ESD-TDR-64-126

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# USER'S MANUAL FOR THE COMPUTERIZED ELECTRONIC

## SYSTEM COST MODEL:  7030 MODIFICATIONS

TECHNICAL DOCUMENTARY REPORT NO.  ESD-TDR-64-126

OCTOBER 1964

B. L. Moores

Prepared for

DEPUTY FOR ADVANCED PLANNING

ELECTRONIC SYSTEMS DIVISION

AIR FORCE SYSTEMS COMMAND

UNITED STATES AIR FORCE

L. G. Hanscom Field,  Bedford,  Massachusetts

Project No.  850.0

Prepared by

THE MITRE CORPORATION
Bedford,  Massachusetts
Contract AF19(628)-2390

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FOREWORD

The author wishes to acknowledge the contribution of Miss Joan
C. DesRoches, programmer of the original cost model, who
assisted in converting the program from FORTRAN II to FORTRAN
I V and also wrote the STRAP subroutine UNPACK.
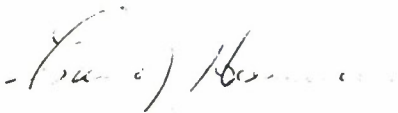
This TDR is a supplement to ESD-TDR-63-446.

ABSTRACT

A computerized electronic system cost model was developed by the Systems Analysis Department and documented in ESD-TDR-63-446. The present document describes the changes which resulted from converting the computer program for the model from FORTRAN II for the IBM 7090 to FORTRAN IV for the IBM 7030, and from implementing several operational improvement.

REVIEW AND APPROVAL

FRANCIS J. HOERMANN
Colonel, USAF
Comptroller

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# SECTION I

## INTRODUCTION

The computerized electronic system cost model, described in ESD-TDR-63-446, <u>User's Manual for the Computerized Electronic System Cost Model</u>, dated October 1964, has been converted from an IBM 7090 FORTRAN II program to an IBM 7030 FORTRAN IV program. At the same time several operation improvements contemplated when the original model was developed were programmed.

Three classes of modifications have been made:

(1)   Revisions to CERs. The maximum number of times a CER may be used has been increased for many CERs by enlarging the parameter tables stored in the computer. One CER has been added and another changed.

(2)   Additional Reports. A report (Input Cost Element) can now be printed that contains the information on the Input Cost Element Sheets, including the shaded areas not key punched. This report also prints the factor and element changes for each sensitivity run.

(3)   Output Control. A "super-control" program has been written which provides the option of printing the output on the system printer or storing it on a separate tape for later use.

This report revises and updates ESD-TDR-63-446 to reflect the current 7030 program. The sections are designed as either revisions (R) or additions (A) to the User's Manual. Each section of ESD-TDR-63-446 which is revised has been rewritten. The additions are intended to follow the text originally written for the subsection.

Sections II and III include the modifications to the Introduction and the Description of Computerized Cost Model (Section 1.0 and 2.0 in the User's Manual). Section IV covers the revisions to the Primer (Section 3.0 in the User's Manual). Changes which affect the Reference Manual (Section 4.0 of the User's Manual) are presented in Section V. Section VI discusses the revisions and additions to the Computer Program Description (Section 5.0 in the User's Manual).

# SECTION II

## CHANGES TO THE INTRODUCTION (SECTION 1.0)

The following changes in the Introduction of the <u>User's Manual</u> reflect the recent model revisions.

### 1.1  Purpose of User's Manual (R)

(First paragraph only;  remainder of Section 1.1 unchanged)

The Systems Analysis Department of MITRE has developed a computerized electronic system cost model as part of its work in system cost methodology. This document describes the current version of the model and gives instructions for the electronic data processing procedures, including presentation of the key punch input forms, computer output formats, and a description of the computer program logic.  The model, originally programmed for the IBM 7090 computer, has been updated for the IBM 7030, on which it is currently operational.

# SECTION III

## CHANGES TO THE DESCRIPTION
## OF COMPUTERIZED COST MODEL (SECTION 2.0)

The following changes in the Description of Computerized Cost Model of the User's Manual reflect the recent model revisions.

### 2.5.2    Analytical Data (A)

A report, designated Table I, containing all of the information on the input cost element estimate sheets (except the budget code is also available if the analyst desires such backup data for his cost study.  A sample format is shown in Appendix I.

---

### 2.8    Planned Extensions (R)

The operational program has been converted from the IBM 7090 computer to the IBM 7030, and several minor changes have been made.  The extensions discussed in Sections 2.8.1 through 2.8.5 below, have been deferred for the present but  may be incorporated at a later date.

SECTION IV

CHANGES TO THE PRIMER (SECTION 3.0)

The following are the modifications and additions to the Primer of the User's Manual.

### 3.2.1  Direct Dollar Estimates (R)

Two CERs, 01 and 24, are available for operating on direct dollar estimates. In CER 01, the analyst estimates time-phased direct dollar costs; a total over years is calculated and the total and time-phased costs are stores in the proper locations of the structure. In CER 24, Multiple Direct, the analyst estimates from two to seven sets of time-phased direct dollar costs; these costs are summed for each time period, and these time-phased costs and the total over years are stores in the structure. The analyst need enter only the number of cards for which he has estimates.

---

### 3.2.4  Factors (R)

CERs 16, 17, 18, and 31 — Factor (1), Factor (2), Factor (3), and Factor (4), respectively — convert estimates of resources such as "number of instructions" or "man-years contractor engineering" to dollars through the use of factors such as dollars per instruction or dollars per man-year contractor engineering. In CER 16, one resource estimate is entered and converted to dollars; in CER 17 two resource estimates for the same element are entered, converted to dollars, and summed to obtain the element cost estimate; in CER 18 three estimates; and in CER 31 four estimates are entered, converted and summed.

### 3.2.6  Move and Subtracts (R)

(CER 33 is changed to CER 32.)

---

### 3.2.7  Unassigned CER Numbers (R, A)

CERs 33 through 37 are presently unassigned.  These CERs will be utilized as other mathematical functions such as exponential and multiple regression relationships are developed.

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(Footnote on Page 26 no longer applies.)

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### 3.4  Output Table Control (A)

An additional table, Table I, containing the information on the input cost element estimate data sheets can now be generated.  If the analyst desires this table, an entry is made on the System Card (Type 01) as described in Section 4.1.2 and all input element estimates for all passes of the first run will be printed.  The analyst may also specify zero suppression for the table, i.e., not to print entries for elements that are not being costed.  The number of lines to be printed on a page may also be varied by the proper entry on the System Card.

A formal report showing the changes made for each sensitivity run is now produced.  This report, a sample of which is shown in Appendix I, Exhibit 2, is discussed in Section 3.6 below.

The analyst may request Table I and the report showing the sensitivity changes without calculating costs.  A computer program, INREPT, has been written which uses the same data deck as the computerized cost model program,

but bypasses the calculations for the output tables and prints only Table I and the sensitivity changes.

A short "super-control" program preceding the executive routine now permits the analyst to choose between (1) printing all output reports via the computer monitor system printer and (2) writing a special output tape from which printing can be done later. Output via the system printer is available more quickly but usually only one copy can be obtained. On the other hand, printing from a special output tape may involve a delay in obtaining results, but as many copies as desired can be printed and the tape retained as long as it is needed.

---

## 3.6 Changes for Sensitivity Analysis (A)

Changes in percentages, factors, and input cost estimates for sensitivity analysis will be printed for each run. The original value and the value for the particular run are included for each factor and percentage change, and each incremental change. The sizes of the incremental changes are also shown. For revised cost element estimates, the table includes the element names, units of measure and reference elements, if any, as well as the numerical information on the cost element change cards.

SECTION V

## CHANGES TO THE REFERENCE MANUAL (SECTION 4.0)

The changes to the cost model result in the following modifications to the Reference Manual section of the User's Manual.

### 4.1   Types of Cards (R)

(First sentence only;  the remainder of the text of Section 4.1 is unchanged.)

Thirteen card formats are currently used by the model.

TABLE 2 (A)

Types of Cards Used in Cost Model

| Card Code | Card Type | Card Name |
|---|---|---|
| 13 | Model | NOT COSTED Nomenclature |
| 15 | System Data | Unit of Measure and Reference Element |

---

### 4.1.1   Model Cards (R, A)

Three of the 13 card formats may be considered model types; these are 02, CER Parameters, 03, Factor and Percentage Values, and 13 NOT COSTED Nomenclature.   The additional 13 card is described below.

### 13 NOT COSTED Nomenclature Card

A card containing the Hollerith characters "NOT COSTED" must be inserted before the first run control card (04) in the data deck, even if the input cost element estimates are not to be printed.   The term is used in printing the input

information when an element is not being costed, appearing in place of the unit of measure for that element.

The format of the card is shown below:

| Card Columns | Information |
|---|---|
| 1-2 | Card Code (13) |
| 3 | Blank |
| 4-13 | NOT COSTED |

---

### 4.1.2   Control Cards (A)

### 01- System

(The following additional information is entered on the system card:)

| Card Columns | Information |
|---|---|
| 55 | 1 = yes, 0 = no — for printing Table I |
| 56 | 1 = yes, 0 = no -- for printing elements in Table I that are not costed |
| 57-58 | Number of lines to be printed on a Table I page before starting a new page if desired to be different from 53 |
| 59-60 | Number of lines to be printed on a Table I page before starting a new page with another subsystem, when different from 45. |

Unless alternative line numbers are given in columns 57-60, the printing routine for input data will start a new page if (1) the last line of an element is equal to or greater than the 53rd line of the page or (2) the last line of a subsystem is equal to or greater than line 45 on the page. The numbers 53 and 45 appear satisfactory, so it is unlikely that alternatives will be necessary.

---

### 4.1.3 System Data Cards (A)

The remaining five card types are considered system data cards. Card 15, Unit of Measure and Reference Element, is associated with all runs. The standard nomenclature for the 15 cards is pre-printed on the Input Cost Element Estimate Sheets and may be punched from those sheets. Non-standard nomenclature for the 15 cards may be recorded on the blank Input Cost Element Estimate Sheet.

### 15 - Unit of Measure and Reference Element

Unit of Measure and Reference Element cards are system data cards used in printing the input information. A set of 15 cards must precede the Input Cost Element Estimate (06) cards for each pass of the first run only if Table I is desired. The information on the cards may vary between passes. However, 15 cards must always be included for each element being changed in a sensitivity run.

The "unit of measure" refers to the input cost data on the 06 (or -6) card with the same sequence and card numbers (field 8 on the Input Cost Element Estimates Sheet). Only one 15 card is necessary for a subsystem which is not costed (CER 99) and should contain the words "NOT COSTED" in place of a unit of measure. The standard unit of measure cards may be included, however, for individual elements that are not costed, because the "NOT COSTED" label is then supplied from the 13 card previously read into the computer.

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If the unit of measure is a percentage, the reference element gives the sequence number of the element of which the percentage is being taken. When there is more than one reference element, the number of reference elements is given.

A standard Unit of Measure and Reference Element Card contains:

| Card Column | Information |
| --- | --- |
| 1-2 | Card Code (15) |
| 3-6 | Sequence Number |
| 7 | Blank |
| 8-17 | Unit of Measure (ten or less alpha-numeric characters) |
| 18 | Blank |
| 19-22 | Reference element number * |

## 4.2 Card Organization (R)

The input data cards are organized for processing in a fashion which follows the card numbers. Fifteen cards for Run 1 are included only if Table I will be printed.

---

\* If there is more than one reference element, the number of reference elements which apply are given, rather than any particular element.

| Card Set* | Description |
|---|---|
| 1 | Header Card (00) with number of systems. |
| 2 | System Card (01) with number of runs and number of passes per run. |
| 3 | Parameter Cards (02) – No internal order necessary. A blank card is required at the end of these cards. |
| 4 | Factor and Percentage Values (03) – No internal order necessary. A blank card is required at the end of these cards. |
| 5 (A) | NOT COSTED Nomenclature Card (13) |
| 6 | Run Card (04) for first run. |
| 7 | Pass Card (05) for first pass of first run. |
| 8 (A) | Unit of Measure and Reference Element Cards (15) for first pass. The cards must be arranged by sequence number and terminated by a blank card. |
| 9 | Input Cost Element Estimates (06) for first pass. A blank card is required at the end of these cards. It is recommended these cards be sorted by the sort code in Columns 78-80 for efficient computer processing. |
| 10 | Pass Card (05) for second pass, if any, followed by 15 cards,** 06 cards and a blank card for second pass. |

---

\* An (A) in the Card Set column signifies additional cards resulting from modification of the model.

\*\* The cards must also be arranged by sequence number and terminated by a blank card.

| Card Set | Description |
|---|---|
| 11 | Pass card (05), 15 cards, 06 cards, and a blank card for third, and subsequent passes, if any. There is no practical limit to the number of passes that may be processed. |
| 12 | Run Card (04) for second run, if any, with number of incremental changes, revised factors and percentages and revised input element <u>cards</u>, not elements alone, for all passes in second run. |
| 13 | Sensitivity Factor and Percentage Increments (-1), if any. |
| 14 | Sensitivity Factor and Percentage Changes (-3), if any. |
| 15 (A) | Unit of Measure and Reference Element Cards (15) for elements being changed in the run. The number of cards is the same as the number of revised input element cards for the run as shown on the Run Card. Their order must correspond to the order of the -6 cards for the run. |
| 16 | Sensitivity Element Change Count (07) of input card changes for first pass in which elements are changed, if any. |
| 17 | Sensitivity Input Cost Element Changes (-6) for pass associated with preceding 07 card. |
| 18 | Sensitivity Element Change Count (07) for next pass, if any, in which elements are changed, and associated Sensitivity Input Cost Element Changes (-6). |

| Card Set | Description |
|---|---|
| 19 | 07 and -6 cards for any additional passes of second run. |
| 20 | Pass Cards (05) for all passes in second run. |
| 21 | Data organized by items 12 through 20 for each additional sensitivity run; there is no practical limit to the number of sensitivity runs which can be made. |
| 22 | If another system is to be processed, the data for the next system is organized by items 2 through 21, thus requiring as input its separate set of Parameter Cards (02) and Factor and Percentage Values (03). As many different systems may be processed as desired. |

In addition to the changes in the data cards noted above, a change has also been made in the program deck to implement the "super-control" program feature. See new Section 4.7 below.

The data deck is also used with the program INPREPT to generate a separate Input Cost Element Report.

(Remainder of the text for this section is unchanged.)

---

Figure 8, Data Organization: Single System Multi-Pass and Multi-Run, should be revised to include:

a.   the new 13 card following Blank (2),

b.   the 15 cards following the 05 cards in the first run,

c.    Blank (3) following each set of 15 cards in the first run –
Blank (3) in the original figure becomes Blank (4),

d.    the 15 cards following the –3 in other runs.

---

## TABLE 3 (A)

### Identification Codes

| Card Type | Card Column ⟶ <br> Name ⟶ | 73 <br> System | 74-75 <br> Run | 76-77 <br> Pass | 78-80 <br> Sort Code |
|---|---|---|---|---|---|
| 13 | | X | 00 | 00 | 006 |
| 15 | | X | YY | ZZ | 006 |
| Blank (3)* | | X | YY | ZZ | 007 |

---

\*    Original Blank (3) is now Blank (4) with no change in its identification code.

## 4.4  CER Utilization (R)

<p style="text-align:center">TABLE 4 (R)</p>

<p style="text-align:center">CER Utilization</p>

| CER # | CER Name | No. of Param. | No. of 06 Cards | Max. No. Avail | No. Currently In Use |
|---|---|---|---|---|---|
| 00 | No Operations | 0 | 1 | No Limit | -- |
| 01 | Direct Dollars | 0 | 1 | No Limit | - |
| 02 | Total of 2 | 2 | 1 | 80* | 54 |
| 03 | Total of 3 | 3 | 1 | 60* | 41 |
| 04 | Total of 4 | 4 | 1 | 35* | 26 |
| 05 | Total of 5 | 5 | 1 | 25* | 17 |
| 06 | Total of 6 | 6 | 1 | 6 | 4 |
| 07 | Total of 7 | 7 | 1 | 3 | 0 |
| 08 | Total of 8 | 8 | 1 | 3 | 0 |
| 09 | Total of 9 | 9 | 1 | 5 | 2 |
| 10 | Total of 10 | 10 | 1 | 10 | 7 |
| 11 | Percent Direct (1) | 2 | 1 | 60* | 41 |
| 12 | Percent Direct (2) | 3 | 1 | 15* | 7 |
| 13 | Percent Spread (1) | 2 | 1 | 35 | 29 |
| 14 | Percent Spread (3) | 4 | 1 | 10* | 1 |
| 15 | Percent Operations (1) | 2 | 1 | 20 | 14 |
| 16 | Factor (1) | 1 | 1 | 40* | 18 |
| 17 | Factor (2) | 2 | 2 | 50* | 22 |
| 18 | Factor (3) | 3 | 3 | 25* | 7 |
| 19 | Percent Spread Special | 1 | 2 | 5 | 2 |
| 20 | Factor (1) + Direct Special | 1 | 3 | 5 | 3 |
| 21 | Factor (2) + Direct Special | 8 | 4 | 4 | 2 |
| 22 | Factor (4) + Percent Spread | 6 | 5 | 7 | 5 |
| 23 | Factor (4) + Direct Special | 10 | 6 | 4 | 2 |
| 24 | Multiple Direct | 0 | 2-7 | No Limit | - |
| 25 | Multiple Percent Spread | 7 | 4 | 3 | 1 |
| 26 | Move | 1 | 1 | 100 | 63 |
| 27 | Factor (2) + Direct | 2 | 3 | 10 | 5 |
| 28 | Subtract (1) | 2 | 1 | 5 | 2 |
| 29 | Subtract (2) | 3 | 1 | 10* | 5 |
| 30 | Subtract (3) | 4 | 1 | 5 | 1 |
| 31 | Factor (4) ** | 4 | 4 | 10 | 0 |
| 32 | Total of 4 Minus 1 | 5 | 1 | 6* | 2 |
| 33 | Unassigned | 2 | -- | 3 | - |
| 34 | Unassigned | 3 | - | 3 | - |
| 35 | Unassigned | 4 | - | 3 | - |
| 36 | Unassigned | 5 | -- | 3 | - |
| 37 | Unassigned | 6 | - | 3 | - |
| 99 | Subsystem Suppression | 0 | 1 | No Limit | - |

* Increased

** New

## TABLE 5

### CERs Obtainable From Other CERs

| Desired CER | | CER From Which Obtainable | |
| --- | --- | --- | --- |
| CER # | CER Name | CER # | CER Name |
| 02–09 | Totals 2 through 9 | 03–10 | Totals 3 through 10 |
| 11 | Percent Direct (1) | 12 | Percent Direct (2) |
| 13 | Percent Spread (1) | 14 | Percent Spread (3) or |
| | | 22 | Factor (4) + Percent Spread |
| 16 | Factor (1) | 17, 18, 31 | Factor (2), (3), and (4) |
| | | 20–23, 27 | Factors Plus Others |
| 17 | Factor (2) | 18, 31 | Factor (3) and (4) |
| | | 21–23, 27 | Factors Plus Others |
| 18 | Factor (3) | 22–23, 31 | Factors Plus Others, Factor (4) |
| 21 | Factor (2) + Direct Special | 23 | Factor (4) + Direct Special |
| 28 | Subtract (1) | 29–30 | Subtract (2) and (3) |
| 29 | Subtract (2) | 30 | Subtract (3) |
| 31 | Factor (4) | 22–23 | Factor (4) + Others |

### 4.6.1  Checks Before Key Punching (A)

An additional check should be made on the Input Cost Element Estimate
Sheets:

(9)  The given unit of measure and reference element are correct.  A
       new unit of measure does not exceed 10 characters.

---

### 4.6.2  Checks After Key Punching (1401 Listing) (A)

| Card Type | Type of Check | |
|---|---|---|
| 01 | 3) | Table I options selected agree with analyst's request. |
| 13 | | Included with proper format. |
| 15  (First run) | 1) | Number of cards required for each element are present in the proper order. |
| | 2) | The elements are arranged by sequence number. |
| 15  (Sensitivity runs) | 1) | Number of cards correspond to number of -6 cards. |
| | 2) | Cards are arranged in the same order as the -6 cards. |

---

## 4.6.3 Computer Error Diagnostics (A)

### TABLE 6

### List of Diagnostic Print Outs and Computer Action

| Diagnostic Print Out | Reason | Subroutine | Computer Action |
|---|---|---|---|
| SEQ. NO. AND REF. NO. NOT MATCH | Seq. # on 06 Card not equal seq. # on 15 Card | SANDS | Stop printing input report; program continues |
| SEQ. NO. AND REF. NO. NOT MATCH | Seq. # on 06 Card not equal seq. # on 15 Card | SENSE | No computer action |

---

## 4.7 Output Control Preparation (New Section)

The proper control routine and IOD deck for the method of output desired must be inserted at the beginning of the program deck. Two control program decks, differing only in the inclusion of an End-of-File Card in the tape generation program, are maintained and are clearly labeled for quick insertion. Generally a new Table Tape will be generated for each new system, thus requiring recompilation of the IOD deck with a new reel number on the REEL card for IOD 7D. Two basic FORTRAN IOD decks have been prepared. The IOD deck for tape generation has a TAPE card for IOD 6, whereas PRINTER is assigned to IOD 6 in the IOD deck for system printing. Other necessary control cards are described in the 7030 Facility Manual.

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SECTION IV

CHANGES TO THE COMPUTER PROGRAM DESCRIPTION (SECTION 5.0)

The following changes and additions have been made in the Computer Program Description in the User's Manual.

## 5.1 Computer Program (R)

(First paragraph only; remainder of Section 5.1 is unchanged.)

The computer program is controlled by one of two short control programs, depending on the method of output desired. In both cases the control program merely calls the executive subroutine which controls, via other subroutines, the processing of the various types of input data, the computation of costs for the structure, and the generation and printing of output tables.

---

### 5.1.1 PARAM (R)

The subroutine PARAM reads in parameter cards (02) and under the control of the CER number and CER line number, stores the sequence number of the element to be calculated and the coded parameter addresses.

---

### 5.1.3 SANDS (R)

The subroutine SANDS is entered in the first run only. It reads in the original input cost element data (06) for a pass, scales the data, sequence checks the card number of elements with multi-card inputs, and writes the data on magnetic tape 8. The data are thus available for recall for use in subsequent runs.

SANDS calls a STRAP subroutine, UNPACK, which unpacks the card number and the scaling factors Y and Z, all of which have been read in as a single field in octal code by subroutine SANDS.

If the input data is to be printed, SANDS reads in the unit of measure and reference elements (15) and before the cost data is scaled, prints Table I. In addition to the 06 cards, the 13 card, and the 15 cards, SANDS uses the cost element nomenclature from the Table Tape as data in printing Table I.

_____

### 5.1.4   SENSE (R)

The subroutine SENSE is entered for all runs. In the first run, it initializes storage locations for sensitivity analysis. In subsequent runs, it reads from magnetic tape 8 the initial set of factors and percentages and checks for the three possible types of sensitivity changes. If new -1 cards are present, it enlarges the incremental table developed for this purpose. It checks for revised factors and percentages (-3 cards) and replaces old values with new ones. It then examines the incremental table and makes appropriate changes to the factors and percentages. If there are changes in the input data elements, the corresponding unit of measure and reference element (15) cards are read. The subroutine records the pass number, reads the new data (-6) and stores the data in a revised read area, the storage area for changing input data elements.

Revised factors and percentages and changes in input data elements are printed out immediately after the cards are read. Incremental changes are printed after each increment is made.

_____

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### 5.1.6   Controls On Card Reading (A)

The reading controls for the additional cards are:

NOT COSTED Nomenclature Card (13) – one card

Unit of Measure and Reference Element Cards (15) – terminated by a blank card in Run 1;  in sensitivity runs the number controlled by the number of input cost element changes specified on the run card.

---

### 5.2   Computation Subroutines (R)

(Changes to second paragraph only)

The subroutines PRECER and MOVE are called to move data associated with CER parameters to a working area.  After the costs are calculated, the subroutines STOUT and STOR store the results.

---

(Figure 10, Cost Model Data Organization, should be revised to include: (a) the new 13 card following the 03 cards;  (b) the 15 cards following the 05 card in the first run and terminated for a blank card;  and (c) the 15 cards following the -3 cards in other runs.)

---

### 5.4   Program Specifications (R)

The computer programs are now all written in FORTRAN IV except for the single STRAP subroutine UNPACK.  The input data is read from Tape 2 while the output is either printed on the system printer or placed on Tape 3.  The model currently uses 7,600 core storage locations for instructions and 25,500 words for COMMON data and tables.

## 5.5  INPREPT Program  (New Section)

A program INPREPT has been assembled from the complete cost model program to by-pass the calculations for the costs and the output tables and to print only the Input Cost Element Estimates tables and the Changes in Factors, Percents, and Input Cost Elements.  INPREPT consists of the super-control program and modified versions of the subroutines EXEC, INFAP, SANDS, SENSE, and UNPACK.  The program uses the same data deck as the complete cost model.

*Barbara L. Moores*
Barbara L. Moores

# APPENDIX I

## ADDITION TO STANDARD TABLE FORMATS

Major References in Text – Section 2.5.2, 3.4, 4.7, 5.5

DATE 2/26/64
SYSTEM NO. SAMPLE
RUN NO. 1
PASS NO. 2

INPUT COST ELEMENT ESTIMATES

| ELEMENT NAME | SEQ NO. | USU. CER | C N | UNIT OF MEASURE | REF ELEM | Y | Z | PRIOR YEARS | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GENERAL SYSTEM SUBSYSTEM | 1001 | 9901 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| DATA PROCESSING SUBSYSTEM | | | | | | | | | | | | | | | | | | |
| MISSION EQUIPMENT | | | | | | | | | | | | | | | | | | |
| DEVELOPMENT, TEST + EVAL | 1017 | 302 | 1 | TOTAL | | | | | | | | | | | | | | |
| | 1018 | 303 | 1 | TOTAL | | | | | | | | | | | | | | |
| ANALYSIS + DESIGN | 1019 | 1301 | 1 | PCT SPREAD | 1026 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 25 | 25 | 0 | 0 | 0 |
| FABRICATION FOR TEST | 1020 | 1703 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| MOCKUPS PROTO. + OTHER | 1021 | 203 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| DEV TOOL + TEST EQUIP | 1022 | 2701 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| TEST + EVALUATION | 1023 | 1101 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| PROCUREMENT + INSTALLATION | 1024 | 1704 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| PRIME EQUIPMENT | 1025 | 403 | 1 | TOTAL | | | | | | | | | | | | | | |
| | 1026 | 204 | 1 | TOTAL | | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 350 | 700 | 0 | 0 | 0 |
| MISSION HARDWARE | 1027 | 101 | 1 | $ | | | | | | | | | | | | | | |
| SPECIAL TOOLING | 1028 | 102 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| DATA | 1029 | 1302 | 1 | PCT SPREAD | 1026 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| FIRST DESTINATION TRANS | 1030 | 1303 | 1 | PCT SPREAD | 1026 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 300 | 600 | 0 | 0 |
| INSTALLATION + CHECKOUT | 1031 | 128 | 1 | $ | | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| INITIAL SPARES | 1032 | 205 | 1 | TOTAL | | | | | | | | | | | | | | |
| SPARES | 1033 | 1304 | 1 | PCT SPREAD | 1026 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 70 | 0 | 0 | 0 |
| TRANSPORTATION OF SPARES | 1034 | 1305 | 1 | PCT SPREAD | 1033 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 |
| AEROSPACE GROUND EQUIP (AGE) | 1035 | 305 | 1 | PCT DIRECT | 1019 | | | | | | | | | | | | | |
| DEVELOPMENT, TEST + EVAL | 1036 | 1102 | 1 | TOTAL | | | | | | | | | | | | | | |
| PROCUREMENT + INSTALLATION | 1037 | 404 | 1 | TOTAL | | | | | | | | | | | | | | |
| EQUIPMENT | 1038 | 1103 | 1 | PCT DIRECT | 1026 | | | | | | | | | | | | | |
| DATA | 1039 | 1104 | 1 | PCT DIRECT | 1029 | | | | | | | | | | | | | |
| FIRST DESTINATION TRANS | 1040 | 1105 | 1 | PCT DIRECT | 1030 | | | | | | | | | | | | | |
| INSTALLATION + CHECKOUT | 1041 | 1106 | 1 | PCT DIRECT | 1031 | | | | | | | | | | | | | |
| INITIAL SPARES | 1042 | 1107 | 1 | PCT DIRECT | 1032 | | | | | | | | | | | | | |
| REPLACEMENT, MAINT + RENTALS | 1043 | 206 | 1 | TOTAL | | | | | | | | | | | | | | |
| MATERIALS + SERVICES | 1044 | 405 | 1 | TOTAL | | | | | | | | | | | | | | |
| FOLLOW-ON SPARES | 1045 | 1501 | 1 | PCT OPS | 1026 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 10 | 10 | |
| TRAN OF FOLLOW-ON SPARES | 1046 | 1108 | 1 | PCT DIRECT | 1045 | | | | | | | | | | | | | |
| EQUIPMENT REPLACEMENT | 1047 | 1502 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| SUBCONTRACT MAINTENANCE | 1048 | 103 | 1 | $ | | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | |
| RENTALS | 1049 | 104 | 1 | $ | | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | |
| DATA PRESENTATION SUBSYSTEM | 1050 | 9903 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| COMMUNICATIONS SUBSYSTEM | 1083 | 9904 | 1 | NOT COSTED | | | | | | | | | | | | | | |

EXHIBIT 1.

| ELEMENT NAME | SEQ NO. | USU. CER | C N | UNIT OF MEASURE | REF ELEM | Y | Z | PRIOR YEARS | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | YEARS | | | | | |
| DATA ACQUISITION SUBSYSTEM | 1118 | 9905 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| AEROSPACE VEHICLES SUBSYSTEM | 1151 | 9906 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| COMPUTER PROGRAMS SUBSYSTEM | 1184 | 9907 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| PERSONNEL SUBSYSTEM | 1204 | 9908 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| FACILITIES + SUPPORT SUBSYSTEM | 1241 | 418 | 1 | TOTAL | | | | | | | | | | | | | | |
| OPERATIONAL + SUPPORT FACIL | 1242 | 235 | 1 | TOTAL | | | | | | | | | | | | | | |
| RESEARCH + DEVELOPMENT | 1243 | 1401 | 1 | PCT SPREAD | 3 EL | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 50 | 0 |
| PROCUREMENT | 1244 | 419 | 1 | TOTAL | | | | | | | | | | | | | | |
| LAND ACQUISITION | 1245 | 122 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| EXISTING FACIL CHANGES | 1246 | 123 | 1 | $ | | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 10 | 0 |
| BASIC FACILITIES | 1247 | 2401 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| CONTINGENCIES | 1248 | 2501 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| INITIAL STOCKS | 1249 | 1902 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| ORGANIZATIONAL EQUIPMENT | 1250 | 1141 | 1 | PCT DIRECT | 1249 | | | | | | | | | | | | | |
| FACILITIES MAINT + OPERATION | 1251 | 236 | 1 | TOTAL | | | | | | | | | | | | | | |
| MATERIALS + SERVICES | 1252 | 601 | 1 | TOTAL | | | | | | | | | | | | | | |
| FOLLOW-ON SPARES | 1253 | 1511 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| HARDWARE REPLACEMENT | 1254 | 1512 | 1 | PCT OPS | 1244 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 0 |
| STOCKS CONSUMPTION | 1255 | 1513 | 1 | PCT OPS | 1249 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 0 |
| ORG EQUIP REPLACEMENT | 1256 | 1514 | 1 | NOT COSTED | | | | | | | | | | | | | | |
| UTILITIES SERVICES | 1257 | 124 | 1 | $ | | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 50 | 0 |
| SUBCONTRACT MAINTENANCE | 1258 | 125 | 1 | $ | | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 50 | 0 |
| LEASED FACILITIES | 1259 | 126 | 1 | $ | | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 50 | 0 |
| TOTAL SYSTEM | 1260 | 902 | 1 | TOTAL | | | | | | | | | | | | | | |

EXHIBIT 1 (Continued)

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CHANGES IN FACTORS, PERCENTS, AND INPUT COST ESTIMATES

FACTOR AND PERCENT CHANGES

| NO. | FACTOR NAME | ORIGINAL VALUE | VALUE FOR RUN |
|---|---|---|---|
| 129 | DATA PROC- SPARES TRANS AS PCT OF INITIAL SPARES | .154E-01 | .700E-01 |
| 146 | DATA PRES- SPARES TRANS AS PCT OF INITIAL SPARES | .154E-01 | .700E-01 |

INCREMENTAL CHANGES

| NO. | FACTOR NAME | ORIGINAL VALUE | VALUE FOR RUN | SIZE OF INCR. |
|---|---|---|---|---|
| 3 | DOLLARS/MAN-YR CONTRACTOR ENGINEERS | .350E+05 | .400E+05 | .500E+04 |
| 4 | DOLLARS/MAN-YR CONTRACTOR TECHNICIANS | .180E+05 | .230E+05 | .500E+04 |

INPUT COST ESTIMATE CHANGES

| ELEMENT NAME | SEQ NO. | USU. CER | C UNIT OF IN MEASURE | REF ELEM Y / | PRIOR YEARS | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | YEARS | | | |
| PASS NO. 2 | | | | | | | | | | | | | | | |
| MISSION HARDWARE | 1027 | 101 | 1 S | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 |

EXHIBIT 2

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|---|---|
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| | 2b. GROUP  N/A |

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**4. DESCRIPTIVE NOTES** *(Type of report and inclusive dates)*

**5. AUTHOR(S)** *(Last name, first name, initial)*

Moores, B.L.

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| | Deputy for Advanced Planning, ESD,<br>L.G. Hanscom Field, Bedford, Mass. |

**13. ABSTRACT**

A computerized electronic system cost model was developed by the Systems Analysis Department and documented in ESD-TDR-63-446. The present document describes the changes which resulted from converting the computer program for the model from FORTRAN II for the IBM 7090 to FORTRAN IV for the IBM 7030, and from implementing several operational improvement.

DD FORM 1 JAN 64 **1473**

| 14. KEY WORDS | LINK A | | LINK B | | LINK C | |
|---|---|---|---|---|---|---|
| | ROLE | WT | ROLE | WT | ROLE | WT |
| Computer<br>Programming<br>IBM 7090<br>IBM 7030<br>System Costs<br>Data Processing | | | | | | |

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