card 0.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-0)	2	N	F
13-16	Blank	4	-	-
17-24	CTFS	8	N	R
25-32	CNFS	8	N	R
33-40	CNFX	8	N	R
41-48	CTSX	8	N	R
49-56	CNSX	8	N	R
57-64	BY	8	N	R
65-80	Blank	16	-	-

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

Table 3.14 - Single Value Variables - Card 1.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-1)	2	N	F
13-16	Blank	4	-	-
17-24	BRCT	8	N	R
25-32	OSTC	8	N	R
33-40	OSTO	8	N	R
41-48	OS	8	N	R
49-56	EBO	8	N	R
57-64	KPSR	8	N	R
65-72	SPRTS	8	N	R
73-80	WRMC	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

*CTFS
COST OF FLIGHT LINE TROUBLESHOOTING MAINTENANCE PORTION PER SRU OF EACH MANUAL (INPUT VS-0,17-24)

*CNFS
COST OF FLIGHT LINE NON-TROUBLESHOOTING MAINTENANCE PORTION PER SRU OF EACH MANUAL (INPUT VS-0,25-32)

*CNFX
COST OF FLIGHT LINE NON-TROUBLESHOOTING MAINTENANCE PORTION PER SUBSYSTEM OF EACH MANUAL (INPUT VS-0,33-40)

*CTSX
COST OF SHOP TROUBLESHOOTING MAINTENANCE PORTION PER SUBSYSTEM OF EACH MANUAL (INPUT VS-0,41-48)

*CNSX
COST OF SHOP NON-TROUBLESHOOTING MAINTENANCE PORTION PER SUBSYSTEM OF EACH MANUAL (INPUT VS-0,49-56)

*BY
BASE YEAR OF THE DATA CONTAINED IN THE DATA BANK (INPUT VS-0,57-64)

Figure 3.12 — Definition of terms for SCALAR VS-0.

```
*BRCT
BASE REPAIR CYCLE TIME IN MONTHS (INPUT VS-1,17-25)

*OSTC
AVERAGE ORDER AND SHIPPING TIME WITHIN CONUS (IN MONTHS)
(INPUT VS-1,25-32)

*OSTO
AVERAGE ORDER AND SHIPPING TIME TO OVERSEAS LOCATIONS (IN MONTHS)
(INPUT VS-1,33-40)

*OS
PROPORTION OF TOTAL FORCE DEPLOYED TO OVERSEAS LOCATIONS
(INPUT VS-1,41-48)

*EBO
EXPECTED BACK ORDER  (INPUT VS-1, 49-56)

*KPSR
PROPORTION OF THE COST OF LRUS USED TO ESTIMATE THE COST OF INITIAL
SPARE PIECE-PARTS REQUIRMENTS (INPUT VS-1,57-64)

*SPRTS
COST OF INITIAL LAY-IN OF SPARE PIECE-PARTS AND MATERIAL
SPRTS = KPSR * SUM(I)(UC(I))                (ALT.INPUT VS-1,65-72)
     WHERE:
     KPSR = PROPORTION OF THE COST OF LRUS USED AS ESTIMATED COST OF
            INITIAL SPARE PIECE-PARTS REQUIREMENTS (INPUT)
     UC   = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
            PROVISIONING (INPUT)

*WRMC
WAR RESERVE MATERIAL COST  (INPUT VS-1,73-80)
```

Figure 3.13 – Definition of terms for SCALAR VS-1.

Table 3.15 - Single Value Variables - Card 2.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-2)	2	N	F
13-16	Blank	4	-	-
17-24	CNFL	8	N	R
25-32	CTFL	8	N	R
33-40	CTFX	8	N	R
41-48	CNSL	8	N	R
49-56	CNSS	8	N	R
57-64	CTSL	8	N	R
65-72	CTSS	8	N	R
73-80	FJG	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

Table 3.16 - Single Value Variables - Card 3.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-3)	2	N	F
13-16	Blank	4	-	-
17-24	NW	8	N	R
25-32	NMMKW	8	N	R
33-40	NMM	8	N	R
41-48	NCHMM	8	N	R
49-56	CCPH	8	N	R
57-64	COC	8	N	R
65-72	CPMM	8	N	R
73-80	SWPC	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

*CNFL
COST OF FLIGHT LINE NON-TROUBLESHOOTING MAINTENANCE PORTION PER LRU OF EACH MANUAL (INPUT VS-2,17-24)

*CTFL
COST OF FLIGHT LINE TROUBLESHOOTING MAINTENANCE PORTION PER LRU OF EACH MANUAL (INPUT VS-2,25-32)

*CTFX
COST OF FLIGHT LINE TROUBLESHOOTING MAINTENANCE PORTION PER SUBSYSTEM OF EACH MANUAL (INPUT VS-2,33-40)

*CNSL
COST OF SHOP NON-TROUBLESHOOTING MAINTENANCE PORTION PER LRU OF EACH MANUAL (INPUT VS-2,41-48)

*CNSS
COST OF SHOP NON-TROUBLESHOOTING MAINTENANCE PORTION PER SRU OF EACH MANUAL (INPUT VS-2,49-56)

*CTSL
COST OF SHOP TROUBLESHOOTING MAINTENANCE PORTION PER LRU OF EACH MANUAL (INPUT VS-2,57-64)

*CTSS
COST OF SHOP TROUBLESHOOTING MAINTENANCE PORTION PER SRU OF EACH MANUAL (INPUT VS-2,65-72)

*FJG
PROPORTION, AS A FUNCTION OF MAINTENANCE MANUALS OR JOB GUIDE TYPE MANUALS, REPRESENTING THE GENERAL MATERIAL FOUND IN THAT TYPE MANUAL (INPUT VS-2,73-80)

Figure 3.14 — Definition of terms for SCALAR VS-2.

```
*NW
NUMBER OF COMPUTER WORDS (INPUT VS-3,17-24)

*NMMKW
NUMBER OF MAN MONTHS PER 1000 COMPUTER WORDS (INPUT VS-3,25-32)

*NMM
NUMBER OF MAN MONTHS REQUIRED TO DEVELOP SOFTWARE
(ALT. INPUT VS-3, 33-40)
NMM = NMMKW * NW/1000
     WHERE:
     NMMKW = NUMBER OF MAN MONTHS PER 1000 COMPUTER WORDS (INPUT)
     NW = NUMBER OF COMPUTER WORDS (INPUT)

*NCHMM
NUMBER OF COMPUTER HOURS PER MAN MONTH (INPUT VS-3,41-48)

*CCPH
COMPUTER COST PER HOUR (INPUT VS-3,49-56)

*COC
COMPUTER OPERATION COST  (ALT. INPUT VS-3,57-64)
COC = NCHMM * CCPH * NMM
     WHERE:
     NCHMM = NUMBER OF COMPUTER HOURS PER MAN MONTH (INPUT)
     CCPH  = COMPUTER COST PER HOUR (INPUT)
     NMM   = NUMBER OF MAN MONTHS REQUIRED TO DEVELOP SOFTWARE

*CPMM
COST PER MAN MONTH TO DEVELOP SOFTWARE (INPUT VS-3,65-72)

*SWPC
SOFTWARE DEVELOPMENT PERSONNEL COSTS   (ALT. INPUT VS-3, 73-80)
SWPC = NMM * CPMM
     WHERE:
     NMM = NUMBER OF MANMONTHS REQUIRED TO DEVELOP SOFTWARE
     CPMM= COST PER MAN MONTH (INPUT)
```

Figure 3.15 – Definition of terms for SCALAR VS-3.

Table 3-17 - Single Value Variables - Card 4.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-4)	2	N	F
13-16	Blank	4	-	-
17-24	CUR	8	N	R
25-32	CC	8	N	R
33-40	SCC	8	N	R
41-48	NSS	8	N	R
49-56	SLR	8	N	R
57-64	PC	8	N	R
65-72	KTS	8	N	R
73-80	KI	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

Table 3.18 - Single Value Variables - Card 5.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-5)	2	N	F
13-16	Blank	4	-	-
17-24	IMC	8	N	R
25-32	RMC	8	N	R
33-40	SA	8	N	R
41-48	PSC	8	N	R
49-56	PSO	8	N	R
57-64	RPUW	8	N	R
65-72	OHR	8	N	R
73-80	COS	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

```
*CUR
SOFTWARE COMPUTER UTILIZATION RATE IN HOURS PER MANMONTH
(INPUT VS-4,17-24)

*CC
SUPPORT COMPUTER COST PER HOUR (INPUT VS-4,25-32)

*SCC
SOFTWARE COMPUTER COST  (ALT. INPUT VS-4,33-40)
SCC = (CUR)(CC)(NSS)(12)
     WHERE:
      CUR = SOFTWARE COMPUTER UTILIZATION RATE IN HOURS PER MANMONTH
      CC  = SUPPORT COMPUTER COST PER HOUR
      NSS = AVERAGE NUMBER OF SOFTWARE SUPPORT STAFF (INPUTS)
      12  = NUMBER OF MONTHS PER MANYEAR

*NSS
AVERAGE NUMBER OF SOFTWARE SUPPORT STAFF (INPUT VS-4,41-48)

*SLR
SOFTWARE STAFF LABOR RATE (INPUT VS-4,49-56)

*PC
SOFTWARE LABOR COSTS FOR BASE YEAR (T) (ALT. INPUT VS-4,57-64)
PC = (NSS)(SLR)
     WHERE:
     NSS = AVERAGE NUMBER OF SOFTWARE SUPPORT STAFF (INPUT)
     SLR = SOFTWARE STAFF LABOR RATE (INPUT)

*KTS
PROPORTION OF UNIT COST (UC(I)) USED TO ESTIMATE THE TESTING AND
INTEGRATION COSTS OF THE LRUS IN A SUBSYSTEM (INPUT VS-4,65-72)

*KI
PROPORTION OF UNIT COST (UC(I)) USED TO ESTIMATE THE AVERAGE
INSTALLATION COST PER LRU (INPUT VS-4,73-80)
```

Figure 3.16 -- Definition of terms for SCALAR VS-4.

*IMC
INITIAL MANAGEMENT COST TO INTRODUCE A NEW LINE ITEM OF SUPPLY (ASSEMBLY OR PIECE-PARTS) INTO THE AIR FORCE INVENTORY(INP.VS-5,17-24)

*RMC
ANNUAL MANAGEMENT COST TO MAINTAIN A LINE ITEM OF SUPPLY (ASSEMBLY OR PIECE PART) IN THE WHOLESALE INVENTORY SYSTEM (INPUT VS-5,25-32)

*SA
ANNUAL BASE SUPPLY LINE ITEM INVENTORY MANAGEMENT COST (INPUT VN-5,33-40)

*PSC
AVERAGE PACKING AND SHIPPING COST TO CONUS LOCATIONS; INPUT VS-5,41-48

*PSO
AVERAGE PACKING & SHIPPING COST TO OVERSEAS LOCATIONS;INPUT VS-5,49-56

*RPUW
RATIO OF PACKED TO UNPACKED WEIGHT (INPUT VS-5,57-64)

*OHR
OVERHAUL RATE -PORTION OF SYSTEMS OVERHAULED PER YEAR FROM EACH BASE (INPUT VS-5,65-72)

*COS
COST OF OVERHAUL PER SYSTEM (INPUT VS-5,73-80)

Figure 3.17 — Definition of terms for SCALAR VS-5.

Table 3.19 - Single Value Variables - Card 6.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-6)	2	N	F
13-24	Blank	12	-	-
25-32	PTT	8	N	R
33-40	CACQ	8	N	R
41-48	OSCY	8	N	R
49-56	PMB	8	N	R
57-64	EFF	8	N	R
65-72	NB	8	N	R
73-80	PIUP	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L - left

Table 3.20 - Single Value Variables - Card 7.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-7)	2	N	F
13-16	Blank	4	-	-
17-24	NACB	8	N	R
25-32	CPA	8	N	R
33-40	FHACM	8	N	R
41-48	MFHACM	8	N	R
49-56	FC	8	N	R
57-64	KSLPT	8	N	R
65-72	KPJG	8	N	R
73-80	KCJG	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

*PTT
PRE TECHNICAL TRAINING SCHOOL PAY AND ALLOWANCE (INPUT VS-6,25-32)

*CACQ
ACQUISITION COSTS PER MAN WHICH INCLUDES RECRUITING, INITIAL TRAVEL, INITIAL CLOTHING ISSUE, AND TRAINING AT MILITARY TRAINING CENTER (INPUT VS-6,33-40)

*OSCY
OVERHEAD SUPPORT COST PER MAN PER YEAR INC. ANNUAL MEDICAL SUPPORT, BASE OPERATION SUPPORT, VEHICULAR AND BASE MAINTENANCE, AND HOSPITALIZATION PER MAN (INPUT VS-6,41-48)

*PMB
PRODUCTIVE MANHOURS PER MAN PER YEAR AT BASE LEVEL (INPUT VS-6,49-56)

*EFF
PERCENTAGE OF MAINTENANCE MAN HOURS DEVOTED TO DIRECT LABOR (INPUT VS-6, 57-64)

*NB
NUMBER OF BASES (INPUT VS-6,65-72)

*PIUP
PLANNED INVENTORY USAGE PERIOD (INPUT VS-6,73-80)

Figure 3.18 – Definition of terms for SCALAR VS-6.

*NACB
NUMBER OF AIRCRAFT PER BASE (INPUT VS-7,17-24)

*CPA
NUMBER OF CREWS ASSIGNED PER AIRCRAFT (INPUT VS-7,25-32)

*FHACM
AVERAGE FLIGHT HOURS PER AIRCRAFT PER MONTH (INPUT VS-7,33-40)

*MFHACM
MAXIMUM FLIGHT HOURS EXPECTED PER AIRCRAFT PER MONTH DURING A PEAK USAGE PERIOD (INPUT VS-7,41-48)

*FC
FUEL COST PER FLIGHT HOUR (INPUT VS-7,49-56)

*KSLPT
PROPORTION OF LRU REPAIR TIME (T(I)) USED AS AN ESTIMATE OF SRU REPAIR PIPELINE TIME (TS(I)) (INPUT VS-7,57-64)

*KPJG
FACTOR ESTIMATE OF THE PORTION OF THE MANUALS THAT WILL BE CORRECTED AND/OR CHANGED EACH YEAR (INPUT VS-7,65-72)

*KCJG
FACTOR ESTIMATE OF THE REDUCED COST NECESSARY TO REWRITE THE CORRECTIONS TO MANUALS AS COMPARED TO THE INITIAL WRITING COST (INPUT VS-7, 73-80)

Figure 3.19 — Definition of terms for SCALAR VS-7.

Table 3.21 - Single Value Variables - Card 8.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-8)	2	N	F
13-16	Blank	4	-	-
17-24	AAOH	8	N	R
25-32	BCA	8	N	R
33-40	BPA	8	N	R
41-48	FLA	8	N	R
49-56	OBSEC	8	N	R
57-64	CGTE	8	N	R
65-72	CGCM	8	N	R
73-80	CCIT	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

Table 3.22 - Single Value Variables - Card 9.

Column	Title	Length	Type*	Justification**
1-2	Card Type - (VS)	2	A	F
3	Blank	1	-	-
4-10	SCALAR	7	A	L
11-12	Card Sequence (-9)	2	N	F
13-16	Blank	4	-	-
17-24	IR	8	N	R
25-32	KSED	8	N	R
33-40	ND	8	N	R
41-48	CDSE	8	N	R
49-56	CFB	8	N	R
57-64	POT	8	N	R
65-72	DPT	8	N	R
73-80	DR	8	N	R

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L = left

*AAOH
AVAILABLE ANNUAL OPERATING HOURS (INPUT VS-8,17-24)

*BCA
TOTAL COST OF ADDITIONAL ITEMS OF COMMON BASE SHOP SUPPORT EQUIPMENT PER BASE REQUIRED FOR THE SYSTEM (INPUT VS-8,25-32)

*BPA
TOTAL COST OF PECULIAR BASE SHOP SUPPORT EQUIPMENT PER BASE REQUIRED FOR THE SYSTEM WHICH IS NOT DIRECTLY RELATED TO REPAIR SPECIFIC LRUS OR WHEN THE QUANTITY REQUIRED IS INDEPENDENT OF THE ANTICIPATED WORKLOAD (SUCH AS: OVERHEAD CRANES & SHOP FIXTURES) (INPUT VS-8,33-40)

*FLA
TOTAL COST OF PECULIAR FLIGHT LINE SUPPORT EQUIPMENT AND ADDITIONAL ITEMS OF COMMON FLIGHT LINE SUPPORT EQUIPMENT PER BASE REQUIRED FOR THE SYSTEM (INPUT VS-8,41-48)

*OBSEC
OTHER BASE LEVEL SUPPORT EQUIPMENT COSTS (ALT.INPUT VI-8,49-56)
OBSEC = BCA + BPA + FLA
WHERE:
BCA = TOTAL COST OF ADDITIONAL ITEMS OF COMMON BASE SHOP SUPPORT EQUIPMENT PER BASE REQUIRED FOR THE SYSTEM (INPUT)
BPA = TOTAL COST OF PECULIAR BASE SHOP SUPPORT EQUIPMENT PER BASE REQUIRED FOR THE SYSTEM WHICH IS NOT DIRECTLY RELATED TO REPAIR OF SPECIFIC LRUS OR WHEN THE QUANTITY REQUIRED IS INDEPENDENT OF THE ANTICIPATED WORKLOAD (SUCH AS: OVERHEAD CRANES AND SHOP FIXTURES) (INPUT)
FLA = TOTAL COST OF PECULIAR FLIGHT LINE SUPPORT EQUIPMENT AND ADDITIONAL ITEMS COMMON FLIGHT LINE SUPPORT EQUIPMENT PER BASE REQUIRED FOR THE SYSTEM (INPUT)

*CGTE
COST OF TRAINING EQUIPMENT (INPUT VS-8,57-64)

*CGCM
COST OF COURSE MATERIAL PREPARATION (INPUT VS-8,65-72)

*CCIT
COST OF INITIAL CONTRACTOR PROVIDED TRAINING FOR DEPOT AND OTHER PERSONNEL NOT INCLUDED IN ON AND OFF EQUIPMENT MAINTENANCE - INCLUDING INSTRUCTION AND TRAINING MATERIALS (INPUT VS-8,73-80)

Figure 3.20 —Definition of terms for SCALAR VS-8.

```
*IR
AVERAGE INFLATION RATE  (INPUT VS-9, 17-24)

*KSED
PROPORTION OF DEPOT SE UNIT COST USED AS ESTIMATE OF INITIAL SPARING
LEVEL FOR MODULES AND PARTS (INPUT VS-9,25-32)

*CDSE
COST OF SUPPORT EQUIPMENT PER DEPOT SITE (ALT.INPUT VS-9,41-48)
CDSE = SUM(D) (NDSER(D) * UCDSE(D) * (1+KSED))
     WHERE:
     NDSER = NUMBER OF DEPOT SUPPORT EQUIPMENT (D) REQUIRED (INPUT)
     UCDSE = UNIT COST OF DEPOT SUPPORT EQUIPMENT(D) (INPUT)
     KSED  = PROPORTION OF DEPOT SE UNIT COST USED AS ESTIMATE OF
             INITIAL SPARING LEVEL FOR MODULES AND PARTS PLUS OVERHAUL
             MAINTENANCE MANUALS DEVELOPMENT AND PROCUREMENT

*CFB
COST OF NEW FACILITIES PER BASE (INPUT VS-9,49-56)

*POT
PHASEOUT TIME PERIOD FOR DISPOSAL (INPUT VS-9, 57-64)

*DPT
DEVELOPMENT AND PROCUREMENT PERIOD OVER WHICH THE NON-RECURRING COST
   OCCURRED   (INPUT VS-9, 65-72)

*DR
AVERAGE DISCOUNT RATE  (INPUT VS-9, 72-80)
```

Figure 3.21 — Definition of terms for SCALAR VS-9.

3.10 CARD TYPE VP (-1) AIRCREW VARIABLES

The aircrew variable card provides input space for COA(P), the cost of an aircrew member (P) in total wages and allowance per year. COA(P) is the only variable input term required per aircrew member for the RMCM equation C.C (cost of aircrew). One card should be input by AFSC for each crewmember assigned to the aircraft configured in the data base. The card format for the aircrew variable input card, VP sequence -1, is shown in Table 3.23.

Table 3.23 - Aircrew Data.

Column	Title	Length	Type*	Justification**
1-2	Card Type _ (VP)	2	A	F
3	Blank	1	-	-
4-10	Aircrew AFSC ID Code	7	X	L
11-12	Card Sequence (-1)	2	N	F
13-16	Blank	4	-	-
17-24	COA_p	8	N	R
25-80	Blank	56	-	-

*A = alpha, N = numeric, X = alphanumeric
**F = fixed, R = right, L - left

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IV. PROCEDURES AND REQUIREMENTS

4.1 INITIATION

4.1.1 Attachment of Required Files

After setting up the terminal and establishing a data link with the host computer, the user must attach the program and all files to be used. The following files must be attached using the given command.

RMCM The primary LGO file which contains the interactive program. It is currently cataloged on the WPAFB CDC-6600 and is attached by the command:

ATTACH, RMCM

RMBASE The R&M input file used to calculate R&M parameters for use in the cost equations. If an R&M file is cataloged in the system called "DAIS85," enter:

ATTACH, RMBASE, DAIS85

The following commands must be entered prior to each session for which output files will be cataloged.

REQUEST, RMPERT, *PF

This command must be entered to perturb the R&M base file (RMBASE) and to permanently save it after the session by cataloging it.

REQUEST, BSEOUT, *PF

If the interface file to the batch print program is to be permanently cataloged (which is necessary to run the batch print program), storage for the interface file (BSEOUT) must be requested prior to the interactive session.

REQUEST, PRTOUT, *PF

Similarly, if a perturb interface file (PRTOUT) is to be cataloged, this command must precede the session.

4.1.2 Attachment of Optional Files

The following files may be optionally attached prior to running the model.

COST All of the cost input values come from this file. If this file is not attached, only R&M output values will be available from the model and no interface files will be produced. If a cost file is cataloged with the name "COSTD85," attach it with the command:

ATTACH, COST COSTD85

RMPERT If a perturbed R&M file from a previous session was cataloged on the system, it may be used for analysis by attaching it prior to the session (in this case, space cannot be requested for it as described above). If the perturbed R&M file is RMTEMP1, attach it by entering:

ATTACH, RMPERT, RMTEMP1

HELP If helpful messages produced by the system are desired at a user request following interactive prompts, this file must be attached by typing:

ATTACH, HELP

DEFINE If the glossary of terms and parameters to be available during the interactive session is desired, type:

ATTACH, DEFINE

Finally, to begin execution of the interactive program, enter:
RMCM

4.1.3 Sample Initiation Procedure

A typical interactive sequence for initiation is shown in Figure 4.12 on page 105.

4.2 INTERACTIVE INPUTS

Throughout the interactive session, numerous prompts occur which demand a response from the user. Each prompt and its meaning is described below. Prompts will be shown in capital letters with quotation marks, whereas the responses will be capitalized and without quotation marks. If the HELP file is attached, the user can type HELP for assistance in selecting an input in response to any prompt. Typical interactive sessions are shown in Figures 4.13 through 4.16 (pages 106-109).

- "DO YOU WANT BASIC INSTRUCTIONS (Y OR N)?"

The user enters Y to obtain a short tutorial on use of the interactive program. Enter N to inhibit the option. All yes/no prompts require the same response. This prompt is produced only if the HELP file is attached.

- "FUNCTION?"

This is the base position of the program. Control is returned here following execution of a program function. The user may then exit the model by typing X or by continuing the operations. [4] At this point there is no active operation in process. The two main program functions are as follows.

[4] Note that the user may also return model operation to the FUNCTION level in case of an error by going through the interactive steps to the REPORT prompt and then responding with X.

MODIFY — Enter this response to begin creation of a perturbed R&M file. File RMBASE is perturbed according to subsequent prompts and responses, and the new R&M data are stored in file RMPERT.

PRODUCTS — This response initiates the program section to display output products. Initially, the R&M file(s) are input, and the parameters required for cost equation are calculated.

The prompts below occur in the following order while employing the MODIFY function:

"R&M VARIABLE?"

Here the user indicates which R&M parameter is to be perturbed. While creating the new RMPERT R&M file, the available variables are:

TW	Shop bench check and repair time for an LRU (time in the case of all variables is the average time it takes to complete that event).
TK	Shop cannot duplicate time for an LRU.
TN	Not reparable this station time for an LRU.
TTD	Test drawer repair time.
TTS	Test station repair time.
TA	Set up flightline SE time for the subsystem.
TT	Flightline troubleshoot time for the subsystem.
TC	Flightline cannot duplicate time for the subsystem.
TR	Flightline average LRU remove and replace times for the subsystem.
RM	On aircraft maintenance time for the subsystem.
TVR	Remove and replace verification time for the subsystem.
TVM	On aircraft maintenance verification time for the subsystem.
MFHBMA	Mean flight-hours between maintenance actions for the subsystem.

All of the above variables may be replaced, multiplied by a factor to be input, or biased by a value to be input. Probability of occurrence of each of the above tasks may also be modified, but only if multiplication of a factor. These variables and their relationship to each other are as follows.

PW	Shop repair probability.
PK	Shop cannot duplicate probability.
PN	Not reparable this station probability.
PTD	Test drawer repair probability.
PTS	Test station repair probability.
PT	Flightline troubleshoot probability; PT = PR + PM.
PC	Flightline cannot duplicate probability; PT + PC = 1.
PR	Remove and replace probability; PR = $\Sigma(I)$ (PW + PK + PN) where (I) is the LRUs in the subsystem.

PM On aircraft maintenance probability.
PVR Remove and replace verification probability; PVR = PR.
PVM On aircraft maintenance verification; PVM = PM.

The integrity of the relationships shown above is maintained in the perturbed file. For example, if PR is cut in half, so is PVR. But also, PM and PVM are increased such that PT = PR + PM. Continuing, PW, PK, and PN for each of the LRUs in the subsystem are also cut in half.

Limits are set as the probability changes to avoid invalid demands. For example, if a probability becomes greater than 1.0 when multiplied by the input factor, the model changes the factor such that the probability becomes 0.195 when multiplied. Thus, the user may not always get what was asked for. This new factor then is used to adjust any other affected probabilities. This action is reported as "TRUNCATION" by the model at the end of the modify function. If no such message appears, no change of the input factor occurred. Similar truncations may occur, for example, if the user tries to increase PR such that the difference could not be made up by PM (PT = PR + PM). Also, the sum of PW + PK + PN remains the same if either one is modified. If modifications of PW, PK, or PN would be so great as to make it larger than the prior total, truncation occurs such that it becomes 0.95 of the total, and the other two make up the difference.

The final anomaly that could occur would appear if the user tried to modify PW, PK, or PN when the other two are zero. The message "NOT CHANGED" appears in the tallies at the end of the function. If no such message is reported, all were changed.

One more response can be entered following the "R&M VARIABLE" prompt, representing a combination of the flightline and shop cannot duplicate probabilities, PC and PK. This special response is:

PC/PK

This option asks for two factors which affect the probabilities of occurrence of all tasks for any subsystem selected and also adjust their MFHBMA accordingly. The model responds with the following two prompts to furnish those required factors.

"FLIGHTLINE CND FACTOR="

If the user has selected PC/PK to be modified, the factor to be applied to PC will be entered first.

"SHOP CND FACTOR="

Here the user enters the factor to be applied to PK.

In either case, or both, the factor chosen must be the percent change in decimal format to be subtracted from unity by which these probability of occurrences are to be multiplied. Thus, if it is desired to reduce the PC probability by 10 percent, a value of 0.1 is input for the flightline CND factor. This will cause the PC probability value to be multiplied by (1.0 - 0.1). The model computes the resultant change in MFHBMA and adjusts other probabilities accordingly.

• "NEW TITLE?"
The new perturbed R&M file (RMPERT) contains, in columns 71-80 of the title card, the 10 characters typed in by the user. It is used solely for identification and can be an abbreviated description of the changes made in the perturbation. (Columns 1-70 are copied from RMBASE to RMPERT.)

• "TYPE?"
For selection of the type of perturbation desired, the user types BIAS, FACTOR, or REPLACE which initiates one of the following three respective prompts:

"BIAS="

Enter the value to be added to the current variable in the RMBASE file. To subtract enter a negative number.

"FACTOR="

Enter the value to be multiplied times the current variable in the RMBASE file.

"REPLACE="

Enter the value that is to replace the existing RMBASE file variable.

• "MASK?"
This option provides the capability to screen any equipment or AFSC, groups of equipment, or groups of AFSCs from the operation about to be performed. An entry of a character string at this option serves to exclude any data items with identifications which do not include the character string entered. Entering a blank inhibits the option.

• "DO YOU WANT A LISTING OF THE CHANGED ITEMS?
If answered affirmatively by entering a Y, the values selected to be changed will be listed for comparison. Note that in the case of perturbing task probabilities, only the task which was initially modified will be displayed, not other probabilities which were changed as a result of the selected change.

The prompts below occur in the following order while employing the PRODUCTS function.

• "COMPARE WITH PERTURBED FILE?"
For side-by-side comparison of output products derived from the base and perturbed R&M files (RMBASE and RMPERT), the user responds Y. If RMPERT was not attached, the prompt does not appear and all output will be derived from the RMBASE file.

• "DO YOU WANT TO CHANGE INITIAL COST INPUTS?"
If the user wishes to change input values from the cost file COST prior to computing the outputs using the cost operations, the user responds Y. This can be used to correct known errors in the cost file (for this session) or changing values which might have been unknown or inaccurate at the time of the preparation of the file (such as IR and DR, the inflation and discount rates).

- "DO YOU WANT TO PERTURB COSTS?"

In a similar fashion, the user may create a second set of output products based on one or more changes to the current cost values. If changes were already made to the "initial cost inputs," the perturbations will be made to the latest set of cost values.

- "COST VARIABLE?"

Here the user indicates which cost parameter is to be perturbed next. There is no limit to how many variables may be changed. After the last variable is changed, the user types X to continue from this prompt. The acceptable list of variable parameters which may be modified is shown in Table 4.1.

- "PERTURBED OUTPUT FILE TITLE?"

The perturbed output file (PRTOUT) contains, in columns 71-80 of the title card, the 10 characters the user types in here. It is used solely for identification and should be an abbreviated description of the changes made in the perturbation. (Columns 1-60 are copied from the COST file and title card, and columns 61-66 contain the word OUTPUT on the title card for both BSEOUT and PRTOUT).

- "REPORT?"

Here the user enters the acronym for the desired output product. The list of acceptable responses is shown in Table 4.2. An X inserted at this point returns the user to the FUNCTION position of the program.

- "DO YOU WANT:
  1 - % CHANGE
  2 - DIFFERENCE?"

When comparing outputs with perturbed output values, the user is allowed to see the effect of the perturbation as a percent change or as an arithmetic difference. Here the correct response is 1 or 2, respectively.

- "SORTED?"

An answer of Y sorts the output before display. For output reports containing only one line of data, the prompt does not occur.

- "ASCENDING?"

If sorting is requested, the user specifies an ascending (Y response) or a descending (N response) list of values.

- "SORT ON:
  1 - BASE DATA
  2 - PERTURBED DATA
  3 - % CHANGE OR DIFFERENCE"

If sorting is requested and perturbed output was calculated, the user specifies here which column of data is to be sorted.

Table 4.1 —Cost Equation Parameters which may be Modified.

SCALAR	SCALAR	COSTS	LRU
BRCT	OSTC	COO	* W
OSTO	OS	CAC	* PW
EBO	KPCR	COP	* PN
SPRTS	WRMC	CFL	* PS
CNFL	CTFL	COM	* LNSRU
CTFX	CNSL	CSM	UC
CNSS	CTSL	CPT	UCSRU
CTSS	FJG	CSP	FCL
NW	NMMKW	CDR	FCS
NMM	NCHMM	CSE	T
CCPH	COC	CSW	DRCT
CPMM	SWPC	CJG	DC
CUR	CC	CIM	TC
SCC	NSS	CRD	PA
SLR	PC	CSI	PP
KTS	KI	COI	SP
IMC	RMC	CPP	IC
SA	PSC	CPM	CALI
PSO	RPUW	CPTI	
OHI	COS	CSPI	
ILR	PTT	CDRI	
CACQ	OSCY	CSEI	**AFSC**
PMB	EFF	CSWI	* FMMH
NB	PIUP	CJGI	* SMMH
NACB	CPA	CIMI	NWK
FHACM	MFHACM	CFAI	ACG
FC	KSLPT	CDP	CIC
KPJG	KCJG		COT
AAOH	BCA		CTTS
BPA	FLA	**SE**	COJT
OBSEC	CGTE	* TSDEM	TCS
CGCM	CCIT	* TSDOT	TRS
IR	KSED	UCSE	CMPS
ND	CDSE	KIH	OPF
CFB	POT	KSE	KM
DPT	DR	CPUSE	DLR
CTFS	CNFS	CSESM	LLR
CNFX	CTSX	IH	BMR
CNSX	YEAR	CSU	
		MSE	
		KTR	
SUBSYSTEM	**DSE**		
* MFHBMA	NDSER		
* SNSRU	UCDSE		
CPINT			
CINST			
CFJG	**AIRCREW**		
CSJG	COA		

* - DENOTES VARIABLE FROM R+M MODEL

Table 4.2 — Available Output Report Parameters.

```
                                      LCC (OR ADJLCC)
                                      -------------
                                            /
                  ---------------------------------------------------------------
                  /                                        /                    /
                 NRC                                 RC (OR RCY)                /
                  /                                        /                    /
     ---------------------------                 --------------                 /
     /            /            /                 /              /               /
    CRD          CSI          COI                CO             CS             CDP
                 ---          ---                --             --
                  /            /                 /              /
                 CPM *        CDRI               CFL            CPT
                 CPP          CPTI               COP            COM
                              CSPI                              CSM
                              CSEI                              CSP
                              CSWI                              CDR
                              CJGI                              CSE
                              CIMI                              CSW
                              CFAI                              CJG
                                                                CIM
```

* - CPM, ALTHOUGH USED TO COMPUTE LCC AND ADJLCC, IS A DATA INPUT ITEM AND IS NOT AVAILABLE AS A REPORT.

ADDITIONAL OUTPUTS AVAILABLE:

SUBSYSTEM	LRU	AFSC	[illegible]
MTTRS	MTTRL	AMMHF	CPUSE
MTTRF	MMHL	AMMHS	CSESM
MTTRT	LRUDS	AMMHT	NSER
MMHS	SRUDS	LLR	IH
MMHF	LRUSS	TCS	
MMHT	SRUSS		
AVAIL	STKL		
CPINT	STKS		
CINST	SPRTS		
CFJG	TC		
CSJG			
MFHBMA			

• SORT ON ABSOLUTE VALUE?"

If the user is sorting on percent change or difference, some values may be negative (if the perturbation lowered the output value). If only interested in the absolute value of the change, the user responds with Y to this prompt and the list is sorted on the absolute value.

4.3 ADDITIONAL FEATURES

The preceding section was devoted to basic operation of the model by explanation of proper responses to prompts. The interactive program is also designed to provide assistance and additional features as described below.

4.3.1 GLOSSARY Routine

The model is programmed to read the GLOSSARY file to provide the user with descriptions of any or all terminology used in the model. Most useful is the definition of the R&M and cost acronyms. The glossary feature may be employed by typing "GLOSSARY" following any of these prompts.

"FUNCTION?"
"R&M VARIABLE?"
"COST VARIABLE?"
"REPORT?"

When the user enters GLOSSARY after any of the above prompts, the next prompt is "TERM?."

• "TERM?"

The proper entry here is the acronym or abbreviation of any term used in the model. The model responds with the definition of the term as presently listed in the file DEFINE which the user should have attached prior to execution of the program. Then the "TERM?" prompt occurs again. The user may ask for the definition of another term or enter X to return to the prompt which initially resulted in the GLOSSARY response. An additional response to the prompt "TERM?" is L or LIST. This feature enables listing the terms in the glossary. When the user types L or LIST, the model prompts again with "MASK=."

• "MASK="

To obtain the entire list of terms in the glossary, the user must enter a blank. Otherwise, the user enters from 1 to 10 characters to be used as a mask in screening glossary terms. Only terms with character strings containing the mask are listed.

4.3.2 HELP Routine

At any prompt, the user may type HELP to receive assistance in determining the proper response. When applicable, the HELP list contains all acceptable responses. HELP is not supplied if the user did not attach the HELP file prior to execution of the program.

4.3.3 SET Routine

Several prompts occur frequently during a typical session with the model; therefore, at times the response will always be the same. In these cases, the SET feature can be invoked to avoid retyping the response each time. The SET function may be employed by typing SET following any of these prompts.

"FUNCTION?"
"R&M VARIABLE?"
"COST VARIABLE?"
"REPORT?"

When the user enters SET after any of these prompts, the next prompt is "PARAMETER=."

- "PARAMETER="

The available parameters which may be SET to inhibit prompts for them throughout the model are as follows.

LINES	This option can change the number of lines of data that will be printed out of a list without stopping. Initially, when listing a large set of lines, the model stops and awaits user response of a blank (to continue) or an X (to cancel continuation) every ten lines. If the user types LINES here, the model responds with "MAX LINES=," to which the user responds with the new desired limit.
DIFFERENCE	When listing output reports of perturbed data, the user can select the third column of each output line to show the arithmetic difference or the percent change from the base value to the perturbed value. If the user enters DIFFERENCE here, the model hereafter displays the arithmetic difference and will not prompt the user.
% CHANGE	Similarly, the user can hereafter get the percent change between base and perturbed outputs without prompting each time.
SORT	When outputs contain a list of values, the user normally is prompted for the option to sort the list. By entering SORT here, future prompts are avoided and the lists are always sorted.
NOSORT	If the user never wants to sort, this entry also bypasses the prompt asking for the sort option.
LIST	To obtain a listing of changed items during perturbation of the R&M file or modification of a cost variable, enter LIST. Prompting for the decision whether to list does not occur.
NOLIST	To list changed items, enter NOLIST. Prompting does not occur.

MASK — If the intent is to use the same mask every time one is called for by the model, the user can select this option and enter up to a 10-character mask following the next prompt, "MASK=," The model will not prompt for a mask when one is needed elsewhere in the program but will use the one entered here.

NOMASK — This option cancels the previous one. After this option is entered, the model will prompt for masks when one is required. Note that this option does not set the mask to blanks as the name might infer..

TITLE — The user sets this option to use the same title for both the RMPERT file and PRTOUT file (such as the date or initials). Prompting for it will not occur later. After selecting this option, the user enters up to ten characters following the next prompt, "TITLE."

NOTITLE — This option cancels the previous one. After this option is entered, the model prompts for a new title when one is required. Note this option does not set the mask to blanks as the name might infer.

4.3.4 BACK Routine

To set all of the options back to their original functions, this option is entered. The original values for all parameters are as follows.

1. maximum lines to be printed at the terminal without stopping: 10
2. prompt for DIFFERENCE or % CHANGE
3. prompt for SORT
4. prompt for listing of changed items
5. NOMASK
6. NOTITLE

Note that the BACK option is the only way the user can reset the program to prompt for DIFFERENCE, % CHANGE, SORT, or LIST.

4.3.5 Abbreviation

The user may abbreviate any response to as few as one character. For example, the user may type GLOS or simply G to enter the glossary. Excessive use of abbreviation is not recommended as it tends to disguise the responses on the terminal printout during later examination and it is easy for ambiguities to exist. For example, if the user answers MFH for the prompt "REPORT?" hoping to see the output MFHBMA, MFHACM is displayed because it appears in the list before MFHBMA and fits the abbreviation. In addition, some acceptable responses are completely contained in others, such as CPT and CPTI. Other restrictions also exist. It is impossible to enter a mask on a title with H, HE, HEL, or HELP since these responses invoke the HELP function. For the same reason, HELP does not appear in the GLOSSARY.

The only exception to the abbreviation feature is in responding to the prompt "TERM?" in the GLOSSARY. The term to be defined must be entered exactly as it appears in the GLOSSARY or exactly as one of its synonyms appears. (Several glossary terms have synonyms so the user does not have to know the exact term name for a definition. For example, R&M is a synonym for R+M and either may be used to get the definition.) In addition, to list the terms in the glossary, enter an L instead of the word LIST, but not LI or LIS.

4.3.6 Multiple Responses

The multiple responses feature, which facilitates use of the interactive program, enables the user to anticipate prompts and respond in advance by entering two or more responses separated by commas. For example, if the user is modifying the unit cost of a group of LRUs, the sequence of prompts and responses might look like the following.

```
COST VARIABLE? UC
TYPE? FACTOR
FACTOR = 1.25
MASK? AC3
DO YOU WANT A LISTING OF THE CHANGED ITEMS? Y
```

This sequence initiates an increase of unit cost of all LRUs with the characater string AC3 for their equipment ID by 25 percent and calls for a listing of those costs. The same factor could be entered in one response instead of two by responding:

```
TYPE? FACTOR, 1.25
```

The comma separates the two responses and prevents the prompt "FACTOR" from being displayed because the user has already responded with a factor. Similarly, the entire sequence above can be replaced by:

```
COST VARIABLE? UC, FACTOR, 1.25, AC3, Y
```

Excessive use of this feature, while very expedient, makes reading the terminal listing at a later date very difficult. There are two functions of the model for which this feature is extremely useful:

```
FUNCTION? SET
PARAMETER = LINES
MAX LINES = 30
FUNCTION? GLOSSARY
TERM? MFHBMA
```

The SET and GLOSSARY functions can be entered faster when separated by commas as:

```
FUNCTION? SET, LINES, 30
FUNCTION? GLOSSARY, MFHBMA
```

Further, by using abbreviation as well, the whole sequence can be stripped down to:

```
FUNCTIONS? S, L,30,G, MFHBMA
```

Although use of all of these features will greatly enhance the use of the model, care should be taken to avoid unwanted operations. There is, however, a built-in safety feature if an error is made. If the model detects an input error in a user response to any prompt or anticipated prompt, all multiple responses following the error are ignored and the model issues a prompt for re-entry of the error response. For example, the user may mistakenly enter (omitting the L as shown above):

FUNCTION? S, 30, G, MFHBMA

The model, realizing that 30 is an invalid SET parameter, ignores G,MFHBMA and responds:

INPUT ERROR. RE-ENTER
PARAMETER =

The user can then type the following for the desired result.

L, 30, G, MFHBMA

4.3.7 Error Messages

Following is a list of all possible error message which might be generated by the model. Included is an explanation of what caused the error and what the user can do to correct it.

- R&M FILE NOT ATTACHED
  This message appears when the user has failed to attach the R&M file prior to execution of the interactive program. The user should terminate the program, attach the R&M file as described in the INITIATION section, and re-start the session.

- INPUT ERROR. RE-ENTER
  TYPE "HELP" FOR ASSISTANCE
  This message is produced each time the user responds to a prompt with other than one of the acceptable responses. No other diagnosis of the problem is reported; however, the user can use the HELP system which provides a list of acceptable inputs or an explanation of what is required. This second part of the message is reported for only the first two errors of the session. It is not printed at all if the HELP file was not attached prior to execution of the program.

- HELP FILE NOT ATTACHED
  This message indicates that the user has asked for help from the HELP system, but did not attach the HELP file prior to the session. The user may either continue without assistance or exit the program, attach the HELP file, and start over.

- FILE DEFINE NOT ATTACHED
  This message appears when the user has asked for the GLOSSARY function but did not attach the DEFINE file prior to the session. The user may either continue without the GLOSSARY or exit the program, attach the DEFINE file, and start over.

- ______________ NOT IN GLOSSARY
  The user has asked for the definition of a term which is not in the GLOSSARY, or has asked the GLOSSARY FUNCTION to list all terms containing a certain mask, and there are none.

- ENTER X TO CANCEL, BLANK TO CONTINUE
  When the model is listing many lines at the terminal, it stops after every 10 lines. (The 10 may be changed. See SET in the section on Additional Features.) When it stops, the user must enter an X or a blank. An X inhibits printing of the remainder of the list (although it does not cancel any function it may be performing), and a blank causes 10 more lines to be printed. If the user enters anything else, the above message appears.

- INCOMPATIBLE FILES
  When comparing two R&M files in the report function (RMBASE and RMPERT), it is required that RMPERT be a file which was created using the MODIFY function with RMBASE as the file from which it was perturbed. It is not necessary that it was created during this session, and it is permissible to compare two files which may have had more perturbation files between them. In other words, if file A was perturbed to obtain file B, and B was perturbed to get file C, files A and C can be compared, with either one being defined as RMBASE and the other as RMPERT. The above message occurs when an attempt is made to compare two files of differing equipment/AFSC structures.

- NO DATA
  This message appears whenever the user tries to perform an operation on a group of data with a MASK so defined as to screen out all the data. To determine why it happened, it may be helpful to perform the operation again with no MASK.

- NUMBER OF AFSCs EXCEEDS 50
  This error occurs when the R&M data base contains more than 50 different AFSCs, the current limit. There is no corrective action other than reducing the number to 50 in the R&M data base.

- NUMBER OF SUPPORT EQUIPMENT EXCEEDS 50
  This error occurs when the R&M data base contains more than 50 different types of SE, the current limit. There is no corrective action other than reducing the number to 50 in the R&M data base.

- CURRENT MAX SUBSYSTEMS AT 40
  This error occurs when the R&M data base contains more subsystems than the model is programmed for. There is no corrective action other than reducing the number in the R&M data base.

- CURRENT MAX LRUs AT 120
  This error occurs when the R&M data base contains more LRUs than the model is programmed for. There is no corrective action other than reducing the number in the R&M data base.

- R&M INPUT FILE ERROR
  DEBUG WITH BATCH R&M MODEL
  The model detected an error in the R&M input deck. As this model has no diagnostic features for the R&M portion, the R&M file used should be run using the R&M batch model to determine the errors.

- THE FOLLOWING CARD HAS AN INVALID CARD CODE . .
  The two character code in the COST file record listed after this message is not an acceptable cost file card type. The error must be corrected outside the model and the program executed again.

- THE FOLLOWING CARD HAS AN INVALID SEQUENCE NUMBER . . .
  The sequence number in the COST file record listed after this message is not an acceptable sequence number for the card type. The error must be corrected outside the model and the program executed again.

- NUMBER OF AIRCREW EXCEEDS 50
  This error occurs when the cost data base contains more than 50 aircrew, the current limit. There is no corrective action, other than reducing the number to 50 in the cost data file.

- NUMBER OF DEPOT SUPPORT EQUIPMENT EXCEEDS 50
  This error occurs when the cost data base contains more than 50 depot SEs, the current limit. There is no corrective action other than reducing the number to 50 in the cost data base.

- EXECUTION HALTED. nn ERRORS LISTED ABOVE
  If there were any errors in the COST data base file, the program is aborted.

- INSUFFICIENT DATA TO COMPUTE xx
  If the COST data file is incomplete, some cost outputs can not be computed and are reported here.

- NO DATA TO CHANGE
  This error results if the user, when modifying costs, has requested modification of a cost variable which was not included in the COST file.

- NOT COMPUTED
  This error occurs when the user requests an output report for a cost which was not computed. Insufficient data were provided on the COST input file. It is possible that this cost is not required for computation of LCC if higher level terms are supplied. If it was required for LCC calculations, the user would have already received the message INSUFFICIENT DATA TO COMPUTE _____. If the message was not received, the cost which was not computed here is not required due to higher level terms input in the cost file.

- BASE YEAR NOT FOUND IN DATA. SET TO 1
  No input was made in the COST file for base year. The user has requested adjusted LCC for a report, so base year is set to 1. The YEAR column on the report will show relative year rather than calendar year.

- INVALID REPORT NUMBER
  This message is produced by the batch print program if the user requested a report other than 01 through 10. The request is ignored and execution continues.

4.3.8 Termination

The user terminates the interactive program by entering END in response to any of the following prompts.

"FUNCTION?"
"REPORT?"

The program terminates with the message, RMCM ENDED. Now the user is required to catalog any created files to be permanently saved. If a perturbed R&M file was created, to save it for future use either by the interactive RMCM or by the R&M batch model, type:

CATALOG, RMPERT, filename, RP = 999

Filename is the name ur [illegible] which the file is to be permanently stored. Similarly, to save the output files for use by the batch print program, enter:

CATALOG, BSEOUT, basename, RP=999
CATALOG, PRTOUT, pertname, RP=999

These statements cannot be entered into the CDC-6600 Intercom system unless a REQUEST was entered for each file prior to running the interactive program.

4.3.9 Batch Print Outputs

To obtain batch print outputs, the user submits a batch job on the terminal or by cards containing the following commands.

```
ZAI,CM250000. V770195
ATTACH, LGO, LCCIMBATCH
ATTACH, TAPE 10, basename.
ATTACH, TAPE 11, pertname.
LGO.
*EOR
data
*EOR
*EOF
```

In the above list, basename is the cataloged file name of the BSEOUT file generated by a session with the interactive R&M. Pertname is the file name of the PRTOUT file. Following the first *EOR card is the input data cards used to select the reports to be printed. The reports to choose from and the description of the format for these input data cards, which may be in any order or quantity, are described below. Samples of each of these output reports are provided in Figures 4.1 through 4.11 at the end of this section.

- Report No. 1--System Cost; the user enters 01 in Columns 1 and 2 (see Figure 4.1).
- Report No. 2--Expanded Nonrecurring Costs (NRC); the user enters 02 in columns 1 and 2 (see Figure 4.2).
- Report No. 3--Expanded Recurring Costs (RC); the user enters 03 in columns 1 and 2 (see Figure 4.3).
- Report No. 4--Costs by Subsystem contributions; the user enters 04 in columns 1 and 2 To sort on a recurring cost element, the user enters the cost element code in columns 4-6. The acceptable recurring cost elements are provided below.

Code	Cost Element
COM	Cost of on-equipment maintenance
CSM	Cost of intermediate shop maintenance
CPT	Cost of maintenance personnel training
CSP	Cost of replacement spares
CDR	Cost of depot maintenance
CJG	Cost of supporting maintenance manuals
CIM	Cost of inventory management
TOT	Total cost

(See Figure 4.4 which has been sorted by the COM cost element as indicated by the asterisk. The nonrecurring cost element display of this output is not included in the sample.)

REPORT NO. 1 -- SYSTEM COST

PIUP = 15 YEARS BASE YEAR - 1976

ORIGINAL - DAIS COST DATA BANK (THEORETICAL)
PERTURBED - TEST # 3

	ORIGINAL		PERTURBED		DIFFERENCE
	COST	% LCC	COST	% LCC	
URRING					
- SUPPORT.................	88,891,590	30.479%	88,497,843	30.369%	-393,746
- OPERATION..............	64,650,960	22.168%	64,650,960	22.186%	0
-RECURRING					
- R & D.............	6,210,000	2.129%	6,210,000	2.131%	0
- SYSTEM INVESTMENT......	64,705,798	22.187%	64,852,572	22.255%	146,773
- SUPPORT INVESTMENT.....	67,185,621	23.037%	67,194,204	23.059%	8,583
POSAL....................	0	0.000%	0	0.000%	0
ALS......................	291,643,970	100.000%	291,405,580	100.000%	-230,389

Figure 4.1 — Example batch output report no. 1.

REPORT NO. 2 -- EXPANDED NON-RECURRING COSTS (NRC)

ORIGINAL - DAIS COST DATA BANK (THEORETICAL)
PERTURBED - TEST # 3

	ORIGINAL		PERTURBED		DIFFERENCE
	COST	% LCC	COST	% LCC	
RECURRING	153,542,550	52.647%	153,148,803	52.555%	-393,746
PIUP = 15 YEARS					
DISPOSAL	0	0.000%	0	0.000%	0
NON-RECURRING					
CRD - R & D	6,210,000	2.129%	6,210,000	2.131%	0
CSI - SYSTEM INVESTMENT					
CPP - PROCUREMENT	64,705,798	22.187%	64,852,572	22.255%	146,773
CPM - PROJECT MANAGEMENT	0	0.000%	0	0.000%	0
COI - SUPPORT INVESTMENT					
CPTI - MAINTENANCE TRAINING	0	0.000%	0	0.000%	0
CSPI - SPARES	16,479,177	5.650%	16,487,761	5.658%	8,583
CDRI - SE, DEPOT	28,110,719	9.639%	28,110,719	9.647%	0
CSEI - SE, FIELD	18,535,020	6.355%	18,535,020	6.361%	0
CSWI - SOFTWARE ACQUISITION	1,997,711	.685%	1,997,711	.686%	0
CJGI - MAINTENANCE MANUALS	2,051,328	.703%	2,051,328	.704%	0
CIMI - INVENTORY MANAGEMENT	11,663	.004%	11,663	.004%	0
CFAI - FACILITIES	0	0.000%	0	0.000%	0
TOTALS	291,643,970	100.000%	291,405,580	100.000%	-238,389

Figure 4.2 — Example batch output report no. 2.

REPORT NO. 3 -- EXPANDED RECURRING COSTS (RC)

ORIGINAL - DAIS COST DATA BANK (THEORETICAL)
PERTURBED - TEST # 3

	ORIGINAL		PERTURBED		DIFFEREN
	COST	% LCC	COST	% LCC	
NRC - NON-RECURRING..........................	138,101,420	47.353%	138,256,777	47.445%	155,3
CDP - DISPOSAL................................	0	0.000%	0	0.000%	
RC - RECURRING (FOR PIUP = 15 YEARS)					
CO - OPERATION					
CFL - FUEL..	0	0.000%	0	0.000%	
COP - PERSO[illegible]					
CAC - AIRCREW......	64,650,960	22.168%	64,650,960	22.1[illegible]6%	
COO - OTHER OPERATIONS......	0	0.000%	0	0.000%	
CS - SUPPORT					
COM - ON-EQUIPMENT MAINTENANCE....	11,050,344	3.789%	11,050,344	3.792%	
CSM - INTERMEDIATE MAINTENANCE....	11,668,625	4.001%	11,377,471	3.904%	-291,1
CPT - TRAINING....................	8,272,825	2.837%	8,168,155	2.803%	-104,6
CSP - SPARES......................	14,970,000	5.133%	14,972,078	5.138%	2,0
CDR - DEPOT MAINTENANCE...........	27,954,939	9.585%	27,954,939	9.593%	
CSE - SUPPORT EQUIPMENT...........	9,573,120	3.282%	9,573,120	3.285%	
CSW - SOFTWARE....................	2,562,000	.878%	2,562,[illegible]	.879%	
CJG - MAINTENANCE MANUALS.........	2,307,745	.791%	2,307,7[illegible]	.[illegible]92%	
CIM - INVENTORY MANAGEMENT........	531,989	.182%	531,9[illegible]	.183%	
LCC - TOTALS..................................	291,643,970	100.000%	291,405,580	100.000%	-230,3

Figure 4.3 — Example batch output report no. 3.

REPORT NO. 4 -- COSTS BY SUBSYSTEM CONTRIBUTIONS

RECURRING COST ELEMENTS (PER YEAR)

OUTPUT FILE - DAIS COST DATA BANK (THEORETICAL)

ID	*COM $ RCY	CSM $ RCY	CPT $ RCY	CSP $ RCY	CDR $ RCY	CJG $ RCY	CIM $ RCY	TOTAL $ RCY
AA120	186,256.2	95,195.9	79,784.1	218,119.3	73,195.8	2,630.0	158.2	615,315.1
	1.829	.930	.779	2.131	.715	.026	.002	6.011
AA110	117,530.0	56,287.6	57,585.1	68,538.5	56,018.5	8,784.1	462.6	365,202.8
	1.148	.550	.563	.670	.547	.086	.005	3.568
AM330	71,395.5	84,360.5	65,233.9	141,083.9	234,980.5	2,221.2	168 [illegible]	[illegible]
	.697	.824	.637	1.378	2.296	.022		
AM310	60,999.7	62,076.8	52,731.0	35,677.1	78,778.5	15,930.1		9,066 [illegible]
	.596	.606	.515	.349	.770			
AM120	58,983.8	52,690.5	35,906.7	275,668.6	715,628.2	1,8[illegible]	.002	.089
	.576	.515	.351	2.693	7.187		158.2	7,432.6
AZ310	35,758.0	8,385.8	17,282.3	14,266.5	34,673.2		.002	.073
	.349	.082	.169	.139	.339		1,079.8	13,170.8
AI110	32,171.1	3,683.5	12,273.3	3,776.2	88,895.0	.021	.01[illegible]	.129
	.314	.036	.120	.037		[illegible],989.5	3,088.0	15,608.[illegible]
AC110	18,815.2	38,512.5	19,306.8	25,473.3	55,8[illegible]	.068	.030	.152
	.180	.376	.189	.249		3,969.7	2,158.8	13,028.3
AC320	16,696.5	47,078.8	21,740.7	7,756.9	[illegible]8	.039	.021	.127
	.163	.450	.212	.076				
AM210	16,608.6	35,471.8	18,086.3	7,819.0	[illegible],662.6	153,889.7	35,465.0	4,989,808.6
	.162	.347	.170	.0[illegible]	18.207	1.503	.346	48.787
AM120	16,439.0	33,458.0	17,000.6	11,683				
	.161	.327	.167					
AC210	16,023.2	21,838.2	12,529.9	?				
	.157	.213	.122					
AM320	15,898.8	19,961.8	15,728.1					
	.151	.195	.1[illegible]					
A7120	13,911.5	31,909.5	20,58[illegible]					
	.136	.312						
AZ420	13,631.9	26,293.6						
	.133							
AZ180	12,88[illegible]							
AC810								

OTHER RECURRING COSTS -- CSE............	638,208.0 6.235
CSG............	170,800.0 1.669
CFL............	0.0 0.000
CAC............	4,319,068.0 42.106
CDD............	0.0 0.000
TEST STATION/TEST DRAWER (CSM)..... ..	92,92[illegible].7 .908
TEST STATION/TEST DRAWER (CPT).......	38,371.8 .336
CDR OVERHAUL.........................	0.0 0.000
TOTAL RCY......	10,236,170.0 100.000

* - SORTED

Figure 4.4 — Example batch output report no. 4.

To sort on a nonrecurring cost element, the user enters the cost element code in column 8-11. The acceptable nonrecurring cost elements are:

Code	Cost Element
CSPI	Cost of spares investment
CJGI	Cost of maintenance manuals initial
CPP	Cost of procurement
CIMI	Cost of inventory management
TOT	Total cost

- Report No. 5--Costs by LRU Contributions; the user enters 05 in columns 1 and 2. To sort on a recurring cost element, the user enters the cost element code in column 4-6. The acceptable recurring cost elements are:

Code	Cost Element
COM	Cost of on-equipment maintenance
CSM	Cost of intermediate shop maintenance
CPT	Cost of maintenance personnel training
CSP	Cost of replacement spares
CDR	Cost of depot maintenance
CIM	Cost of inventory management
TOT	Total cost

(See Figure 4.5 which has been sorted on a cost of on equipment maintenance (COM) as indicated by the asterisk. The nonrecurring cost element display of this output is not included in the sample.)

To sort on nonrecurring cost elements, the user enters the cost element code in columns 8-11. The acceptable cost elements are:

Code	Cost Element
CSPI	Cost of spares investment
CPP	Cost of procurement
CIMI	Cost of inventory management initial
TOT	Total cost

- Report No. 6--Reliability, Maintainability, and Availability by Subsystem; the user enters 06 in columns 1 and 2 (see Figure 4.6).

- Report No. 7--Man-hour Costs per Year by AFSCs and Subsystem Supported; the user enters 07 in columns 1 and 2 (see Figure 4.7).

To sort on one column heading, the user enters that heading code in column 4-8. The acceptable headings are:

REPORT NO. 5 -- COSTS BY LRU CONTRIBUTIONS

RECURRING COST ELEMENTS (PER YEAR)

OUTPUT FILE - DAIS COST DATA BANK (THEORETICAL)

ID	*COM $ RCY	CSM $ %CY	CPT $ RCT	CSP $ RCY	COR $ RCY	CIM $ RCY	TOTAL $ RCY
AA121	146,256.2 1.429	95,195.9 .930	79,784.1 .779	218,119.3 2.131	73,195.4 .715	154.2 .002	612,705.1 5.986
AN331	71,395.5 .697	84,300.5 .824	65,253.9 .637	141,083.9 1.378	234,980.5 2.296	154.2 .002	597,128.5 5.834
AN121	58,943.8 .576	52,690.5 .515	35,906.7 .351	275,664.6 2.693	735,620.2 7.187	154.2 .002	1,158,958.0 11.322
AA113	58,331.3 .570	31,758.3 .310	29,256.1 .286	47,095.6 .460	37,383.6 .365	154.2 .002	203,979.1 1.993
AA112	44,047.2 .430	18,128.9 .177	21,152.0 .207	7,570.6 .074	9,743.3 .095	154.2 .002	100,796.2 .985
AZ311	35,754.0 .349	8,345.8 .082	17,282.4 .169	14,266.5 .139	34,673.2 .339	2,158.8 .021	112,480.7 1.099
AK311	23,808.0 .233	23,763.2 .232	20,293.3 .198	24,023.7 .235	47,173.4 .461	154.2	139,215.9 1.360
AN313	22,004.1 .215	23,710.8 .232	19,558.6 .191	5,983.1 .058	16,913.4	462.6 .005	[illegible]0.2
AC321	16,279.5 .159	46,778.3 .457	21,603.7 .211	7,677.9 .075	[illegible].5	308.4	493.4
AW121	15,815.7 .155	33,325.3 .326	16,854.6 .165	11,553.7	.000	.003	.005
AC211	15,671.8 .153	21,613.7 .211	12,333.8 .120				
AN321	15,197.2 .149	19,911.8 .195	15,601.5				
AA111	15,151.5 .148	6,400.4 .063	7,1[illegible]				
AN211	14,698.0 .144	34,649.7 .338					
AZ421	13,631.7 .133	26,293.6					
AI114	13,[illegible]92.0 .129	1[illegible]					
AZ121	13,078.0 .12[illegible]						
AI113	11,230						
AN312							
				[illegible].0 9.750	1,863,662.6 18.207	35,466.0 .346	4,835,954.9 47.244

OTHER RECURRING COSTS --	CSE.............	638,208.0 6.235
	CSW.............	170,800.0 1.669
	CJG.............	153,849..7 1.503
	CFL.............	7.0 0.000
	CAC.............	4,310,054.0 42.106
	COO.............	0.0 0.000
TEST STATION/TEST DRAWER (CSM).............		92,921.7 .908
TEST STATION/TEST DRAWER (CPT).............		34,371.8 .336
COR OVERHAUL.............................		0.0 0.000
	TOTAL RCY......	10,236,170.0 100.000

* = SORTED

Figure 4.5 – Example batch output report no. 5.

REPORT NO. 6 -- RELIABILITY,MAINTAINABILITY, AND AVAILABILITY BY SUBSYSTEM

OUTPUT FILE - DAIS COST DATA BANK (THEORETICAL)

ID	MFHBMA	MTTR		MTTR/KFH		MMH/KFH		AVAIL	SUBSYSTEM LCC CONTRIBUTION	
		FLIGHT	SHOP	FLIGHT	SHOP	FLIGHT	SHOP		FLIGHT	SHOP
AA110	37.40	5.186	2.707	138.669	72.390	270.038	127.662	.87822	3,397,094.3	12,406,339.9
AA120	34.00	5.925	4.096	174.271	120.471	335.500	217.212	.85159	4,165,666.1	15,637,510.4
AC110	51.00	1.884	2.412	36.934	47.297	45.746	98.897	.96438	553,904.6	5,890.240.2
AC210	74.80	2.288	2.011	30.592	26.985	39.321	50.330	.97032	455,264.0	1,778,694.9
AC310	404.60	2.675	.958	6.612	2.369	7.324	3.692	.99343	98,432.2	631,336.5
AC320	62.90	2.097	3.516	33.340	55.897	40.151	109.872	.96774	469,573.3	2,163,913.8
AC330	328.10	2.335	.660	7.116	2.011	10.546	3.241	.99293	160,511.8	553,226.0
AC410	149.80	2.156	.729	14.393	4.867	27.583	6.803	.98581	319,904.5	302,352.7
AC510	647.70	2.030	1.514	3.134	2.338	4.449	4.368	.99688	61,351.1	356,242.7
AC610	120.70	1.502	.341	12.442	2.828	17.644	2.955	.98771	217,370.7	1,765,220.0
AI110	56.10	3.131	.[illegible]72	55.807	6.636	80.711	7.089	.94714	934,273.8	1,726,717.6
AI120	680.00	3.692	.949	5.429	1.396	9.249	1.396	.99460	111,755.0	447,014.9
AM110	113.90	1.883	1.218	16.535	10.690	24.495	19.822	.98373	302,045.5	2,398,350.4
AM120	57.80	3.996	3.937	69.141	68.108	134.995	119.274	.93533	1,688,575.4	24,323,574.1
AM210	1261.40	6.090	.853	4.828	.676	9.656	1.044	.99520	162,718.3	658,641.1
AN110	1031.90	3.325	.502	3.222	.487	3.948	.487	.99679	55,134.9	107,930.9
AN120	62.90	2.125	2.515	33.781	39.988	39.814	77.910	.96732	454,835.9	1,992,912.6
AN130	232.90	1.836	.689	7.885	2.959	12.136	5.558	.99218	154,262.7	388,096.4
AN210	54.40	1.600	2.323	29.405	42.704	40.908	82.392	.97143	482,013.9	2,472,538.5
AN220	110.50	1.410	.617	12.760	5.587	17.591	8.638	.98740	215,491.6	1,259,232.7
AN310	37.40	5.285	2.834	141.313	75.788	158.045	143.487	.87618	2,178,342.8	9,929,775.3
AN320	136.00	4.174	3.296	30.692	24.234	40.539	46.259	.97022	479,690.7	2,749,774.8
AN330	30.60	3.945	3.392	128.922	110.838	174.301	189.583	.88580	2,268,619.9	15,381,589.0
AZ110	2041.70	2.074	2.308	1.016	1.130	1.270	2.155	.99899	39,816.4	4,600,196.9
AZ120	73.10	2.070	2.939	28.317	40.201	34.974	72.926	.97246	481,895.4	9,991,623.7
AZ130	168.30	1.912	3.361	11.358	19.969	13.568	34.358	.98877	201,123.0	9,262,251.6
AZ140	102.00	2.480	1.658	24.314	16.259	32.076	22.613	.97626	461,065.9	5,613,675.1
AZ210	1266.50	2.019	1.766	1.594	1.394	2.148	2.269	.99841	51,468.8	1,675,369.3
AZ220	1263.10	1.991	1.205	1.576	.954	2.089	1.453	.99843	104,291.6	1,459,728.6
AZ310	40.80	2.037	.435	49.926	10.671	84.353	18.970	.95245	1,076,964.9	4,118,904.7
AZ410	249.90	2.756	4.208	11.028	16.837	14.944	29.483	.98909	211,078.0	2,477,221.6
AZ420	103.70	2.590	3.654	24.976	35.236	34.503	58.689	.97563	468,248.8	3,218,524.6

Figure 4.6 —Example batch output report no. 6.

REPORT NO. 7

MANHOUR COSTS PER YEAR BY AFSC'S AND SUBSYSTEMS SUPPORTED

OUTPUT FILE - DAIS COST DATA BANK (THEORETICAL)

ANNUAL BASE FLYING HOURS (ABFH) = 25920.00
NUMBER OF BASES (NB) = 1
PERCENT OF TOTAL LABOR DEVOTED TO DIRECT LABOR (EFF) = 60.00%

AFSC	SUBSYS	LOADED LABOR RATE (LLR N)	DIRECT MMH/FH FLIGHTLINE (FMMH N,M)	TOTAL LABOR FLIGHTLINE (MURF N,M)	DIRECT MMH/FH SHOP (SMMH N,M)	TOTAL LABOR SHOP (MURS N,M)	TOTAL LABOR	TOTAL COST
32632..................		4.578047						
	AA110		.12602	5444.136	0.00000	0.000	5444.136	40,330.4
	AA120		.15545	6715.313	0.00000	0.000	6715.313	49,747.4
	AM120		.06239	2695.403	0.00000	0.000	2695.403	19,967.7
	AN310		.11110	4799.474	0.00000	0.000	4799.474	35,554.7
	AN330		.10340	4466.824	0.00000	0.000	4466.824	33,090.4
	AZ110		.00083	35.792	0.00000	0.000	35.792	265.2
	AZ120		.02320	1002.287	0.00000	0.000	1002.287	7,425.0
	AZ130		.00909	392.630	0.00000	0.000	392.630	2,908.6
	AZ140		.02235	965.647	0.00000	0.000	965.647	7,153.6
	AZ210		.00144	62.046	0.00000	0.000	62.046	459.6
	AZ220		.00142	61.262	0.00000	0.000	61.262	453.8
	AZ310		.04502	1945.059	0.00000	0.000	1945.059	14,409.1
	AZ410		.01023	441.854	0.00000	0.000	441.854	3,273.3
	AZ420		.02305	995.641	0.00000	0.000	995.641	7,375.8
	TOTAL		.69499	30023.367	0.00000	0.000	30023.367	222,414.5

Figure 4.7 – Example batch output report no. 7.

Code	Column Heading
LLR	Loaded labor rate
FMMH	Direct MMH/FH flightline
MURF	Total labor flightline
SMMH	Direct MMH/FH shop
MURS	Total labor shop
LABOR	Total labor
COST	Total cost

- Report Nos. 8A and 8B--Spares Requirements - Investment (8A)--Spares Requirements per year - Replacement (8B); the user enters 08 in columns 1 and 2 (see Figures 4.8 and 4.9, respectively).

To sort on one column heading in report 8A, the user enters a heading code in columns 4-8. The acceptable headings are:

Code	Column Heading
STKL	LRU shop spares
STKS	SRU shop spares
DPLL	LRU depot spares
DPLS	SRU depot spares
UC	LRU unit cost
UCSRU	SRU unit cost
LRUSS	LRU cost of shop spares
LRUDS	LRU cost of depot spares
SRUSS	SRU cost of shop spares
SRUDS	SRU cost of depot spares
TOTAL	Total cost

To sort on column headings in report 8B, the user enters a heading code in columns 10-14. The acceptable headings are:

Code	Column Heading
PN	NRTS probability
FCL	LRU condemnation rate
FCS	SRU condemnation rate
UC	LRU unit cost
UCSRU	SRU cost of spares
SRURS	SRU cost of spares
TOTAL	Total cost

- Report No. 9--Support Equipment Requirements/Cost; the user enters 09 in column 1 and 2 (see Figure 4.10).

To sort on one column heading, the user enters a heading code in columns 4-8. The acceptable headings are:

REPORT NO. 8A

SPARES REQUIREMENTS -- INVESTMENT

OUTPUT FILE - DAIS COST DATA BANK (THEORETICAL)

NUMBER OF BASES (NB) = 1
ANNUAL PEAK BASE FLYING HOURS (PBFH) = 51840.00
EXPECTED BACK ORDER (EBO) = .10

DEPOT REPAIR CYCLE TIME (DRCT) = .17 YRS.
BASE REPAIR CYCLE TIME (BRCT) = .13 YRS.

	SHOP SPARES		DEPOT SPARES		UNIT COST		COST OF LRU SPARES		COST OF SRU SPARES		
	LRU	SRU	LRU	SRU	LRU	SRU	SHOP	DEPOT		SHOP	DEPOT
LRU	(STKL)	(STKS)	(DPLL)	(DPLS)	(UC)	(UCSRU)	(LRUSS)	(LRUDS)	(CRUSS)	(SRUDS)	TOTAL COST
AA111	1	1	4.89852	12.17698	50000	3571.43	50,000.0	244,926.0	3,571.4	43,489.2	341,986.6
AA112	1	1	5.79966	42.76962	10000	909.09	10,000.0	57,996.6	909.1	38,881.5	107,787.2
AA113	1	1	22.36683	41.96090	30000	4285.71	30,000.0	671,004.8	4,285.7	179,832.4	885,122.9
AA121	1	1	43.79323	139.33516	60000	6666.67	60,000.0	2,627,593.6	6,666.7	928,901.0	3,621,161.4
AC111	1	1	3.08391	27.00964	10546	958.73	10,546.0	32,522.9	958.7	25,894.0	
AC112	1	1	2.91447	30.22910	15738	1311.50	15,738.0	45,867.9	1,311.5	39,6[illegible]	
AC113	1	8	4.33781	5.71032	5016	5016.00	5,016.0	21,758.[illegible]	40,128.0		
AC114	1	9	.72862	9.98035	5495	5495.00	5,495.0	4,003.7	49,455.0		265,200.[illegible]
AC211	1	1	5.07182	50.08274	4823	283.7[illegible]	4,823.0	24,361.4	283.7	.0	2,650.0
AC212	2	1	0.00000	1.42103	5000	[illegible]100.00	10,000.0	0.0	5,0[illegible]	[illegible]3,174.7	2,551,232.5
AC311	1	3	4.20980	2.40499	2153	269.13	2,153.0	9,063.7		3,209.2	75,667.5
AC312	1	3	1.87957	1.87957	900	900.00	900.0	1,691.6		22,576.3	109,671.6
AC321	1	1	4.05296	93.28670	4581	509.00	4,581.0	18,566.6	[illegible].0	139,231.1	664,143.5
AC322	2	1	.12355	1.04415	700	350.00	1,400.0	86.6	[illegible],000.0	101,274.9	372,334.4
AC323	4	1	.71442	.71442	168	168.00	672.0	120	4,400.0	107,044.5	645,701.5
AC331	2	1	0.00000	.71641	657	328.50	1,314.0		2,135.3	1,779.8	51,724.6
AC332	6	1	1.15344	.56892	960	960.00	5,760.0	1	71,866.7	62,018.2	249,231.5
AC333	3	2	0.00000	1.64090	2691	384.43	8,073.0	[illegible]	1,375.0	15,190.8	265,118.6
AC334	7	2	1.16680	1.16680	133	133.00	931.0	[illegible].9	4,400.0	3,504.1	16,460.0
AC411	1	8	1.40183	7.60334	606	121.20	60[illegible]	[illegible],736.2	5,940.0	3,651.8	51,968.0
AC412	1	6	0.00000	7.58026	308	51.33		10,439.7	10,000.0	8,948.8	109,384.4
AC413	1	0	3.18440	0.00000	200	[illegible]		409.4	1,100.0	215.2	3,924.6
AC511	1	5	1.27151	6.74[illegible]			440.0	26.8	440.0	85.6	992.6
AC611	1	[illegible]	[illegible]			[illegible].00	440.0	81.9	0.0	43.0	564.9
AC612					5000	5000.00	5,000.0	824.4	0.0	441.3	6,265.7
[illegible]			[illegible]	.11357	5940	1980.00	5,940.0	1,247.6	0.0	224.9	7,412.5
[illegible]		0	.18609	.09784	440	440.00	440.0	81.9	0.0	43.0	564.9
[illegible]	8	2	1.31018	1.45317	990	990.00	7,920.0	1,297.1	1,980.0	1,438.6	12,615.7
AZ311	1	1	5.35872	21.73180	33000	2750.00	33,000.0	176,837.7	2,750.0	59,761.4	272,349.1
AZ411	1	1	6.20724	16.81316	17000	2125.00	17,000.0	105,523.1	2,125.0	35,728.0	160,376.1
AZ421	1	1	23.71350	33.22524	12000	184.62	12,000.0	284,802.0	184.6	6,133.9	303,120.5
TOTAL	147	135	477.04290	1250.88111	781471	203717.67	1,161,843.0	10,271,772.9	406,218.8	4,600,319.5	16,440,104.2

TOTAL ALL BASES.. 16,440,104.2
OTHER COSTS:
SPARE PARTS (SPRTS)..................... 39,073.6
WAR RESERVE MATERIAL COST (WRMC)..... 0.0
TOTAL.. 39,073.6

TOTAL CSPI... 16,479,177.7

Figure 4.8 — Example batch output report no. 8A.

REPORT NO. 8B

SPARES REQUIREMENTS PER YEAR -- REPLACEMENT

OUTPUT FILE - DAIS COST DATA BANK (THEORETICAL)

NUMBER OF BASES (NB) = 1
ANNUAL BASE FLYING HOURS (ABFH) = 25920.00

LRU	MRTS PROB.	CONDEMNATION RATE		UNIT COST		COST OF SPARES		
	(PM)	LRU (FCL)	SRU (FCS)	LRU (UC)	SRU (UCSRU)	LRU (LSURS)	SRU (SSURS)	TOTAL COST
AA111	.02120	.01	.05	50000.00	3571.43	7,346.3	6,522.1	13,868.4
AA112	.02510	.01	.05	10000.00	909.09	1,739.6	5,831.1	7,570.6
AA113	.09680	.01	.05	30000.00	4285.71	20,126.1	26,969.5	47,095.6
AA121	.17230	.01	.05	60000.00	6666.67	78,812.0	139,307.3	218,119.3
AC111	.01820	.01	.05	10546.00	958.73	975.5	3,883.5	4,858.9
AC112	.01720	.01	.05	15738.00	1311.50	1,375.8	5,945.6	7,321.4
AC113	.02560	.01	.05	5016.00	5016.00	652.6	4,295.6	4,948.2
AC114	.00430	.01	.05	5495.00	5495.00	120.1	8,224.7	8,344.7
AC211	.04390	.01	.05	4823.00	283.71	733.7	2,130.9	2,864.6
AC212	0.00000	.01	.05	5000.00	5000.00	0.0	1,065.6	1,0[illegible]
AC311	.19710	.01	.05	2153.00	269.13	271.9	97.1	
AC312	.08800	.01	.03	900.00	900.00	50.7	253 [illegible]	
AC321	.02950	.01	.05	4581.00	509.00	556.9	7 [illegible]	
AC322	.00090	.01	.05	700.00	350.00	2.6		58.4
AC323	.00520	.01	.05	168.00	168.00	3.6		32,828.9
AC331	0.00000	.01	.05	657.00	328.50	0.0	[illegible].0	15.0
AC332	.04380	.01	.05	960.00	960.00	3[illegible]	[illegible],759.9	141,043.9
AC333	0.00000	.01	.05	2691.00	384.43		481.3	555.0
AC334	.04430	.01	.05	133.00	133.00		3,385.8	3,424.6
AC411	.02430	.01	.05	606.00	121.20	[illegible].4	20,880.5	35,499.9
AC412	0.00000	.01	.05	308.00	51.33	45.9	15,188.2	15,334.1
AC413	.05520	.01	.05	200.00	200.0[illegible]	4,572.8	16,053.5	30,626.3
AC511	.09530	.01	.05	2654.00	66[illegible]	708.1	266.9	975.[illegible]
AC611	.40250	.01	.05	8000.00	[illegible]	2,535.9	9,300.9	11,836.8
AC612	.00780	.01	.05	207.00		7,290.1	2,278.2	9,568.3
AI111	.07370	.01	.05	2110.00	[illegible].00	190.6	525.5	716.2
AI112	.00750	.01	.05	802.[illegible]	[illegible]40.00	202.0	547.7	749.7
AI113	.13670	.01	.05	[illegible]	5000.00	313.1	1,342.0	1,655.2
AI114	.14460	.01	.05		1100.00	12.3	32.3	44.6
AI121	.73000	.01		[illegible]	440.00	.8	12.9	13.7
[illegible]				[illegible].00	440.00	2.5	6.5	8.9
				5000.00	5000.00	24.7	66.2	90.9
			[illegible]	5940.00	1980.00	37.4	33.7	71.1
	[illegible]	.01	.05	440.00	440.00	2.5	6.5	8.9
[illegible]	.19150	.01	.05	990.00	990.00	38.9	215.8	254.7
AZ311	.02530	.01	.05	33000.00	2750.00	5,304.1	8,962.4	14,266.5
AZ411	.17950	.01	.05	17000.00	2125.00	3,165.1	5,358.1	8,523.2
AZ421	.28480	.01	.05	12000.00	184.62	8,542.4	919.9	9,462.3
TOT	6.49890	.77	3.85	781471.00	203717.67	308,090.1	683,910.0	998,000.0

TOTAL CSP (ALL BASES) -- 998,000.0

Figure 4.9 – Example batch output report no. 8B.

REPORT NO. 9 -- SUPPORT EQUIPMENT REQUIREMENTS/COST

OUTPUT FILE - DAIS COST DATA BANK (THEORETICAL)

ANNUAL PEAK BASE FLYING HOURS (PBFH) = 51840.00
NUMBER OF BASES (NB) = 1
AVAILABLE ANNUAL OPERATING HOURS (AAOH) = 8760.00

SEID *	TEST STATION DEMAND TIME (TSDEM)	REPAIR TIME (TSDOT)	UTIL RATE (U)	# PER BASE (NPER)	UNIT COST (UCSE)	SE COST/BASE (CPUSE)	INITIAL SE SPARES COST/BASE (CSESM)	COST OF INTER-CONNECTION HARDWARE (IH)	COST OF SOFTWARE (CSU)	INVESTMENT COST (CSEI)	REPLACEMENT COST (CSE)
ARFTS	.24455	.03010	.90172	1	1,370,200.0	1,370,200.0	137,020.0	0.0	0.0	1,507,220.0	54,808.0
CNITM	.22197	.02903	.84800	1	1,667,100.0	1,667,100.0	166,710.0	0.0	0.0	1,833,810.0	66,684.0
CMPTS	.21257	.01821	.98832	1	3,559,000.0	3,559,000.0	355,900.0	0.0	0.0	3,914,900.0	142,360.0
MWTS	.10912	.01825	.56001	1	5,462,100.0	5,462,100.0	546,210.0	0.0	0.0	6,008,310.0	218,484.0
DTS	.06647	.01018	.33559	1	2,816,400.0	2,816,400.0	281,640.0	0.0	0.0	3,098,040.0	112,656.0
ICTM	.01425	.00312	.06065	1	1,080,400.0	1,080,400.0	108,040.0	0.0	0.0	1,188,440.0	43,216.0
TOTAL SHOP PECULIAR SE COSTS PER BASE						15,955,200.0	1,595,520.0	0.0	0.0	17,550,720.0	638,208.0

OTHER BASE LEVEL COSTS:
- COMMON SH[illegible] COST (BCA)............... 78,000.0
- EQUIPMENT [illegible]NUENT BASE SE COST (BPA).... 388,000.0
- PECULIAR A[illegible]MMON FLIGHTLINE SE (FLA)..... 518,300.0
- TOTAL OTHER [illegible] COSTS (OBSEC)............................ 984,300.0

TOTAL SE COST PER BASE...................................... 18,535,020.0 638,208.0

CSEI -- TOTAL NON-RECURRING SE COST (ALL BASES)............................... 18,535,020.0
CSE -- TOTAL RECURRING SE COST PER YEAR (ALL BASES)............ 638,208.0
TOTAL RECURRING SE COST OVER USAGE PERIOD OF 15 YEARS........................ 9,573,120.0

SUPPORT EQUIPMENT LIFE CYCLE COST.. 28,108,140.0

* - SORTED

Figure 4.10 -- Example batch output report no. 9.

Code	Column Heading
TSDEM	Test station demand time
TSDOT	Test station repair time
A	Utility rate
NSER	Number per base
UCSE	Unit cost
CPUSE	Cost per base
CSESM	Initial support equipment spares cost per base
IH	Cost of interconnection hardware
CSU	Cost of software
CSEI	Investment cost
CSE	Replacement cost

- Report No. 10--Cost of Training; the user enters 10 in columns 1 and 2 (see Figure 4.11).

To sort on one column heading, the user enters a heading code in columns 4-8. The acceptable headings are:

Code	Column Heading
NWK	TTS course length weeks
CTTS	TTS cost/AFSC
COJT	OJT cost/AFSC
MU	Manpower requirements
TRS	Annual turnover rate
TOTAL	Total cost

A sample input data deck format is shown below:

```
01
03
02
08   TOTAL TOTAL
04   COM
05   COM TOT
06
07
09   TSDEM
10
08
```

The foregoing input deck generates reports 1, 3, and 2, followed by report 8, with both sections of report 8 sorted on total cost and then report 4 sorted by 8 COM for recurring costs and not sorted for nonrecurring costs. Report 5 appears sorted by COM for recurring costs and sorted on the total for the nonrecurring costs. Reports 6 and 7 follow with no sorting. Report 9 is displayed sorted on TSDEM, followed by report 10 with no sort, and finally report 8 is repeated, this time with no sorting.

REPORT NO. 10 -- COST OF TRAINING

OUTPUT FILE - DAIS COST DATA BANK (THEORETICAL)

ANNUAL BASE FLYING HOURS (ABFH) = 25920.00
NUMBER OF BASES (NB) = 1

AFSC	TTS COURSE LENGTH WEEKS (NWK)	TTS COST/ AFSC (CTTS)	OJT COST/ AFSC (COJT)	MANPOWER REQUIREMENTS (MU)	ANNUAL TURNOVER RATE (TRS.	TOTAL COST
43171	0.00	0.0	0.0	1.61205	0.000	0.0
42153	0.00	0.0	1,307.0	1.61205	.246	658.8
32652	0.00	0.0	5,939.0	11.63051	.246	21,597.0
32632	28.40	18,672.1	0.0	15.63717	.592	192,317.0
32251	0.00	0.0	5,433.0	7.95766	.246	13,517.8
32231	28.50	17,489.4	0.0	6.38327	.592	73,533.3
32833	20.60	14,433.0	0.0	2.81752	.592	26,784.9
32853	0.00	0.0	722.0	1.26749	.246	286.1
32850	0.00	0.0	2,327.0	5.16384	.247	3,769.1
32830	30.10	18,881.1	0.0	4.61776	.621	59,956.6
32831	19.50	13,016.3	0.0	3.57791	.676	34,586.8
32851	0.00	0.0	2,268.0	1.34127	.254	975.5
32651	0.00	0.0	7,870.0	6.43740	.246	15,840.4
32631	39.10	24,017.5	0.0	4.53653	.592	71,765.7
40451	0.00	0.0	4,379.0	.12027	.246	164.7
40431	23.20	18,705.4	0.0	.11334	.592	1.396.4

TOTAL COST PER BASE.......................... 517,150.0
TOTAL CPT (ALL BASES)........................ 517,150.0
TOTAL RECURRING CPT (PIUP = 15 YEARS)....... 7,757,249.3
NON-RECURRING INITIAL CADRE COST (CPTI)..... 0.0
LIFE CYCLE TRAINING COST.................... 7,757,249.3

Figure 4.11 — Example batch output report no. 10.

Reports 1, 2, and 3 are designed to compare the base file with the perturbed file. The remaining reports are displays for the base file only. If the first three reports are not desired, the command to attach that file is not necessary (ATTACH, TAPE11, pertname).

A sample termination sequence is shown in Figure 4.6. This sample illustrates the foregoing request for a batch print output.

4.3.10 Example Sessions

The following is a sample session using RMCM in the interactive mode. Explanations of certain lines in this process are interspersed among the excerpts from this CDC-6600 intercom session.

Excerpt	**Explanation**
COMMAND- SCREEN,80	for 80 column terminals, wider screen
COMMAND- ATTACH,LCCIM	attach the model
PFN IS	
LCCIM	
PF CYCLE NO. = 001	
COMMAND- ATTACH,RMBASE,DAIS85	attach the R&M data base
PF CYCLE NO. = 001	
COMMAND- REQUEST,RMPERT,*PF	request storage for perturbed R&M file
COMMAND- REQUEST,BSEOUT,*PF	request storage for output file
COMMAND- REQUEST,PRTOUT,*PF	request storage for perturbed output file
COMMAND- ATTACH,COST,COSTD85	attach cost file
PF CYCLE NO. = 001	
COMMAND- ATTACH,HELP	attach HELP file
PFN IS	
HELP	
PF CYCLE NO. = 001	
COMMAND- ATTACH,DEFINE	attach glossary
PFN IS	
DEFINE	
PF CYCLE NO. = 001	
COMMAND- LCCIM	execute the model

Figure 4.12 – Sample initiation procedure.

Excerpt	Explanation
NON-FATAL LOADER ERRORS - TRIED TO LOAD INTO BLOCK BELOW ORIGIN - GET.RT LAST PROGRAM READ - W.SQ LAST FILE ACCESSED- SYSIO THE DRC LIFE CYCLE COST IMPACT MODEL DO YOU WANT BASIC INSTRUCTIONS (Y OR N) ? NON-FATAL LOADER ERRORS - TRIED TO LOAD INTO BLOCK BELOW ORIGIN - GET.RT LAST PROGRAM READ - W.SQ LAST FILE ACCESSED- SYSIO N	← refuse basic instructions
FUNCTION? PRODUCTS	← request output products
DO YOU WANT TO CHANGE INITIAL COST INPUTS? N	← do not alter cost file values
DO YOU WANT TO PERTURB COSTS? N	← do not perturb costs
REPORT? LCC	← request life cycle cost
*LCC BSEOUT 291,643,970 REPORT? RC	← request total recurring cost
*RC BSEOUT 153,542,550 REPORT? RCY	← request annual recurring cost
*RCY BSEOUT 10,236,170.0 REPORT? NRC	← request non-recurring cost
*NRC BSEOUT 138,101,420 REPORT? X	← exit products function

Figure 4.13 — Example session with no perturbation.

Excerpt	Explanation
FUNCTION? MODIFY	← initiate R&M modify function
R+M VARIABLE? TW	← select shop repair time for modifications
NEW TITLE? TEST # 1	← append R&M header card
TYPE? FACTOR	← select modification type
FACTOR = .60	← select factor of .6
MASK=AC3	← modify only those equipments with "AC3" in the name
DO YOU WANT A LISTING OF THE CHANGED ITEMS? Y	← request a listing

```
EQUIP    RMBASE    RMPERT
AC311      2.8       1.7
AC312      2.5       1.5
AC321      5.0       3.0
AC322       .8        .5
AC323      5.9       3.5
AC331      3.1       1.9
AC332      4.5       2.7
AC333      2.5       1.5
AC334      1.5        .9
 9 CHANGES.
```

Excerpt	Explanation
FUNCTION? PRODUCTS	← request output products
COMPARE WITH PERTURBED FILE? Y	← use new R&M file just produced
DO YOU WANT TO CHANGE INITIAL COST INPUTS? N	
DO YOU WANT TO PERTURB COSTS? N	
PERTURBED OUTPUT FILE TITLE? TEST # 1	← append perturbed input file
REPORT? LCC	← request life cycle cost
DO YOU WANT: 1-% CHANGE 2-DIFFERENCE ? 1	← request percent change comparison

```
*LCC        BSEOUT         PRTOUT        % CHANGE
         291,643,970    291,248,146         -.1
REPORT?     RCY
```

Excerpt	Explanation
REPORT? RCY	← request annual recurring costs
DO YOU WANT: 1-% CHANGE 2-DIFFERENCE ? 1	← request percent change comparison. Note reduced cost due to reduction of shop repair time.

```
*RCY          BSEOUT          PRTOUT        % CHANGE
       10,236,170.0    10,209,781.7            -.3
REPORT?     X
```

Excerpt	Explanation
REPORT? X	← exit products function

Figure 4.14 – Example session with R&M perturbation.

Excerpt	Explanation
FUNCTION? PRODUCTS	begin new products function
COMPARE WITH PERTURBED FILE? N	do not use perturbed R&M file
DO YOU WANT TO CHANGE INITIAL COST INPUTS? N	
DO YOU WANT TO PERTURB COSTS? Y	request cost perturbation
COST VARIABLE? UC	select unit cost for perturbation
TYPE? FACTOR	
FACTOR = 1.15	Suggest a 15% increase in unit cost to pay for 40% reduction in shop repair time.
MASK= AC3	
DO YOU WANT A LISTING OF THE CHANGED ITEMS? Y	

	COST	PERTURBED
AC311	2153.00	2475.95
AC312	900.00	1035.00
AC321	4581.00	5268.15
AC322	700.00	805.00
AC323	168.00	193.20
AC331	657.00	755.55
AC332	960.00	1104.00
AC333	2691.00	3094.65
AC334	133.00	152.95

Excerpt	Explanation
9 CHANGES.	
COST VARIABLE? X	exit cost modification
PERTURBED OUTPUT FILE TITLE? TEST # 2	
REPORT? LCC	
DO YOU WANT: 1-% CHANGE 2-DIFFERENCE ? 1	

*LCC	BSEOUT	PRTOUT	% CHANGE
	291,643,970	291,801,405	.1

Excerpt	Explanation
REPORT? NRC	
DO YOU WANT: 1-% CHANGE 2-DIFFERENCE ? 1	

*NRC	BSEOUT	PRTOUT	% CHANGE	Explanation
	138,101,420	138,256,777	.1	Note cost increase of acquisition cost, simulating cost to reduce shop repair time.

Excerpt	Explanation
REPORT? RCY	
DO YOU WANT: 1-% CHANGE 2-DIFFERENCE ? 1	

*RCY	BSEOUT	PRTOUT	% CHANGE
	10,236,170.0	10,236,308.6	.0

REPORT? X

Figure 4.15 — Example session with cost perturbation.

Excerpt	Explanation
FUNCTION? SET,MASK,AC3	set mask permanently
FUNCTION? SET,TITLE,TEST # 3	set title permanently
FUNCTION? SET,NOLIST	inhibit listing of changed items
FUNCTION? SET,DIFFERENCE	display difference rather than percent change of perturbed outputs
FUNCTION? PRODUCTS	request output products
COMPARE WITH PERTURBED FILE? Y	
DO YOU WANT TO CHANGE INITIAL COST INPUTS? N	
DO YOU WANT TO PERTURB COSTS? Y	
COST VARIABLE? UC	
TYPE? FACTOR,1.15	combine TYPE and FACTOR prompts. Note no prompt for mask, listing of changed items, or title, due to SET.
9 CHANGES.	
COST VARIABLE? GLOSSARY,UC	ask for definition of UC from glossary.
*UC EXPECTED COST OF LRU(I) (INPUT VI-1,17-24)	
TERM? X	exit glossary
COST VARIABLE? X	exit cost modification
REPORT? LCC	request life cycle cost output. Difference is displayed automatically due to SET. Trade-off analysis shows significant cost improvement.

```
*LCC        BSEOUT          PRTOUT          DIFFERENCE
        291,643,970     291,405,580        -238,389
REPORT?     RCY

*RCY        BSEOUT          PRTOUT          DIFFERENCE
        10,236,170.0    10,209,920.2       -26,249.8
REPORT?     NRC

*NRC        BSEOUT          PRTOUT          DIFFERENCE
        138,101,420     138,256,77[illegible]        155,356
REPORT?     RC

*RC         BSEOUT          PRTOUT          DIFFERENCE
        153,542,550     153,148,803        -393,746
REPORT?     END
```

← exit interactive program

```
LCCIM ENDED
     STOP
     12.[illegible]6 CP SECONDS EXECUTION TIME
```

Figure 4.16 — Sample interactive session with both R&M and cost perturbations.

Excerpt	Explanation
COMMAND- CATALOG,RMPERT,TEST1RM	permanently save perturbed R&M file
INITIAL CATALOG RP = 008 DAYS CT ID= V770195 PFN=TEST1RM: CT CY= 001 00005696 WORDS.:	
COMMAND- CATALOG,BSEOUT,TEST3OUT	permanently save base output file
INITIAL CATALOG RP = 008 DAYS CT ID= V770195 PFN=TEST3OUT CT CY= 001 00008960 WORDS.:	
COMMAND- CATALOG,PRTOUT,TEST3PRT	permanently save perturbed output file
INITIAL CATALOG RP = 008 DAYS CT ID= V770195 PFN=TEST3PRT CT CY= 001 00008960 WORDS.:	
COMMAND- EDITOR	use the editor to create batch print program input deck
..CREATE	
100=ZA1,CM250000. V770195,USERNAME	
110=ATTACH,LGO,LCCIMBATCH.	
120=ATTACH,TAPE10,TEST3OUT.	base output file
130=ATTACH,TAPE11,TEST3PRT.	perturbed output file
140=LGO.	
150=*EOR	
160=01	
170=03	
180=02	
190=08 TOTAL TOTAL	

Figure 4.17 — Termination procedure.

Excerpt	Explanation

```
    200=04 COM
    210=05 COM TOT
    220=06
    230=07
    240=09 TSDEM
    250=10
    260=08
    270=*EOR
    280=*EOF
    290==
..SAVE,DECK
..BATCH,DECK,INPUT
..B,B
COMMAND- LOGOUT
CPA     54.024 SEC.        23.451 ADJ.
IO      56.890 SEC.        28.462 ADJ.
CRUS                       80.316
CONNECT TIME    0 HRS.   24 MIN.
 11/16/78  LOGGED OUT AT 21.26.17.
```

← submit batch print (explanation for ..BATCH,DECK,INPUT)

Figure 4.17 — Termination procedure (concluded)

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10. Air Force Regulation 173-10, Cost analysis: USAF cost and planning factors (volumes I and II). Washington, D.C. Department of the Air Force, 6 February 1975. (for official use only - available to qualified requestors only).

APPENDIX A - RMCM INPUT COST ELEMENTS AND SOURCES

The cost input data to the RMCM have been furnished on punched cards and computer tapes. The record cards required to contain the data items have a standard format, as described in Section III of this volume.

Table A.1 lists by code and describes the data items included on each of the card types by code and its column location. For each data element listed, the table also provides its source.

The values used in the cost data bank files for these data elements consist of four basic types:

1. Standard values
2. Estimates based on historical comparisons or estimating relationships
3. Scenario constraints
4. Computed values

These categories, by virtue of the nature of their sources, tend to be homogeneous groupings in terms of confidence in their accuracy. This can be readily noted from the following explanations of what constitutes each of the four categories and the type of sources from which values were obtained.

STANDARD VALUES

The standard value data elements are those that have been furnished by Government sources. These data have usually been developed by Government agencies from historical cost-accounting information or special studies. The documentation sources from which these data were obtained are listed in the references at the end of this appendix. These sources, as listed in Table A.1, are summarized below.

Reference #	Name Used in Source Column
A-1	AFLC LSC Model
A-2	LCOM (ref. AFM 26-3)
A-3	AFM 26-3
A-4	AFR 173-10, Vols. I and II
A-5	AFRP 177-1
A-6	Rand Report R-1351
A-7	ATC/ACM letter

ESTIMATES

This category subsumes those data elements whose values are judgemental and/or dependent on estimates derived from comparable system experience (historical data). Data in this category include those which are normally furnished by contractors based on the characteristics of this particular design configuration. Actual data (including cost for the particular subsystem under study) are used when available, but comparable item values are used in cases when the subsystem has not yet been fielded. An example is the use of a proportion of the unit cost of an item as the value to allocate to spares procurement. Historical estimated data are referred to in Table A.1 as follows:

Reference #	Name used in Source Column
A-8	KO51-PN8L
A-9	A7D Manpower Source Listing
A-10	Uniform Airman Records
A-11	Technical Training School Course Charts
-	Design/Logistics Support Data
-	National Stock Catalog/comparable item estimate
-	Reasonable Value
-	Historical estimate

When required historical estimate comparison data are unavailable, specially developed cost estimating relationships were developed. These cost estimating relationships are based on historical experience. Two specific cases where this was required for this study were (a) to compute the cost of maintenance manuals, and (b) to estimate the cost of software development and upkeep.

SCENARIO CONSTRAINTS

These are inuts whose values are established from the operational, environmental, and equipment standards required by the weapons system deployment. These elements include the number of sites, number of aircraft per site, flying hour program, time frames, and equipment configuration. For this study, the basis for comparing the two avionics configurations was as follows:

A. System Mission
   1. Close-air-support (CAS) functions
   2. 1 wing, 72 aircraft
   3. 1 base located within CONUS
   4. 30/60 (peacetime/contingency) flying hours per aircraft per month

B. System Design
   1. All subsystems completely designed (R&D cost includes only the system-level integration)
   2. An instantaneous acquisition (off the shelf)
   3. Life cycle of 15 years (planned inventory usage period)
   4. No further inherent reliability growth to be expected.

COMPUTED VALUES

The data elements in this category are higher level terms in the hierarchical order of the cost equations within the RMCM. Values for these data elements can be pre-computed and inserted in the data bank to be used as a substitute for those that would be computed by the model should lower level data not be available. When all lower level elements necessary to calculate a higher order value are present, even if zero, the model supersedes any assigned value for that higher order element.[5]

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5 The term UCSRU(I)--average SRU unit cost within LRU(I)--can supersede its lower level values and is one programmed exception to this rule. This exception was allowed since the UCSRU(I) value, if available, would probably be more accurate than the cost estimate obtained from the model and yet the presence of all the lower level terms is required for other equations. The terms IC(I) (integration cost of an LRU(I)) and CAL(I) (average cost of installation per LRU(I)) are two more exceptions for similar reasons.

Table A.1 — Data Element Location, Definition, and Sources.

Code	Column No.'s	Description	Source
CARD TYPE VE-1 RECURRING COST ELEMENTS			
COO	17-24	Cost of other operations manpower including command staff, security, and other deployed personnel	Historical estimate
CAC	25-32	Cost of aircrew	Computed value
COP	33-40	Cost of operations personnel	Computed value
CFL	41-48	Cost of fuel	Computed value
COM	49-56	Cost of on equipment maintenance	Computed value
CSM	57-64	Cost of intermediate shop maintenance	Computed value
CPT	65-72	Cost of maintenance personnel training	Computed value
CSP	73-80	Cost of replacement spares	Computed value
CARD TYPE VE-2 RECURRING COST ELEMENTS (continued)			
CDR	17-24	Cost of depot maintenance	Computed value
CSE	25-32	Cost of maintaining support equipment	Computed value
CSW	33-40	Cost of software support	Computed value
CJG	41-48	Cost of supporting maintenance manuals	Computed value
CIM	49-56	Cost of inventory management	Computed value
CARD TYPE VE-3 NON-RECURRING COST ELEMENTS			
CRD	17-25	Cost of research and development	Historical estimate
CSI	25-32	System investment costs	Computed value
COI	33-40	Support investment costs	Computed value
CPP	41-48	Cost of procurement	Computed value
CPM	49-56	Cost of project management	Historical estimate
CPTI	57-64	Cost of initial maintenance personnel training	Computed value
CSPI	65-72	Cost of spares investment	Computed value
CDRI	73-80	Cost of depot support	Computed value
CARD TYPE VE-4 NON-RECURRING COST ELEMENTS (continued)			
CSEI	17-24	Cost of base level support equipment investment	Computed value
CSWI	25-32	Cost of software acquisition	Computed value
CJGI	33-40	Cost of maintenance manuals	Computed value
CIMI	41-48	Cost of non-recurring inventory management	Computed value
CFAI	49-56	Cost of facilities investment	Computed value
CDP	57-64	Cost of system disposal in constant year dollars of the baseline year	Historical estimate

Table A.? ata Element Location, Definition, and Sources (continued).

Code	Column No.'s	Description	Source
CARD TYPE VS-1 SINGLE VALUE VARIABLE CARD No. 1			
BRCT	17-24	Base repair cycle time in months	AFLC LSC model
OSTC	25-32	Average order and shipping time within CONUS (in months)	AFLC LSC model
DSTO	33-40	Average order and shipping time to overseas locations (in months)	AFLC LSC model
OS	41-48	Fraction of total force deployed to overseas locations	Scenario information
EBO	49-56	Expected back order	Reasonable value
KPSR	57-64	Fraction of the cost of LRUs used to estimate the cost of initial spare piece-parts requirements	Reasonable value
SPRTS	65-72	Cost of initial lay-in of spare piece-parts and material	Computed value
WRMC	73-80	War reserve material cost	Historical estimate
CARD TYPE VS-2 SINGLE VALUE VARIABLE CARD No. 2			
CNFL	17-24	Cost of flightline non-troubleshooting maintenance portion per LRU of each manual	Cost estimating relationship
CTFL	25-32	Cost of flightline troubleshooting maintenance portion per LRU of each manual	Cost estimating relationship
CTFX	33-40	Cost of flightline troubleshooting maintenance portion per subsystem of each manual	Cost estimating relationship
CNSL	41-48	Cost of shop non-troubleshooting maintenance portion per LRU of each manual	Cost estimating relationship
CNSS	49-56	Cost of shop non-troubleshooting maintenance portion per SRU of each manual	Cost estimating relationship
CTSL	57-64	Cost of shop troubleshooting maintenance portion per LRU of each manual	Cost estimating relationship
CTSS	65-72	Cost of shop troubleshooting maintenance portion per SRU of each manual	Cost estimating relationship
FJG	73-80	Fraction as a function of maintenance manuals or job guide type manuals representing the general material found in that type manual	Cost estimating
CARD TYPE VS-3 SINGLE VALUE VARIABLE CARD No. 3			
NW	17-24	Number of computer words	Software requirements estimate
NMMKW	25-32	Number of man months per 1000 computer words	Software requirements estimate
NMM	33-40	Number of computer hours per man month	Software requirements estimate
NCHMM	41-48	Number of computer hours per man month	Software requirements estimate
CCPH	49-56	Computer cost per hour	Software requirements estimate
COC	57-64	Computer operation cost	Computed value
CPMM	65-72	Cost per man month to develop software	AFR173-10, Volume I Table 23
SWPC	73-80	Software development personnel costs	Computed value

Table A.1 —Data Element Location, Definition, and Sources (continued).

Code	Column No's	Description	Source
CARD TYPE VS-4 SINGLE VALUE VARIABLE CARD No. 4			
CUR	17-24	Software computer utilization rate in hours per man month	Software requirements estimate
CC	25-32	Support computer cost per hour	Software requirements estimate
SCC	33-40	Software computer cost	Computed value
NSS	41-48	Average number of software support staff	Software requirements estimate
SLR	49-56	Software staff labor rate	AFR173-10, Column 1 Table 23
PC	57-64	Software labor costs for year	Computed value
KTS	65-72	Proportion of unit cost (UC_i) used to estimate the testing and integration costs	Reasonable value
KI	73-80	Proportion of unit cost (UC_i) used to estimate the average installation cost per LRU	Reasonable value
CARD TYPE VS-5 SINGLE VALUE VARIABLE CARD No. 5			
IMC	17-24	Initial management cost to introduce a new line item of supply (assembly or piece-parts) into the Air Force inventory	AFLC LSC model
RMC	25-32	Annual management cost to maintain a line item of supply in the wholesale inventory system	AFLC LSC model
SA	33-40	Annual base supply line item inventory management cost	AFLC LSC model
PSC	41-48	Average packing and shipping cost to CONUS locations	AFLC LSC model
PSO	49-56	Average packing & shipping cost to overseas locations	AFLC LSC model
RPUW	57-64	Proportion of packed to unpacked weight	AFLC LSC model
OHR	65-72	Overhaul rate—portion of systems overhauled per year from each base	Scenario information
COS	73-80	Cost of overhaul per system	Reasonable value
CARD TYPE VS-6 SINGLE VALUE VARIABLE CARD No. 6			
PTT	25-32	Pre-technical training school pay and allowance	ATC/ACM
CACQ	33-40	Acquisition costs per man which includes recruiting, initial travel, initial clothing issue, and training at military training center	ATC/ACM
OSCY	41-48	Overhead support cost per man per year including annual medical support, base operation support, vehicular and base maintenance, and hospitalization per man	AFR173-10, Volume II
PMB	49-56	Direct Productive manhours available per man per year at base level	Scenario information
EFF	57-64	Percentage of maintenance man hours devoted to direct labor	LCOM (ref. AFM26-3)
NB	65-72	Number of bases	Scenario information
PIUP	73-80	Planned inventory usage period	Scenario information

Table A.1 — Data Element Location, Definition, and Sources (continued).

Code	Column No.'s	Description	Source
CARD TYPE VS-7 SINGLE VALUE VARIABLE CARD No. 7			
NACB	17-24	Number of aircraft per base	Scenario information
CPA	25-32	Number of crews assigned per aircraft	Scenario information
FHACM	33-40	Average flight hours per aircraft per month	Scenario information
MFHACM	41-48	Maximum flight hours expected per aircraft per month during a peak usage period	Scenario information
FC	49-56	Fuel cost per flight hour	Scenario information
KSLPT	57-64	Proportion of LRU repair time (T_i) used as estimate of SRU repair pipeline item (TS_i)	Historical estimate
KPJG	65-72	Proportion estimate of the portion of the manuals that will be corrected and/or changed each year	Historical estimate
KCJG	73-80	Proportion estimate of the reduced cost necessary to rewrite the corrections as compared to the initial writing cost	Historical estimate
CARD TYPE VS-8 SINGLE VALUE VARIABLE CARD No. 8			
AAOH	17-24	Available annual operating hours	Scenario information
BCA	25-32	Total cost of additional items of common base shop support equipment per base required for the system	Historical estimate
BPA	33-40	Total cost of peculiar base shop support equipment per base required for the system which is not directly related to repair specific LRUs or when the quantity required is independent of the anticipated workload (such as: overhead cranes & shop fixtures)	Historical estimate
FLA	41-48	Total cost of peculiar flightline support equipment and additional items of common flightline support equipment per base required for the system	National stock catalog—comparable item estimate
OBSEC	49-56	Other base level support equipment costs	Computed value
CGTE	57-64	Cost of training equipment	Reasonable value/ historical estimate
CGCM	65-72	Cost of course material preparation	Reasonable value/ historical estimate
CCIT	73-80	Cost of initial contractor provided training for depot and other personnel not included in on and off equipment maintenance—including instruction and training materials	Reasonable value/ historical estimate
CARD TYPE VS-9 SINGLE VALUE VARIABLE CARD No. 9			
IR	17-24	Average inflation rate	Estimate
KSED	25-32	Proportion of unit cost of depot SE used as estimate of initial sparing level for modules and parts	Historical estimate
ND	33-40	Number of depots	Scenario information
CDSE	41-48	Cost of support equipment per depot site	Computed value
CFB	49-56	Cost of new facilities per base	Reasonable value
POT	57-64	Phaseout time period for disposal	Historical estimate
DPT	65-72	Development and procurement period over which the non-recurring cost occurred	Scenario information
DR	72-80	Average discount rate	Estimate

Code	Column No.'s	Description	Source
CARD TYPE VI-1 LRU DATA, CARD No. 1			
UC_i	17-24	Expected cost of LRU_i	KO51-PNBL, (comparable item estimate)
$UCSRU_i$	25-32	Average unit cost of SRUs within LRU_i	Computed value
FCL_i	33-40	Fraction of NRTSed LRU_i expected to result in condemnation at the base/depot level	Reasonable values
FCS_i	41-48	Fraction of shop repaired and NRTS LRU_i expected to result in SRU condemnation at the base level	Reasonable values
T_i	49-56	LRU_i repair pipeline time	Computed value
$DRCT_i$	57-64	Average depot repair cycle time in years	AFLC LSC model
DC_i	65-72	Depot repair cost per LRU and its SRU(s)	KO51-PNBL, (comparable item estimate)
TC_i	73-80	Round trip transportation and packaging cost per item	Computed value
CARD TYPE VI-2 LRU DATA, CARD No. 2			
PA_i	17-25	Number of new "P" coded repairable assemblies within the LRU_i	Design/Logistics support data
PP_i	26-32	Number of new "P" coded consumable items within the LRU_i	Design/Logistics support data
SP_i	33-40	Number of standard (already stocked NSN) parts within the LRU which will be managed for the first time at bases where this system is deployed	Design/Logistics support data
IC_i	41-48	Integration cost of each LRU into the subsystem	Computed value
$CALI_i$	49-56	Average cost per LRU_i for installation	Computed value
CARD TYPE VM-1 SUBSYSTEM DATA			
$CPINT_m$	17-24	Cost of production and integration per $subsystem_m$	Computed value
$CINST_m$	25-32	Cost of installation per subsystem	Computed value
$CFJG_m$	33-40	Cost of flightline manuals, maintenance portion, per subsystem	Computed value
$CSJG_m$	41-48	Cost of shop manual, maintenance portion per subsystem	Computed value
CARD TYPE VJ-1 SUPPORT EQUIPMENT DATA, CARD No. 1			
$UCSE_j$	17-25	Unit cost of peculiar support equipment	National stock catalog/comparable item estimate
KIH_j	25-32	Proportion of support equipment unit cost used to estimate procurement cost for interface hardware	Reasonable value
KSE	33-40	Proportion of support equipment unit cost allocated to satisfy initial sparing level requirements for modules and parts	Reasonable value
$CPUSE_j$	41-48	Cost per unit of support equipment	Computed value
$CSESM_j$	49-56	Cost of initial support spare modules and spare parts for repair of shop support equipment at base level	Computed value
IH_j	57-64	Cost of interconnection hardware to utilize existing automatic test equipment	Computed value
CSU_j	65-72	Cost of software to utilize existing automatic test equipment for the system	Reasonable value
MSE_j	73-80	Proportion of the support equipment cost allocated to the non-personnel cost of maintaining support equipment including replacement parts	Reasonable value
CARD TYPE VJ-2 SUPPORT EQUIPMENT DATA, CARD No. 2			
KTR_j	17-24	Proportion of shop mean time to repair the LRUs that require the test $station_j$ to be used	Reasonable value

Code	Column No's	Description	Source
CARD TYPE VD-1 DEPOT SUPPORT EQUIPMENT DATA			
$NDSER_d$	17-24	Number of depot support equipment$_d$ required	Historical estimate
$UCDSE_d$	25-32	Unit cost of depot support equipment$_d$	National stock catalog/ comparable item estimate
CARD TYPE VP-1 AIRCREW DATA			
COA_p	17-24	Cost of an aircrew man$_p$ in wages and allowances per year	AFR173-10, Volume I Table 20
CARD TYPE VN-1 PERSONNEL TRAINING DATA BY AFSC			
NWK_n	17-24	Course length in weeks	Modified from technical training school course charts
ACG_n	25-32	Average cost per graduate (n) per week	ATC/ACM
CIC_n	33-40	Capital investment cost prorated by AFSC (n) per week	ATC/ACM
COT_n	41-48	Cost of type 4 and other training not included in the average cost per graduate (ACG)	ATC/ACM
$CTTS_n$	49-56	Cost of technical training school per man by AFSC to 3 level	Computed value
$COJT_n$	57-64	Cost of on-the-job training per man by AFSC to 5 level including non-productive wages based on a factor of (1-KM_n)	AFR173-10, Volume I Table 29, Rand Report R-1351
TCS_n	65-72	Cost of training an airman for each skill category and level	Computed value
TRS_n	73-80	Annual turnover rate of airman in each skill category and level	Uniform airmen records
CARD TYPE VN-2 ON-OFF EQUIPMENT DATA BY AFSC			
$CMPS_n$	17-24	Cost of military personnel services per hour	AFR173-10, Volume I, Table 20, Updated from AFRP 177-1, Volume 27, No. 11
OPF_n	25-32	Other personnel cost factors per manhour for skill category (n) not provided in CMPS	AFR173-10, Volume I, Table 20, Updated from AFRP 177-1, Volume 27, No. 11
KM_n	33-40	Proportion of direct labor manhours devoted to tasks vs. OJT	A7D manpower source listing
DLR_n	41-48	Direct labor rate per manhour (per skill category and level)	Computed value
LLR_n	49-56	Loaded labor rate for skill level category (n)	Computed value
BMR_n	57-64	Base consumable material consumption cost rate for repairing LRUs in shop work center utilized by AFSC (n)	AFLC LSC model
ILR_n	65-72	Indirect labor rate per manhour (supervisors & administrative personnel)	AFR173-10, Volume 2 Table 20
CARD TYPE VS-0 SINGLE VALUE VARIABLE Card No. 0			
CTFS	17-24	Cost of flightline troubleshooting maintenance portion per SRU of each manual	Cost estimating relationship
CNFS	25-32	Cost of flightline non-troubleshooting maintenance portion per SRU of each manual	Cost estimating relationship
CNFX	33-40	Cost of flightline non-troubleshooting maintenance portion per subsystem of each manual	Cost estimating relationship
CTSX	41-48	Cost of shop troubleshooting maintenance portion per subsystem of each manual	Cost estimating relationship
CNSX	49-56	Cost of shop non-troubleshooting maintenance portion per subsystem of each manual	Cost estimating relationship
BY	57-64	Base year of the data contained in the data bank	Scenario information

APPENDIX A REFERENCES

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3ABR326320, Integrated Avionics System Specialist, Chanute AFB
3ABR32830, Avionic Communication Specialist, Keesler AFB
3ABR32831, Avionic Navigation System Specialist, Keesler AFB
3ABR32833, Electronic Warfare Systems Specialist, Keesler AFB
E3ABR32834, Avionics Inertial & Radar Nav. Specialist, Keesler AFB
3ABR40431, Aerospace Photographic System Repairman, Lowry AFB
3ABR42335, Aerospace Ground Equipment Mechanic, Chanute AFB
3ABR43131C-1, Aircraft Maintenance Specialist, Sheppard AFB
G3ABR46230-002, Weapons Mechanic, Lowry AFB.

APPENDIX B
SPECIFIC COST ELEMENT EQUATIONS

This section provides the equations as well as definitions and explanations of special considerations for each of the cost elements included in the RMCM. The RMCM equations and subequations necessary to compute each of the cost elements have been displayed in levels. The set of equations for each cost element shows these levels separated by a line. The first level (top) defines the basic equation necessary to compute the cost element and defines its terms. The lower levels define the subequations containing the factors necessary for computing the high-order terms. The sets of equations and subequations as well as the definitions of their terms and factors are extracts from the RMCM interactive glossary. Each of the sets of cost element equations receives a figure number to match its paragraph number for ease of reference.

Figure 1.2 (Life Cycle Cost Hierarchy) provided an overview of the relationships of the primary equations contained in the RMCM to their component cost elements. The individual cost elements are defined in this section in the order in which they appeared in Figure 1.2.

Many of the equations are adaptations of those used in the Air Force Logistics Command (AFLC) Logistics Support Cost (LSC) model [9]. The LSC model was used as a foundation for the cost model portion of the RMCM, since it is well known and accepted as an estimator of operation and support (O&S) costs. However, the LSC model equations had to be supplemented with those necessary to obtain the acquisition cost elements of life cycle costing. Also, the LSC equations were modified to be compatible with the RMCM structure. In particular, the RMCM integrates the cost equations with the R&M Model parameters which are considered principal inputs to calculating O&S costs. Since these R&M parameters are modeled by subsystem and LRU, greater visibility into the impact of equipment design characteristics on these cost drivers is attained.

Design characteristics can also have an indirect impact on LCC through the human resources areas of maintenance training, job guides (maintenance manuals), and manpower allocations. Therefore, the cost equations for these human resources data are structured to permit these indirect LCC impacts to be more accurately assessed. This feature is illustrated by the hierarchical structure of the model and of the equations themselves. The model is designed to permit the user to provide input data at a highly detailed level. However, recognizing that such detail is not available or required in all cases, provision has been made for the use of multiple input levels. This capability will be noted in the equations whereby each cost element is computed from one or more lower level subequations.

The user can insert higher order terms to be used as a substitute for those not obtainable because more detailed lower level data are not available. However, the model is programmed to first seek for complete lower level data (including zeros) when calculating each higher order term. This results in superseding higher order assigned values when all lower level data are available. The exceptions to this rule will be identified in the equation descriptions later in this volume.

B.1 COST OF RESEARCH AND DEVELOPMENT (CRD)

Research and development costs refer to all costs associated with the research, development, test, and evaluation (RDT&E) of the system and equipment excluding basic research and exploratory development. Specifically, this element covers all RDT&E costs leading to hardware configurations incurred during the conceptual, validation, and full scale development phases of the program. This element includes both hardware and software costs for engineering design, development, fabrication, assembly, and test of engineering prototype models; initial system evaluation; and the associated documentation.

The costs incurred in this category are so many and varied that the model has been designed to accept this cost element as a single value. It is expected that the user would normally develop a value for this cost element through experience with similar programs and/or the application of proportionality constants to the factors of significance to the program under consideration. In either case the following cost factors are offered as potential costs but should not be considered exhaustive: conceptual studies, design engineering, testing, technical publications, software, training, engineering change proposals, and program/project management. Embedded in these factors are such subfactors or considerations as test hardware, test spares, test equipment for test program, training devices, training personnel, contractor and Government program management, engineering hours, system analysis hours, and computer time.

The foregoing level of detail is provided to illustrate the fact that given a single value for RDT&E, a user would have to know what factors have been included, to avoid duplicating costs in the investment or operation and support cost phases.

B.2 COST OF PROCUREMENT (CPP)

The weapon system procurement (CPP) and the cost of program management (CPM are the nonrecurring system investment cost elements of the weapon system. CPP includes the cost of production and integration (CPINT(M)),[3] and the cost of installation (CINST(M)) per subsystem (M). The total cost per system is obtained by summing

---

[3] Note that variables normally indicated as lower case subscripts are notated in parentheses and capitalized to coincide with the computer printouts in this volume.

the costs of the subsystems. The total procurement cost is computed by multiplying the cost per aircraft by the number of aircraft allotted per base and then by the number of bases to be manned. The equations for computing CPP are given in Figure B.1.

The CPINT(M) term combines the production and integration cost factors for CPP by subsystem. Included in the production unit cost factor (UC(I)) would be such cost items prorated per LRU(I) as production tooling and test equipment, production program start-up, and technical data. The integration cost factor (IC(I)) accounts for the costs of interconnection cabling of the LRUs, the subsystem interface and the subsystem level testing necessary to qualify the subsystem for operational use exclusive of prototype testing which was included in RDT&E. An estimated value for IC(I) is obtained by using a proportion (KTS) of the unit cost of each LRU. CPINT(M) is determined by summing UC(I) and IC(I) over the LRUs (I) that belong to the subsystem (M).

CINST(M) is the cost of installation per subsystem (M). It represents all costs of installing the subsystem in the aircraft including LRU mounting racks not included in the unit costs of the LRU. It also includes any repair costs incurred during installation and system level tests. CINST(M) is obtained by summing the cost for each LRU(I) installation (CALI(I)). The LRU installation cost is obtained by assigning a proportion (KI) of the unit cost of the LRU as the estimated value.

The model assumes that the number of subsystems purchased and installed are equal. Also, it assumes a single lot purchase with no discount as a function of larger total purchases. Initial and replacement spares are each considered as separate cost elements CSPI and CSP, respectively.

B.3 COST OF PROGRAM/PROJECT MANAGEMENT (CPM)

The program and/or project management cost element accounts for the technical and administrative planning, organizing, directing, coordinating, controlling, and approving actions designed to accomplish overall program objectives during the investment phase of the equipment life cycle. Examples of these activities are configuration management, cost/schedule management, data management, contract management, liaison, value engineering, quality assurance, and integrated logistics support management. This cost element covers Government management costs in particular. However, it also considers any contractor management costs not included in the RDT&E or buried in the production hardware cost elements.

B.4 COST OF INITIAL MAINTENANCE PERSONNEL TRAINING (CPTI)

The CPTI element includes those costs incurred in setting up a training program. The cost factors accounted for in this value are training equipment, course material preparation, and contractor-provided training. The equation for CPTI is provided in Figure B.2.

```
*CPP
COST OF PROCUREMENT      (ALT. INPUT VE-3, 41-48)
CPP = NB * NACB * SUM(M) (CPINT(M) + CINST(M))
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     NACB = NUMBER OF AIRCRAFT PER BASE
     CPINT(M) = COST OF PRODUCTION AND INTEGRATION PER SUBSYSTEM
     CINST(M) = COST OF INSTALLATION PER SUBSYSTEM
```

```
*CPINT
COST OF PRODUCTION AND INTEGRATION PER SUBSYSTEM (M)
CPINT(M) = SUM(I) ((UC(I) * QPA(I)) + IC(I))  (ALT. INPUT VM-1,17-24)
     WHERE:
     UC = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
          PROVISIONING (INPUT)
     IC = INTEGRATION COST OF EACH LRU INTO THE SUBSYSTEM (INPUT)
     QPA= QUANTITY PER APPLICATION; (I.E., NUMBER OF LIKE LRUS(I)
           WITHIN SUBSYSTEM(M))
     (I) SUMS OVER THOSE LRUS BELONGING TO SUBSYSTEM(M)

*CINST
COST OF INSTALLATION PER SUBSYSTEM  (ALT. INPUT VM-1,25-32)
CINST(M) =  SUM(I) (CALI(I) * QPA(I))
     WHERE:
     CALI =  COST PER LRU(I) FOR INSTALLATION
     (I) SUMS OVER THOSE LRUS BELONGING TO SUBSYSTEM(M)
     QPA  = QUANTITY PER APPLICATION; (I.E., NUMBER OF LIKE LRUS(I)
            WITHIN SUBSYSTEM(M))
```

```
*IC
INTEGRATION COST OF EACH LRU INTO THE SUBSYSTEM (ALT.INPUT VI-2,41-48)
IC(I) =(KTS)*(UC(I))
     WHERE:
     KTS = PROPORTION OF UNIT COST (UC(I)) USED TO ESTIMATE THE
           TESTING AND INTEGRATION COSTS (INPUT)
     UC  = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
           PROVISIONING (INPUT)

*CALI
COST PER LRU(I) FOR INSTALLATION  (ALT.INPUT VI-2,49-56)
CALI(I) =KI * (UC(I))
     WHERE:
     KI = PROPORTION OF UNIT COST (UC(I)) USED TO ESTIMATE THE
          INSTALLATION COST PER LRU  (INPUT)
     UC = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
          PROVISIONING (INPUT)
```

Figure B.1 — Cost of procurement equation.

```
*CPTI
COST OF INITIAL MAINTENANCE PERSONNEL TRAINING (ALT.INPUT VE-3,57-64)
CPTI = CGTE + CGCM + CCIT
     WHERE:
     CGTE = COST OF TRAINING EQUIPMENT (INPUT)
     CGCM = COST OF COURSE MATERIAL PREPARATION (INPUT)
     CCIT = COST OF INITIAL CONTRACTOR PROVIDED TRAINING FOR DEPOT AND
            OTHER PERSONNEL NOT INCLUDED IN ON & OFF EQUIPMENT
            MAINTENANCE (INPUT)
```

Figure B.2 - Cost of initial maintenance personnel training equation.

B.5 COST OF SPARES INVESTMENT (CSPI)

The support investment cost of spares element accounts for three types of spares: (a) LRUs and SRUs, (b) piece-parts and material, and (c) war reserve materials. The equation to compute CSPI is provided in Figure B.3. The cost of LRU and SRU spares is a summation over all LRU(I)s of the cost of the spares needed in the shop and to fill the depot pipeline. The cost of laying in spare piece parts refers to the initial provisioning of any assemblies and spare components not included in the SRUs to be used for maintenance replacement purposes in end items of equipment. It is estimated as a proportion of the expected LRU unit cost (UC(I)) at the time of initial provisioning. War reserve material covers any cost of establishing or increasing stocks of material amassed in peacetime to meet wartime stock requirements.

The average number of LRUs (STKL(I)) and SRUs (STKS(I)) needed as shop spares to satisfy the cost terms LRUSS and SRUSS, respectively, are computed by first assuming that the demand is a random variable with a Poisson distribution. Then, the equation requires that the number of spares in inventory be the minimum number necessary to ensure that, with the demand so distributed, the expected number of spares backordered (EBO) will be less than a user-specified level. The equation used to compute both stock levels STKL and STKS is given in Figure B.4. The model is programmed to consider the mean demand rate per base for LRUs or SRUs, LAM(I) or LAMS(I), that are required to support the peak level of aircraft activity, peak base flying hours (PBFH). It also considers the weighted pipeline times, T(I) and TS(I), per base for completing the repair of each LRU(I). The product, (LAM(I)) * (T(I)) or LAMS(I)) * (TS(I)), represents the expected number of demands on supply for the Ith LRU or its SRUs respectively over their average base repair pipeline times. This equation was adapted from those used by the Logistic Support Cost (LSC) model [9] for computing LRU spares and has been extended to include SRU estimates.

The number of LRU (DPLL(I)) and SRU (DPLS(I)) spares required to fill the depot pipeline for each base must be determined to compute th cost terms LRUDS(I) and SRUDS(I), respectively. The DPLL term is computed for each LRU(I) as a function of its probability of being non-reparable at this station (PN), depot repair cycle time (DRCT) and reliability (mean flight-hours between maintenance actions) values for a specified value of peak base flying hours. The PN and MFHBMA factors are obtained from the R&M Model portion of the RMCM.

The average number of depot pipeline SRU spares required is obtained by a similar equation except the probability of a bench check and repair (PW) term is substituted for the PN term. The assumption here is that each PW action requires an average of one SRU repair action.

```
*CSPI
COST OF SPARES INVESTMENT    (ALT. INPUT VE-3, 65-72)
CSPI = NB*(SUM(I)(LRUSS(I)+ LRUDS(I)+SRUSS(I)+SRUDS(I)) +SPRTS)+ WRMC
     WHERE:
     NB = NUMBER OF BASES (INPUT)
     LRUSS = COST OF LRU(I) SHOP SPARES PER BASE
     LRUDS = COST OF LRU(I) DEPOT PIPELINE SPARES PER BASE
     SRUSS = COST OF SRU SHOP SPARES PER BASE BELONGING TO LRU(I)
     SRUDS = COST OF SRU DEPOT PIPELINE SPARES PER BASE BELONGING TO
             LRU(I)
     SPRTS = COST OF INITIAL LAY-IN OF SPARE PIECE-PARTS AND MATERIAL
     WRMC  = WAR RESERVE MATERIAL COST (INPUT)
```

```
*LRUSS
COST OF LRU(I) SHOP SPARES PER BASE
LRUSS(I) = STKL(I)*UC(I)
     WHERE:
     STKL = NUMBER OF LRU SPARES REQUIRED FOR EACH BASE TO FILL THE
            BASE REPAIR PIPELINE INCLUDING A SAFETY STOCK TO PROTECT
            AGAINST RANDOM FLUCTUATIONS IN DEMAND
     UC   = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
            PROVISIONING (INPUT)
*LRUDS
COST OF LRU(I) DEPOT PIPELINE SPARES PER BASE
LRUDS(I) = DPLL(I)* UC(I)
     WHERE:
     DPLL = NUMBER OF LRU DEPOT PIPELINE SPARES PER BASE PER YEAR
     UC   = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
            PROVISIONING (INPUT)
*SRUSS
COST OF SRU SHOP SPARES PER BASE BELONGING TO LRU(I)
SRUSS(I) = STKS(I)*UCSRU(I)
     WHERE:
     STKS = NUMBER OF SRU SPARES BELONGING TO LRU(I) REQUIRED FOR EACH
            BASE TO FILL THE BASE REPAIR PIPELINES INCLUDING A SAFETY
            STOCK TO PROTECT AGAINST RANDOM FLUCTUATIONS IN DEMAND
     UCSRU= AVERAGE UNIT COST OF SRUS WITHIN LRU(I)
*SRUDS
COST OF SRU DEPOT PIPELINE SPARES PER BASE BELONGING TO LRU(I)
SRUDS(I) = DPLS(I)*UCSRU(I)
     WHERE:
     DPLS = NUMBER OF SRU DEPOT PIPELINE SPARES PER BASE PER YEAR
     UCSRU= AVERAGE UNIT COST OF SRUS WITHIIN LRU(I)
*SPRTS
COST OF INITIAL LAY-IN OF SPARE PIECE-PARTS AND MATERIAL
SPRTS = KPSR * SUM(I)(UC(I))                (ALT.INPUT VS-1,65-72)
     WHERE:
     KPSR = PROPORTION OF THE COST OF LRUS USED AS ESTIMATED COST OF
            INITIAL SPARE PIECE-PARTS REQUIREMENTS (INPUT)
     UC   = EXPECTED UNIT COST OF EACH LRU AT THE TIME OF INITIAL
            PROVISIONING (INPUT)
```

Figure B.3 — Cost of spares investment equation.

```
*STKL
NUMBER OF LRU SPARES REQUIRED FOR EACH BASE TO FILL THE BASE REPAIR
PIPELINES INCLUDING SAFETY STOCK TO PROTECT AGAINST RANDOM FLUCTUATION
IN DEMAND DETERMINED BY POISSON DISTRIBUTION EQUATIONS
STKL(I) = F(EBO,LAM(I),T(I))
     WHERE:
     F    = FUNCTION OF (FACTORS)
     EBO = EXPECTED BACK ORDER
     LAM(I)= NUMBER OF MAINTENANCE ACTIONS PER BASE FOR LRU(I)
     T(I)   =  LRU(I) REPAIR PIPELINE TIME

*DPLL
NUMBER OF LRU DEPOT PIPELINE SPARES PER BASE PER YEAR
DPLL(I) = (PBFH * PN(I) * DRCT(I))/MFHBMA(M)
     WHERE:
     PBFH = PEAK BASE FLYING HOURS
     PN    = PROBABILITY OF LRU(I) ENTERING SHOP BEING SENT TO THE
             DEPOT FOR REPAIR (R&M INPUT)
     DRCT = DEPOT REPAIR CYCLE TIME IN YEARS (INPUT)
     MFHBMA=MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS FOR
             SUBSYSTEM (M) (R&M INPUT)

*STKS
NUMBER OF SRU SPARES REQUIRED FOR EACH BASE TO FILL THE BASE REPAIR
PIPELINES INCLUDING SAFETY STOCK TO PROTECT AGAINST RANDOM FLUCTUATION
IN DEMAND DETERMINED BY POISSON DISTRIBUTION EQUATIONS
STKS(I) = F(EBO,LAMS(I),TS(I))
     WHERE:
     F    = FUNCTION OF (FACTORS)
     EBO     =EXPECTED BACK ORDER
     LAMS(I)=NUMBER OF MAINTENANCE ACTIONS PER BASE FOR SRUS
             OF LRU(I)
     TS(I)  =SRUS REPAIR PIPELINE TIME

*DPLS
NUMBER OF SRU DEPOT PIPELINE SPARES PER  BASE PER YEAR
DPLS(I) = (PBFH * PW(I) * DRCT(I))/MFHBMA(M)
     WHERE:
     PBFH = PEAK BASE FLYING HOURS
     PW    = PROBABILITY OF SHOP BENCH-CHECK AND REPAIR OF LRU(I)
             (R&M INPUT)
     DRCT = DEPOT REPAIR CYCLE TIME IN YEARS (INPUT)
     MFHBMA=MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS FOR
             SUBSYSTEM (M) (R&M INPUT)
```

```
*PBFH
PEAK BASE FLYING HOURS ON AN ANNUAL BASIS
PBFH = NACB * MFHACM * 12
     WHERE:
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     MFHACM=MAXIMUM FLIGHT HOURS EXPECTED PER AIRCRAFT PER MONTH
             DURING A PEAK USAGE PERIOD (INPUT)
     12    = NUMBER OF MONTHS PER YEAR
```

Figure B.3 — Cost of spares investment equation (concluded).

$$STKL(I) = F(EBO, \lambda\ (I), T(I)) \text{ or } STKS(I) = F(EBO, \lambda S(I), TS(I))$$

$$\min_a \left[\sum_{x > a} (x-a)\, p\left\{ \chi \mid \lambda\ t \right\} \right] \leq EBO; \text{ where:}$$

$$p\left\{ \chi \mid \lambda\tau \right\} = \frac{(\lambda\tau)^{\chi} e^{-\lambda\tau}}{\chi!}$$

$$\min_a \left[\sum_{\chi=a+1}^{\infty} \frac{(\lambda\tau)^{\chi} e^{-\lambda\tau}}{(\chi-1)!} - a \sum_{\chi=a+1}^{\infty} \frac{(\lambda\tau)^{\chi} e^{-\lambda\tau}}{\chi!} \right] \leq EBO$$

let $\chi - 1 = y$

$$\min_a \left[\sum_{y=a}^{\infty} \frac{(\lambda\tau)^{y+1} e^{-\lambda\tau}}{y!} - a \sum_{y=a+1}^{\infty} \frac{(\lambda\tau)^{y} e^{-\lambda\tau}}{y!} \right] \leq EBO$$

$$\min_a \left[(\lambda\tau - a)\, p \left\{ \chi \geq a \mid \lambda\tau \right\} + a\, p \left\{ \chi = a \mid \lambda\ t \right\} \right] \leq EBO$$

$$(\lambda(I) \text{ or}) \; LAM(I) = \frac{(PBFH)(PS(I))}{MFHBMA(M)}$$

$$(\lambda S(I) \text{ or}) \; LAMS(I) = \frac{(PBFH)(PW(I))}{(MFHFMA(M))}$$

$$T(I) = BRCT + \frac{P_{N(I)}}{P_{S(I)}} \left[OST\, C(1-OS) + OSTO(OS) - BRCT \right]$$

$$TS(I) = (KSLPT)(T(I))$$

Figure B.4 — Poisson equation for determining stock levels.

B.6 COST OF DEPOT SUPPORT INITIAL (CDRI)

CDRI includes the initial investment cost of the equipment peculiar and associated common SE plus the overhaul manuals required to supply the depot overhaul/repair sites. The equation for CDRI is given in Figure B.5.

The cost of support equipment per depot site (CDSE) is a summation over all peculiar SE required per repair test station (D). It is computed in terms of the number of depot SE stations (D), including any common SE associated with that station, the unit cost of each type of SE, and a proportion of this unit cost to allow for manuals, spare parts, and modules. Then, CDSE times the number of depots provides the total depot SE cost for the system.

B.7 COST OF SUPPORT EQUIPMENT INITIAL (CSEI)

CSEI is a nonrecurring cost element which provides for all initial investment base level SE costs. Included are cost of acquiring the common and peculiar SE and its associated software needed for operating, testing, and repairing the aircraft subsystems of interest and maintaining its SE. The equations for computing CSEI are given in Figure B.6. The cost of personnel required to operate and maintain the SE is accounted for in the cost of on- and off-equipment maintenance elements, COM and CSM. The CSEI element is an aggregate of the five principal cost terms given in the first level equation in Figure B.6.

The term CPUSE is the total cost for each type of peculiar shop SE required per base. It is obtained by multiplying the unit cost of each by the number required. CPUSE includes all cost factors contributing to the unit cost for each type of peculiar SE unit required to test LRUs in the shop. These factors would include both the hardware and software costs. The term CSESM includes the initial buy of SE spare modules and spare parts required to maintain the SE. The terms IH and CSU, respectively, provide for the cost of any interconnection hardware and/or the cost of any software required when existing automatic test equipment (ATE) are used rather than a new SE design. OBSEC accounts for all other base level SE costs including common shop SE (BCA), peculiar shop SE not directly related to testing LRUs (BPA), and any peculiar and common SE required on the flightline (FLA).

The equations in Figure B.6 are used for computing values for these terms when they are not single valued inputs. The equations are self-explanatory with the exception of how the number of test stations (NSER(J)) were obtained. NSER(J) equals the next highest integer value of A(J), the utilization rate of each SE test station (J) necessary to accommodate a peak load per base. A(J) is obtained by first multiplying the peak base flying hours (PBFH) by the total demand time (TSDEM(J)) plus down time (TSDOT(J)) per flight-hour

```
*CDRI
COST OF DEPOT SUPPORT INVESTMENT          (ALT. INPUT VE-3,73-80)
CDRI = (ND)*(CDSE)
     WHERE:
     ND   = NUMBER OF DEPOTS (INPUT)
     CDSE= COST OF SUPPORT EQUIPMENT PER DEPOT SITE
```

```
*CDSE
COST OF SUPPORT EQUIPMENT PER DEPOT SITE (ALT.INPUT VS-9,41-48)
CDSE = SUM(D) (NDSER(D) * UCDSE(D) * (1+KSED))
     WHERE:
     NDSER = NUMBER OF DEPOT SUPPORT EQUIPMENT (D) REQUIRED (INPUT)
     UCDSE = UNIT COST OF DEPOT SUPPORT EQUIPMENT(D) (INPUT)
     KSED  = PROPORTION OF DEPOT SE UNIT COST USED AS ESTIMATE OF
             INITIAL SPARING LEVEL FOR MODULES AND PARTS PLUS OVERHAUL
             MAINTENANCE MANUALS DEVELOPMENT AND PROCUREMENT
```

B.5 — Cost of depot support investment equation.

```
*CSEI
COST OF BASE LEVEL SUPPORT EQUIPMENT INVESTMENT (ALT.INPUT VE-4,17-24)
CSEI = SUM(J) (NB*(CPUSE(J)+CSESM(J)+IH(J))+CSU(J)) +NB * OBSEC
     WHERE:
     NB = NUMBER OF BASES  (INPUT)
     CPUSE = COST PER TYPE OF PECULIAR SUPPORT EQUIPMENT AT EACH BASE
     CSESM = COST OF INITIAL SUPPORT EQUIPMENT SPARE MODULES AND
             SPARE PARTS FOR REPAIR OF SHOP SUPPORT EQUIPMENT AT
             BASE LEVEL
     IH    = COST OF INTERCONNECTING HARDWARE TO UTILIZE EXISTING
             AUTOMATIC EQUIPMENT (J) TO TEST NEW SUBSYSTEMS OR LRUS
     CSU   = COST OF SOFTWARE TO UTILIZE EXISTING AUTOMATIC TEST
             EQUIPMENT FOR THE SYSTEM (INPUT)
     OBSEC = OTHER BASE LEVEL SUPPORT EQUIPMENT COSTS
```

```
*CPUSE
COST PER TYPE OF PECULIAR SUPPORT EQUIPMENT(J) (ALT. INPUT VJ-1,41-48)
CPUSE(J)=(NSER(J) * UCSE(J))
     WHERE:
     NSER = NUMBER OF PECULIAR SUPPORT EQUIPMENT AT EACH BASE
     UCSE = UNIT COST OF PECULIAR SUPPORT EQUIPMENT (INPUT)

*CSESM
COST OF INITIAL SUPPORT EQUIPMENT SPARE MODULES AND SPARE PARTS FOR
REPAIR OF SHOP SUPPORT EQUIPMENT AT BASE LEVEL (ALT.INPUT VJ-1, 48-56)
CSESM(J) = KSE(J) * NSER(J) * UCSE(J)
     WHERE:
     KSE  = PROPORTION OF SUPPORT EQUIPMENT UNIT COST USED AS ESTIMATE
            TO SATISFY INITIAL SPARING LEVEL REQUIREMENTS FOR MODULES
            AND PARTS (INPUT)
     NSER = NUMBER OF PECULIAR SUPPORT EQUIPMENT REQUIRED AT EACH BASE
     UCSE = UNIT COST OF PECULIAR SUPPORT EQUIPMENT (INPUT)

*IH
COST OF INTERCONNECTION HARDWARE TO UTILIZE EXISTING AUTOMATIC TEST
EQUIPMENT (J) TO TEST NEW SUBSYSTEM/LRUS  (ALT. INPUT VJ-1,57-64)
IH(J)= KIH(J)*NSER(J)*UCSE(J)
     WHERE:
     KIH  =PROPORTION OF SUPPORT EQUIPMENT UNIT COST USED TO ESTIMATE
           PROCUREMENT COST FOR INTERFACE HARDWARE (INPUT)
     NSER =NUMBER OF PECULIAR SUPPORT EQUIPMENT REQUIRED AT EACH BASE
     UCSE =UNIT COST OF PECULIAR SUPPORT EQUIPMENT (INPUT)
```

Figure B.6 — Cost of base level support equipment investment equation.

```
*OBSEC
OTHER BASE LEVEL SUPPORT EQUIPMENT COSTS  (ALT.INPUT VI-8,49-56)
OBSEC = BCA + BPA + FLA
     WHERE:
     BCA = TOTAL COST OF ADDITIONAL ITEMS OF COMMON BASE SHOP SUPPORT
           EQUIPMENT PER BASE REQUIRED FOR THE SYSTEM (INPUT)
     BPA = TOTAL COST OF PECULIAR BASE SHOP SUPPORT EQUIPMENT PER BASE
           REQUIRED FOR THE SYSTEM WHICH IS NOT DIRECTLY RELATED TO
           REPAIR OF SPECIFIC LRUS OR WHEN THE QUANTITY REQUIRED IS
           INDEPENDENT OF THE ANTICIPATED WORKLOAD (SUCH AS: OVERHEAD
           CRANES AND SHOP FIXTURES) (INPUT)
     FLA = TOTAL COST OF PECULIAR FLIGHT LINE SUPPORT EQUIPMENT AND
           ADDITIONAL ITEMS COMMON FLIGHT LINE SUPPORT EQUIPMENT PER
           BASE REQUIRED FOR THE SYSTEM (INPUT)
```

```
*NSER
NUMBER OF PECULIAR SUPPORT EQUIPMENT REQUIRED AT EACH BASE;
NEXT HIGHEST INTEGER VALUE OF A(J) THE UTILIZATION RATE OF THE
SUPPORT EQUIPMENT

*A(J)
UTILIZATION RATE, ACCUMULATED PROPORTIONAL REQUIREMENTS FOR SUPPORT
EQUIPMENT ITEM (J) (IE.,NSER(J) = NEXT HIGHEST INTEGER FROM A (J)
VALUE)
A(J) = ((PBFH/AAOH) * (TSDEM(J) + TSDOT(J))
     WHERE:
     PBFH = PEAK BASE FLYING HOURS
     AAOH = AVAILABLE ANNUAL OPERATING HOURS (INPUT)
     TSDEM= TEST STATION(J) DEMAND TIME PER FLIGHT HOUR
     TSDOT = TEST STATION(J) DOWN TIME FOR REPAIR PER FLIGHT HOUR
```

```
*PBFH
PEAK BASE FLYING HOURS ON AN ANNUAL BASIS
PBFH = NACB * MFHACM * 12
     WHERE:
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     MFHACM=MAXIMUM FLIGHT HOURS EXPECTED PER AIRCRAFT PER MONTH
            DURING A PEAK USAGE PERIOD (INPUT)
     12     = NUMBER OF MONTHS PER YEAR

*TSDOT
TEST STATION(J) DOWN TIME FOR REPAIR PER FLIGHT HOUR
TSDOT(J) = SUM(I)(PTS(I,J)*TTS(I,J) + PTD(I,J))*TTD(I,J)/MFHBMA(M)
     WHERE:
     PTS   = PROBABILITY OF TEST STATION(J) REQUIRING REPAIR ACTION
     PTD   = PROBABILITY OF TEST DRAWER REQUIRING REPAIR ACTION
     TTS   = TEST STATION(J) REPAIR TIME FOR LRU(I)
     TTD   = TEST DRAWER REPAIR TIME FOR LRU(I)
     MFHBMA=MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTION PER
            SUBSYSTEM(M)
```

Figure B.6 — Cost of base level support equipment investment equation (continued).

```
*TSDEM
TEST STATION(J) DEMAND TIME PER FLIGHT HOUR
TSDEM(J)=SUM(I)(KTR(J)*PW(I)*TW(I)+PK(I)*TK(I)+PN(I)*TN(I))/MFHBMA(M)
     WHERE:
     PW(I) =PROBABILITY OF SHOP BENCH CHECK & REPAIR OF LRU(I)
     PK(I) =PROBABILITY OF SHOP CANNOT DUPLICATE DISCREPANCY (CND)
            OF LRU(I)
     PN(I) =PROBABILITY OF LRU(I) ENTERING SHOP BEING SENT TO THE
            DEPOT FOR REPAIR
     TW(I) =TASK TIME FOR SHOP BENCH CHECK &REPAIR OF LRU(I)
     TK(I) =TASK TIME FOR SHOP CANNOT DUPLICATE DISCREPANCY (CND)
            OF LRU(I)
     TN(I) =TASK TIME TO DETERMINE IF LRU(I) WILL BE SENT TO THE DEPOT
            FOR REPAIR
     MFHBMA= MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTION FOR
             SUBSYSTEM(M)
     KTR(J)= PROPORTION OF SHOP MEAN TIME TO REPAIR OF THE LRUS THAT
             REQUIRES THE TEST STATION(J) TO BE USED
```

Figure B.6 -- Cost of base level support equipment investment equation (concluded).

of that test station. Then, division by the available annual operating hours allocated to the work center utilizing that station will give the usage rate. The TSDEM and TSDOT values are obtained from the R&M Model [4,5] portion of RMCM whereby the actual SE usage and maintenance requirements are computed. The equations used by the R&M Model are also given in Figure B.6 as lower level equations.

B.8 COST OF SOFTWARE ACQUISITION (CSWI)

The CSWI element is determined from cost estimating relationships for determining the software development personnel costs (SWPC) and associated computer operation cost (COC). These equations are provided in Figure B.7.

SWPC is computed by determining the number of man-months (NMM) needed to complete the programming based on the type and the size of the program involved and then multiplying by the cost per man-month. NMM is determined by specifying the number of man-months needed to complete 1000 words of the type of programming required and then multiplying by the expected number of computer words required.

COC is similarly made dependent upon the programming requirements by using NMM as a multiplier. The estimated computer hours required per man-month of program development time is multiplied by NMM to obtain computer operation time.

B.9 COST OF INITIAL MAINTENANCE MANUALS (CJGI)

This cost element accounts for the initial cost to acquire technical orders, manuals, and repair instructions to be used by intermediate and organizational maintenance personnel. Relationships that were developed to estimate the cost of manuals have been programmed into RMCM.

A large number of conventional and fully-proceduralized manuals were evaluated to arrive at the job guide cost (CJGI) equation shown in Figure B.8. The cost of manuals for a particular subsystem is considered to be a function of the number of LRUs and SRUs; the number of maintenance functions to be performed; and, the related number and type of pictorials, schematics, and graphics required.

In preparing the CJG equation, it has been assumed that job guides are comprised of three basic parts: (a) general information, (b) troubleshooting information, and (c) nontroubleshooting information. General information cost includes costs of cover sheets, table of contents, and so forth. This general cost is represented as a fixed fractional adder (FJG) over and above other sections of the job guide. Troubleshooting information cost at both flightline and shop

```
*CSWI
COST OF SOFTWARE ACQUISTION    (ALT. INPUT VE-4, 25-32)
CSWI = SWPC + COC
     WHERE:
     SWPC = SOFTWARE DEVELOPMENT PERSONNEL COSTS
     COC  = COMPUTER OPERATION COST
```

```
*SWPC
SOFTWARE DEVELOPMENT PERSONNEL COSTS   (ALT. INPUT VS-3, 73-80)
SWPC = NMM * CPMM
     WHERE:
     NMM = NUMBER OF MANMONTHS REQUIRED TO DEVELOP SOFTWARE
     CPMM= COST PER MAN MONTH (INPUT)

*COC
COMPUTER OPERATION COST  (ALT. INPUT VS-3,57-64)
COC = NCHMM * CCPH * NMM
     WHERE:
     NCHMM = NUMBER OF COMPUTER HOURS PER MAN MONTH (INPUT)
     CCPH  = COMPUTER COST PER HOUR (INPUT)
     NMM   = NUMBER OF MAN MONTHS REQUIRED TO DEVELOP SOFTWARE
```

```
*NMM
NUMBER OF MAN MONTHS REQUIRED TO DEVELOP SOFTWARE
(ALT. INPUT VS-3, 33-40)
NMM = NMMKW * NW/1000
     WHERE:
     NMMKW = NUMBER OF MAN MONTHS PER 1000 COMPUTER WORDS (INPUT)
     NW = NUMBER OF COMPUTER WORDS (INPUT)
```

Figure B.7 — Cost of software acquisition equation.

```
*CJGI
COST OF MAINTENANCE MANUALS INITIAL  (ALT. INPUT VE-4, 33-40)
CJGI = (1 + FJG)*SUM(M)(CFJG(M) + CSJG(M))
     WHERE:
     FJG  = PROPORTION, AS A FUNCTION OF MAINTENANCE MANUALS OR JOB
            GUIDE TYPE MANUAL, REPRESENTING THE GENERAL MATERIAL FOUND
            IN THAT TYPE MANUAL (INPUT)
     CFJG = COST OF FLIGHT LINE MANUALS, MAINTENANCE PORTION, PER
            SUBSYSTEM
     CSJG = COST OF SHOP MANUAL, MAINTENANCE PORTION, PER SUBSYSTEM
```

```
*CFJG
COST OF FLIGHT LINE MANUALS, MAINTENANCE PORTION, PER SUBSYSTEM
(ALT. INPUT VM-1, 33-40)
CFJG(M) = NLRU(M)*(CTFL+CNFL) + NSRU(M)*(CTFS+CNFS) + CTFX + CNFX
     WHERE:
     NLRU = NUMBER OF LRUS PER SUBSYSTEM(M) (INPUT)
     NSRU = NUMBER OF SRUS PER SUBSYSTEM(M) (INPUT)
     CTFL = COST OF FLIGHT LINE TROUBLESHOOTING MAINTENANCE PORTION
            PER LRU OF EACH MANUAL (INPUT)
     CNFL = COST OF FLIGHT LINE NON-TROUBLESHOOTING MAINTENANCE
            PORTION PER LRU OF EACH MANUAL (INPUT)
     CTFS = COST OF FLIGHT LINE TROUBLESHOOTING MAINTENANCE PORTION
            PER SRU OF EACH MANUAL (INPUT)
     CNFS = COST OF FLIGHT LINE NON-TROUBLESHOOTING MAINTENANCE
            PORTION PER SRU OF EACH MANUAL (INPUT)
     CTFX = COST OF FLIGHT LINE TROUBLESHOOTING MAINTENANCE PORTION
            PER SUBSYSTEM OF EACH MANUAL (INPUT)
     CNFX = COST OF FLIGHT LINE NON-TROUBLESHOOTING MAINTENANCE PORTION
            PER SUBSYSTEM OF EACH MANUAL (INPUT)

*CSJG
COST OF SHOP MANUAL, MAINTENANCE PORTION, PER SUBSYSTEM
(ALT. INPUT VM-1, 41-48)
CSJG(M) = NLRU(M)*(CTSL+CNSL) + NSRU(M)*(CTSS+CNSS) + CTSX + CNSX
     WHERE:
     NLRU = NUMBER OF LRUS PER SUBSYSTEM(M) (INPUT)
     NSRU = NUMBER OF SRUS PER SUBSYSTEM(M) (INPUT)
     CTSL = COST OF SHOP TROUBLESHOOTING MAINTENANCE PORTION PER
            LRU OF  EACH MANUAL (INPUT)
     CNSL = COST OF SHOP NON-TROUBLESHOOTING MAINTENANCE PORTION PER
            LRU OF EACH MANUAL  (INPUT)
     CTSS = COST OF SHOP TROUBLESHOOTING MAINTENANCE PORTION PER
            SRU OF EACH MANUAL  (INPUT)
     CNSS = COST OF SHOP NON-TROUBLESHOOTING MAINTENANCE PORTION PER
            SRU OF EACH MANUAL  (INPUT)
     CTSX = COST OF SHOP TROUBLESHOOTING MAINTENANCE PORTION PER
            SUBSYSTEM OF EACH MANUAL (INPUT)
     CNSX = COST OF SHOP NON-TROUBLESHOOTING MAINTENANCE PORTION PER
            SUBSYSTEM OF EACH MANUAL (INPUT)
```

Figure B.8 — Cost of maintenance manuals investment equation.

levels includes the costs of job guides for both the fault detection and the fault isolation steps and is directly proportional to the number of LRUs on the flightline and LRUs plus SRUs in the shop. The cost of nontroubleshooting information at the flightline level comprises costs of job guides for scheduled and unscheduled maintenance functions. This cost is directly proportional to the number of different nontroubleshooting maintenance functions expected on the flightline for each subsystem. The replenishment and upkeep factors for the manuals are contained in the recurring cost element, CJG.

B.10 COST OF INVENTORY MANAGEMENT INITIAL (CIMI)

The CIMI element accounts for those initial inventory management costs incurred when introducing new line items of supply into the Government inventory. This element includes costs of manpower and materials needed to manage the procurement of the repair parts, and to set up control and accountability of these assets.

A value for CIMI is computed by first determining the number (NNII) of P coded reparable (PA) and consumable (PP) items procured that are contained within each LRU(I). This number is then multiplied by a per item initial management cost constant (IMC). The CIMI equation is given in Figure B.9.

B.11 COST OF NEW OR ADDITIONAL FACILITIES (CFAI)

The CFAI element provides for the construction, conversion, or expansion of the necessary facilities required to house or support the various services needed by a new weapon system. These services include those required in the operation or support of the aircraft, its subsystems, and SE. The types of facilities included are training, utilities, real estate, roads, and base maintenance shops. Also included should be any nonproduction industrial and test facilities, and equipment required.

The equation for CFAI is provided in Figure B.10. However, this cost element is normally an aggregated value.

```
*CFAI
COST OF NEW OR ADDITIONAL FACILITIES    (ALT.INPUT VE-4, 49-56)
CFAI = NB * (CFB)
     WHERE:
     NB = NUMBER OF BASES (INPUT)
     CFB= COST OF NEW FACILITIES PER BASE (INPUT)
```

Figure B.10 — Cost of new or additional facilities equation.

```
*CIMI
COST OF INVENTORY MANAGEMENT INITIAL (ALT. INPUT VE-4, 41-48)
CIMI = (IMC)* SUM(I)(NNII(I))
     WHERE:
     IMC = INITIAL MANAGEMENT COST TO INTRODUCE A NEW LINE ITEM OF
           SUPPLY (ASSEMBLY OR PIECE-PARTS) INTO THE AIR FORCE
           INVENTORY (INPUT)
     NNII= NUMBER OF NEW INVENTORY ITEMS WITHIN EACH LRU(I)
```

```
*NNII
NUMBER OF NEW INVENTORY ITEMS WITHIN EACH LRU(I)
NNII(I) = 1 + PA(I) + PP(I)
     WHERE:
     PA = NUMBER OF NEW "P" CODED REPAIRABLE ASSEMBLIES WITHIN THE LRU
     PP = NUMBER OF NEW "P" CODED CONSUMABLE ITEMS WITHIN THE LRU
```

Figure B.9 — Cost of inventory management investment equation.

B.12 COST OF OPERATIONS PERSONNEL (COP)

This cost element is one of two that constitute the recurring cost of operation (CO) of the system. (The other element is the cost of fuel (CFL).)The COP element includes the cost of paying the full complement of aircrews (CAC) needed to man unit aircraft and the cost of all other operations manpower (COO). The equation for COP is given in Figure B.11.

The first term, CAC, aggregates the annual cost of all aircrew personnel. The cost per aircrew is obtained by summing the complement of crewmembers per aircraft (P), their wages and allowances including an overhead support cost per person. This value is multiplied by the number of crews assigned per aircraft (CPA); the number of aircraft per base (NACB); and, the total number of bases (NB) to obtain CAC.

The cost of other operations manpower (COO) term includes a lump sum value for the wages and allowances attributed to the command staff, security personnel, and other deployed personnel (not including maintenance personnel or base support personnel such as base operations personnel and weather personnel). The personnel included in the command staff perform such jobs as command, operations control, planning and scheduling, and flying safety. They include the combat commander, the squadron commander, and their respective staffs. Security personnel are those needed for unit aircraft security such as boundary support, entry control, and security alert teams. Other deployed manpower refers to the cost of paying all other people assigned to typical deployed units during peacetime to support operations (not including maintenance personnel).

```
*COP
COST OF OPERATIONS PERSONNEL     (ALT. INPUT, VE-1, 33-40)
COP = CAC + COO
     WHERE:
     CAC= COST OF AIRCREW
     COO= COST OF OTHER OPERATIONS MANPOWER INCLUDING COMMAND STAFF,
          SECURITY, AND OTHER DEPLOYED PERSONNEL (BUT NOT INCLUDING
          MAINTENANCE PERSONNEL REQUIREMENTS) (INPUT)
```

```
*CAC
COST OF AIRCREW          (ALT. INPUT VE-1,25-32)
CAC = NB * NACB * CPA * SUM(P) (COA(P) + OSCY)
     WHERE:
     NB  = NUMBER OF BASES (INPUT)
     NACB= NUMBER OF AIRCRAFT PER BASE (INPUT)
     CPA = NUMBER OF CREWS ASSIGNED PER AIRCRAFT (INPUT)
     COA = COST OF AN AIRCREW MAN(P) IN WAGES AND ALLOWANCES PER YEAR
          (INPUT)
     OSCY= OVERHEAD SUPPORT COST PER MAN PER YEAR (INPUT)
```

Figure B.11 — Cost of operations personnel equation.

B.13 COST OF FUEL (CFL)

The CFL equation (shown in Figure B.12) provides the operation and support cost element to compute the annual fuel consumption cost of the weapon system. The value for this cost element is determined by multiplying the number of bases supporting the weapon system, the annual base flying hours, and the fuel cost per flight-hour for that type weapon system. When an aggregated cost for this element is input, it should combine the cost of petroleum, oil, and lubricants required for peacetime flying operations including allowances for distribution, storage, and spillage.

```
*CFL
COST OF FUEL         (ALT. INPUT VE-1,41-48)
CFL = NB * ABFH * FC
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     ABFH= ANNUAL BASE FLYING HOURS
     FC   = FUEL COST PER FLIGHT HOUR (INPUT)
```

```
*ABFH
ANNUAL BASE FLYING HOURS
ABFH = NACB * FHACM * 12
     WHERE:
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     FHACM= AVERAGE FLIGHT HOURS PER AIRCRAFT PER MONTH (INPUT)
     12    = NUMBER OF MONTHS PER YEAR
```

Figure B.12 — Cost of fuel equation.

B.14 COST OF ON-EQUIPMENT MAINTENANCE (COM)

The COM element accounts for the cost of manpower and material needed to perform the flightline scheduled and unscheduled on-equipment maintenance of unit aircraft (such as organizational level maintenance). The equations for computing COM are given in Figure B.13.

The basic equation computes COM by first multiplying the number of actual maintenance man-hours (MMH) for each AFSC, skill category and level (N), required per base (MURF) by a loaded labor rate and a material cost rate per MMH. The cost over all AFSCs (N) then is summed before multiplying by the number of bases (NB).

The manpower utilization rate (MURF) is obtained by first multiplying the number of direct flightline MMHs per flight-hour (FMMH(N,M)) required by each AFSC (N) used to maintain specific subsystems (M) by the annual base flying hour rate (ABFH), and then dividing by the percentage of those man-hours which would be devoted to direct labor to obtain the actual MMH required per

```
*COM
COST OF ON EQUIPMENT MAINTENANCE  (ALT. INPUT VE-1,49-56)
COM = NB * SUM(N)(MURF(N) * (LLR(N)+BMR(N)))
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     MURF= LABOR UTILIZATION RATE BY SKILL CATEGORY(N)
           MAINTAINING SPECIFIC SUBSYSTEMS FOR FLIGHT LINE TASKS
     LLR = LOADED LABOR RATE FOR SKILL LEVEL CATEGORY(N)
     BMR = BASE CONSUMABLE MATERIAL CONSUMPTION COST RATE PER MANHOUR
           FOR REPAIRING LRUS BY WORKCENTER EMPLOYING AFSC(N) (INPUT)
```

```
*MURF
LABOR UTILIZATION RATE BY SKILL CATEGORY(N) MAINTAINING
SPECIFIC SUBSYSTEMS FOR FLIGHT LINE TASKS
MURF(N) = SUM(M)(ABFH * FMMH(N,M))/EFF
     WHERE:
     ABFH= ANNUAL BASE FLYING HOURS
     FMMH= FLIGHT LINE MAINTENANCE MANHOURS PER FLIGHT HOUR FOR THE
           AFSC(N) RESPONSIBLE FOR THE MAINTENANCE OF SUBSYSTEM (M)
     EFF = PERCENTAGE OF MAINTENANCE MANHOURS DEVOTED TO DIRECT LABOR

*LLR
LOADED LABOR RATE FOR SKILL LEVEL CATEGORY (N) (ALT.INPUT VN-2,49-56)
LLR(N)= DLR(N) + ILR(N) +(OSCY/PMB)
     WHERE:
     DLR = DIRECT LABOR RATE PER MANHOUR (PER SKILL CATEGORY & LEVEL)
     ILR = INDIRECT LABOR RATE PER MANHOUR (SUPERVISORS AND
           ADMINISTRATIVE PERSONNEL)(INPUT)
     OSCY= OVERHEAD SUPPORT COST PER MAN PER YEAR (INPUT)
     PMB = PRODUCTIVE (AVAILABLE) MANHOURS PER MAN PER  YEAR AT
           BASE LEVEL (INPUT)
```

```
*ABFH
ANNUAL BASE FLYING HOURS
ABFH = NACB * FHACM * 12
     WHERE:
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     FHACM= AVERAGE FLIGHT HOURS PER AIRCRAFT PER MONTH (INPUT)
     12   = NUMBER OF MONTHS PER YEAR

*DLR
DIRECT LABOR RATE PER MANHOUR (PER SKILL CATEGORY AND LEVEL)
(ALT. INPUT VN-2, 41-48)
DLR(N) = KM(N) *(CMPS(N) + OPF(N))
     WHERE:
     KM   = PROPORTION OF DIRECT LABOR MANHOURS DEVOTED TO TASKS VS.
            OJT; KM(N)=1 FOR ALL AFSCS OTHER THAN 1 OR 3 LEVEL AND
            KM(N)=0.5 FOR ALL 1 OR 3 LEVEL AFSC (INPUT)
     CMPS= COST OF MILITARY PERSONNEL SERVICES PER HOUR (INPUT)
     OPF = OTHER PERSONNEL COST FACTORS PER MANHOUR FOR SKILL CATEGORY
           (N) NOT PROVIDED FOR IN CMPS (INPUT)
```

Figure B.13 — Cost of on-equipment maintenance equation.

```
*FMMH
FLIGHT LINE DIRECT MAINTENANCE MANHOURS PER FLIGHT HOUR FOR  AFSC (N)
RESPONSIBLE FOR THE MAINTENANCE OF SUBSYSTEM (M) (R+M OUTPUT)
FMMH(N,M)=((PSE(M)*TA(M)*HA(M))+(PT(M)*TT(M)*HT(M))+(PCND(M)*TCND(M)*
        HC(M))+(PR(M)*TR(M)*HR(M))+(PM(M)*TM(M)*HM(M))
        +(PVR(M)*TVR(M)*HVR(M))+(PVM(M)*TVM(M)*HVM(M)))/MFHBMA(M,I)
    WHERE:
    PSE = PROBABILITY OF SETTING UP SUPPORT EQUIPMENT (SE) ON THE
          FLIGHT LINE TO ACCOMPLISH REPAIR OF THE SUBSYSTEM
    PT  = PROBABILITY THAT A GIVEN MALFUNCTION WILL RESULT IN A
          TROUBLESHOOTING ACTION
    PCND= PROBABILITY THAT A GIVEN MALFUNCTION WILL RESULT IN A
          CND AT THE FLIGHT LINE
    PR  = PROBABILITY THAT A GIVEN TROUBLESHOOT OPERATION WILL
          RESULT IN A REMOVAL OF AN LRU
    PVR = PROBABILITY THAT A GIVEN TROUBLESHOOT OPERATION WILL
          RESULT IN A REMOVAL OF AN LRU AND THE REPAIR VERIFIED
    PM  = PROBABILITY THAT A GIVEN TROUBLESHOOT OPERATION WILL
          RESULT IN AN ON-AIRCRAFT REPAIR
    PVM = PROBABILITY THAT A GIVEN TROUBLESHOOT OPERATION WILL
          RESULT IN AN ON- AIRCRAFT REPAIR AND THE REPAIR IS
          VERIFIED FOR THE SUBSYSTEM
    TA  = AVERAGE TIME REQUIRED TO SET UP SUPPORT EQUIPMENT
    TT  = AVERAGE TIME REQUIRED TO TROUBLESHOOT THE SUBSYSTEM
    TCND= AVERAGE TIME REQUIRED TO DETERMINE THAT A CND
          CONDITION EXISTS
    TR  = AVERAGE TIME REQUIRED TO REMOVE AND REPLACE ONE OR MORE
          OF THE LRUS OF THE SUBSYSTEM FROM THE AIRCRAFT
    TVR = AVERAGE TIME REQUIRED TO VERIFY SUBSYSTEM OPERATION
          FOLLOWING A REMOVAL AND REPLACEMENT
    TM  = AVERAGE TIME REQUIRED TO REPAIR THE SUBSYSTEM ON THE
          AIRCRAFT
    TVM = AVERAGE TIME REQUIRED TO VERIFY SUBSYSTEM OPERATION
          FOLLOWING AN ON-EQUIPMENT REPAIR
    HA  = NUMBER OF HUMAN RESOURCES (AFSC) REQUIRED TO SET UP SE
    HT  = NUMBER OF HUMAN RESOURCES REQUIRED FOR SUBSYSTEM
          TROUBLESHOOTING
    HC  = NUMBER OF HUMAN RESOURCES REQUIRED TO DETERMINE THAT A
          CND CONDITION EXISTS
    HR  = NUMBER OF HUMAN RESOURCES REQUIRED TO REMOVE AND REPLACE
          LRUS FROM THE AIRCRAFT ON THE FLIGHT LINE
    HVR = NUMBER OF HUMAN RESOURCES REQUIRED TO VERIFY SUBSYSTEM
          OPERATION FOLLOWING A REMOVE AND REPLACE OPERATION
    HM  = NUMBER OF HUMAN RESOURCES REQUIRED TO REPAIR THE
          SUBSYSTEM ON THE AIRCRAFT
    HVM = NUMBER OF HUMAN RESOURCES REQUIRED TO VERITY SUBSYSTEM
          OPERATION FOLLOWING AN ON-EQUIPMENT REPAIR
    MFHBMA= MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS FOR
          SUBSYSTEM (M)
```

Figure B.13 — Cost of on-equipment maintenance equation (concluded).

flight-hour. Values for the FMMH(N,M) term are obtained from the R&M Model portion of the RMCM which uses the equation given in Figure B.13. This model computes the number of manhours of each AFSC (N) required to maintain each subsystem (M) by summing across all required tasks.

The loaded labor rate per man-hour include three terms: (a) a direct labor rate (DLR) which accounts for the wages, allowances, and benefits of the direct labor work force; (b) an indirect labor rate (ILR) which accounts for the supervisors and administrative personnel used to directly support the direct labor (DL) work force; and (c) an overhead support cost rate which provides for such factors as medical support, base operation support, vehicular and base maintenance, and hospitalization. These overhead support cost rate factors are embodied in the term OSCY which is an annual cost per man and must be divided by the productive (available) man-hours per man per year to obtain a man-hour cost rate [10].

The direct labor rate (DLR) term includes an empirical factor (KM(N)) to reduce the cost per hour rate for DL of selected skill levels (N). This factor avoids double counting by not allowing the proportion of DL man-hoursdevoted to on-job training OJT to be charged against the tasks. (Note that the COJT term in the cost of maintenance personnel training element (CPT) must have a cost value assigned for those AFSCs (N) whose KM(N) value is less than unity.)

B.15 COST OF INTERMEDIATE SHOP MAINTENANCE (CSM)

The CSM element accounts for the cost of manpower and material needed to perform intermediate shop maintenance. The shop maintenance includes bench check and repair of LRUs removed from the aircraft, and also the repairs of the test stations used to test those LRUs. The equations for computing CSM are given in Figure B.14.

The same basic equation formats used for computing all of the factors contained in the cost of on-equipment maintenance (the COM element) is used for this cost element with one exception. The terms are redesignated when necessary (such that the labor utilization rate is designated MURS(N)). The maintenance man-hour value for MURS(N) is obtained by dividing the percentage of direct labor man-hours (EFF) expected per man into the product of the shop maintenance man-hours expended by an AFSC(N) per flight-hour per LRU(I), SMMH(N,I), and the number of flight-hours. The values for SMMH(N,I) are obtained from the R&M Model portion of the RMCM using the equation given in Figure B.14.

The cost rates per AFSC and skill level (N) are the same as those used in the COM equations.

```
*CSM
COST OF INTERMEDIATE SHOP MAINTENANCE  (ALT. INPUT VE-1, 57-64)
CSM = NB * SUM(N)(MURS(N)*(LLR(N) + BMR(N)))
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     MURS= LABOR UTILIZATION RATE BY SKILL CATEGORY MAINTAINING
           SPECIFIC GROUP OF LRUS FOR SHOP TASKS
     LLR  = LOADED LABOR RATE FOR SKILL LEVEL CATEGORY (N)
     BMR  = BASE CONSUMABLE MATERIAL CONSUMPTION COST RATE FOR
           REPAIRING LRUS BY WORKCENTER EMPLOYING AFSC(N) (INPUT)
```

```
*MURS
LABOR UTILIZATION RATE BY SKILL CATEGORY MAINTAINING SPECIFIC
GROUP OF LRUS FOR SHOP TASKS
MURS(N) = SUM(I) (ABFH * SMMH(N,I))/EFF
     WHERE:
     ABFH= ANNUAL BASE FLYING HOURS
     SMMH= SHOP MAINTENANCE MANHOURS PER FLIGHT HOUR FOR THE AFSC
           LEVEL (N) RESPONSIBLE FOR THE MAINTENANCE OF LRU (I)
     EFF = PERCENTAGE OF MAINTENANCE MANHOURS DEVOTED TO DIRECT LABOR
*LLR
LOADED LABOR RATE FOR SKILL LEVEL CATEGORY (N) (ALT.INPUT VN-2,49-56)
LLR(N)= DLR(N) + ILR(N) +(OSCY/PMB)
     WHERE:
     DLR = DIRECT LABOR RATE PER MANHOUR (PER SKILL CATEGORY & LEVEL)
     ILR = INDIRECT LABOR RATE PER MANHOUR (SUPERVISORS AND
           ADMINISTRATIVE PERSONNEL)(INPUT)
     OSCY= OVERHEAD SUPPORT COST PER MAN PER YEAR (INPUT)
     PMB = PRODUCTIVE (AVAILABLE) MANHOURS PER MAN PER  YEAR AT
           BASE LEVEL (INPUT)
```

```
*ABFH
ANNUAL BASE FLYING HOURS
ABFH = NACB * FHACM * 12
     WHERE:
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     FHACM= AVERAGE FLIGHT HOURS PER AIRCRAFT PER MONTH (INPUT)
     12    = NUMBER OF MONTHS PER YEAR

*DLR
DIRECT LABOR RATE PER MANHOUR (PER SKILL CATEGORY AND LEVEL)
(ALT. INPUT VN-2, 41-48)
DLR(N) = KM(N) *(CMPS(N) + OPF(N))
     WHERE:
     KM   = PROPORTION OF DIRECT LABOR MANHOURS DEVOTED TO TASKS VS.
            OJT; KM(N)=1 FOR ALL AFSCS OTHER THAN 1 OR 3 LEVEL AND
            KM(N)=0.5 FOR ALL 1 OR 3 LEVEL AFSC (INPUT)
     CMPS= COST OF MILITARY PERSONNEL SERVICES PER HOUR (INPUT)
     OFF = OTHER PERSONNEL COST FACTORS PER MANHOUR FOR SKILL CATEGORY
           (N) NOT PROVIDED FOR IN CMPS (INPUT)
```

Figure B.14 —Cost of intermediate shop maintenance equation.

```
*SMMH
SHOP DIRECT MAINTENANCE MANHOURS PER FLIGHT HOUR FOR THE AFSC LEVEL
(N) RESPONSIBLE FOR THE MAINTAINANCE OF LRU (I) (R&M OUTPUT)
SMMH(N,I)=H(M)((PW(I)*TW(I)*HW(I))+(PK(I)*TK(I)*HK(I))
          +(PN(I)*TN(I)*HN(I))+(PTD(I)*TTD(I)*HTD(I))
          +(PTS(I)*TTS(I)*HTS(I)))/MFHBMA(M,I)
     WHERE:
     H(M)= THE RATIO BETWEEN THE NUMBER OF LRUS TESTED IN THE SHOP
          AND THE FLIGHT LINE REMOVAL ACTIONS FOR SUBSYSTEM (M)
     PW = PROBABILITY OF SHOP BENCH CHECK AND REPAIR OF LRU(I)
     PK = PROBABILITY OF SHOP RETEST OK OF LRU(I)
     PN = PROBABILITY OF LRU(I) ENTERING SHOP BEING SENT TO THE
          DEPOT FOR REPAIR
     PTD= PROBABILITY OF TEST DRAWER(J) REQUIRING REPAIR ACTION
     PTS= PROBABILITY OF TEST STATION(J) REQUIRING REPAIR ACTION
     TW = TASK TIME FOR SHOP BENCH CHECK AND REPAIR OF LRU(I)
     TK = TASK TIME SOR SHOP RETEST OK OF LRU(I)
     TN = TASK TIME TO DETERMINE IF LRU(I) WILL BE SENT TO THE
          DEPOT FOR REPAIR (NRTS)
     TTD= TEST DRAWER REPAIR TIME FOR LRU(I)
     TTS= TEST STATION(J) REPAIR TIME FOR LRU(I)
     HW = NUMBER OF HUMAN RESOURCES (AFSC) REQUIRED TO PERFORM BENCH
          CHECK AND REPAIR OF THE (I)TH LRU OF A GIVEN SUBSYSTEM
     HK = NUMBER OF HUMAN RESOURCES REQUIRED TO DETERMINE THAT A
          SHOP CND CONDITION EXISTS WITH RESPECT TO THE (I)TH LRU
          OF A GIVEN SUBSYSTEM
     HN = NUMBER OF HUMAN RESOURCES REQUIRED TO DETERMINE THAT A
          NRTS ACTION EXISTS WITH RESPECT TO THE (I)TH LRU OF A
          GIVEN SUBSYSTEM
     HTD= NUMBER OF HUMAN RESOURCES (AFSC) REQUIRED TO PERFORM REPAIR
          ACTIONS ON THE TEST DRAWER
     HTS= NUMBER OF HUMAN RESOURCES (AFSC) REQUIRED TO PERFORM REPAIR
          ACTIONS ON THE TEST STATION(J)
     MFHBMA= MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS FOR
          SUBSYSTEM (M)
```

Figure 3.14 — Cost of intermediate shop maintenance equation (concluded).

B.16 COST OF MAINTENANCE PERSONNEL TRAINING (CPT)

The CPT element accounts for the cost of training the initial work force of organizational and intermediate level maintenance personnel as well as the annual cost of training their replacements. Because the initial training is considered to be received prior to the first year, attrition of personnel during the first year is allowed. The equations for computing CPT are given in Figure B.15.

The basic equation computes CPT on an annual basis by first multiplying the number of AFSCs required per base MU(N) by the terms (1/PIUP + TRS(N)) and then by the cost of training by each skill category and level (TCS(N) before summing over N and finally multiplying by the number of bases (NB). The term 1/PIUP amortizes the training cost of the initial manning level over the life of the system (PIUP). The term TRS(N) is the loss rate per year for each personnel category (N).

Manpower utilization (MU(N)) is the average number of AFSCs of skill category and level (N) required at each base. MU(N) is obtained by adding the labor utilization rates in terms of man-hours required by any specific AFSC(N) for the flightline (MURF) and the intermediate shop (MURS) tasks and dividing the result by the number of productive (available) man-hours per man per year (PMB). For example, PMB = 40 man-hours/work-week x 48 work-weeks/year = 1920 hours/man year. The labor utilization rates are the total manhours required by each AFSC(N) to maintain specific subsystem (M). These maintenance man-hours required to perform the flightline and shop tasks (MURF and MURS) are obtained from the equations used to compute these same terms for the cost of on-equipment (COM) and cost of shop maintenance (CSM) elements, respectively.

The cost of training (TCS) an airman for a specific job category to the 3-skill level is the cost of technical training school (CTTS) for that AFSC. CTTS is computed as the course length in weeks (NWK) multiplied by the average cost per graduate per week (ACG) plus the capital investment cost (CIC) per AFSC per week. This value is then added to the costs per man for pretechnical training school pay and allowance (PTT), the cost of type four training (COT), and the acquisition cost (CACQ) per man which includes initial travel, clothing issue, and basic training. These data are maintained by the Air Training Command.

The cost of upgrading a 3-skill level AFSC to a 5-skill level is obtained by adding to the CTTS the cost of on-the-job training (COJT) per person by AFSC. The COJT cost factor input values must account for all nonproductive wages earned by each AFSC while undergoing on-the-job training. Empirical values for training costs can be obtained from Table 29 in AFHR173-10 after adjusting for TTS and the percentage of nonproduction time while in OJT (KM(N) factor). The airman's productive time has already been accounted for in the cost of on- and off-equipment elements by reducing that individual's wages by the factor KM(N).

```
*CPT
COST OF MAINTENANCE PERSONNEL TRAINING    (ALT. INPUT VE-1, 65-72)
CPT = NB * SUM(N)((1/PIUP + TRS(N)) * MU(N) * TCS(N))
     WHERE:
     NB = NUMBER OF BASES (INPUT)
     TRS= ANNUAL TURNOVER RATE OF AIRMAN IN EACH SKILL CATEGORY
          AND LEVEL (INPUT)
     MU = MANPOWER UTILIZATION BY AFSC (N)
     TCS= COST OF TRAINING AN AIRMAN FOR EACH SKILL CATEGORY & LEVEL
     PIUP= PLANNED INVENTORY USAGE PERIOD (INPUT)
```

```
*MU
MANPOWER UTILIZATION BY AFSC (N)
MU(N) = (MURF(N) + MURS(N))/PMB
     WHERE:
     MURF= LABOR UTILIZATION RATE BY SKILL CATEGORY (N)
           MAINTAINING SPECIFIC SUBSYSTEMS FOR FLIGHT LINE TASKS
     MURS= LABOR UTILIZATION RATE BY SKILL CATEGORY MAINTAINING
           SPECIFIC GROUP OF LRUS FOR SHOP TASKS
     PMB = PRODUCTIVE MANHOURS PER MAN PER YEAR AT BASE LEVEL
           (INPUT)

*TCS
COST OF TRAINING AN AIRMAN FOR EACH SKILL CATEGORY AND LEVEL
TCS(N) = CTTS(N) + COJT(N)         (ALT.INPUT VN-1,65-72)
     WHERE:
     CTTS= COST OF TECHNICAL TRAINING SCHOOL PER MAN BY AFSC TO
           3 LEVEL
     COJT= COST OF ON-THE-JOB TRAINING PER MAN BY AFSC TO 5 LEVEL
           INCLUDING NON-PRODUCTIVE WAGES BASED ON A FACTOR OF
           (1-KM(N)) (INPUT)
```

```
*MURF
LABOR UTILIZATION RATE BY SKILL CATEGORY(N) MAINTAINING
SPECIFIC SUBSYSTEMS FOR FLIGHT LINE TASKS
MURF(N) = SUM(M)(ABFH * FMMH(N,M))/EFF
     WHERE:
     ABFH= ANNUAL BASE FLYING HOURS
     FMMH= FLIGHT LINE MAINTENANCE MANHOURS PER FLIGHT HOUR FOR THE
           AFSC(N) RESPONSIBLE FOR THE MAINTENANCE OF SUBSYSTEM (M)
     EFF = PERCENTAGE OF MAINTENANCE MANHOURS DEVOTED TO DIRECT LABOR

*MURS
LABOR UTILIZATION RATE BY SKILL CATEGORY MAINTAINING SPECIFIC
GROUP OF LRUS FOR SHOP TASKS
MURS(N) = SUM(I) (ABFH * SMMH(N,I))/EFF
     WHERE:
     ABFH= ANNUAL BASE FLYING HOURS
     SMMH= SHOP MAINTENANCE MANHOURS PER FLIGHT HOUR FOR THE AFSC
           LEVEL (N) RESPONSIBLE FOR THE MAINTENANCE OF LRU (I)
     EFF =  PERCENTAGE OF MAINTENANCE MANHOURS DEVOTED TO DIRECT LABOR
```

Figure B.15 — Cost of maintenance personnel training equation.

```
*CTTS
COST OF TECHNICAL TRAINING SCHOOL PER MAN BY AFSC TO 3 LEVEL
CTTS(N)= NWK(N)*(ACG(N)+CIC(N)) + PTT(N) + COT(N) + CACQ
(ALT.INPUT VN-1,49-56)
     WHERE:
     NWK= COURSE LENGTH IN WEEKS (INPUT)
     ACG= AVERAGE COST PER GRADUATE (N) PER WEEK (INPUT)
     CIC= CAPITAL INVESTMENT COST PRORATED BY AFSC (N) PER WEEK (INPUT
     PTT= PRE TECHNICAL TRAINING SCHOOL PAY AND ALLOWANCE
          PER MAN (INPUT)
     COT= COST OF TYPE 4 AND OTHER TRAINING , NOT INCLUDED IN ACG,
          PER MAN (INPUT)
     CACQ=ACQUISITION COST PER MAN WHICH INCLUDES RECRUITING, INITIAL
          TRAVEL, INITIAL CLOTHING ISSUE, AND TRAINING AT MILITARY
          TRAINING CENTER (INPUT)
```

```
*ABFH
ANNUAL BASE FLYING HOURS
ABFH = NACB * FHACM * 12
     WHERE:
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     FHACM= AVERAGE FLIGHT HOURS PER AIRCRAFT PER MONTH (INPUT)
     12   = NUMBER OF MONTHS PER YEAR

*SMMH
SHOP DIRECT MAINTENANCE MANHOURS PER FLIGHT HOUR FOR THE AFSC LEVEL
(N) RESPONSIBLE FOR THE MAINTAINANCE OF LRU (I) (R&M OUTPUT)
SMMH(N,I)=H(M)((PW(I)*TW(I)*HW(I))+(PK(I)*TK(I)*HK(I))
         +(PN(I)*TN(I)*HN(I))+(PTD(I)*TTD(I)*HTD(I))
         +(PTS(I)*TTS(I)*HTS(I)))/MFHBMA(M,J)
     WHERE:
     H(M)= THE RATIO BETWEEN THE NUMBER OF LRUS TESTED IN THE SHOP
           AND THE FLIGHT LINE REMOVAL ACTIONS FOR SUBSYSTEM (M)
     PW = PROBABILITY OF SHOP BENCH CHECK AND REPAIR OF LRU(I)
     PK = PROBABILITY OF SHOP RETEST OK OF LRU(I)
     PN = PROBABILITY OF LRU(I) ENTERING SHOP BEING SENT TO THE
          DEPOT FOR REPAIR
     PTD= PROBABILITY OF TEST DRAWER(J) REQUIRING REPAIR ACTION
     PTS= PROBABILITY OF TEST STATION(J) REQUIRING REPAIR ACTION
     TW = TASK TIME FOR SHOP BENCH CHECK AND REPAIR OF LRU(I)
     TK = TASK TIME SOR SHOP RETEST OK OF LRU(I)
     TN = TASK TIME TO DETERMINE IF LRU(I) WILL BE SENT TO THE
          DEPOT FOR REPAIR (NRTS)
     TTD= TEST DRAWER REPAIR TIME FOR LRU(I)
     TTS= TEST STATION(J) REPAIR TIME FOR LRU(I)
     HW = NUMBER OF HUMAN RESOURCES (AFSC) REQUIRED TO PERFORM BENCH
          CHECK AND REPAIR OF THE (I)TH LRU OF A GIVEN SUBSYSTEM
     HK = NUMBER OF HUMAN RESOURCES REQUIRED TO DETERMINE THAT A
          SHOP CND CONDITION EXISTS WITH RESPECT TO THE (I)TH LRU
          OF A GIVEN SUBSYSTEM
     HN = NUMBER OF HUMAN RESOURCES REQUIRED TO DETERMINE THAT A
          NRTS ACTION EXISTS WITH RESPECT TO THE (I)TH LRU OF A
          GIVEN SUBSYSTEM
     HTD= NUMBER OF HUMAN RESOURCES (AFSC) REQUIRED TO PERFORM REPAIR
          ACTIONS ON THE TEST DRAWER
     HTS= NUMBER OF HUMAN RESOURCES (AFSC) REQUIRED TO PERFORM REPAIR
          ACTIONS ON THE TEST STATION(J)
     MFHBMA= MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS FOR
          SUBSYSTEM (M)
```

Figure B.15 — Cost of maintenance personnel training equation (continued).

```
*FMMH
FLIGHT LINE DIRECT MAINTENANCE MANHOURS PER FLIGHT HOUR FOR  AFSC (N)
RESPONSIBLE FOR THE MAINTENANCE OF SUBSYSTEM (M) (R+M OUTPUT)
FMMH(N,M)=((PSE(M)*TA(M)*HA(M))+(PT(M)*TT(M)*HT(M))+(PCND(M)*TCND(M)*
          HC(M))+(PR(M)*TR(M)*HR(M))+(PM(M)*TM(M)*HM(M))
          +(PVR(M)*TVR(M)*HVR(M))+(PVM(M)*TVM(M)*HVM(M)))/MFHBMA(M,I)
     WHERE:
     PSE = PROBABILITY OF SETTING UP SUPPORT EQUIPMENT (SE) ON THE
           FLIGHT LINE TO ACCOMPLISH REPAIR OF THE SUBSYSTEM
     PT  = PROBABILITY THAT A GIVEN MALFUNCTION WILL RESULT IN A
           TROUBLESHOOTING ACTION
     PCND= PROBABILITY THAT A GIVEN MALFUNCTION WILL RESULT IN A
           CND AT THE FLIGHT LINE
     PR  = PROBABILITY THAT A GIVEN TROUBLESHOOT OPERATION WILL
           RESULT IN A REMOVAL OF AN LRU
     PVR = PROBABILITY THAT A GIVEN TROUBLESHOOT OPERATION WILL
           RESULT IN A REMOVAL OF AN LRU AND THE REPAIR VERIFIED
     PM  = PROBABILITY THAT A GIVEN TROUBLESHOOT OPERATION WILL
           RESULT IN AN ON-AIRCRAFT REPAIR
     PVM = PROBABILITY THAT A GIVEN TROUBLESHOOT OPERATION WILL
           RESULT IN AN ON- AIRCRAFT REPAIR AND THE REPAIR IS
           VERIFIED FOR THE SUBSYSTEM
     TA  = AVERAGE TIME REQUIRED TO SET UP SUPPORT EQUIPMENT
     TT  = AVERAGE TIME REQUIRED TO TROUBLESHOOT THE SUBSYSTEM
     TCND= AVERAGE TIME REQUIRED TO DETERMINE THAT A CND
           CONDITION EXISTS
     TR  = AVERAGE TIME REQUIRED TO REMOVE AND REPLACE ONE OR MORE
           OF THE LRUS OF THE SUBSYSTEM FROM THE AIRCRAFT
     TVR = AVERAGE TIME REQUIRED TO VERIFY SUBSYSTEM OPERATION
           FOLLOWING A REMOVAL AND REPLACEMENT
     TM  = AVERAGE TIME REQUIRED TO REPAIR THE SUBSYSTEM ON THE
           AIRCRAFT
     TVM = AVERAGE TIME REQUIRED TO VERIFY SUBSYSTEM OPERATION
           FOLLOWING AN ON-EQUIPMENT REPAIR
     HA  = NUMBER OF HUMAN RESOURCES (AFSC) REQUIRED TO SET UP SE
     HT  = NUMBER OF HUMAN RESOURCES REQUIRED FOR SUBSYSTEM
           TROUBLESHOOTING
     HC  = NUMBER OF HUMAN RESOURCES REQUIRED TO DETERMINE THAT A
           CND CONDITION EXISTS
     HR  = NUMBER OF HUMAN RESOURCES REQUIRED TO REMOVE AND REPLACE
           LRUS FROM THE AIRCRAFT ON THE FLIGHT LINE
     HVR = NUMBER OF HUMAN RESOURCES REQUIRED TO VERIFY SUBSYSTEM
           OPERATION FOLLOWING A REMOVE AND REPLACE OPERATION
     HM  = NUMBER OF HUMAN RESOURCES REQUIRED TO REPAIR THE
           SUBSYSTEM ON THE AIRCRAFT
     HVM = NUMBER OF HUMAN RESOURCES REQUIRED TO VERITY SUBSYSTEM
           OPERATION FOLLOWING AN ON-EQUIPMENT REPAIR
     MFHBMA= MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS FOR
             SUBSYSTEM (M)
```

Figure B.15 - Cost of maintenance personnel training equation (concluded).

B.17 COST OF REPLACEMENT SPARES (CSP)

CSP element is the annual cost of replacing condemned LRU and SRU spares in the shop and depot pipeline. The equation for computing CSP is provided in Figure B.16. These are the spares and modules that are normally repaired and returned to stock. However, the SRUs can also be "discard on failure" modules.

The number of maintenance actions per LRU(I) is determined by dividing the annual base flying hours by the mean time between maintenance actions for the subsystem containing that LRU. The number of Ith LRU failures that are sent to the depot is determined by multiplying by the probability (PN) that an LRU(I) is not reparable this station. This value then is multiplied by the proportion the the LRUs expected to be condemned (FCL) resulting in the number of replacement spares required. The cost of LRU replacement spares (LRURS) then is determined by multiplying the number of replacement LRUs required by the LRU(I) unit cost and summing over all LRUs.

The same procedure applies for determining the cost of replenishing SRUs except that the repair rate of the SRU is determined by the bench check and repair probability (PW) of the LRU to which the SRU belongs. When an LRU is repaired, the failure is normally isolated to a replacement SRU. A proportion of these SRUs, including those items considered to be throwaways, will be condemned (FCS). The average unit cost of the SRUs (UCSRU(I)) within LRU(I) is computed as the LRU(I) unit cost (UC(I)) divided by the number of SRUs in that LRU(I). This estimating relationship assumes that the failure modes of the SRUs and their average cost are each linearly proportioned to the cost of an LRU. These assumptions, although gross, provide the user with representative SRU cost data if no other estimates are available. The user has the option to input the UCSRU(I) term directly overriding any lower level values.

B.18 COST OF DEPOT MAINTENANCE (CDR)

The CDR element accounts for all recurring depot costs including subsystem repairs and system overhaul. The equation for CDR is given in Figure B.17.

The first term computes the cost of the subsystem repairs as a function of the number of LRUs that have been returned to the depot for repair (NRTS) per year. This number is multiplied by an average LRU repair cost (DC) and an LRU transportation cost (TC) to determine the cost of depot repairs. The average LRU repair cost multiplier (DC) must account for all manpower, material, and overhead cost factors sustained by a DoD centralized repair depot, Government or contractor operated. The transportation cost is computed as a function of each LRU's weight using standard packing and shipping cost factors.

```
*CSP
COST OF REPLACEMENT SPARES    (ALT. INPUT VE-1, 73-80)
CSP = LRURS + SRURS
     WHERE:
     LRURS = COST OF LRU REPLACEMENT SPARES
     SRURS = COST OF SRU REPLACEMENT SPARES
```

```
*LRURS
COST OF LRU REPLACEMENT SPARES
LRURS= NB * SUM(I)(ABFH * UC(I) * FCL(I) * PN(I)/MFHBMA(M))
     WHERE:
    NB    = NUMBER OF BASES (INPUT)
     ABFH = ANNUAL BASE FLYING HOURS
     UC   = EXPECTED UNIT COST OF LRU (I) (INPUT)
     FCL  = PROPORTION OF NRTSED LRU(I)S EXPECTED TO RESULT IN
            CONDEMNATION AT THE BASE/DEPOT LEVEL (INPUT)
     PN   = PROBABILITY OF LRU(I) ENTERING SHOP BEING SENT TO THE
            DEPOT FOR REPAIR (R&M INPUT)
     MFHBMA=MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS FOR
            SUBSYSTEM (M) TO WHICH LRU(I) BELONGS (R&M INPUT)

*SRURS
COST OF SRU REPLACEMENT SPARES
SRURS= NB * SUM(I)(ABFH * UCSRU(I) * FCS(I) * PW(I)/MFHBMA(M))
     WHERE:
     NB    = NUMBER OF BASES (INPUT)
     ABFH = ANNUAL BASE FLYING HOURS
     UCSRU= AVERAGE UNIT COST OF SRUS WITHIN LRU(I)
     FCS  = PROPORTION OF SHOP REPAIRED AND NRTS LRU(I) EXPECTED TO
            RESULT IN SRU CONDEMNATION AT THE BASE LEVEL (INCLUDING
            THROWAWAYS) (INPUT)
     PW   = PROBABILITY OF SHOP BENCH-CHECK AND REPAIR ACTION
            (R&M INPUT)
     MFHBMA=MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS FOR
            SUBSYSTEM (M) TO WHICH LRU(I) BELONGS (R&M INPUT)
```

```
*UCSRU
AVERAGE UNIT COST OF SRUS WITHIN LRU(I) (ALT.INPUT VI-1,25-32)
UCSRU(I) = UC(I)/NSRU(I)
     WHERE:
     UC   = EXPECTED UNIT COST OF LRU(I) (INPUT)
     NSRU = NUMBER OF UNIQUE SRUS PER LRU

*ABFH
ANNUAL BASE FLYING HOURS
ABFH = NACB * FHACM * 12
     WHERE:
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     FHACM= AVERAGE FLIGHT HOURS PER AIRCRAFT PER MONTH (INPUT)
     12   = NUMBER OF MONTHS PER YEAR
```

Figure B.16 — Cost of replacement spares equation.

```
*CDR
COST OF DEPOT MAINTENANCE    (ALT. INPUT VE-2,17-24)
CDR= NB*SUM(I)(ABFH*PN(I)*(DC(I)+TC(I))/MFHBMA(M))+ NB*NACB*COS*OHR
     WHERE:
     NB   = NUMBER OF BASES (INPUT)
     ABFH = ANNUAL BASE FLYING HOURS
     PN   = PROBABILITY OF LRU(I) ENTERING SHOP BEING SENT TO THE
            DEPOT FOR REPAIR (R+M INPUT)
     DC   = AVERAGE DEPOT REPAIR COST PER LRU AND ITS SRUS (INPUT)
     TC   = ROUND TRIP TRANSPORTATION AND PACKAGING COST PER ITEM
     MFHBMA=MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTIONS
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     COS  = COST OF OVERHAUL PER SYSTEM (INPUT)
     OHR  = OVERHAUL RATE -PORTION OF SYSTEMS OVERHAULED PER YEAR FROM
            EACH BASE (RECIPROCAL OF YEARS BETWEEN SYSTEM OVERHAULS)
            (INPUT)
```

```
*TC
ROUND TRIP TRANSPORTATION AND PACKAGING COST PER ITEM
(ALT. INPUT VI-1,73-80)
TC(I)= W(I) * RPUW * 2 *(PSC(1-OS)+PSO * OS)
     WHERE:
     W   = WEIGHT IN POUNDS OF ITEM(I) (R+M INPUT)
     RPUW= RATIO OF PACKED TO UNPACKED WEIGHT (INPUT)
     PSC = AVERAGE PACKING AND SHIPPING COST TO CONUS LOCATIONS -INPUT
     PSO = AVERAGE PACKING AND SHIPPING COST TO OVERSEAS LOCATIONS-INP
     OS  = PROPORTION OF TOTAL FORCE DEPLOYED TO OVERSEAS LOCATIONS -I
*ABFH
ANNUAL BASE FLYING HOURS
ABFH = NACB * FHACM * 12
     WHERE:
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     FHACM= AVERAGE FLIGHT HOURS PER AIRCRAFT PER MONTH (INPUT)
     12   = NUMBER OF MONTHS PER YEAR
```

Figure B.17 — Cost of depot maintenance equation.

The second term computes the annual cost of overhaul of all systems deployed or the contribution of the subsystems under study to that cost, as applicable. The cost of overhaul per system (COS), as with the DC term, must account for all depot cost factors contributing to the overhaul process.

B.19 COST OF MAINTAINING SUPPORT EQUIPMENT (CSE)

The CSE element provides for the annual recurring costs of the peculiar shop SE maintenance, excluding manpower costs. The cost of manpower is included in the cost of intermediate shop maintenance element (CSM). CSE allows for the cost of spare parts needed to maintain the SE, as well as the cost of replacement of the SE at the end of its useful life span.

The cost estimating equations used to compute the value of this element is based on a proportion (MSE) of the cost per type of SE (CPUSE). The entire equation for computing CSE including lower level terms necessary to provide inputs are included in Figure B.18. The equations for computing CPUSE are identical to those contained in the CSEI equation.

B.20 COST OF SOFTWARE SUPPORT (CSW)

The annual CSW element includes the labor cost and the software computer costs required to perform software maintenance. The software labor cost (PC) is determined by the average number (NSS) and grade level (SLR) of the software staff personnel who are retained over the system life cycle to support and maintain the software and to implement engineering change proposal (ECP) enhancements. When developing data for this manpower term, consideration should be given to assigning a large staff during the early deployment years, and a token staff for the remaining years considering the amount of software involved (including support software). The software computer cost (SCC) term is also determined as a function of the number of support staff and of the estimated computer utilization rate per man-month. The equation for CSW is given in Figure B.19.

B.21 COST OF SUPPORTING MAINTENANCE MANUALS (CJG)

The annual cost of supporting maintenance manuals (CJG) element accounts for the upkeep and updating costs of the manuals needed by the base facilities for flightline and shop maintenance activities. This value is determined by multiplying the initial cost of maintenance manuals (CJGI) by two factors (refer to Figure B.8). The first factor estimates what portion of the manuals will be corrected and/or changed each year (KPJG). The second factor estimates the reduced cost necessary to revise the materials as compared to the initial preparation costs (KCJG). The equation for determining CJG is provided in Figure B.20.

```
*CSE
COST OF MAINTAINING SUPPORT EQUIPMENT  (ALT. INPUT VE-2,25-32)
CSE = NB * SUM(J) (MSE(J) * CPUSE(J))
     WHERE:
     NB  = NUMBER OF BASES (INPUT)
     MSE = PROPORTION OF THE SUPPORT EQUIPMENT COST USED AS ESTIMATE
           OF THE NON-PERSONNEL COST OF MAINTAINING SUPPORT EQUIPMENT
           INCLUDING REPLACEMENT PARTS (INPUT)
     CPUSE=COST PER TYPE OF PECULIAR SUPPORT EQUIPMENT (J)
```

```
*CPUSE
COST PER TYPE OF PECULIAR SUPPORT EQUIPMENT(J) (ALT. INPUT VJ-1,41-48)
CPUSE(J)=(NSER(J) * UCSE(J))
     WHERE:
     NSER = NUMBER OF PECULIAR SUPPORT EQUIPMENT AT EACH BASE
     UCSE = UNIT COST OF PECULIAR SUPPORT EQUIPMENT (INPUT)
```

```
*NSER
NUMBER OF PECULIAR SUPPORT EQUIPMENT REQUIRED AT EACH BASE;
NEXT HIGHEST INTEGER VALUE OF A(J) THE UTILIZATION RATE OF THE
SUPPORT EQUIPMENT

*A(J)
UTILIZATION RATE, ACCUMULATED PROPORTIONAL REQUIREMENTS FOR SUPPORT
EQUIPMENT ITEM (J) (IE.,NSER(J) = NEXT HIGHEST INTEGER FROM A (J)
VALUE)
A(J) = ((PBFH)/AAOH) * (TSDEM(J) + TSDOT(J))
     WHERE:
     PBFH = PEAK BASE FLYING HOURS
     AAOH = AVAILABLE ANNUAL OPERATING HOURS (INPUT)
     TSDEM= TEST STATION(J) DEMAND TIME PER FLIGHT HOUR
     TSDOT = TEST STATION(J) DOWN TIME FOR REPAIR PER FLIGHT HOUR
```

```
*PBFH
PEAK BASE FLYING HOURS ON AN ANNUAL BASIS
PBFH = NACB * MFHACM * 12
     WHERE:
     NACB = NUMBER OF AIRCRAFT PER BASE (INPUT)
     MFHACM=MAXIMUM FLIGHT HOURS EXPECTED PER AIRCRAFT PER MONTH
            DURING A PEAK USAGE PERIOD (INPUT)
     12    = NUMBER OF MONTHS PER YEAR

*TSDOT
TEST STATION(J) DOWN TIME FOR REPAIR PER FLIGHT HOUR
TSDOT(J) = SUM(I)(PTS(I,J)*TTS(I,J) + PTD(I,J)*TTD(I,J)/MFHBMA(M))
     WHERE:
     PTS  = PROBABILITY OF TEST STATION(J) REQUIRING REPAIR ACTION
     PTD  = PROBABILITY OF TEST DRAWER REQUIRING REPAIR ACTION
     TTS  = TEST STATION(J) REPAIR TIME FOR LRU(I)
     TTD  = TEST DRAWER REPAIR TIME FOR LRU(I)
     MFHBMA=MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTION PER
            SUBSYSTEM(M)
```

Figure B.18 — Cost of maintaining support equipment equation.

```
*TSDEM
TEST STATION(J) DEMAND TIME PER FLIGHT HOUR
TSDEM(J)=SUM(I)(KTR(J)*PW(I)*TW(I)+PK(I)*TK(I)+PN(I)*TN(I))/MFHBMA(M))
     WHERE:
     PW(I) =PROBABILITY OF SHOP BENCH CHECK & REPAIR OF LRU(I)
     PK(I) =PROBABILITY OF SHOP CANNOT DUPLICATE DISCREPANCY (CND)
            OF LRU(I)
     PN(I) =PROBABILITY OF LRU(I) ENTERING SHOP BEING SENT TO THE
            DEPOT FOR REPAIR
     TW(I) =TASK TIME FOR SHOP BENCH CHECK &REPAIR OF LRU(I)
     TK(I) =TASK TIME FOR SHOP CANNOT DUPLICATE DISCREPANCY (CND)
            OF LRU(I)
     TN(I) =TASK TIME TO DETERMINE IF LRU(I) WILL BE SENT TO THE DEPOT
            FOR REPAIR
     MFHBMA= MEAN FLIGHT HOURS BETWEEN MAINTENANCE ACTION FOR
             SUBSYSTEM(M)
     KTR(J)= PROPORTION OF SHOP MEAN TIME TO REPAIR OF THE LRUS THAT
             REQUIRES THE TEST STATION(J) TO BE USED
```

Figure D.18 — Cost of maintaining support equipment equatin (concluded).

```
*CSW
COST OF SOFTWARE SUPPORT      (ALT. INPUT VE-2, 33-40)
CSW = PC + SCC
     WHERE:
     PC = SOFTWARE LABOR COST FOR BASE YEAR T
     SCC= SOFTWARE COMPUTER COST
```

```
*PC
SOFTWARE LABOR COSTS FOR BASE YEAR (T) (ALT. INPUT VS-4,57-64)
PC = (NSS)(SLR)
     WHERE:
     NSS = AVERAGE NUMBER OF SOFTWARE SUPPORT STAFF (INPUT)
     SLR = SOFTWARE STAFF LABOR RATE (INPUT)

*SCC
SOFTWARE COMPUTER COST  (ALT. INPUT VS-4,33-40)
SCC = (CUR)(CC)(NSS)(12)
     WHERE:
      CUR = SOFTWARE COMPUTER UTILIZATION RATE IN HOURS PER MANMONTH
      CC  = SUPPORT COMPUTER COST PER HOUR
      NSS = AVERAGE NUMBER OF SOFTWARE SUPPORT STAFF (INPUTS)
      12  = NUMBER OF MONTHS PER MANYEAR
```

Figure B.19 — Cost of software support equation.

```
*CJG
COST OF SUPPORTING MAINTENANCE MANUALS    (ALT. INPUT VE-2,41-48)
CJG = (KPJG)(KCJG)(CJGI)
    WHERE:
    KPJG = FACTOR ESTIMATE OF THE PORTION OF THE MANUALS THAT WILL BE
           CORRECTED AND/OR CHANGED EACH YEAR (INPUT)
    KCJG = FACTOR ESTIMATE OF THE REDUCED COST NECESSARY TO REWRITE
           THE CORRECTIONS AS COMPARED TO THE INITIAL WRITING COSTS
           (INPUT)
    CJGI = COST OF MAINTENANCE MANUALS INITIAL
```

Figure B.20 — Cost of supporting maintenance manuals equation.

B.22 COST OF INVENTORY MANAGEMENT (CIM)

The CIM element is the recurring annual cost of managing the Air Force inventory of spare parts to support a system. When these spares have become a part of the Air Force-wide supply system (refer to the CIMI element), they add to the cost of maintaining the supply system. The costs incurred include receiving, unpacking, storage, inspection, distribution, packaging, and crating. The material and personnel salaries needed to fill requisitions, as well as maintain the inventory, are also accounted for in CIM. The equation for CIM is given in Figure B.21.

The CIM equations use the same standard cost factors as the AFLC LSC model to account for all of the recurring costs inherent in the inventory management requirements. This equation also is shown in Figure B.21.

The first term of the CIM equation computes the cost of managing all of the new inventory items that were added into the wholesale inventory loop. The number of new inventory items (NNII, as in the CIMI equation) is multiplied by an annual management cost factor (RMC).

The second term computes the base level supply management cost. The new items of supply, as well as already stock-numbered items which will be carried for the first time in base supply system (SP), are added to provide the number of base level inventory items (BLII) per LRU(I). The sum of BLIIs then is multiplied by an annual base supply inventory management cost factor (SA), and by the number of bases supported, to obtain the base supply cost term.

```
*CIM
COST OF INVENTORY MANAGEMENT        (ALT. INPUT VE-2,49-56)
CIM = RMC * SUM(I) (NNII(I)) + NB * SA * SUM(I) (BLII(I))
     WHERE:
     RMC  = ANNUAL MANAGEMENT COST TO MAINTAIN A LINE ITEM OF SUPPLY
            (ASSEMBLY OR PIECE PART) IN THE WHOLESALE INVENTORY SYSTEM
     NNII = NUMBER OF NEW INVENTORY ITEMS WITHIN EACH LRU(I)
     NB   = NUMBER OF BASES  (INPUT)
     SA   = ANNUAL BASE SUPPLY LINE ITEM INVENTORY MANAGEMENT COST
     BLII = NUMBER OF BASE LEVEL INVENTORY ITEMS PER LRU(I)
```

```
*NNII
NUMBER OF NEW INVENTORY ITEMS WITHIN EACH LRU(I)
NNII(I) = 1 + PA(I) + PP(I)
     WHERE:
     PA = NUMBER OF NEW "P" CODED REPAIRABLE ASSEMBLIES WITHIN THE LRU
     PP = NUMBER OF NEW "P" CODED CONSUMABLE ITEMS WITHIN THE LRU

*BLII
NUMBER OF BASE LEVEL INVENTORY ITEMS PER LRU(I)
DLII(I) = 1 + PA(I) + PP(I) + SP(I)
     WHERE:
     PA =NUMBER OF NEW "P" CODED REPAIRABLE ASSEMBLIES WITHIN THE LRU
     PP =NUMBER OF NEW "P" CODED CONSUMABLE ITEMS WITHIN THE LRU
     SP =NUMBER OF STANDARD (ALREADY STOCKED NSN) PARTS WITHIN THE LRU
         WHICH WILL BE MANAGED FOR THE FIRST TIME AT BASES WHERE THIS
         SYSTEM IS DEPLOYED
```

Figure B.21 — Cost of inventory management equation.

APPENDIX C - ACRONYMS

Note that acronyms of equation terms are defined in the LCCIM Glossary contained in Volume II to this report rather than on this table.

AAF	annual adjustment factor
ADJLCC	adjusted life cycle cost
AFSC	Air Force specialty code
ATE	automatic test equipment
CND	cannot duplicate
DAIS	Digital Avionics Information System
DOD	Department of Defense
ECP	engineering change proposal
FOM	figure of merit
ID	equipment identification number
IMA	intermediate maintenance activity
LCC	life cycle cost
LCCIM	Life Cycle Cost Impact Model
LCCM	Life Cycle Cost Model
LRU	line replaceable unit
LSC	logistics support cost
MFHBMA	mean flight-hours between maintenance actions
MMH	maintenance man-hours
MTBF	mean time between failures
NRC	nonrecurring cost
NRTS	not reparable this station
O&S	operation and support
PIUP	planned inventory usage period
RC	recurring cost total
RCY	recurring cost per year
R&D	research and development
RDT&E	research, development, test, and evaluation
R&M	reliability and maintainability
SCALAR	single value variables
SE	support equipment
SRU	shop replaceable unit
WSAP	weapon system acquisition process
WUC	work unit code