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COST EFFECTIVENESS PROGRAM PLAN FOR JOINT TACTICAL COMMUNICATIO--ETC(U)
JUN 78

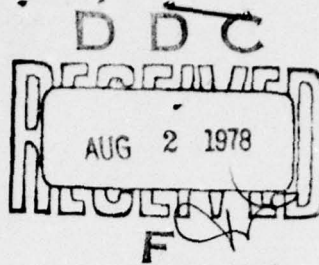
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COST EFFECTIVENESS PROGRAM PLAN FOR JOINT TACTICAL COMMUNICATIONS

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VOLUME III LIFE CYCLE COSTING

APPENDIX F COMPUTER MODELS FOR LCC

JUNE 1978

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APPENDIX F
COMPUTER MODELS FOR LCC

Volume III
Life Cycle Costing

COST EFFECTIVENESS PROGRAM PLAN
FOR
JOINT TACTICAL COMMUNICATIONS

David J. Boyd,
Capt, USAF

June 1978

Joint Tactical Communications Office
Fort Monmouth, New Jersey

SOURCE OF ADDITIONAL INFORMATION

ON

APPENDIX F

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

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

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APPENDIX F

COMPUTER MODELS FOR LCC

1.0 INTRODUCTION

1.1 Background

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

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

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

1.2 Purpose

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

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

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

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

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

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

1.3 Organization of Document

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

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

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

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

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

2.0

THE BASIC TRI-TAC LCCM

2.1

Cost and Data Elements

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

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

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

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

¹ Also called RDT&E.

TABLE 1

DATA CONSTANTS/ASSUMPTION
FOR THE BASIC TRI-TAC LCCM

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

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

TABLE 2

DATA INPUTS
FOR THE BASIC TRI-TAC LCCM

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

TABLE 3
COST DATA OUTPUT
FOR THE BASIC TRI-TAC LCCM

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

2.2 LCC MODEL EQUATIONS

2.2.1 General

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

2.2.2 Energy Consumption Cost (para 311)

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

2.2.3 Material Consumption (para 312)

$$R34 = R_{24} \times R_{25}$$

2.2.4 Operator Personnel (para 313 Alternate)

$$R41 = R_{11} \times R_{10} \times R_9 \times R_1$$

2.2.5 Maintenance Personnel Cost (para 321.1)

$$R35 = R_{36} + R_{37} + R_{38}$$

where, ^{1/}

$$R36 = \left[R_{22} + \left(\frac{R_1 \times R_{15}}{R_{16}} \right) \right] \times R_{26} \times R_9 \quad (\text{para 321.11})$$

and

$$R37 = \frac{R_1 \times R_9}{R_{16}} \times [1 - R_{27}] \times R_{17} \times R_{28} \quad (\text{para 321.12})$$

and

$$R38 = R_{57} \times R_{75} \times R_{90} \quad (\text{para 321.13})$$

2.2.6 Support Equipment Maintenance (para 321.3)

$$R39 = R_4 \times (R_{312} + R_{321})$$

2.2.7 Supply Personnel (para 322.1)

$$R42 = 0.03 (R_{36} + R_{37})$$

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

2.2.8

Replenishment Spares and Repair Material
(para 322.21 Alternate)

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

2.2.9

Inventory Administration Cost (para 322.3)

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

Y_i = Annual Recurring Cost

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

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

2.2.10

Transportation Cost (para 322.5 and Appendix E)

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

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

(a) $R44 = R3 \times R13$

(para 322.5)

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

2.2.11

Production Recurring (para 220)

$R336 = R49 \times R9 + R343$

2.2.12

Production Non-Recurring (para 210)

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

2.2.13 Unit Production Cost (Volume III, para 5.3) ^{1/}

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

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

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

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

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

2.2.14 R&D

R&D is a point estimate made by the analyst

2.2.15 Summation Formulas

$$\text{Operations} \quad R31 = (R33 + R34 + R41 + R50 + R51 + R52) R6$$

$$\text{Logistic Support} \quad R32 = (R35 + R39 + R40 + R42 + R43 + R44 + R53 + R54 + R55 + R56) R6$$

$$\begin{array}{l} \text{Operations \& Logistics Support} \\ R30 = R31 + R32 \end{array}$$

$$\text{Production} \quad R300 = R301 + R336 + R347$$

$$\text{LCC} \quad R48 = R200 + R300 + R30$$

^{1/}See also, "The Experience Curve Tables," U. S. Army Missile Command, Redstone Arsenal, Alabama, September 1962.

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

FIGURE F-2.1

OPERATOR PROCEDURES

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

FIGURE F-2.1

OPERATOR PROCEDURES
(Cont'd)

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

FIGURE F-2.1

OPERATOR PROCEDURES
(Cont'd)

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

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

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

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

FIGURE F-2.2

PROGRAM LISTING FOR LCC MODEL

```

0:
FXD 2:2920+R1:1.2
+R2:1.5+R3:1.1+R4:
.05+R5:10+R6:1.03
+R7:1.04+R8:
1:
.05+R60:25+R63:3
000+R64:1.001+R65
1.0001+R66:1.4+R6
7:1656+R90:
2:
ENT "EQU QUAN",R
9,"NO. OPERS",R10,
"OPR COST",R11,"
EQU MT",R13:
3:
ENT "AVE LRU COS
T",R14,"ORG MTTR
",R15,"EQU MTBF"
,R16,"INT MTTR",
R17:
4:
ENT "BASE UPC",R
18,"UPC QUAN",R1
9,"SLOPE",R20,"E
QU PMR",R21:
5:
ENT "PM HR",R22,
"MATL RATE",R24,
"MATL COST",R25:
6:
ENT "ORG PERS CO
ST",R26,"INT PER
S COST",R28,"DIS
CARD RATE",R27:
7:
ENT "DEPOT PERS.
COST",R75:
8:
ENT "NO. DEPOT PE
RS",R57,"EQU COD
E",R77,"ITERATIO
N NO.",R78:

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9:
PRT "OPS FACLT$+
R50","EQU LESHLD
S+R51","OTHER OP
S+R52":
10:
PRT "MAINT FACLT
S+R53","CONTRACT
SVCS+R54","SPLY
FACLT$+R55":
11:
PRT "OTHR LOGIST
S+R56","R&D+R200
","PEC.SUPT.EQU+
","R312":
12:
PRT "OTR NR PROD
+R320","COMMON S
PT EQU+","R331",
"OTR R PROD+R343
":
13:
PRT "-----
-----":SPC 2:
DSP "OTHER ESTIM
ATES":STP :
14:
"C":LOG R20/LOG
2+B:(R19(1+B)/((
R19+.5)+(1+B)-.5
+(1+B)))+(1/B)+
X:
15:
R18/X+B+C:(R9(1+
B)/((R9+.5)+(1+B
)-.5+(1+B)))+(1
/B)+X:
16:
PRT "UPC CALCULA
TED",CX+B+R49:
SPC :PRT "-----
-----":SPC
:

```

```

17:
PRT "ANNUAL O&S
COST","IN $":
SPC 2:PRT "ENERG
Y CONSUMPT",R21R
8R1R9+R33:
18:
PRT "MATL CONSUM
PT",R24R25R9+R34
,"OPER PERS",R9R
11R10R1+R41:
19:
PRT "OTHER OPS C
OST",R52," ORG
MAINT",R22+R1R1
5/R16)R26R9+R36:
20:
PRT " LRU REPAI
R",R1R9/R16)(1-
R27)R17R28+R37,"
DEPOT OVRHL PERS
":
21:
PRT R57R75R90+R3
8,"MAINT PERS CO
ST",R36+R37+R38+
R35:
22:
PRT "SUPT EQU MA
INT",R4(R312+R33
1)+R39,"CONTRACT
SVCS",R54:
23:
PRT "SUPY PERS",
.03(R36+R37)+R42
,"SPARE PARTS":
24:
PRT R1R9R14/R16+
(R27+R5(1-R27))+
R40:0+C+Z+R23+R1
2:
25:
0+R334:ENT "FSN
0-5K",C:306+X:23
6+Y:GSB "A":

```

FIGURE F-2.2

PROGRAM LISTING FOR LCC MODEL

(Cont'd)

```

26:
ENT "FSN 5K-49.9
K",C(306+X(326+Y
)GSB "A"
27:
ENT "FSN 50K-500
K",C(306+X(918+Y
)GSB "A"
28:
ENT "FSN 500K",C
(306+X(1489+Y
)GSB "A"
29:
PRT "INV MGT",R2
3,"INV HOLD",R71
.15R49R9-R40/21+
R68,"INV ADM"
30:
PRT R23+R68+R43
ENT "TRS EQU 1 0
R 2?",Z( IF Z=1
PRT "TRANS",R3+R
13+R44(JMP 5
31:
ENT "LRU WT",R61
,"PART WT",R62,
P2",R71,"P3",R72
(1-(R71+R72)+R70
)
32:
(R27-R70)/(R71+R
72)+R73(1-R73+R7
4(R70+2R71+2R72+
)X
33:
R70+R71(R62/R61R
74+R73)+2R72+Y
34:
PRT "TRANS",R61R
9(R1/R16)(R63R65
X+R64R66Y)+R44

```

```

35:
PRT "OTHER LOGIS
TS",R56
36:
PRT "-----
-----";SPC 1PRT
"LIFE CYCLE COST
"," IN #K";
SPC 1
37:
PRT "R&D",R200/1
000
38:
PRT "PROD N-R",
(R49R9+R337(R67+
R334+R331+R312+R
320)/1000+R301
39:
PRT "PROD REC",
R337+R343/1000+
R336
40:
PRT "TOTAL PROD",
R301+R336+R300
41:
PRT "TOTAL OPNS",
(R33+R34+R41+R5
0+R51+R52)R6/100
0+R31
42:
R35+R39+R40+R42+
R43+R44+R53+R54+
R55+R56+R32
43:
PRT "TOT LOG SUP
T",R32R6/1000,"T
OTAL O&S",R31+R3
2R6/1000+R30
44:
PRT "TOTAL LCC",
R300+R200/1000+R
30+R48;SPC 2
PRT "-----
-----";SPC 1

```

```

45:
PRT " REGISTER
S"," R1 TO R78
";1+Z;SPC 2
46:
PRT RZ( IF 5INT (
Z/5)=Z;SPC 1PRT
Z;SPC 1
47:
Z+1+Z( IF Z<78
GTO -1
48:
PRT "REGISTERS",
"R200,R300,R301",
"R312,R321,R331",
"R334,R336,R34
3"
49:
PRT R200,R300,R3
01,R312,R321,R33
1,R334,R336,R343
)
50:
SPC 3;PRT "BEGIN
TRADE-OFF","ANA
LYSIS.SEE"
51:
PRT " APPENDIX
F";SPC 6;DSP "ST
OP";STP 1GTO "C"
)
52:
"A";C(YR6)/R6+R2
3+R23(R12+C+R12
CX+R334+R334
RET 1
53:
END 1
217653
R558

```

2.5 Sample LCC Estimate

2.5.1 General

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

2.5.2 Assumptions

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

- a. Operating hours per year is 2920 hrs/yr (R1)
- b. Depot Overhaul Rate is 20% (R2)
- c. Transportation Factor is \$.50/lb (R3)
- d. Support Equipment Maintenance Factor is 10% (R4)
- e. Repair Material Cost Factor is 5% (R5)
- f. Years of Operation are 10 (R6)
- g. Holding Inventory Factor is 3% (R7)
- h. Power Cost is \$0.04 per kwh (R8)
- i. Transportation Cost Factor is 5% (R60)
- j. Distance from Organization to Intermediate Maintenance Level is 25 mi (R63)
- k. Distance from Intermediate to Depot Maintenance Level is 3,000 mi (R64)
- l. Transportation Factors of \$.001/lb/mi for short distances (R65) and \$0.0001 \$/lb/mi for long distances (R66)
- m. Non-recurring Investment Factor is 40% (R67)
- n. Available Manhours per Year is 1656 hrs (R90)

2.5.3

Input Data

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

- a. Equipment quantity to be procured in 1000 units (R9).
- b. Number of operators/equipment is 1/32 (R10)
(one man, 15 min/day) (this included for illustration purposes only).
- c. Cost of operator is \$9.00 per hour (R11).
- d. Facsimile equipment weight is 80 lbs (R13).
- e. Average assembly or replacement module cost for this equipment is \$300 (R14).
- f. Mean Time to Repair (MTTR) this equipment at Organizational Level is 15 min (.25 hr) (R15).
- g. Mean Time Between Failures (MTBF) is 2,500 hrs (R16).
- h. Mean Time To Repair (MTTR) the average replacement module is one hour (R17).
- i. The unit production cost is estimated at \$9,500 per unit (R18) for the first 500 units (R19).
- j. .85 learning curve slope (R20) is considered applicable for this equipment.
- k. Equipment has a power rating of 400 watts (.4 kw) (R21).
- l. Preventive maintenance time required for this equipment is 20 hrs/yr (R22).
- m. It is estimated that each equipment will use an average of 10,000 (R24) sheets of paper per year at \$0.05 (R25) per sheet.
- n. The average cost for maintenance personnel is \$8.50 per hour (R26) at Organization Level and \$9.00 per hour (R28) at Intermediate Level.
- o. It is assumed that 15% (R27) of the failed parts/modules will be discarded/scraped.
- p. Depot personnel cost is \$16.00 per hr (R75, number of Depot personnel is 3 (R57)).

- q. For bookkeeping purposes, the equipment is given a code number 4.01 (R77) and an iteration number 1 (R78).
- r. The Research and Development Costs for this equipment are assumed to be \$4 million (R200).
- s. Peculiar Support Equipment \$20,000 (R312), Common Support Equipment \$20,000 (R331).
- t. Other Non-recurring Production Costs (R320) are estimated at \$120,000.
- u. Facsimile equipment will require the supply system to introduce 50 new FSN's values less than \$5,000 and 3 FSN's valued between \$5,000 and \$50,000. Total number of new FSN's is 53 (R12).
- v. The average weight of packaged LRU's (line replaceable units) and repair parts is estimated to be 8 lbs (R61) and 2 lbs (R62) respectively.
- w. P2 (R71) and P3 (R72) are estimated to be 0.05 and .93 respectively.

2.5.4 Cost Element Outputs

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

- a. Unit Production Cost (R49) is \$8,089.
- b. Energy Consumption Cost (R33) is \$46,720 per year.
- c. Material Consumption Cost (R34) is \$500,000 per year.
- d. Operating Personnel Cost (R41) is \$821,250 per year.
- e. Maintenance Personnel Cost (R35) is \$260,905 per year.
 - 1. At Organization Level (R36), \$172,482.
 - 2. At Intermediate Level (LRU Repair) (R37), \$8,935.
 - 3. At Depot Level (Depot overhaul) (R38), \$79,488.
- f. Support Equipment Maintenance Cost (R39) is \$4,000 per year.
- g. Supply Personnel Cost (R42) is \$5,433 per year.

- h. Spare Parts and Repair Material Cost (R40) is \$67,452 per year.
- i. Inventory Management Cost (R23) is \$12,778 per year.
- j. Inventory Holding Cost (R68) is \$35,388 per year.
- k. Inventory Administrative Cost (R43) is \$48,165 per year.
- l. Transportation Cost (R44) is \$5,792 per year.
- m. Production Non-recurring Costs (R301) are \$3,412K.
- n. Production Recurring Costs (R336) are \$8.089K.
- o. Operations Costs (R31) are \$13,680K.
- p. Logistics Costs (R32) are \$3,918K.

2.5.5

Total Cost Outputs

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

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

- a. Research and Development Cost (R200), \$4.000 million.
- b. Production Cost (R300), \$11.5 million.
- c. Operations and Logistics Costs (R30), \$17.597 million.

FIGURE F-2.3

COMPUTER OUTPUT TAPE

	ANNUAL O&S COST IN \$	LIFE CYCLE COST IN \$K
TACTICAL		R&D
DIGITAL	ENERGY CONSUMPT	4000.00
FACSIMILE	46720.00	PROD N-R
EXAMPLE	MATL CONSUMPT	3411.72
	500000.00	PROD REC
	OPER PERS	8088.76
	821250.00	TOTAL PROD
	OTHER OPS COST	11500.49
	0.00	TOTAL OPNS
	ORG MAINT	13679.70
	172482.00	TOT LOG SUPT
	LRU REPAIR	3917.57
	8935.20	TOTAL O&S
	DEPOT OVRHL PERS	17597.27
	79488.00	TOTAL LCC
	MAINT PERS COST	33097.76
	260905.20	
	SUPT EQU MAINT	
	4000.00	
	CONTRACT SVCS	
	0.00	
	SUPY PERS	REGISTERS
	5442.52	R1 TO R78
	SPARE PARTS	
	67452.00	2920.00
	INV MGT	.20
	12778.00	.50
	INV HOLD	.10
	35087.66	.05
	INV ADM	5.00
	48165.66	
	TRANS	10.00
	5791.54	.03
	OTHER LOGISTS	.04
	0.00	1000.00
		.03
		10.00
OPS FACILTS+R50		
EQU LESHLDs+R51		
OTHER OPS+R52		
MAINT FACILTS+R53		
CONTRACT SVCS+R54		
SPLY FACILTS+R55		
OTHR LOGISTS+R56		
R&D+R200		
PEC. SUPT. EQU+		
R312		
QTR NR PROD+R320		
COMMON SPT EQU+		
R331		
QTR R PROD+R343		

UPC CALCULATED		
8088.76		

FIGURE F-2.3

COMPUTER OUTPUT TAPE
(Cont'd)

9.00	172402.00	8.00
53.00	8935.20	2.00
80.00	79488.00	25.00
300.00	4000.00	3000.00
.25	67452.00	.00
15.00	40.00	65.00
2500.00	821250.00	.00
1.00	5442.52	.40
9500.00	43165.66	35387.66
500.00	5791.54	0.00
.25	0.00	.02
20.00	45.00	70.00
.40	0.00	.05
20.00	0.00	.01
12773.00	33097.76	.12
10000.00	2022.76	.81
.95	0.00	16.00
25.00	50.00	75.00
8.50	0.00	0.00
.15	0.00	4.01
9.00	0.00	1.00
0.00	0.00	
17597.27	0.00	
30.00	55.00	
13679.70	0.00	
391756.91	3.00	
46720.00	0.00	
500000.00	0.00	
260905.20	.05	
35.00	60.00	

REGISTERS

R200, R300, R301
R312, R321, R331
R334, R336, R343
4000000.00
11500.49
3411.72
20000.00
0.00
20000.00
16218.00
2088.71
0.00

BEGIN TRADE-OFF
ANALYSIS. SEE
APPENDIX F

3.0

EXPANDED TRI-TAC LCCM

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

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

3.1

Cost and Data Elements

3.1.1

General

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

TABLE 4

DATA CONSTANTS/ASSUMPTIONS
FOR THE EXPANDED LCC MODEL

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

TABLE 5
DATA INPUTS
FOR THE EXPANDED LCC MODEL

R9.	Equipment Quantity (#)
R10.	Avg. No. Operators/equipment (#)
R11.	Avg. Operator Cost (\$/hr)
R12.	No. of new FSN (#)
R13.	Equipment Weight (lbs)
R14.	Avg. Replacement Assembly (LRU) Cost (\$)
R15.	Avg. MTTR (Org Level)(hrs)
R16.	Avg. MTBF (hrs)
R17.	Avg. MTTR (Int Level)(hrs)
R18.	Unit Production Cost Est (\$)
R19.	Quantity Used for UPC Est (#)
R20.	Learning Curve Slope (%)
R21.	Avg. Power Rating (kw)
R22.	Avg. Preventative Maintenance (hr/yr)
R24.	Avg. Material Consumption Rate (units/yr/equip)
R25.	Avg. Material Cost (\$/unit)
R26.	Org Level Maintenance Pers Costs (\$/hr)
R27.	Discard Rate (decimal)
R28.	Int Level Maintenance Personnel Cost (\$/hr)
R29.	Tech. Data Management Costs (\$/page)
R46.	Avg. MTTR (Depot Level)(hrs)
R47.	No. Pages in Set of Tech. Data (pages)
R50.	Operational Facilities (\$)
R51.	Equipment leaseholds (\$)
R52.	Other Operating Costs (\$)
R53.	Maintenance Facilities (\$)
R54.	Contractor Services (\$)
R55.	Supply Facilities (\$)
R56.	Other Logistic Support Costs (\$)
R57.	No. Depot Overhaul Personnel (#)
R61.	Avg. WT of LRU (lbs)
R62.	Avg. WT of Repair Parts (lbs)
R71.	P2 (% of all failed LRU's to be repaired/discarded at Int level)(expressed as a decimal)
R72.	P3 (% of all failed LRU's to be repaired/discarded at Depot level)(expressed as a decimal)
R75.	Depot Personnel (\$/hr)
R76.	Support Equipment Area (ft ² /yr)
R77.	Equipment Code
R78.	Iteration Number (for subsequent runs)(#)
R79.	Avg. Depot Level Repair Rate (%)

TABLE 5
DATA INPUTS
FOR THE EXPANDED LCC MODEL
(cont'd)

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

TABLE 6

COST DATA OUTPUT
FOR THE EXPANDED LCC MODEL

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

TABLE 6

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

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

3.2 LCC Model Equations

3.2.1 General

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

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

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

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

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

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

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

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

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

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

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

$$\begin{aligned} R91 &= P1 P2 P3 \\ \text{and,} \\ R87 &= P91 + P4 \end{aligned}$$

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

3.2.6 Summation of Operations Cost (para 310)

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

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

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

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

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

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

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

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

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

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

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

$$R38 = P1 P2 P3$$

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

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

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

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

3.2.11 Summation of Maintenance Personnel Cost (para 321.1)

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

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

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

EQUATION ONE:

$$R53 = P12$$

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

EQUATION TWO:

$$R\ 53 = (P13 + P4) P5$$

where: P13 = Maintenance Work Area (ft²/yr) (R89)
P4 = Support Equipment Area (ft²/yr) (R76)
P5 = Cost of Floor Space (\$/ft²/yr) (R86)

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

EQUATION ONE:

$$R39 = P7$$

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

EQUATION TWO:

$$R39 = P1 P2 P3$$

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

3.2.14 Contractor Services Cost (para 321.4)

$$R\ 54 = P10$$

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

3.2.15 Summation of Maintenance Cost (para 321)

$$R84 = R35 + R53 + R39 + R54$$

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

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

$$P3 = .03 P1$$

where: P1 = Organizational Maintenance Personnel Cost (R36)

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

$$P4 = .03 P2$$

where: P2 = Intermediate Maintenance Personnel Cost (R37)

3.2.18 Summation of Supply Personnel Cost (para 322.1)

$$R42 = P3 + P4$$

where: P3 and P4 are as previously defined.

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

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

$$R58 = R40 + R97 + R98$$

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

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

EQUATION ONE:

$$R40 = P1 P2 P3$$

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

EQUATION TWO:

is comprised of 322.211, 322.212 and 322.13

3.2.19.1.1 Organizational Maintenance Spares Cost (para 322.211)

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

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

3.2.19.1.2 Intermediate/Depot Maintenance Spares Cost (para 322.212)

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

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

3.2.19.1.3 Repair Material Cost (para 322.213)

$$R83 = P17 \ P10 \ P11$$

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

and,

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

P10 = LRU/Equipment Repair Rate (%)

P11 = Repair Material Rate (%) (R5)

3.2.19.2 Modifications (para 322.22)

$$R97 = P1 \ P3 \ P5$$

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

3.2.19.3 Replacement Common Support Equipment (para 322.23)

$$R98 = P6 \ P7$$

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

then, $R58 = R40 + R97 + R98$

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

3.2.20 Inventory Administration Cost (para 322.3)

$$R43 = R23 + R68 + R59$$

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

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

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

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

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

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

EQUATION ONE:

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

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

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

EQUATION TWO:

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

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

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

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

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

3.2.20.3 Technical Data Support (para 322.33)

R59 = P1 P2

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

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

R55 = P5

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

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

3.2.22.1 Depot Overhaul Transportation Costs (included in para 322.5)

R106 = 2 P5 P7 P9 P11 P12

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

3.2.22.2 Spares Transportation Cost (included in para 322.5)

EQUATION ONE:

$$R44 = P1 P2 + R106$$

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

EQUATION TWO:

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

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

3.2.23 Summation of Supply Costs (para 322)

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

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

3.2.24 Other Logistics Cost (para 323)

R56 = Point estimate made by the analyst.

3.2.25 Summation of Logistic Support (para 320)

$$R32 = R84 + R85 + R56$$

where:

R84, R85, and R56 are as previously defined.

3.2.26 Personnel Training & Support (para 330)

$$R99 = R101 + R102 + R103 + R104 + R106$$

where:

R101 = Replacement Training Costs (\$)

R102 = Health Care Costs (\$)

R103 = Personnel Activities (\$)

R104 = Personnel Support (\$)

R105 = Base Operating Support (\$)

3.2.27 Summation of O&S Costs (para 300)

$$R30 = R31 + R32 + R99$$

where:

R31, R32, and R99 are as previously defined.

3.2.28 R&D (para 100)

R200 = Point estimate made by the analyst.

3.2.29 Production Non-recurring (para 210)

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

$$R301 = R49 R9 R67 + R320$$

where:

R49 = Unit Production Cost Calculated (\$)

R9 = Equipment Quantity (#)

R67 = Non-recurring Investment Cost Factor (%)

R320 = Other Investment Non-recurring (\$)

3.2.30 Production Recurring (para 220)

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

$$R336 = R49 R9 + R343$$

where:

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

3.2.31 Summation of Investment Costs

$$R300 = R301 + R336$$

where:

R301 and R336 are as previously defined.

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

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

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

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

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

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

where:

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

$$\left. \begin{array}{l} P5 = (B) \\ P6 = (X_1/X_2) \\ P7 = (C) \end{array} \right\} **$$

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

** Same as defined in Section 2.2.13.

3.2.33

Summation for LCC

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

where:

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

3.3

Program Operation

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

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES

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

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

STEP	DISPLAY	INSTRUCTIONS & REMARKS													
6. Cont'd		NOTE: <u>NO DIFF LRU/EQP</u> - data input specifies the number of different LRU's or equipment for which the power will be calculated. <u>LRU/EQP QTY</u> - the number of LRU's per equipment. <u>PWR RATING</u> - input is in <u>KWH</u>.													
	CLC MTRL CNSMPTN, NO SPEC MTL'S, MATL RATE, MATL COST.	To run Special Material sub-routine, Press: RUN PROGRAM also Press: RUN PROGRAM after each data input. NOTE: Sub-routine will calculate as many special materials as are input to it. <u>MATL RATE</u> - is the Material Consumption Rate (units/yr/equip).													
8. CALC OPER PRES, NO TYPE OF PER, NO OPER/EQP, OPER COST \$/HR.		To run the Operator Personnel Sub-routine, Press: RUN PROGRAM enter required data and, Press: RUN PROGRAM after each entry. NOTE: <u>NO TYPE OF PER</u> - is the number of different operator MOS, AFSC, etc. required to operate the equipment. <u>NO OPER/EQP, OPER COST \$/HR</u> - self-explanatory, if more than one MOS, AFCS, enter the data in sequences, i.e., for two different type operators: <table> <tr> <td>NO OPR/EQP</td> <td>1</td> <td rowspan="2">} 1st MOS</td> </tr> <tr> <td>OPER COST \$/HR</td> <td>\$9.25</td> </tr> <tr><td colspan="3"> </td></tr> <tr> <td>NO OPR/EQP</td> <td>1</td> <td rowspan="2">} 2nd MOS</td> </tr> <tr> <td>OPER COST \$/HR</td> <td>\$10.35</td> </tr> </table>	NO OPR/EQP	1	} 1st MOS	OPER COST \$/HR	\$9.25				NO OPR/EQP	1	} 2nd MOS	OPER COST \$/HR	\$10.35
NO OPR/EQP	1	} 1st MOS													
OPER COST \$/HR	\$9.25														
NO OPR/EQP	1	} 2nd MOS													
OPER COST \$/HR	\$10.35														

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

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

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

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

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

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

FIGURE F-3.1
EXPANDED LCC MODEL
OPERATOR PROCEDURES

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

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

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

XX $\rightarrow$ RX
XX.00

Program Listing

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

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

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

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

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

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

3.5 Sample LCC Estimates

3.5.1 General

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

3.5.2 Assumptions

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

- a. Operating hours per year is 2920 hrs/yr (R1)
- b. Depot overhaul rate is 20% (.20) (R2)
- c. Transportation Factor is \$.50/lb (R3)
- d. Support Equipment Maintenance Factor is 10% (.10) (R4)
- e. Repair Material Cost Factor is 5% (.5) (R5)
- f. Years of Operations are 10 (R6)
- g. Holding Inventory Factor is 23% (.23) (R7)
- h. Power Cost is \$.04 per kwh (R8)
- i. Transportation Cost Factor is 5% (.05) (R60)
- j. Distance from Organization to Intermediate Maintenance Level is 25 mi (R63)
- k. Distance from Intermediate to Depot Maintenance Level is 3,000 mi (R64)
- l. Transportation Factors of .001 \$/lb/mi for short distances (R65) and \$.0001 \$/lb/mi for long distances (R66)
- m. Non-recurring investment factor is 40% (.40) (R67)
- n. Inventory Replenishment Cost factor (.05) (R80)

- o. Available manhours per year (1656 hrs) (R90)
- p. Modification factor (.005) (R107)
- q. Replenishment factor (.07) (R108)

3.5.3 Input Data

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

- a. "EQU QUAN" 2,000 units (R9)
- b. "EQU WT" 47.5 lbs (R13)
- c. "DSCRD RATE" 15% (.15) (R27)
- d. "EQU CODE" 3.01 (R77), iteration number 1 (R78)
- e. The following are point estimates to be input by the analyst:

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

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

- (1) "BASE UPC \$" is estimated at \$21,130 per unit (R18)
- (2) "UPC QTY" is 100 (R19)
- (3) "SLOPE %" 91.4% (.914) (R20)

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

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

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

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

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

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

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

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

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

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

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

(6) "SFTWR CNTR MAINT"

(7) "OTHR OPER'L"

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

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

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

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

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

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

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

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

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

(1) "NO DEPOT PERS" 2

(2) "DLM PERS \$/HR" 16.00

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

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

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

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

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

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

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

(3) "CONTRCT SRU \$/YR" 0

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

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

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

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

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

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

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

- (1) "NO FSN 0- 5K" 118
- (2) "NO FSN 5-49.9K" 8
- (3) "NO FSN 50-500K" 0
- (4) "NO FSN >500K" 0

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

- (1) "INV HD EQ 1 OR 2" 2 (See Fig 3.1, step 17)
- (2) "NO TYPES LRU" 10 LRU; 1* EQP

(3)	(4)	(5)	(6)	(7)	(8)	
"QTY THIS LRU/EQP"	"LRU MTBF"	"LRU COST"	"LRU I L RPR %"	"LRU DPT RPR %"	"LRU DSCD %"	BDA LRU LEVEL
1	92,166	3,152	1.0	.85	.15	
1	52,910	1,310	0	.85	.15	
1	35,448	1,736	0	.85	.15	
1	41,841	1,087	0	.85	.15	
1	191,571	961	0	.85	.15	
1	191,571	961	0	.85	.15	
1	80,000	825	0	.85	.15	
1	113,636	2,521	0	.85	.15	
1	61,920	1,562	1.0	.95	.15	
1	50,000,000	404	.95	.60	.15	
(3) 1*	(4) 7706*	(5) 14,521*	(6) .3*	(7) .85*	(8) .15*	BDA EQUIPMENT LEVEL
	(9) "NO PAGES"			1,000		
	(10) "COST PER PAGE"			\$2.00		
	(11) "SPLY FCLT \$"			0		

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

- (1) "TRAN EQ 1 OR 2" 2 (See Fig 3.1, step 18)
- (2) "NO. LRU/EQP" 10 LRU; 1* EQP

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

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

3.5.4 Cost Element Outputs

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

- a. Unit Production Cost (R49) is \$14,521.
- b. Energy Consumption Cost (R33) is \$14,250 per year.
- c. Special Materials (consumables) Cost (R34) is \$0.0 per year.
- d. Operating Personnel Cost (R41) is \$0.0 per year.
- e. Maintenance Personnel Cost (R35) is \$160,147 per year.
 - (1) At Organizational Level (R36), \$1,753.
 - (2) At Intermediate Level (LRU Repair) (R37), \$2,335.
 - (3) At Depot Level (Depot Overhaul) (R38), \$52,992.
 - (4) At Depot Level (Depot LRU Repair) (R69), \$103,068.
- f. Support Equipment Maintenance Cost (R39), \$1,400 per year.
- g. Supply Personnel Cost (R42) is \$123 per year.

- h. Sustaining Investment Cost (R58) is \$335,134 per year.
 - (1) Spares & Repair Material (R40), \$189,430.
 - (2) Modifications (R97), \$145,214.
 - (3) Replacement Common Support Equipment (R98), \$490.
- i. Inventory Administration Cost (R43) is \$177,023 per year.
 - (1) Inventory Management (R23), \$30,456.
 - (2) Inventory Holding (R68), \$144,567.
 - (3) Technical Data Support (R59), \$2,000.
- j. Transportation Cost (R44) is \$12,110 per year.
- k. Supply Costs (R85) is \$524,390 per year.

3.5.5

Total Costs Outputs

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

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

- a. Research & Development Cost (R200), \$4.014 million.
- b. Production Cost (R300), \$35.373 million.
- c. Operations & Support Cost (R30), \$7.001 million.

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL

0:	9:	24:
FXD 2;2920+R1;.2	10+R100;GSB "LOA	25+R100;GSB "LOA
+R2;.5+R3;.1+R4;	D" F	D" F
.05+R5;10+R6;.03	10:	25:
+R7;.04+R8 F	CLL "FB"R1,R8,R9	CLL "GD"R1,R9 F
1:	F	26:
.05+R60;25+R63;3	11:	PRT "321.1";"MAI
000+R64;.001+R65	12+R100;GSB "LOA	NT PERS COST";R3
;.0001+R66;.4+R6	D" F	6+R37+R38+R69+R3
7;.05+R80 F	12:	5 F
2:	CLL "FC"R9 F	27:
1656+R90;ENT "EO	13:	28+R100;GSB "LOA
U QUAN";R9;"LOU	14+R100;GSB "LOA	D" F
WT";R13;"DISCRD R	D" F	28:
ATE";R27 F	14:	CLL "GE"R4,R312;
3:	CLL "FD"R9,R1 F	R331 F
.005+R107;.07+R1	15:	29:
08;ENT "EOU CODE	16+R100;GSB "LOA	PRT "321";"MAINT
";R77;"ITERATION	D" F	ENHANCE";R35+R53+
NO.";R78 F	16:	R39+R54+R84 F
4:	CLL "FE"0,0,R90 F	30:
ENT "OTHR LOG CO	17:	31+R100;GSB "LOA
STS";R56;"R&D";P	PRT "310";"OPERA	D" F
200;"PROD N-R";R	TIONS";R33+R34+R	31:
301 F	41+R50+R51+R52+R	CLL "GF"R36,R37 F
5:	87+R31 F	32:
ENT "OTHR PROD N	18:	33+R100;GSB "LOA
-R";R320;"PROD R	19+R100;GSB "LOA	D" F
EC";R336;"OTHR P	D" F	33:
ROD REC";R343 F	19:	CLL "GG"R9,R80,F
6:	CLL "GA"R1,R9 F	49,R1,R107,R108;
ENT "CMMN SPT EO	20:	R331;0,0,0,R5 F
U";R331;"PEC.SPT	21+R100;GSB "LOA	34:
.EQU.";R312 F	D" F	35+R100;GSB "LOA
7:	21:	D" F
8+R100;0+X;GSB "	CLL "GB"R1,R9 F	35:
LOAD" F	22:	CLL "GH"R6 F
8:	23+R100;GSB "LOA	36:
CLL "FA"R9 F	D" F	37+R100;GSB "LOA
	23:	D" F
	CLL "GC"R90 F	37:
		CLL "GI"R1,R7,R9
		,R40,R49 F

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL

(Cont'd)

```

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

```

```

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

```

```

;SPC +
53:
PRT " REGISTE
RS"," R1 TO R
110";1+Z;SPC 2
54:
PRT R2;IF 5INT (
2/5)=2;SPC ;PRT
2;SPC +
55:
Z+1+Z;IF Z<110;
GTO -1
56:
PRT "REGISTERS",
"R200,R300,R301"
,"R312,R320,R33
1","R336,R343"
57:
PRT R200,R300,R3
01,R312,R320,R33
1,R336,R343
58:
SPC 3;PRT "BEGIN
TRADE-OFF","ANA
LYSIS,SEE"
59:
PRT " APPENDIX
F";SPC 6;DSP "S
TOP";STP ;GTO 7
60:
"LOAD";1+X+X;
GTO 61;LDF X,R10
0
61:
+
62:
END
S25498
R632

```

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL

(Cont'd)

Sub-routine "FA"

```

00: "FA";ENT "CALC -
LARN CURVE",P50F
1:
ENT "BASE UPC",P3
2: "UPC QTY",P3
3: "SLOPE %",P4F
4:
LOG P4/LOG 2+P5;
5: P3/(1+P5)/((P3+.
5)/(1+P5))- .5/(1+
P5))) + (-1/P5)+P6
6:
7:
8: P2/P5+P5+P7/(P1
+P5)/((P1+.5)/(
1+P5))- .5/(1+P5)
9: + (-1/P5)+P6F
10:
11: P2+R18;P3+R19;P4
+R20;PRT "UPC CA
LCULATED",P7P6+P
5+R49;SPC F
12:
13: PRT "-----"
14: "-----";SPC F
15:
16: RET F
17:
18:
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```

Sub-routine "FB"

```

00: "FB";ENT "CLC EN
RGY CNSMPTN",P90
1:
2:
3: "FB";P1P2+P4;
4: ENT "NO.DIFF LRU
/EQP",P5;0+P8+P1
0F

```

```

2:
3: ENT "LRU/EQP QTY
",P6;"PWR RATING
",P7+P11+P11F
4:
5: P8+1+P8;P6P7P4+P
9;P9+P10+P10F
6:
7: IF P5>P8;JMP -2F
8:
9: IF P5<P8;PRT "31
1": "ENGRY CNSMPT
N",P3P10+R33;P11
/P6+R21F
2:
3: RET F
4:
5:
6:
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```

Sub-routine "FC"

```

00: "FC";ENT "CLC MT
RL CNSMPTN",P90F
1:
2: 0+P6+P7+P8+P9;
3: ENT "NO.SPEC MTL
'S",P2;IF P2=0;
4: 1+P2F
5:
6:
7: ENT "MATL RATE",
8: P3;"MATL COST",P
9;P3+P8+P8;P4+P9
10: +P9F
11:
12:
13: P1P3P4+P5;P5+P6+
14: P6;P7+1+P7;IF P2
15: >P7;JMP -1F
16:
17:
18: IF P2<P7;PRT "31
19: 2", "SPEC MATL",P
20: 6+R34;P8/P2+R24;
21: P9/P2+R25F
22:
23:
24: RET F
25:
26:
27:
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```

Sub-routine "FD"

```

00: "FD";ENT "CALC.O
PER PERS",P90F
1:
2: 0+P5+P6+P7+P8;
3: ENT "NO.TYPE OP
PER",P5;IF P5=0;
4: .1+P5F
5:
6:
7: ENT "NO.OPER/EQP
",P3;"OPER COST
$/HR",P10;P1P3P4
8: P2+P9+P9F
9:
10:
11: P3+P7+P7;P4+P8+P
12: 8;1+P6+P6;IF P5>
13: P6;JMP -1F
14:
15:
16: IF P5<P6;PRT "31
17: 3", "OPER PERS",P
18: 9+R41;P7+R10;P8/
19: P5+R11F
20:
21:
22:
23: RET F
24:
25:
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100:

```

Sub-routine "FE"

```

00: "FE";ENT "OPR FC
LTS",P2+R50;PRT
1: "314";"OPR FCLTS
",R50F
2:
3:
4: ENT "EQP LSHLDS",
5: P2+R51;PRT "315
6: ", "EQP LSHLD",R5
7: 1F
8:
9:
10:
11: 0+P1+P2;ENT "NO.
12: PRS.SFTWR CTR",P
13: 1+R109;"PERS.COS
14: T $/HR",P2+R110F

```

FIGURE F-3.2
PROGRAM LISTING FOR EXPANDED LCC MODEL
(Cont'd)

```

3:
P1P2R90+R91;ENT
"STWR CNTR";" M
NT $";P4+R92;R91
+R92+R87F
4:
PRT "316";"SOFTW
ARE SUPPORT";R87
F
5:
ENT "OTHER OPER'
L";P1+R52;PRT "3
17";"OTHER OPS";
R52F
6:
RET F
Σ3764
R875

```

Sub-routine "GA"

```

0:
"GA";ENT "CALC.O
L M PERS";P90;0
+P4+P8+P9+P10+P1
1F
1:
ENT "O L M PERS
$/HR";P3+R26;"NO
.LRU/EQP";P4;IF
P4=0;.1+P4F
2:
ENT "P.M.HR/YR";
P5+P10+P10;"MTTR
HRS";P6+P11+P11
;"MTBF HRS";P7F
3:
1+P8+P8;P5+P1P6/
P7+P9+P9;IF P4>P
8;JMP -1F
4:
IF P4<P8;PRT "32
1.11";"ORG MAINT
";P9P3P2+R36F
5:
P10/P4+R22;P11/P
4+R15F
6:
RET F
Σ26477
R876

```

Sub-Routine "GB"

```

0:
"GB";ENT "CALC.I
L M PERS";P90;0
+P7+P8+P9+P10F
1:
ENT "NO.LRU/EQP"
,P7;"I L M PERS
$/HR";P5+R28;IF
P7=0;.1+P7F
2:
ENT "MTBF HRS";P
3;"INT.MTTR HRS"
,P4+P10+P10;"I M
RPR RATE";P6+R7
4F
3:
1+P8+P8;P1P2P4P5
P6/P3+P9+P9;IF P
7>P8;JMP -1F
4:
IF P7<P8;PRT "32
1.12";"I M L LRU
REPAIR";P9+R37;
P10/P7+R17F
5:
RET F
Σ11208
R877

```

Sub-routine "GC"

```

0:
"GC";ENT "CALC.D
L M PERS";P90F
1:
ENT "NO.DEPOT PE
RS";P2+R57;"DLM
PERS.$/HR";P3+R7
5;P1R57R75+R38F
2:
PRT "321.13";"DL
M OVRHL";R38F
3:
RET F
Σ1583
R898

```

Sub-routine "GD"

```

0:
"GD";ENT "CALC.D
L M LRU";P90;0+
P6+P7+P8+P9+P10F
1:
ENT "NO.LRU/EQP"
,P7;"D L M PERS
$/HR";P5+R75;IF
P7=0;.1+P7F
2:
ENT "MTBF HRS";P
3;"DPT.MTTR HRS"
,P4+P11+P11;"DLM
RPR RATE";P6+P1
0+P10F
3:
1+P8+P8;P1P2P4P5
P6/P3+P9+P9;IF P
7>P8;JMP -1F
4:
IF P7<P8;PRT "32
1.14";"DEPOT LRU
RPR";P9+R69;P10
/P7+R79;P11/P7+R
46F
5:
RET F
Σ25795
R875

```

Sub-routine "GE"

```

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

```

FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL
(Cont'd)

```

3:
ENT "FLOOR AREA
$/YR",P5+R86;(P1
3+P4)P5+P12F
4:
PRT "321.2","MAI
NT FCLT",P12+R53
F
5:
PRT "321.3","SPT
EQP MAINT",P1(P
2+P3)+R39F
6:
ENT "CONTRACT SRV
$/YR",P10F
7:
PRT "321.4","CON
TRACT SVCS",P10+R
54F
8:
RET F
29896
R873

```

Sub-routine "GF"

```

0:
"GF":PRT "322.11
","ORG SUPY PERS
",.03F1+P3+R93F
1:
PRT "322.12","I L
M SUPY PERS",.03P
2+P4+R94F
2:
PRT "322.13","DE
POT SUPY PERS","
INCLD IN 321.13"
F
3:
PRT "322.1","SUP
LY PERS",P4+P3+R
42F
4:
RET F
29468
R892

```

Sub-routine "GG"

```

0:
"GG":ENT "CALC.
SPARES",P90,"SPA
RES EQ 1 OR 2",P
14F
1:
IF P14=2:JMP 2F
2:
PRT "322.21","SP
ARES",P1P3P2+R40
:JMP 13F
3:
0+P16+P17+P19+P2
1:ENT "NO LRU DI
SCRD",P15+P22F
4:
IF P15=0:JMP 3F
5:
ENT "DISCRD LRU
MTBF",P25,"DISCR
D LRU COST",P26+
P19+P19F
6:
P1P4P26/P25+P17+
P17:1+P16+P16:
IF P15>P16:JMP -
2F
7:
PRT "322.211","O
L M SPARES",P17
+R81F
8:
0+P15+P16+P17+P1
8:ENT "NO LRU RP
RBLE",P15+P20:
IF P15=0:JMP 4F
9:
ENT "% LRU DISCRD
",P9+R27:1-P9+P1
0F
10:
ENT "RPRBLE LRU
MTBF",P27,"RPRBL
E LRU COST",P8+P
21+P21F

```

```

11:
P1P4P8/P7+P18+P1
8:P18P9+P17+P17:
1+P16+P16:IF P15
>P16:JMP -1F
12:
IF P15<P16:PRT "
322.212","I L M
SPARES",P18P9+R8
2F
13:
PRT "322.213","R
EPAIR MAT'L",P17
P10P11+R83F
14:
PRT "322.21","SP
ARES",R81+R82+R8
3+R40:(P21+P19)/
(P20+P22)+R14F
15:
PRT "322.22","NO
DIFICATIONS",P1P
3P5+R97F
16:
PRT "322.23","RP
L CMNH SPT EQU",
P6P7+R98F
17:
PRT "322.2","SUS
TAIN INVST",R40+
R97+R98+R58F
18:
RET F
312559
R809

```


FIGURE F-3.2

PROGRAM LISTING FOR EXPANDED LCC MODEL
(Cont'd)

Sub-routine "GH"

```

0:
"GH":ENT "CALC.I
NV MGT",P90:0+P5
+P6F
1:
ENT "NO.FSN 0-5K
",P2:306+P3:236+
P4:GSB "A"
2:
ENT "NO.FSN 5-49
.9K",P2:306+P3:3
26+P4:GSB "A"
3:
ENT "NO.FSN 50K-
500K",P2:306+P3:
918+P4:GSB "A"
4:
ENT "NO.FSN >500
K",P2:306+P3:148
9+P4:GSB "A"
5:
JMP 2F
6:
"A":P2P4P1/P1+P5
+P5:P6+P2+P6:
RET F
7:
PRT "322.31","IN
V MGT",P5+R23:P6
+R12:P2P3+R334+R
334F
8:
RET F
225163
R871

```

Sub-routine "GI"

```

0:
"GI":ENT "CALC.I
NV HLD",P90:"INV
HD EQ 1 OR 2",P
6F
1:
IF P6=2:JMP 3F
2:
IF P6=1:PRT "322
.32","INV HLD",P
2:1.15P3P5-P4/2)+
R68F
3:
JMP 10F
4:
ENT "NO.TYPES LR
U",P10:0+P8+P9+P
18+P19+P20+P21+P
17F
5:
ENT "QTY THIS LR
U/EOP",P7:"LRU M
TBF",P11:"LRU CO
ST",P12:1/P11+P8
+P8F
6:
P12+P9+P9:ENT "L
RU I L RPR %",P1
3:"LRU DPT RPR %
",P14F
7:
ENT "LRU DISORD %
",P15:P13+P18+P1
8:P14+P19+P19:P1
5+P20+P20F
8:
1+P17+P17:IF P10
>P17:JMP -3F

```

```

9:
IF P10:P17:1/P8+
P11:P9/P10+P12:P
18/P10+P13:P19/P
10+P14F
10:
P20/P10+P15:P10+
P7F
11:
(P1P7/P11)P12:0
3P13+.25P14+1.5P
15)+P16F
12:
PRT "322.32","IN
V HLD",P2:P3P16-
P4/2)+R68F
13:
ENT "NO.PAGES",P
1+R47,"COST PER
PAGE",P2+R29F
14:
PRT "322.33","TE
CH DATA SPT",R47
R29+R59F
15:
PRT "322.3","INV
ADM",R23+R68+R5
9+R43F
16:
ENT "SPLY FCLT #
",P5:PRT "322.4"
,"SPLY FCLT",P5+
R55F
17:
RET F
29560
R817

```

FIGURE F-3.2
PROGRAM LISTING FOR EXPANDED LCC MODEL
(Cont'd)

Sub-routine "GJ"

```

0:
"GJ":ENT "CALC,T
RAHS",P90F
1:
2P5P7P9P11P12+R1
06F
2:
ENT "TRAN EO 1 0
R 2",P41;IF P41=
2;JMP 2F
3:
PRT "322.5", "TRA
NS",P1P2+R106+R4
4;JMP 12F
4:
ENT "NO.LRU/EQP",
P20;0+P23+P24+P
30+P31+P32F
5:
ENT "LRU MTBF",P
14,"LRU MT",P15+
P31+P31;1/P14+P3
0+P30F
6:
ENT "WT PPR PART
S",P16,"P2",DSC
RD I.L.I",P17,"P
3",DSCRD DRT",
P18F

```

```

7:
P16+P32+P32;P17+
R71+R71;P18+R72+
R72F
8:
1-(P17+P18)+P19;
(P10-P19)/(P17+P
18)+P21;1-P21+P2
2F
9:
P5P15(P2/P14)+P2
5;P19+2P17(P22+
P21)+2P18)P4P6+P
26F
10:
P5P7(P19+P17(P16
P22/P15+P21))+2P1
8)+P27F
11:
P25(P26+P27)+P23
+P23;1+P24+P24F
IF P20+P24;JMP 6F
12:
IF P20;P24;1/P30
+P30;PRT "322.5",
"TRANS",P23+R10
6+R44F
13:
R72/P20+R72;P71/
P20+R71;1-R71+R7
3;1-R73+R74F
14:
P30+P16;P31/P30+
P61;P32/P20+R62;
1-(R71+R72)+P70F
15:
RET F
S17167
R819

```

FIGURE F-3.3

COMPUTER OUTPUT TAPE

BASIC
DATA
ADAPTER

UPC CALCULATED
14521.36

311
ENGRY CNSMPN
14249.60

312
SPEC MATL
0.00

313
OPER PERS
0.00

314
OPR FCLTS
0.00

315
EQP LSHLD
0.00

316
SOFTWARE SUPPORT
0.00

317
OTHER OPS
0.00

318
OPERATIONS
14249.60

321.11
ORG MAINT
1752.53

321.12
I M L LRU REPAIR
2334.94

321.13
DLM OVRAL
52992.00

321.14
DEPOT LRU RPR
103067.74

321.1
MAINT PERS COST
160147.21

321.2
MAINT FCLT
0.00

321.3
SPT EQP MAINT
1400.00

321.4
CONTRCT SVCS
0.00

321
MAINTENANCE
161547.21

322.11
ORG SUPY PERS
52.58

322.12
ILM SUPY PER
70.05

322.13
DEPOT SUPY PERS
INCLD IN 321.13

322.1
SUPLY PERS
122.62

322.211
O L M SPARES
0.00

322.212
I L M SPARES
181707.43

322.213
REPAIR MAT'L
7722.57

322.21
SPARES
189429.99

322.22
MODIFICATIONS
145213.60

322.23
RPL CMMN SPT EQU
490.00

322.2
SUSTAIN INVST
335133.60

322.31
INV MGT
30456.00

322.32
INV HLD
144567.24

322.33
TECH DATA SPT
2000.00

322.3
INV ADM
177023.24

322.4
SPLY FCLT
0.00

322.5
TRANS
12110.40

322
SUPPLY
524389.86

323
OTHER LOGISTS
0.00

320
LOG SUPPORT
685937.07

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

FIGURE F-3.3

COMPUTER OUTPUT TAPE

(Cont'd)

LIFE CYCLE COST IN \$K		
R&D	7786.00	10.00
4014.08	1.00	1000.00
PROD N-R	21310.00	46388.89
6330.94	100.00	0.00
PROD R	.91	0.00
29042.00		
TOTAL PROD	20.00	50.00
35372.94		
TOTAL OPNS	.00	0.00
142.50	0.00	0.00
TOTAL LOG SUPT	30456.00	0.00
6859.37	0.00	0.00
TOTAL O&S	0.00	0.00
7001.87		
TOTAL LCC	25.00	55.00
46388.89		

REGISTERS	9.25	0.00
R1 TO R110	.15	2.00
	10.27	335133.60
	2.00	2000.00
	7001.87	.05
	30.00	60.00
1000.00	142.50	4.75
.20	685937.07	1.00
.50	14249.60	25.00
.10	0.00	3000.00
.05	160147.21	.00
5.00	35.00	65.00
10.00	1752.53	.00
2.00	2334.94	.40
.04	52992.00	144567.24
2000.00	1400.00	103067.74
0.00	189429.99	.00
10.00	40.00	70.00
0.00	0.00	.15
126.00	122.62	.85
47.50	177023.24	.86
1452.00	12110.40	.15
.25	0.00	16.00
15.00	45.00	75.00

FIGURE F-3.3
COMPUTER OUTPUT TAPE
 (Cont'd)

0.00	0.00
3.01	145213.60
1.00	490.00
.85	0.00
.05	39.00
80.00	100.00
0.00	0.00
181707.43	0.00
7722.57	0.00
161547.21	0.00
524389.86	0.00
85.00	105.00
0.00	11400.00
0.00	.01
0.00	.07
0.00	0.00
1656.00	0.00
90.00	110.00
0.00	REGISTERS
0.00	R200,R300,R301
52.58	R312,R320,R331
70.05	R336,R343
0.00	4014078.00
95.00	35372.94
	6330.94
	7000.00
	201390.00
	7000.00
	29042.00
	0.00
	BEGIN TRADE-OFF
	ANALYSIS.SEE
	APPENDIX F

ANNEX I

TRI-TAC

LIFE CYCLE COST MODEL PROGRAM

USER'S GUIDE

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SECTION A

INTRODUCTION

I. PURPOSE

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

II. FUNCTIONS PERFORMED

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

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

FIGURE 1
FORTRAN IV PROGRAM FOR TTLCCM

```

10000 FILE 1=FILE1,UNIT=REPUTE
10100 FILE 2=INFILE,UNIT=DISK,BLOCKING=30,RECORD=10
10200 C=
10300 C= **PROGRAMED BY D.J. POYD, OPERATIONS RESEARCH DIVISION**
10400 C= **DIRECTORATE FOR OPERATIONS RESEARCH TEST AND ANALYSIS**
10500 C= **JOINT TACTICAL COMMUNICATIONS (TRI-TAC) OFFICE (II-RT-LR)**
10600 C= **TINTON FALLS, N.J. 07724, AUTOVON 992-8383 **
10700 C=
10800 DIMENSION AL(9,4), AR(4,4), AU(10,4), AER(9,4), AWR(4,4),
10900 AOR(10,4), AMC(54,4), ARTR(54,4), EN(4), EM(4),
11000 ON(4), OM(4), CA(4), BUC(4), MUC1(4), MUC2(4)
11100 REAL MSG, MUS, LTR, VAL
11200 DIMENSION AM(108,4), NOS(4,4), BPCS(4,4), ATCS(4,4),
11300 MDCS(4,4), PCSS(4,4), BUCS(4,4), RTCS(4,4), TPCS(4,4)
11400 DIMENSION X(4), Y(4), R(400), LUGS(400), R1(2,4), Z(4),
11500 S(100), IRD(100), IP(100), IOS(100), RD(7,43), PD(7,55),
11600 CS(7,46), RP(100,100), IHUS(100)
11700 DIMENSION VL(1,3), RH(9,32), NV(124), VAL(400)
11800 DATA((NOS(L,M),L=1,4),M=1,4)/16*0/
11900 DATA((BPCS(L,M),L=1,4),M=1,4)/16*0/
12000 DATA((ATCS(L,M),L=1,4),M=1,4)/16*0/
12100 DATA((MDCS(L,M),L=1,4),M=1,4)/16*0/
12200 DATA((PCSS(L,M),L=1,4),M=1,4)/16*0/
12300 DATA((BUCS(L,M),L=1,4),M=1,4)/16*0/
12400 DATA((RTCS(L,M),L=1,4),M=1,4)/16*0/
12500 DATA((TPCS(L,M),L=1,4),M=1,4)/16*0/
12600 C=
12700 C= .ALL FORMATS FOR MIL. PERSONNEL COSTING ARE LOCATED HERE
12800 C=
12900 1 FORMAT('APPENDIX D MILITARY PERSONNEL AND TRAINING COSTS')
13000 - 'INDICATE THE SERVICE OF THE PERSONNEL TO BE COSTED'
13100 - 'ANSWER WITH A FOR ARMY, N FOR NAVY, MC FOR MARINE CORP.'
13200 - 'OR AF FOR AIR FORCE'
13300 2 FORMAT('INVALID ENTRY-PLEASE RE-ENTER DATA/CODES')
13400 3 FORMAT('ENTER THE PERSONNEL INFORMATION IN THE ORDER')
13500 - 'AND FORMAT INDICATED USING THE FOLLOWING CODES AND'
13600 - 'SEPARATING THE DATA BY COMMAS'
13700 - 'UNDER **LEVEL** ENTER ONE OF THE FOLLOWING CODES'
13800 - ' OPR = OPERATOR'
13900 - ' SWP = SOFTWARE PERSONNEL'
14000 - ' OLM = ORGANIZATIONAL LEVEL MAINTENANCE'
14100 - ' ILM = INTERMEDIATE LEVEL MAINTENANCE'
14200 - 'UNDER **MUS** ENTER THE APPROPRIATE CODE AS FOLLOWS'
14300 - 'FOR ARMY, MOS CODE MUST BE OF TYPE XXXXX'
14400 - 'FOR NAVY, MOS CODE MUST BE AA-XXXX, AAAAXAA OR AA-XXXXAB'
14500 - 'FOR MARINE CORP MOS CODE MUST BE XXXXX'
14600 - 'FOR AIR FORCE MOS CODE MUST BE XXXXX'
14700 - 'WHERE IX=NUMBER, AND A=ALPHA'
14800 - 'UNDER **PAY GRADE** ENTER PAY GRADE AS E1 TO E9'
14900 - 'UNDER **NUMBER** ENTER THE NUMBER OF PERSONNEL (01 TO 99)'
15000 - 'TO BE COSTED FOR EACH, LEVEL, MOS AND PAY GRADE ENTERED'
15100 - 'UNDER **DONE** ENTER ZZ WHEN AND ONLY IF YOU ARE'
15200 - 'FINISHED WITH ALL INPUTS AT ALL LEVELS...'
15300 - ' (EX-OPR,02820,12,07,ZZ)'
15400 21 FORMAT('**LEVEL** **MOS** **PAY GRADE** **NUMBER** **DONE**')
15500 22 FORMAT(A3,1X,A5,1X,A1,1X,12,1X,A2)
15600 23 FORMAT(A3,1X,A6,1X,1X,A1,1X,12,1X,A2)
15700 24 FORMAT(A3,1X,A4,1X,A1,1X,12,1X,A2)

```

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

```

10000 70  FORMAT(A2)
10000 39  FORMAT(A1)
10000 78  FORMAT(A5)
10000 79  FORMAT(A6,A6)
10000 80  FORMAT(A1)
10000 6   FORMAT("WHAT IS MOS, NEC, AFSC ?"/)
10000 7   FORMAT("AVAILABLE ARMY MOS(S) ARE"/
10000 -   "05B20  20V40  31L40  32A10  32E40  35L20  74B20"/
10000 -   "05B40  20V50  31M20  32B20  32F20  36G20  74B30"/
10000 -   "05C20  20Y20  31M40  32B40  32F40  36H20  74B40"/
10000 -   "20L10  20Y40  31N20  32C20  32G20  36H40  74C20"/
10000 -   "26L20  31B20  31N40  32C40  32G40  41F20  74C40"/
10000 -   "26L40  31E20  31S20  32U20  35B20  51A10  74F20"/
10000 -   "26N20  31J20  31S30  32U40  35D20  52B20"/
10000 -   "26V20  31L20  31T30  32E40  35K20  72B10"/)
10000 8   FORMAT("AVAILABLE NAVY NEC(S) ARE"/
10000 -   "CE-5642  CTM48JB  CT048MB  DS-1636  ET-1412  EI-1462"/
10000 -   "CE-5644  CTM48JC  CT048MC  ET-1402  ET-1421  EI-1463"/
10000 -   "CTM48JB  CTM48JJ  CTR48QB  ET-1403  ET-1423  ET-1464"/
10000 -   "CTM48JD  CTM48JM  CTT48BA  ET-1404  ET-1426  RM-0000"/
10000 -   "CTM48JF  CTM48JL  CTT48CB  ET-1405  ET-1431  RM-2304"/
10000 -   "CTM48IH  CTM48JJ  DS-1615  ET-1406  ET-1432  RM-2305"/
10000 -   "CTM48II  CTM48JA  DS-1616  ET-1407  ET-1436  RM-2393"/
10000 -   "CTM48IK  CTM48KL  DS-1617  ET-1408  ET-1448  RM-48JA"/
10000 -   "CTM48IS  CT048JA  DS-1618  ET-1411  ET-1449  RM-48MA"/)
10000 72  FORMAT("AVAILABLE MARINE CORP MOS(S) ARE"/
10000 -   "2511 , 2542 , 2818 , 2831 , 2871,"/
10000 -   "2519 , 2549 , 2825 , 2841 , 2872,"/
10000 -   "2531 , 2591 , 2826 , 2831,"/
10000 -   "2532 , 2811 , 2827 , 2853,"/
10000 -   "2534 , 2813 , 2828 , 2861,"/
10000 -   "2537 , 2814 , 2829 , 2860"/)
10000 73  FORMAT("AVAILABLE AIR FORCE AFSC(S) ARE"/
10000 -   "27450 , 30450 , 30650 , 30120 , 36254 , 54550"/
10000 -   "29150 , 30454 , 30651 , 36124 , 36350,"/
10000 -   "29353 , 30456 , 30750 , 36221 , 51150,"/
10000 -   "29550 , 30554 , 32850 , 36252 , 53550"/)
10000 2A  FORMAT("IS PERSONNEL COSTING FOR TRADE-OFF (A) OR BASE LINE COST"/
10000 -   "ESTIMATE, INDEPENDENT PARAMETRIC COST ESTIMATE OR"/
10000 -   "COST PRESENTATION (B)?"/
10000 -   "NOTE: OUTPUT TO LCC MODEL FOR TRADE-OFF (A) IS AVERAGE"/
10000 -   "COST PER MAN HOUR. FOR (B) OUTPUT IS ACCUMULATED "/
10000 -   "PERSONNEL COSTS. ANSWER WITH A OR B"/)
10000 C-  **PERSONNEL COSTS CALCULATED HERE**
10000 C-  **COMPOSITE PAY RATES FROM TABLES 1, 2, 3 AND 4**
10000 C-  **PAY RATE DATA ARE SEQUENCED BY GRADE**
10000 C-  **ARMY COMPOSITE ENLISTED PAY RATES FROM TABLE 1**
10000 -   DATA AF/6164.,6748.,7165.,8124.,9583.,11471.,13634.,15875.,
10000 -   19067.,
10000 C-  **NAVY COMPOSITE ENLISTED PAY RATES FROM TABLE 2**
10000 -   5981.,6703.,7395.,8359.,10094.,12298.,14407.,
10000 -   16524.,19023.,
10000 C-  **MARINE CORP COMPOSITE ENLISTED PAY RATES FROM TABLE 3**
10000 -   5952.,6502.,6975.,7838.,9220.,11139.,13141.,
10000 -   15470.,18518.,
10000 C-  **AIR FORCE COMPOSITE ENLISTED PAY RATES FROM TABLE 4**
10000 -   6035.,6647.,7275.,9031.,10550.,12336.,14360.,16291.,
10000 -   19033.,
10000 C-  **ARMY WARRANT OFFICER COMPOSITE PAY RATES FROM TABLE 1**
10000 -   DATA AW/13229.,15270.,18472.,22005.,
10000 C-  **NAVY WARRANT OFFICER COMPOSITE PAY RATES FROM TABLE 2**
10000 -   11620.,15572.,18549.,22631.,

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

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22000 C- *MARINE CORP WARRANT OFFICER COMPOSITE PAY RATES, TABLE 3*
22100 - 11054.,15509.,10455.,21006.
22200 C- *AIR FORCE WARRANT OFFICER COMPOSITE PAY RATES FROM TABLE 4*
22300 - 3.0.,24439./
22400 C- **ARMY OFFICER COMPOSITE PAY RATES FROM TABLE 1**
22500 - DATA AGR/11/22.,12554.,19832.,23551.,28346.,34514.,37863.
22600 - 41931.,41208.,43719.
22700 C- **NAVY OFFICER COMPOSITE PAY RATES FROM TABLE 2**
22800 - 11314.,16242.,21702.,24293.,29062.,35002.,38107.
22900 - 44886.,41929.,43713.
23000 C- *MARINE CORP OFFICER COMPOSITE PAY RATES FROM TABLE 3*
23100 - 11011.,16340.,20433.,23789.,28430.,33510.,38311.
23200 - 44221.,42246.,43175.
23300 C- **AIR FORCE OFFICER COMPOSITE PAY RATES FROM TABLE 4**
23400 - 17080.,16247.,20751.,24203.,29249.,34196.,38863.
23500 - 44488.,44110.,44048.
23600 C- **1 OF PERSONNEL TO CONTINUE ON ACTIVE DUTY, TABLE 7**
23700 C- **3 OF ARMY ENLISTED PERSONNEL, TABLE 7**
23800 - DATA AGR/.135.,.144.,.157.,.243.,.541.,.837.,.905.,.981.,.983.
23900 C- **2 OF NAVY ENLISTED PERSONNEL, TABLE 7**
24000 - .123.,.129.,.168.,.245.,.584.,.877.,.961.,.979.,.983.
24100 C- **3 OF MARINE CORP ENLISTED PERSONNEL, TABLE 7**
24200 - .103.,.104.,.113.,.140.,.341.,.710.,.939.,.970.,.970.
24300 C- **2 OF AIR FORCE ENLISTED PERSONNEL, TABLE 7**
24400 - .141.,.142.,.159.,.210.,.751.,.955.,.978.,.982.,.982.
24500 C- **1 OF ARMY WARRANT OFFICER PERSONNEL, TABLE 7**
24600 - DATA AGR/.020.,.034.,.065.,.979.
24700 C- **3 OF NAVY WARRANT OFFICER PERSONNEL, TABLE 7**
24800 - .331.,.955.,.983.,.991.
24900 C- **1 OF MARINE CORP WARRANT OFFICER PERSONNEL, TABLE 7**
25000 - .726.,.777.,.777.,.984.
25100 C- **1 OF AIR FORCE WARRANT OFFICER PERSONNEL, TABLE 7**
25200 - 3.0.,.979.
25300 C- **1 OF ARMY OFFICER PERSONNEL, TABLE 7**
25400 - DATA AGR/.281.,.371.,.741.,.905.,.963.,.983.,.988.,.989.,.989.,.988.
25500 C- **2 OF NAVY OFFICER PERSONNEL, TABLE 7**
25600 - .777.,.336.,.543.,.028.,.962.,.987.,.993.,.992.,.991.
25700 C- **1 OF MARINE CORP OFFICER PERSONNEL, TABLE 7**
25800 - .146.,.300.,.048.,.728.,.980.,.980.,.992.,.993.,.993.
25900 C- **2 OF AIR FORCE OFFICER PERSONNEL, TABLE 7**
26000 - .206.,.315.,.002.,.069.,.963.,.970.,.977.,.980.,.981.,.981.
26100 C- **MUS,NLC,MUS,AFSC--TABLES 11,12,14 AND 13**
26200 C- **ARMY MOS(S),TABLE 11**
26300 - DATA(CM(1,1),1=1,54)/
26400 - "05B20","05B40","05C20","26L10","26L20","26L40",
26500 - "26N20","26V20","26V40","26V20","26Y20","26Y40","31B20",
26600 - "31E20","31J20","31L20","31L40","31M20","31M40","31N20",
26700 - "31N40","31S20","31S30","31I30","32A10","32B20","32E40",
26800 - "32C20","32C40","32D20","32D40","32E20","32E40","32F20",
26900 - "32F40","32G20","32G40","32G20","32G20","32K20","32L20",
27000 - "36G20","36H20","36H40","41E20","51A10","52B20","72B10",
27100 - "72B20","72B30","72B40","72C20","72C40","72F20",
27200 C- **NAVY NEC(S),TABLE 12**
27300 - DATA(CM(1,2),1=1,108)/
27400 - "C1-54A","2","C1-56A","4","C1M48I","B","C1M48I","B",
27500 - "C1M48I","F","C1M48I","H","C1M48I","I","C1M48I","K",
27600 - "C1M48I","S","C1M48J","J","C1M48J","C","C1M48J","F",
27700 - "C1M48J","B","C1M48J","I","C1M48J","J","C1M48J","K",
27800 - "C1M48K","C","C1M48J","A","C1C48M","B","C1C48M","C",
27900 - "C1M48C","B","C1I48B","A","C1I48C","B","DS-161","5",
28000 - "DS-161","C","DS-161","7","DS-161","8","DS-163","6",
28100 - "C1-140","2","C1-140","4","C1-140","6","C1-140","8".

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

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28400 - "ET-140","0","ET-140","7","ET-140","8","ET-141","1",
28500 - "ET-141","2","ET-142","1","ET-142","3","ET-142","6",
28600 - "ET-143","1","ET-143","2","ET-143","6","ET-144","8",
28700 - "ET-144","9","ET-146","2","ET-146","3","ET-146","8",
28800 - "RM-000","0","RM-230","4","RM-230","5","RM-239","3",
28900 - "RM-44J","A","RM-44M","A"/
29000 C- **MARINE CURP MOD(S), TABLE 14**
29100 - DATA(AM(I,3),I=1,54)/
29200 - "2511","2519","2531","2532","2534","2537","2542","2549",
29300 - "2591","2811","2813","2814","2818","2825","2826","2827",
29400 - "2828","2829","2831","2841","2851","2853","2861","2866",
29500 - "2871","2872","2870"/
29600 C- **AIR FORCE AFSC(S),TABLE 13**
29700 - DATA(AM(I,4),I=1,54)/
29800 - "27450","27450","29353","28550","30450","30454","30456",
29900 - "30554","30650","30651","30750","32850","36150","36154",
30000 - "36251","36252","36254","36350","51150","53550","54550",
30100 - "33400"/
30200 C- ****TRAINING COSTS****
30300 C- ****TRAINING COSTS ARE SEQUENCED BY MOS,NEC,MOS ON AFSC****
30400 C- **ARMY TRAINING COSTS, TABLE 11**
30500 - DATA(AMC(I,1),I=1,54)/
30600 - 7925,,7925,,15300,,15470,,50146,,50146,,51884,,
30700 - 33603,,33603,,33983,,23469,,43468,,9047,,17884,,13144,,
30800 - 20930,,20930,,10375,,10375,,14160,,14160,,12345,,13535,,
30900 - 50146,,11407,,39402,,39402,,11407,,11407,,24146,,24146,,
31000 - 26771,,26771,,28062,,28062,,19904,,19904,,15667,,10889,,
31100 - 10746,,19110,,1095,,21678,,21678,,10847,,5969,,6077,,
31200 C- **NAVY TRAINING COSTS, TABLE 12**
31300 - DATA(AMC(I,2),I=1,54)/
31400 - 15003,,15510,,22228,,21246,,41246,,31034,,23318,,
31500 - 23318,,24007,,35040,,42485,,40075,,19810,,21292,,24627,,
31600 - 18613,,20868,,20868,,17786,,11337,,20444,,11208,,18535,,
31700 - 29262,,21630,,19436,,19710,,40241,,20562,,25044,,23529,,
31800 - 20562,,20562,,20562,,20562,,23412,,22845,,20644,,20644,,
31900 - 23781,,20937,,21406,,22788,,20109,,24868,,27323,,20947,,
32000 C- **MARINE TRAINING COSTS, TABLE 14**
32100 - DATA(AMC(I,3),I=1,54)/
32200 - 5281,,9054,,6521,,7259,,6521,,11248,,6880,,9053,,
32300 - 10325,,7524,,7524,,7524,,6761,,6735,,6735,,6735,,
32400 - 17426,,6411,,9850,,11875,,11075,,19764,,22151,,10419,,
32500 - 10419,,28400/
32600 C- ****AIR FORCE TRAINING COSTS, TABLE 13****
32700 - DATA(AMC(I,4),I=1,54)/
32800 - 10101,,11916,,9077,,23910,,20942,,20191,,15757,,
32900 - 20115,,21076,,20707,,15450,,17724,,15387,,13559,,22110,,
33000 - 22513,,14611,,15462,,10579,,9204,,15988,,33000/
33100 C- ****REPLACEMENT TURNOVER RATES (RTR)****
33200 C- ****RTR ARE SEQUENCED BY MOS,NEC,MOS ON AFSC****
33300 C- **ARMY RTR, TABLE 11**
33400 - DATA(ARTR(I,1),I=1,54)/
33500 - .25,.20,.27,.23,.20,.20,.37,.14,.14,.14,.26,.26,
33600 - .27,.28,.27,.16,.16,.20,.20,.20,.20,.31,.38,.28,.26,.26,
33700 - .26,.26,.17,.17,.19,.19,.25,.25,.22,.22,.36,.30,.24,.16,
33800 - .24,.15,.15,.27,.16,.22,.22,.25,.25,.25,.29,.29,.24/
33900 C- **NAVY RTR, TABLE 12**
34000 - DATA(ARTR(I,2),I=1,54)/
34100 - .364,.364,.496,.364,.364,.133,.219,.254,.148,
34200 - .110,.120,.181,.400,.551,.500,.488,.460,.406,.400,.291,
34300 - .181,.224,.232,.226,.351,.462,.190,.140,.234,.325,.170,

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

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14400 - .285..309..275..337..33..217..161..334..200..209..368
14500 - .251..150..340..323..150..270..194..410..164..177..172..129/
14600 C- *****MARINE CORP RIN: TABLE 14****
14700 - DATA(ARIR(1:3),1*1.54)/
14800 - .358..433..399..373..433..433..373..433..433
14900 - .390..433..490..402..623..504..307..567..283..407..429/
15000 - .433..433..433..433..544..433..2840./
15100 C- *****AIR FORCE RIN: TABLE 13****
15200 - DATA(ARIR(1:4),1*1.54)/
15300 - .1051..1250..127..1148..1321..1278..1121/
15400 - .1235..1634..1634..1213..1224..1273..1208..1440..1154/
15500 - .1273..1240..1101..1225..1208..3340./
15600 C- *****THE FOLLOWING COSTS ARE SEQUENCED BY SERVICE
15700 C- A.N.M.C.A.F.****
15800 C- *EGLISTED PCS COSTS:TABLE 01CALISTED RETIRED COSTS PARA 2.4
15900 - DATA EN/239..510..484..444..7283..292..389..239/
16000 C- *OFFICER PCS COSTS:TABLE 01OFFICER A RETIRED COSTS PARA 2.4
16100 - DATA DN/2895..1494..1458..1457..CM/..205..235..218..254/
16200 - DATA CA/521..0.0*0.0*0.0/HUG/770..505..600..620./
16300 - DATA MDC1/275..640..278..500..MDC2/274..640..278..500./
16400 C- **LCC MODEL STARTS HERE**
16500 - INTEGER SWXA,SWXB,SWXC,UNE
16600 - ONE=1
16700 - SWXB=1
16800 - SWXA=2
16900 - SWXC=1
17000 - DATA CMGS/400*0./
17100 - DATA R12/4*0./
17200 - DATA VAL/400*0./
17300 C- **X IS 1ST YEAR RECURRING COST**
17400 - DATA X/30..130..440..390./
17500 C- **Y IS ANNUAL RECURRING COST**
17600 - DATA Y/110..130..420..720./
17700 C- **Z IS INTRODUCTION COST INTO INVENTORY LCC ELMNT **2.17**
17800 - DATA Z/430..450..530..680./
17900 C- *****INDEXED SET POSITION OF COST IN PRINT OUT MATRIX****
18000 C- **INDEX DATA POSITION FOR R&D SUMMARY**
18100 - DATA IRD/5*4*3*3*4*4*3*2*1*1*2*1*1*1*1*1*2*1*1*1/
18200 - 2*2*1*1*1*1*1*2*2*2*2*2*2*2*4*3*2*1*2*2*3*57*0/
18300 C- *****INDEX DATA POSITION FOR PRODUCTION SUMMARY****
18400 - DATA IP/5*4*3*2*1*2*1*1*2*1*1*2*2*1*1*1*1*1*2*2*2*2/
18500 - 1*1*1*2*1*1*2*2*4*2*2*2*2*4*3*2*1*2*1*1*2*3*2*2*2*1/
18600 - 1*1*2*2*2*4*45*0/
18700 C- *****INDEX DATA POSITION FOR USS SUMMARY****
18800 - DATA IOS/5*4*3*3*3*3*3*2*2*3*4*3*3*2*2*2*3*3*3*3*3*3/
18900 - 2*2*2*3*2*1*1*1*2*2*2*2*2*2*3*3*4*3*3*3*3*3*54*0/
19000 C- *****THIS INDEX SETS THE SEQUENCE OF RCS TO BE PRINTED****
19100 - DATA IRUS/30*31*33*34*41*50*51*87*91*92*52*32*84*35*36/
19200 - 37*38*49*54*39*54*85*42*93*54*58*40*81*82*83*97*98/
19300 - 43*23*68*55*55*44*56*94*101*102*103*104*105*54*0/
19400 - DATA R/2920..2*5*1*05*10*03*04*81*0./
19500 - .05*0..0..65..3000..001..0001*4*12*0..05*9*0./
19600 - 1056..1640..005*07*292*0./
19700 C- ALL FORMATS FOR LCC MODEL LOCATED HERE
19800 C-
19900 C-
20000 5 FORMAT(20X,"LIFE CYCLE COSTING MODEL")
20100 5 FORMAT("DO YOU WANT TO CHANGE/DISPLAY THE MODEL ASSUMPTIONS")
20200 - "ANSWER Y FOR YES, N FOR NO."
20300 11 FORMAT("THE FOLLOWING ASSUMPTIONS ARE MADE")
20400 - "EN001: OPERATING HOURS IS 4920 HRS/YR"
20500 - "EN002: DEFUT OVERHAUL RATE IS 204"
20600 - "EN003: TRANSPORTATION FACTOR IS $.50/LH"

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

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40600 - "(R004) SUPPORT EQUIPMENT MAINTENANCE FACTOR IS 10% "/
40700 - "(R005) REPAIR MATERIAL COST FACTOR IS 5% "/
40800 - "(R006) YEARS OF OPERATION IS 10 YEARS "/
40900 - "(R007) HOLDING INVENTORY FACTOR IS 3% "/
41000 - "(R008) POWER COST IS $0.04 PER KWH "/
41100 - "(R009) TRANSPORTATION COST FACTOR IS 5% "/
41200 - "(R063) DISTANCE FROM ORGANIZATION TO INTERMEDIATE "/
41300 - "MAINTENANCE LEVEL IS 25 MI "/
41400 - "(R064) DISTANCE FROM INTERMEDIATE TO DEPOT MAINTENANCE "/
41500 - "LEVEL IS 3000 MI "/
41600 - "(R065) SHORT DISTANCE TRANSPORTATION FACTOR IS $0.01 $/LB/MI "/
41700 - "(R066) LONG DISTANCE TRANSPORTATION FACTOR IS $0.001 $/LB/MI "/
41800 - "(R067) NON RECURRING INVESTMENT FACTOR IS 40% "/
41900 - "(R040) INVENTORY REPLENISHMENT FACTOR IS 5% "/
42000 - "(R090) AVAILABLE MANHOURS PER YEAR 1680 HRS "/
42100 - "(R107) MODIFICATION FACTOR .005 "/
42200 - "(R108) REPLENISHMENT FACTOR 7% "/
42300 - 12 FORMAT("IF ANY OF THE ABOVE ASSUMPTIONS ARE NOT VALID "/
42400 - "FOR YOUR SYSTEM/EQUIPMENT, ENTER THE CODES AND CORRECT VALUES "/
42500 - "ONE AT A TIME AS FOLLOWS "/
42600 - "RNNNNX, WHERE NNNN IS THE DATA ELEMENT(R001,R014,ETC) "/
42700 - "AND X IS THE DATA VALUE(ENTER AS A REAL NUMBER). "/
42800 - "IF NO CHANGES ARE REQUIRED, OR AFTER LAST CHANGE HAS BEEN " /
42900 - "MADE, ENTER R99990.")
43000 - 13 FORMAT("ENTER INPUT VARIABLE VALUES AS INDICATED. "/
43100 - "ENTER ONLY THE VALUES(NU CODES NEEDED), IN THE ORDER "/
43200 - "SPECIFIED. SEPARATE EACH VALUE WITH A COMMA. "/
43300 - "EX - 1000.,.003125,10500.,80.,0. ")
43400 - 16 FORMAT("INVALID ENTRY - PLEASE RE-ENTER OPTION")
43500 - 32 FORMAT("ENTER 4 (REAL #) VALUES FOR R121 SEPARATE BY COMMAS")
43600 - 38 FORMAT("DO YOU WANT FORMULA R404 OR R44B7 ")
43700 - "ANSWER A OR B ")
43800 - 60 FORMAT(A1)
43900 - 180 FORMAT(A1,13,A1,F13.2)
44000 - 101 FORMAT(YA6)
44100 - 121 FORMAT(CM )
44200 - 136 FORMAT("ENTER CHANGES IN VARIABLES")
44300 - 137 FORMAT("DO YOU WANT TO MAKE CHANGES TO ANY OF THE "/
44400 - "ASSUMPTIONS AND/OR VARIABLES? "/
44500 - "ANSWER WITH N(NU) B(OTH) A(ASSUMPTIONS ONLY) "/
44600 - "OR V(VARIABLES ONLY)")
44700 - 138 FORMAT("ENTER CHANGES IN ASSUMPTIONS ")
44800 - 139 FORMAT("ENTER ONLY THOSE DATA ELEMENTS TO BE CHANGED "/
44900 - "ONE AT A TIME AS FOLLOWS "/
45000 - "RNNNNX, WHERE NNNN IS THE DATA ELEMENT(R001,R014,ETC) AND X IS "/
45100 - "THE DATA VALUE(ENTER AS A REAL NUMBER). IF NO CHANGES ARE "/
45200 - "REQUIRED, OR AFTER LAST CHANGE HAS BEEN MADE, ENTER R99990.")
45300 - 140 FORMAT("CHANGES IN COST ELEMENT OUTPUTS")
45400 - 201 FORMAT(YA6)
45500 - 202 FORMAT("DO YOU WANT TO USE APPENDIX D. "/
45600 - "MILITARY PERSONNEL AND TRAINING TO COST THE "/
45700 - "MILITARY PERSONNEL OF YOUR SYSTEM ? "/
45800 - "ANSWER Y FOR YES, N FOR NO. ")
45900 - 206 FORMAT("DO YOU WANT TO INPUT ALL THE COST "/
46000 - "ELEMENTS FOR R8V(R200-R242) AND PRODUCTION(R300-R354) "/
46100 - "(A) OR JUST THE MINIMUM INPUTS TO OPERATE THE "/
46200 - "LCC MODEL (R3)? ")
46300 - 1206 FORMAT("ENTER INPUT VALUES AS INDICATED. "/
46400 - "ENTER ONLY THE VALUES, IN THE ORDER AS SPECIFIED. "/
46500 - "SEPARATE EACH VALUE WITH A COMMA. "/
46600 - "EXAMPLE-- 1000.,.002,0.,43.1")
46700 - 1000 FORMAT("*****")

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

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46800 - "*****"/
46900 - 40X" COSTS IN (M) OF CONSTANT 1978 1"/
47000 - " TRI-TAC LIFE CYCLE COST ELEMENTS LEVEL LEVEL SUBO/
47100 - 16X"STRUCTURE",17X,"3",5X,"4",2X"ELEMENT ELEMENT CAT."/
47200 - "-----"
47300 - "-----"/
47400 - 1005 FORMAT(1H,5X,"TRI-TAC LIFE CYCLE COST ELEMENTS"/
47500 - 16X"STRUCTURE",15X,"PRIOR ",FY-78 ",FY-79 ",FY-80 ",
47600 - "FY-81 ",FY-82 ",FY-83 ",FY-84 ",FY-85 ",FY-86 ",
47700 - "FY-87 ",FY-88 ",FY-89 ",FY-90 ",TOTAL"/)
47800 - 1006 FORMAT(1H,5X,"TRI-TAC LIFE CYCLE COST ELEMENTS"/
47900 - 16X"STRUCTURE",15X,"PRIOR ",FY-78 ",FY-79 ",FY-80 ",
48000 - "FY-81 "/)
48100 - 1007 FORMAT(1H,"FY-84 ",FY-83 ",FY-84 ",FY-85 ",FY-86 ",
48200 - "FY-87 ",FY-88 ",FY-89 ",FY-90 ",TOTAL"/)
48300 - 1008 FORMAT(40X,5F6.2/
48400 - 1009 FORMAT(5F6.2,5F7.4/
48500 - 2001 FORMAT(7A6,134,F13.2/
48600 - 2002 FORMAT(7A6,139,F13.2/
48700 - 2003 FORMAT(7A6,146,F13.2/
48800 - 2004 FORMAT(7A6,155,F13.2/
48900 - 2005 FORMAT(7A6,163,F13.2/
49000 - 2021 FORMAT("-----"
49100 - "-----"/
49200 - "TOTAL RESEARCH AND DEVELOPMENT COSTS",T63,F13.2/
49300 - "-----"
49400 - "-----"/
49500 - 2022 FORMAT("-----"
49600 - "-----"/
49700 - "TOTAL PRODUCTION COSTS",T63,F13.2/
49800 - "-----"
49900 - "-----"/
50000 - 2023 FORMAT("-----"
50100 - "-----"/
50200 - "TOTAL OPERATING AND SUPPORT COSTS",T61,F13.2/
50300 - "-----"
50400 - "-----"/
50500 - 2024 FORMAT("-----"
50600 - "-----"/
50700 - "TOTAL LIFE CYCLE COSTS",T63,F13.2/
50800 - "-----"
50900 - "-----"/
51000 - 2025 FORMAT("*****"
51100 - "*****"/
51200 - "THERE WERE NO CHANGES IN THE LIFE CYCLE COSTS"/
51300 - "*****"
51400 - "*****"/)
51500 - 2026 FORMAT(20X,"-----"/
51600 - 20X"TRI-TAC LIFE CYCLE COST MODEL"/
51700 - 20X"-----"/)
51800 - 2030 FORMAT("LIFE CYCLE COSTS CALCULATED FOR THE")
51900 - 2028 FORMAT(30H
52000 - 2028 FORMAT(
52100 - "WITH A DTUPC OF ",F13.2," BASED ON",F13.2," EQUIPMENTS"/
52200 - "AND A PRODUCTION BUY OF",F13.2," EQUIPMENTS"/)
52300 - 2027 FORMAT("INPUT THE NAME OF YOUR SYSTEM/EQUIPMENT"/
52400 - "IN THIRTY(30) LETTERS OR LESS"/)
52500 - C- *****CHANGES IN COST ELEMENT STRUCTURES WILL
52600 - C- REQUIRE CHANGES IN THE CORRESPONDING INDEXES****
52700 - C- *****COST ELEMENT STRUCTURE PRINT OUT*****
52800 - DATA(CRD(1,J),J=1,7),J=1,30/
52900 - 40H100 RESEARCH & DEVELOPMENT

```


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

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

```

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

```

58200 - 40H 211.154 SUPPORT
58300 - 40H 211.155 SOFTWARE SUPPORT
58400 - 40H 211.16 INITIAL SPARES & RPR PRIS
58500 - 40H 211.17 OTHER (SPECIFY)
58600 - 40H 212.1 GOVERNMENT (N-H)
58700 - 40H 212.11 INITIAL TRAINING
58800 - 40H 212.111 EQUIPMENT
58900 - 40H 212.112 SERVICES
60000 - 40H 212.113 FACILITIES
60100 - 40H 212.12 SYSTEM TEST & EVALUATION
60200 - 40H 212.121 PROD ACCT TEST/EVAL(PATE)
60300 - 40H 212.122 UPRNL TEST & EVAL(CTRE) /
60400 - DATA((P(1,J),J=1,7),J=10,55)/
60500 - 40H 212.13 PROGRAM MANAGEMENT
60600 - 40H 212.14 TEST SITE ACTIVATION
60700 - 40H 212.15 COMMON SUPPORT EQUIP
60800 - 40H 212.16 SOFTWARE CENTER
60900 - 40H 212.17 GOVT FURN EQUIP(CGFE)(SPECIFY)
61000 - 40H 212.18 INVENTORY MANAGEMENT
61100 - 40H 212.19 OTHER (SPECIFY)
61200 - 40H 220 PRODUCTION(RECURRING)
61300 - 40H 221.1 CONTRACTOR (RECUM)
61400 - 40H 221.11 PRIME MISSION EQUIP
61500 - 40H 221.111 SUBSYSTEMS (SPECIFY)
61600 - 40H 221.12 SYSTEMS/PROJECT MGMT
61700 - 40H 221.121 SYSTEM ENGINEERING
61800 - 40H 221.122 PROJECT MANAGEMENT
61900 - 40H 221.13 OTHER (SPECIFY)
62000 - 40H 222.1 GOVERNMENT (RECUM)
62100 - 40H 222.11 QUALITY CONTROL & INSPECT
62200 - 40H 222.12 TRANSPORTATION
62300 - 40H 222.13 OPERATIONAL/SITE ACT
62400 - 40H 222.131 SITE CONSTRUCTION
62500 - 40H 222.132 SITE/SHIP/VEHICLE CONV
62600 - 40H 222.133 ASSEMBLY, INSTAL & CHECKOUT
62700 - 40H 222.14 TECH ORDERS & MANUALS
62800 - 40H 222.15 GOVT FURN EQUIP(CGFE)(SPECIFY)
62900 - 40H 222.16 SUPPORT ENGINEERING
63000 - 40H 222.17 OTHER (SPECIFY) /
63100 - C- ***** COST STRUCTURE PRINT OUT*****
63200 - DATA((S(1,J),J=1,7),J=1,30)/
63300 - 40H300 OPERATING & SUPPORT
63400 - 40H 310 OPERATIONS
63500 - 40H 311 ENERGY CONSUMPTION
63600 - 40H 312 MATERIAL CONSUMPTION
63700 - 40H 313 OPERATOR PERSONNEL
63800 - 40H 314 OPERATIONAL FACILITIES
63900 - 40H 315 EQUIPMENT LEASEHOLDS
64000 - 40H 316 SOFTWARE SUPPORT
64100 - 40H 316.1 SOFTWARE PERSONNEL
64200 - 40H 316.2 SOFTWARE CENTER
64300 - 40H 317 OTHER OPERATIONS
64400 - 40H 320 LOGISTIC SUPPORT
64500 - 40H 321 MAINTENANCE
64600 - 40H 321.1 PERSONNEL
64700 - 40H 321.11 DRUNZTNL MAINT
64800 - 40H 321.12 INTRKDT MAINT
64900 - 40H 321.13 DEPOT MAINT
65000 - 40H 321.14 DEPOT MAINT(LNU/MOD RPR)
65100 - 40H 321.2 MAINT FACILITIES
65200 - 40H 321.3 SUPPORT EQUIP MAINT
65300 - 40H 321.4 CONTRACTOR SERVICES

```

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

```

65400 -      40H  322 SUPPLY
65500 -      40H  322.1 PERSONNEL
65600 -      40H  322.11 ORGNZTNL SUPPLY
65700 -      40H  322.12 INRMOT SUPPLY
65800 -      40H  322.13 DEPT SUPPLY
65900 -      40H  322.4 SUSTAIN INVLST
66000 -      40H  322.21 REPLNMNT SUPPLIES
66100 -      40H  322.211 URGNZTNL LEVEL
66200 -      40H  322.212 INT/DEPT LEVEL
66300 -      DATA((N5(I,J),I=1,7),J=31,46)/
66400 -      40H  322.213 MPR MATERIAL
66500 -      40H  322.22 MODIFICATIONS
66600 -      40H  322.23 RPLCMNT CUMMUN SPRT EQUIP
66700 -      40H  322.3 INVTNRY ADMIN
66800 -      40H  322.31 INVTNRY MNGMNT
66900 -      40H  322.32 INVTNRY DIST/HOLDING
67000 -      40H  322.33 TECH DATA SUPPRT
67100 -      40H  322.4 SUPPLY FACILITIES
67200 -      40H  322.5 TRANSPORTATION
67300 -      40H  323 OTHER LOGISTIC SPT
67400 -      40H  330 PERSONNEL TRNGNG & SPT
67500 -      40H  331 RPLCMNT TRNGNG
67600 -      40H  332 HEALTH CARE
67700 -      40H  333 PERSONNEL ACTIVITIES (PCS)
67800 -      40H  334 PERSONNEL SUPPORT
67900 -      40H  335 BASE OPERATING SUPPORT
68000 C- ***** THE MAIN PROGRAM STARTS HERE *****
68100 10  WRITE(1,2046)
68200      WRITE(1,2047)
68300      READ(1,2024)
68400      WRITE(1,9)
68500      READ(1,39)LTR
68600      IF(LTR.EQ."N")GO TO 30
68700      WRITE(1,11)
68800      WRITE(1,12)
68900 C-  READ IN CHANGES TO BE MADE TO THE ASSUMPTIONS AND OVERLAY
69000 C-  THEM IN THE VALUES ARRAY.
69100 14  READ(1,180)R0,RNUM,EQS,VALUE
69200      IF(RNUM.EQ.012)GO TO 241
69300      IF(RNUM.EQ.999)GO TO 30
69400      R(RNUM)=VALUE
69500      GO TO 14
69600 114 WRITE(1,134)
69700      GO TO 14
69800 C-  WRITE MSGS REQUESTING INPUTS FOR THE VARIOUS VARIABLES
69900 C-  ACCEPT INPUTS AND STORE IN THE VALUES ARRAY
70000 241 WRITE(1,32)
70100      READ(1,3)R12
70200      GO TO 14
70300 30  IF(SWXC.EQ.1)GO TO 100
70400      IF(SWXC=3)5,200,200
70500      DATA(VL(1,1),1=1,3)/"ENTER","VALUE","FORM"/
70600      DATA R1/202,203,208,210,211,213,214,215,216,217,219,
70700      220,221,222,224,225,226,227,228,229,231,232,233,234,
70800      235,239,240,241,242,12,12,12,304,306,307,309,310,311,312,
70900      314,315,316,317,318,319,320,323,324,325,327,328,329,
71000      330,331,332,333,334,335,339,341,342,343,345,346,340,
71100      349,350,351,352,353,354,12,4,18,19,20,10,
71200      11,109,110,57,75,26,28,13,61,62,14,15,17,46,16,27,1,
71300      72,79,1,2,24,25,29,47,50,51,52,53,54,55,56,76,77,78,
71400      86,89,92,1,200,12,320,331,343,12,12,12,
71500      DATA(RR(I,J),I=1,4),J=1,18)/

```


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

```

71000 C- **INPUTS FOR RESEARCH & DEVELOPMENT **
71700 - 24HR202,R203,R200,R210,
71800 - 24HR211,R213,R214,R215,
71900 - 24HR216,R217,R218,R220,
72000 - 24HR221,R222,R224,R225,
72100 - 24HR226,R227,R220,R229,
72200 - 24HR231,R232,R233,R234,
72300 - 24HR235,R239,R240,R241,
72400 - 24HR242,
72500 C- **INPUTS FOR PRODUCTION **
72600 - 24HR304,R306,R307,R309,
72700 - 24HR310,R311,R312,R314,
72800 - 24HR315,R316,R317,R318,
72900 - 24HR319,R320,R323,R324,
73000 - 24HR325,R327,R320,R329,
73100 - 24HR330,R331,R332,R333,
73200 - 24HR334,R335,R337,R341,
73300 - 24HR342,R343,R347,R346,
73400 - 24HR348,R349,R350,R351,
73500 - 24HR352,R353,R354,
73600 - DATA((RR(I,J),I=1,4),J=19,29)/
73700 C- **INPUTS FOR OAS**
73800 - 24HR9,R18,R19,R20,
73900 - 24HR10,R11,R109,R110,
74000 - 24HR57,R75,R26,R28,
74100 - 24HR13,R61,R62,R14,
74200 - 24HR15,R17,R46,R16,
74300 - 24HR27,R71,R72,R79,
74400 - 24HR21,R22,R24,R25,
74500 - 24HR29,R47,R50,R21,
74600 - 24HR52,R53,R54,R25,
74700 - 24HR56,R76,R77,R78,
74800 - 24HR86,R89,R92,
74900 - DATA((RR(I,J),I=1,4),J=30,31)/
75000 - 24HR200,R312,R320,R331,
75100 - 24HR343,
75200 100 WRITE(1,202)
75300 READ(1,39)100
75400 IF(T00.EQ."Y")GO TO 740
75500 IF(SWXC.EQ."1")GO TO 71
75600 IF(SWXC.EQ."F")GO TO 200
75700 C-
75800 C- **USER TO PICK SERVICE OF PERSONNEL TO BE COSTED**
75900 C- ***USES METHODOLOGY AND DATA OF TIO-CRT-032-76A-VJ-APD***
76000 740 WRITE(1,1)
76100 74 READ(1,70)MSG
76200 92 IF(MSG.EQ."A")GO TO 75
76300 IF(MSG.EQ."N")GO TO 76
76400 IF(MSG.EQ."MC")GO TO 77
76500 IF(MSG.EQ."AF")GO TO 15
76600 WRITE(1,2)
76700 GO TO 74
76800 75 L=1
76900 WRITE(1,3)
77000 GO TO 25
77100 76 L=2
77200 WRITE(1,3)
77300 GO TO 26
77400 77 L=3
77500 WRITE(1,3)
77600 GO TO 27
77700 15 L=4

```


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

```

77800      WRITE(1,3)
77900      GO TO 25
78000 25    WRITE(1,21)
78100      READ(1,22) LVL, MOS, G, K, NU, DONE
78200      GO TO 120
78300 26    WRITE(1,21)
78400      READ(1,23) LVL, MOS, MOS1, G, K, NU, DONE
78500      GO TO 120
78600 27    WRITE(1,21)
78700      READ(1,24) LVL, MOS, G, K, NU, DONE
78800 120   IF(G.EQ."E") GO TO 81
78900      GO TO A2
79000 81    PCS=EN(L)
79100      RCF=FM(L)
79200      WDC=WDC1(L)
79300      RPC=AE(K,L)
79400      RRG=AER(K,L)
79500      GO TO A4
79600 82    IF(G.EQ."W") GO TO 83
79700      GO TO A6
79800 83    PCS=ON(L)
79900      RCF=ON(L)
80000      WDC=WDC2(L)
80100      RPC=AW(K,L)
80200      RRG=AWR(K,L)
80300      GO TO A4
80400 86    IF(G.EQ."O") GO TO 131
80500      GO TO 124
80600 131   PCS=ON(L)
80700      RCF=ON(L)
80800      WDC=WDC2(L)
80900      RPC=AO(K,L)
81000      RRG=AOR(K,L)
81100      GO TO A4
81200 124   WRITE(1,2)
81300      GO TO 25
81400 84    GO TO(85,87,85,85),L
81500 87    I=1
81600      J=2
81700 237   IF(MOS.EQ.AM(I,2).AND.MOS1.EQ.AM(J,2)) GO TO 227
81800      I=I+2
81900      J=J+2
82000      IF(J.GT.100) GO TO 128
82100      GO TO 237
82200 227   I=(I+1)/2
82300      GO TO 127
82400 85    I=1
82500 90    IF(MOS.EQ.AM(I,L)) GO TO 127
82600      I=I+1
82700      IF(I.GT.54) GO TO 128
82800      GO TO 90
82900 128   GO TO(91,132,133,134),L
83000 91    WRITE(1,7)
83100      WRITE(1,2)
83200      GO TO 25
83300 132   WRITE(1,8)
83400      WRITE(1,2)
83500      GO TO 25
83600 133   WRITE(1,72)
83700      WRITE(1,2)
83800      GO TO 25
83900 134   WRITE(1,73)

```

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

```

84000      WRITE(1,2)
84100      GO TO 25
84200      127  ATC=(ANC(I,L)*AHIR(I,L))+C(L)
84300      RTC=RPC*RGF*PRG
84400      C=  **CALCULATIONS FOR, AND STORAGE OF RESULTS**
84500      IF(LVL.EQ."OPR")M=3
84600      IF(LVL.EQ."SWP")M=4
84700      IF(LVL.EQ."ULM")M=1
84800      IF(LVL.EQ."ILM")M=2
84900      95  NDS(L,M)=NU+NDS(L,M)
85000      RPCS(L,M)=RPF*NU*RPCS(L,M)
85100      ATCS(L,M)=ATC*NU*ATCS(L,M)
85200      MDCS(L,M)=MDC*NU*MDCS(L,M)
85300      PCSS(L,M)=PCS*NU*PCSS(L,M)
85400      RDCS(L,M)=RUC(L)*NU*RDCS(L,M)
85500      RTCS(L,M)=RTC+RTCS(L,M)
85600      TPCS(L,M)=RPCS(L,M)+PCSS(L,M)+ATCS(L,M)+RDCS(L,M)+
85700      MDCS(L,M)+RTCS(L,M)
85800      IF(DNF.NE."ZZ")GO TO (25,26,27,25),L
85900      R41B=RPCS(L,3)
86000      R91B=RPCS(L,4)
86100      R36B=RPCS(L,1)
86200      R37B=RPCS(L,2)
86300      R101B=ATCS(L,1)+ATCS(L,2)+ATCS(L,3)+ATCS(L,4)
86400      R102B=MDCS(L,1)+MDCS(L,2)+MDCS(L,3)+MDCS(L,4)
86500      R103B=PCSS(L,1)+PCSS(L,2)+PCSS(L,3)+PCSS(L,4)
86600      R105B=MDCS(L,1)+MDCS(L,2)+RUCS(L,3)+RDCS(L,4)
86700      WRITE(1,28)
86800      READ(1,30)100
86900      IF(T00.EQ."R")GO TO 29
87000      IF(NDS(L,4).EQ.0)GO TO 301
87100      R110A=(TPCS(L,4)/NDS(L,4))/1656.
87200      301  IF(NDS(L,1).EQ.0)GO TO 302
87300      R26A=(TPCS(L,1)/NDS(L,1))/1656.
87400      302  IF(NDS(L,2).EQ.0)GO TO 303
87500      R28A=(TPCS(L,2)/NDS(L,2))/1656.
87600      303  IF(NDS(L,3).EQ.0)GO TO 304
87700      R11A=(TPCS(L,3)/NDS(L,3))/1656.
87800      304  R10A=NDS(L,3)
87900      R105A=NDS(L,4)
88000      GO TO 71
88100      29  R(41)=R41B
88200      R(36)=R36B
88300      R(37)=R37B
88400      R(91)=R91B
88500      R(101)=R101B
88600      R(102)=R102B
88700      R(103)=R103B
88800      R(105)=R105B
88900      71  IF(SWXC.NE.1)GO TO 200
89000      C=  ***REQUESTS INPUTS FOR LCM***
89100      WRITE(1,206)
89200      READ(1,39)44N
89300      WRITE(1,1206)
89400      IF(ANN.EQ."A")GO TO 109
89500      M=73
89600      N=19
89700      MM=31
89800      GO TO 104
89900      109  M=1
90000      N=1
90100      MM=29

```

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

```

90200 104 DO 105 J=N*MM
90300 WRITE(1,101)(VL(4,1),I=1,3),(KR(I,J),I=1,4)
90400 IF(J=8)GO TO 108
90500 IF(J=18)GO TO 107
90600 IF(J=31)GO TO 100
90700 IF(J=29)GO TO 107
90800 C- ****READS INPUTS USING DATA MV FOR INDIRECT ADDRESSING
90900 C- TO ASSIGN VALUES TO CORRESPONDING R() LOCATIONS
91000 C- RV ARE SEQUENCE TO R() INPUTS****
91100 READ(1,1)A,B,C,U
91200 GO TO 106
91300 108 READ(1,1)A
91400 GO TO 106
91500 107 READ(1,1)A,B,C
91600 GO TO 106
91700 106 KK=RV(M)
91800 R(KK)=A
91900 M=M+1
92000 KK=RV(M)
92100 R(KK)=B
92200 M=M+1
92300 KK=RV(M)
92400 R(KK)=C
92500 M=M+1
92600 KK=RV(M)
92700 R(KK)=D
92800 M=M+1
92900 105 CONTINUE
93000 WRITE(1,32)
93100 READ(1,1)R12
93200 C- THE USER IS GIVEN THE OPTION OF SELECTING THE TRANS-
93300 C- PORTATION COST FORMULA TO BE USED.
93400 C- THE VARIOUS COMPUTATIONS ARE MADE HERE. REFER TO
93500 C- VARIOUS APPENDICES OF TIO-UNT-032-78-V3 LIFE CYCLE COSTING
93600 C- FOR AN EXPLANATION/ANALYSIS OF THE FORMULAS USED
93700 C- **065 CALCULATIONS**
93800 C- **LEARNING CURVE CALCULATION**
93900 200 B=ALOG10(R(20))/ALOG10(2.)
94000 X1=(R(19)*(1.+B)/(R(19)+.5))*(1.+B)-(1.5)*(1.+B))*(-1./B)
94100 X2=((R(9)*(1.+B)/((R(9)+.5)*(1.+B))-(1.5)*(1.+B)))
94200 *(-1./B)
94300 C=((R(8))/(X1)**B)
94400 R(49)=C*((X2)**B)
94500 R(70)=1.-(R(71)+R(72))
94600 R(73)=(R(27)-R(70))/(R(71)+R(72))
94700 R(74)=1.-R(73)
94800 R(40)=(R(1)*R(9)*R(14)*R(27))/R(16))+
94900 (R(1)*R(4)*(1.-R(27))*R(14)*R(53))/R(16))
95000 R(43)=R(23)+R(68)
95100 C- **311**ENERGY CONSUMPTION**
95200 R(33)=R(21)*R(1)*R(8)+R(9)
95300 C- **312**MATERIAL CONSUMPTION**
95400 R(34)=(R(24)+R(25))*R(9)
95500 C- **313**OPERATOR PERSONNEL**
95600 IF(R10A.NE.0.)R(10)=R10A
95700 IF(R11A.NE.0.)R(11)=R11A
95800 R41A=R(11)*R(10)*R(4)
95900 IF(T00.NE."B")R(41)=R41A
96000 C- **314**OPERATIONAL FACILITIES**
96100 C- R(50) IS DIRECT INPUT
96200 C- **315**EQUIPMENT LEASEHOLDS**
96300 C- R(51) IS DIRECT INPUT

```


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

```

96400 C-    **116**SOFTWARE SUPPORT**
96500      IF(R109A.NF.O.AND,R(109).EQ.O.)R(109)=R109A
96600      IF(R110A.NF.O.AND,R(110).EQ.O.)R(110)=R110A
96700      R01A=R(109)+R(110)+R(90)
96800      IF(100.NF."R")R(91)=R01A
96900      R(87)=R(92)+R(91)
97000 C-    **117**OTHER OPERATIONS COSTS**
97100 C-    R(52) IS DIRECT INPUT
97200 C-    **118**OPERATIONS**
97300      R(31)=(R(33)+R(34)+R(41)+R(50)+R(51)+R(52)+R(87))
97400 C-    **121.1**ORGANIZATIONAL MAINT**
97500      IF(R26A.NF.O.AND,R(26).EQ.O.)R(26)=R26A
97600      R26A=R(22)+((R(13)+R(15))/R(14))+R(26)+R(9)
97700      IF(100.NF."R")R(34)=R26A
97800 C-    **121.12**INTERMEDIATE MAINT**
97900      IF(R28A.NF.O.AND,R(28).EQ.O.)R(28)=R28A
98000      R28A=((R(11)+R(9))/R(16))+R(74)+R(17)+R(28)
98100      IF(100.NF."R")R(37)=R28A
98200 C-    **121.13**DEPOT MAINT(OVERHAUL)**
98300      R(38)=R(57)+R(75)+R(90)
98400      IF(R(2).EQ.O.)R(38)=0.
98500 C-    **121.14**DEPOT LRU/MODULE REPAIR**
98600      R(49)=R(1)+R(20)+R(44)+R(75)+R(79)/R(18)
98700 C-    **121.14**TOTAL MAINT PERSONNEL COST**
98800      R(45)=R(34)+R(37)+R(38)+R(60)
98900 C-    **121.2**MAINTENANCE FACILITIES**
99000      R51=(R(80)+R(76))+R(86)
99100      IF(R(53).EQ.O.)R(53)=R51
99200 C-    **121.3**SUPPORT EQUIPMENT MAINTENANCE**
99300      R(49)=R(8)+R(112)+R(331)
99400 C-    **121.4**CONTRACTOR SERVICES**
99500 C-    R(54) IS DIRECT INPUT
99600 C-    **121**MAINT-NANCE**
99700      R(88)=R(35)+R(53)+R(39)+R(54)
99800 C-    **122.11**ORGANIZATIONAL SUPPLY PERS.**
99900      R(93)=R(3)+R(36)
100000 C-    **122.12**INTERMEDIATE SUPPLY PERS.**
100100      R(94)=R(3)+R(37)
100200 C-    **122.13**DEPOT SUPPLY PERS.**
100300 C-    COSTS ARE INCLUDED IN OVERHEAD RATES OF 321.13
100400 C-    **122.14**SUPPLY PERSONNEL**
100500      R(92)=R(93)+R(94)+R(95)
100600 C-    **122.21**ORGANIZATIONAL SPARES**
100700      R(41)=R(70)+R(91)+R(1)+R(14)/R(16)
100800 C-    **122.212**INTER/DEPOT SPARES**
100900      R(42)=(R(9)+R(1)+R(14)/R(16))+R(27)
101000 C-    **122.213**REPAIR MATERIAL**
101100      R(43)=(1-R(27))+R(5)+R(9)+R(1)+R(14)/R(16)
101200 C-    **122.214**REFRESHMENT SPARES**
101300      R(40)=R(81)+R(82)+R(83)
101400 C-    **122.22**MODIFICATIONS**
101500      R(67)=R(9)+R(49)+R(107)
101600 C-    **122.23**REPLACEMENT COMMON SUPPORT EQUIPMENT**
101700      R(68)=R(108)+R(331)
101800 C-    **122.24**SUSTAINING INVESTMENTS**
101900      R(58)=R(40)+R(97)+R(98)
102000 C-    **122.31**INVENTORY MANAGEMENT**
102100      R21=0.
102200      R314=0.
102300      R(73)=0.
102400      R(134)=0.
102500      DO 300 I=1,4,1

```


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

```

102000      R231=R12(I)*(X(I)+Y(I)*(R(6)*1.))/R(6)
102100      R334=R12(I)*Z(I)
102800      R(23)=R(23)+R231
102900      R(334)=R(334)+R334
103000      300 CONTINUE
103100 C=    **322.32**INVENTORY DISTRIBUTION/HOLDING**
103200      R(68)=R(7)*((.15*R(9)+R(49))*(R(40)/2.))
103300 C=    **322.33**TECHNICAL DATA SUPPORT**
103400      R(59)=R(47)+R(29)
103500 C=    **322.34**INVENTORY ADMINISTRATION**
103600      R(43)=R(23)+R(68)+R(59)
103700 C=    **322.4**SUPPLY FACILITIES**
103800 C=    R(55) IS DIRECT INPUT
103900 C=    **322.5**TRANSPORTATION**
104000      R(106)=2.*(R(64)+R(66)+R(9)+R(13)+R(2))
104100      R44A=R(60)+R(40)+R(106)
104200 C=    **R44A FORMULA IS DERIVED FROM APPENDIX E OF VOL.3**
104300 C=    **TTO-ORT-032-78-V3-APE**
104400      R44B=(R(1)+R(9)+R(16))
104500 C=    **DISCARD AT ORG LEVEL NEW LRU FROM DEPOT**
104600      R(70)=(R(61)+R(63)+R(65)+R(61)+R(64)+R(66))
104700 C=    **ORG TO INT REPAIR AND RETURN**
104800      R(71)+R(74)*(2.*R(61)+R(63)+R(65)+R(62)+R(64)+R(66))
104900 C=    **ORG TO INT AND DISCARD NEW LRU TO ORG**
105000      R(71)+R(74)*(2.*R(61)+R(63)+R(65)+R(61)+R(64)+R(66))
105100 C=    **DEPOT REPAIR/DISCARD RETURN TO ORG**
105200      R(72)*(2.*R(61)+R(63)+R(65)+2.*R(61)+R(64)+R(66))
105300 C=    **USFR TO SELECT TRANSPORTATION FORMULA**SEE
105400 C=    TTO-ORT-032-78-V3-APE FOR EXPLANATION OF CHOICES**
105500      WRITE(1,38)
105600      READ(1,39)LTR
105700 501 IF(LTR.EQ."A".OR.LTR.EQ."B") GO TO 141
105800      WRITE(1,16)
105900      READ(1,39)LTR
106000      GO TO 501
106100 141 IF(LTR.EQ."A")R(44)=R44A
106200      IF(LTR.EQ."B")R(44)=R44B
106300 C=    **322.4**SUPPLY**
106400      R(85)=R(42)+R(58)+R(43)+R(55)+R(44)
106500 C=    **323**LOGISTIC SUPPORT COSTS**
106600 C=    R(56) IS DIRECT INPUT
106700 C=    **320**LOGISTIC SUPPORT**
106800      R(32)=R(84)+R(85)+R(56)
106900 C=    **330**PERSONNEL TRAINING & SUPPORT**
107000      R(99)=R(101)+R(102)+R(103)+R(104)+R(105)
107100 C=    **300**OPERATING AND SUPPORT**
107200      R(30)=R(31)+R(32)+R(99)
107300      IF(AMN.EQ."A")GO TO 1111
107400      R(301)=(R(49)+R(67)+R(320)+R(312)+R(331)+R(334)
107500      R(336)=R(49)+R(67)+R(343)
107600      R(300)=R(301)+R(336)
107700      GO TO 111
107800 C=    **R & D CALCULATIONS**
107900 1111 R(238)=R(239)
108000      R(237)=R(238)+R(440)+R(241)
108100      R(236)=R(237)+R(442)
108200      R(230)=R(231)+R(432)+R(233)+R(234)+R(235)
108300      R(223)=R(244)+R(425)+R(226)+R(227)+R(228)
108400      R(218)=R(219)+R(420)+R(221)
108500      R(212)=R(213)+R(414)+R(215)+R(216)+R(217)
108600      R(209)=R(210)+R(411)
108700      R(207)=R(208)

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108800 R(204)=R(207)+R(409)+R(212)+R(218)+R(222)+R(223)+R(229)
108900 R(205)=R(206)+R(436)
109000 R(206)=R(205)+R(436)
109100 R(207)=R(202)+R(403)
109200 R(208)=R(201)+R(404)
109300 C- ***PRODUCTIUN CALCULATIONS ***
109400 R(347)=R(348)+R(349)+R(350)
109500 R(348)=R(345)+R(346)+R(347)+R(351)+R(352)+R(353)+R(354)
109600 R(349)=R(341)+R(342)
109700 R(350)=R(349)
109800 R(351)=R(348)+R(340)+R(343)
109900 R(352)=R(357)+R(344)
110000 R(353)=R(347)+R(328)
110100 R(354)=R(343)+R(324)+R(325)
110200 R(355)=R(342)+R(326)+R(329)+R(330)+R(331)+R(332)+R(333)
110300 +R(334)+R(335)
110400 R(356)=R(341)+R(315)+R(316)+R(317)+R(318)
110500 R(357)=R(345)+R(310)+R(311)
110600 R(358)=R(306)+R(307)
110700 R(359)=R(304)
110800 R(360)=R(303)+R(305)+R(308)+R(312)+R(313)+R(319)+R(320)
110900 R(361)=R(302)+R(321)
111000 R(362)=R(301)+R(336)
111100 111 DTUPC=R(49)
111200 QTY=R(19)
111300 BUY=R(9)
111400 WRITE(1,121)
111500 WRITE(1,121)
111600 IF(SWXR*EQ*2) WRITE(1,140)
111700 IF(R(49).NE.CHGS(49))WRITE(1,2026)
111800 IF(R(49).NE.CHGS(49))WRITE(1,2030)
111900 IF(R(49).NE.CHGS(49))WRITE(1,2029)
112000 IF(R(49).NE.CHGS(49))WRITE(1,2028)DTUPC,QTY,BUY
112100 IF(R(200).EQ.CHGS(200))GO TO 998
112200 IF(SWXR*EQ*2)WRITE(1,1000)
112300 IF(SWXR*EQ*1)WRITE(1,1000)
112400 C- ***CONVERSIONS AND FORMAT PRINTOUTS COME HERE***
112500 C- **NOTE:000001+R(K) CONVERTS VALUES TO MILLIONS**
112600 C- ***R*P***
112700 123 K=200
112800 L=1
112900 DO 126 J=1,43
113000 M=IND(L)
113100 VAL(K)=000001+R(K)
113200 GO TO(2006,2007,2008,2009,2010),M
113300 2006 IF(CH(K).NE.CHGS(K))WRITE(1,2001)(RD(I,J),I=1,7),VAL(K)
113400 GO TO 122
113500 2007 IF(CH(K).NE.CHGS(K))WRITE(1,2002)(RD(I,J),I=1,7),VAL(K)
113600 GO TO 122
113700 2008 IF(CH(K).NE.CHGS(K))WRITE(1,2003)(RD(I,J),I=1,7),VAL(K)
113800 GO TO 122
113900 2009 IF(CH(K).NE.CHGS(K))WRITE(1,2004)(RD(I,J),I=1,7),VAL(K)
114000 GO TO 122
114100 2010 IF(CH(K).NE.CHGS(K))WRITE(1,2005)(RD(I,J),I=1,7),VAL(K)
114200 122 K=K+1
114300 L=L+1
114400 126 CONTINUE
114500 WRITE(1,2041)VAL(200)
114600 C- ***PRODUCTIUN***
114700 WRITE(1,121)
114800 WRITE(1,121)
114900 998 IF(CH(300).EQ.CHGS(300))GO TO 997

```

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

```

115000      WRITE(1,1000)
115100      K=300
115200      L=1
115300      DO 150 J=1,55
115400      M=IP(L)
115500      VAL(K)=.000001*R(K)
115600      GO TO(2011,2012,2013,2014,2015),M
115700      2011 IF(R(K).NE.CHGS(N))WRITE(1,2001)(PD(I,J),I=1,7),VAL(K)
115800      GO TO 155
115900      2012 IF(R(K).NE.CHGS(N))WRITE(1,2002)(PD(I,J),I=1,7),VAL(K)
116000      GO TO 155
116100      2013 IF(R(K).NE.CHGS(N))WRITE(1,2003)(PD(I,J),I=1,7),VAL(K)
116200      GO TO 155
116300      2014 IF(R(K).NE.CHGS(N))WRITE(1,2004)(PD(I,J),I=1,7),VAL(K)
116400      GO TO 155
116500      2015 IF(R(K).NE.CHGS(N))WRITE(1,2005)(PD(I,J),I=1,7),VAL(K)
116600      155 K=K+1
116700      KK=KK+1
116800      L=L+1
116900      150 CONTINUE
117000      WRITE(1,2042)VAL(300)
117100      C= *****0.85*****R(N)*R(6) CONVERTS ANNUAL COSTS TO LCC**
117200      WRITE(1,121)
117300      WRITE(1,121)
117400      997 IF(R(30).EQ.CHGS(30))GO TO 996
117500      WRITE(1,1000)
117600      L=1
117700      M=1
117800      DO 160 J=1,46
117900      K=IRDS(M)
118000      VAL(K)=.000001*R(K)*R(6)
118100      N=IOS(L)
118200      GO TO(2016,2017,2018,2019,2020),N
118300      2016 IF(R(K).NE.CHGS(N))WRITE(1,2001)(DS(I,J),I=1,7),VAL(K)
118400      GO TO 165
118500      2017 IF(R(K).NE.CHGS(N))WRITE(1,2002)(DS(I,J),I=1,7),VAL(K)
118600      GO TO 165
118700      2018 IF(R(K).NE.CHGS(N))WRITE(1,2003)(DS(I,J),I=1,7),VAL(K)
118800      GO TO 165
118900      2019 IF(R(K).NE.CHGS(N))WRITE(1,2004)(DS(I,J),I=1,7),VAL(K)
119000      GO TO 165
119100      2020 IF(R(K).NE.CHGS(N))WRITE(1,2005)(DS(I,J),I=1,7),VAL(K)
119200      165 L=L+1
119300      M=M+1
119400      160 CONTINUE
119500      WRITE(1,2043)VAL(30)
119600      VAL(48)=VAL(200)+VAL(300)+VAL(30)
119700      R(48)=VAL(48)
119800      WRITE(1,2044)VAL(48)
119900      996 IF(R(48).EQ.CHGS(48))WRITE(1,2025)
120000      C= *****[C=DS CHGS(I) AND R(I) HERE]
120100      C= NOTE-ON SUBSEQUENT RUNS ONLY THE CHANGES ARE PRINTED OUT***
120200      IF(SWXB.NE.1) GO TO 500
120300      DO 450 K=1,400,1
120400      CHGS(K)=R(K)
120500      450 CONTINUE
120600      500 SWXB=2
120700      DO 600 L=1,400,1
120800      R(L)=CHGS(L)
120900      600 CONTINUE
121000      C= THE USER IS GIVEN THE OPTION HERE TO MAKE ANY CHANGES
121100      C= TO THE ORIGINAL INPUTS. THE OPTIONS ARE TO CHANGE JUST

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AD-A056 981

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

UNCLASSIFIED

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

NL

2 OF 2

AD
A056 981



END

DATE
FILMED

9-78

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

```

121200 C-  VARIABLES, JUST ASSUMPTIONS, OR BOTH, ONLY THOSE
121300 C-  ELEMENTS THAT ARE TO BE CHANGED ARE ENTERED.
121400      WRITE(1,137)
121500      50 READ(1,70)MSG
121600          IF(MSG.EQ."N") GO TO 900
121700          IF(MSG.EQ."B") GO TO 51
121800          IF(MSG.EQ."A") GO TO 52
121900          IF(MSG.EQ."V") GO TO 53
122000      WRITE(1,14)
122100      GO TO 60
122200      51 SWXC=2
122300      WRITE(1,130)
122400      GO TO 114
122500      52 SWXC=3
122600      WRITE(1,130)
122700      GO TO 114
122800      53 SWXC=4
122900      WRITE(1,130)
123000      GO TO 114
123100      55 SWXC=5
123200      WRITE(1,130)
123300      GO TO 114
123400      900 STOP
123500      END

```

SECTION B

GENERAL INFORMATION

I. ACCEPTABLE INPUT DATA

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

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

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

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

II. PROCESSING AVAILABLE

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

TABLE 1

DATA CONSTANTS/ASSUMPTIONS
FOR FORTRAN LCC MODEL

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

TABLE 2

RESEARCH AND DEVELOPMENT
DATA INPUTS FOR FORTRAN LCC MODEL

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

TABLE 3
PRODUCTION
DATA INPUTS FOR FORTRAN LCC MODEL

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

TABLE 4

OPERATIONS AND SUPPORT
DATA INPUTS FOR FORTRAN LCC MODEL

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

TABLE 4
OPERATIONS AND SUPPORT
DATA INPUTS FOR FORTRAN LCC MODEL
(Cont'd)

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

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

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

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

TABLE 5

MILITARY PERSONNEL & TRAINING COSTS
DATA INPUTS FOR FORTRAN LCC MODEL

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

Input Values For

Service _____

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

OPR	_____	_____	_____
SWP	_____	_____	_____
OLM	_____	_____	_____
ILM	_____	_____	_____

TABLE 6

RESEARCH AND DEVELOPMENT
COST DATA OUTPUTS FOR FORTRAN LCC MODEL

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

TABLE 7

PRODUCTION
COST DATA OUTPUTS FOR FORTRAN LCC MODEL

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

TABLE 7
PRODUCTION
COST DATA OUTPUTS FOR FORTRAN LCC MODEL
(Cont'd)

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

TABLE 8

OPERATING AND SUPPORT
COST DATA OUTPUT FOR FORTRAN LCC MODEL

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

TABLE 8

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

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

Other Registers Used but not Printed Out

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

TABLE 9

TRANSPORTATION COST FORMULAS

DEPOT OVERHAUL TRANSPORTATION FORMULA:

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

TRANSPORTATION COST FORMULA A (R44A):

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

TRANSPORTATION COST FORMULA B (R44B):

$$\begin{aligned} R44B = & R9 \times \frac{R1}{R61} \times \left\{ R70 \times \left[R61 \times R63 \times R65 + R61 \times R64 \times R66 \right] \right. \\ & + R71 \times R74 \times \left[2 \times R61 \times R63 \times R65 + R62 \times R64 \times R66 \right] \\ & + R71 \times R73 \times \left[2 \times R61 \times R63 \times R65 + R61 \times R64 \times R66 \right] \\ & + R72 \times \left[2 \times R61 \times R63 \times R65 + 2 \times R61 \times R64 \times R66 \right] \left. \right\} \\ & + R106 \end{aligned}$$

where,

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

OUTPUT DATA GENERATED

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

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

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

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

IV CONVERSATIONAL SYSTEM CONTROL STATEMENTS

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

V. ENTERING YOUR INPUT DATA

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

VI LISTING DATA FILES

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

FIGURE 2

SAMPLE PROGRAM OUTPUT (WITH ANNOTATIONS)

RUN TTLOCM/TRITAC
RUNNING

TRI-TAC LIFE CYCLE COST MODEL

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

Msg
#1

?TACTICAL DIGITAL FACIMILE_
DO YOU WANT TO CHANGE/DISPLAY THE MODEL ASSUMPTIONS
ANSWER Y FOR YES, N FOR NO.

-Reply
Msg
#2

?Y_
THE FOLLOWING ASSUMPTIONS ARE MADE

-Reply

(R001) OPERATING HOURS IS 2920 HRS/YR
(R002) DEPOT OVERHAUL RATE IS 20%
(R003) TRANSPORTATION FACTOR IS \$.50/LB
(R004) SUPPORT EQUIPMENT MAINTENANCE FACTOR IS 10%
(R005) REPAIR MATERIAL COST FACTOR IS 5%
(R006) YEARS OF OPERATION IS 10 YEARS
(R007) HOLDING INVENTORY FACTOR IS 3%
(R008) POWER COST IS \$0.04 PER KWH
(R009) TRANSPORTATION COST FACTOR IS 5%
(R063) DISTANCE FROM ORGANIZATION TO INTERMEDIATE
MAINTENANCE LEVEL IS 25 MI
(R064) DISTANCE FROM INTERMEDIATE TO DEPOT MAINTENANCE
LEVEL IS 3000 MI
(R065) SHORT DISTANCE TRANSPORTATION FACTOR IS \$.001 \$/LB/MI
(R066) LONG DISTANCE TRANSPORTATION FACTOR IS \$.0001 \$/LB/MI
(R067) NON RECURRING INVESTMENT FACTOR IS 40%
(R080) INVENTORY REPLENISHMENT FACTOR IS 5%
(P090) AVAILABLE MANHOURS PER YEAR 1656 HRS
(P107) MODIFICATION FACTOR .005
(P108) REPLENISHMENT FACTOR 7%

Msg
#3

IF ANY OF THE ABOVE ASSUMPTIONS ARE NOT VALID
FOR YOUR SYSTEM/EQUIPMENT, ENTER THE CODES AND CORRECT VALUES
ONE AT A TIME AS FOLLOWS
RNN=X, WHERE RNN IS THE DATA ELEMENT (R001-R114, ETC)
AND X IS THE DATA VALUE (ENTER AS A REAL NUMBER).
IF NO CHANGES ARE REQUIRED, OR AFTER LAST CHANGE HAS BEEN
MADE, ENTER R999=0.

?R001=4380._
?R002=0._
?R999=0._

-Reply

DO YOU WANT TO USE APPENDIX D,
MILITARY PERSONNEL AND TRAINING TO COST THE
MILITARY PERSONNEL OF YOUR SYSTEM ?
ANSWER Y FOR YES, N FOR NO.

Msg
#4

?Y_

-Reply

FIGURE 2
SAMPLE PROGRAM OUTPUT (WITH ANNOTATIONS)
(Cont'd)

<pre> APPENDIX D MILITARY PERSONNEL AND TRAINING COSTS INDICATE THE SERVICE OF THE PERSONNEL TO BE COSTED ANSWER WITH A FOR ARMY, N FOR NAVY, MC FOR MARINE CORP, OR AF FOR AIR FORCE </pre>	Msg #5
<pre> PA_ ENTER THE PERSONNEL INFORMATION IN THE ORDER AND FORMAT INDICATED USING THE FOLLOWING CODES AND SEPARATING THE DATA BY COMMAS: UNDER **LEVEL** ENTER ONE OF THE FOLLOWING CODES: OPR = OPERATOR SMP = SOFT-WARE PERSONNEL OLM = ORGANIZATIONAL LEVEL MAINTENANCE ILN = INTERMEDIATE LEVEL MAINTENANCE UNDER **MOS** ENTER THE APPROPRIATE CODE AS FOLLOWS: FOR ARMY: MOS CODE MUST BE OF TYPE XXXXX FOR NAVY: MOS CODE MUST BE AA-XXXX-XXXXXX OR AA-XXXX FOR MARINE CORP MOS CODE MUST BE XXXX FOR AIR FORCE MOS CODE MUST BE XXXXX WHERE: X=NUMBER, AND A=ALPHA UNDER **PAY GRADE** ENTER PAY GRADE AS E1 TO E9. UNDER **NUMBER** ENTER THE NUMBER OF PERSONNEL (01 TO 99) TO BE COSTED FOR EACH LEVEL, MOS AND PAY GRADE ENTERED. UNDER **DONE** ENTER ZZ WHEN AND ONLY IF YOU ARE FINISHED WITH ALL INPUTS AT ALL LEVELS... (EN-OPR-05B20-E5-07-ZZ) </pre>	Reply Msg #6
<pre> **LEVEL**,**MOS**,**PAY GRADE**,**NUMBER**,**DONE** TOLN-ET-1411-E3-01_ **LEVEL**,**MOS**,**PAY GRADE**,**NUMBER**,**DONE** </pre>	Replies
<pre> FILN-ET-1411-E5-01-ZZ_ IS PERSONNEL COSTING FOR TRADE-OFF (A) OR BASE LINE COST ESTIMATE, INDEPENDENT PARAMETRIC COST ESTIMATE OR ORIG PRESENTATION (B)? NOTE: OUTPUT TO LCC MODEL FOR TRADE-OFF (A) IS AVERAGE COST PER MAN HOUR, FOR (B) OUTPUT IS ACCUMULATED PERSONNEL COSTS. ANSWER WITH A OR B </pre>	Msg #7
<pre> PA_ DO YOU WANT TO INPUT ALL THE COST ELEMENTS FOR R20-R200-R242 AND PRODUCTION (R300-R354) (A) OR JUST THE MINIMUM INPUTS TO OPERATE THE LCC MODEL (B)? </pre>	Reply Msg #8
<pre> PA_ ENTER INPUT VALUES AS INDICATED. ENTER ONLY THE VALUES IN THE ORDER AS SPECIFIED. SEPERATE EACH VALUE WITH A COMMA. EXAMPLE-- 1000.,.002,0.,.43,1 ENTER VALUE FOR R202,R203,R208,R210, R2102520.,0.,.4574161.,0._ ENTER VALUE FOR R211,R213,R214,R215, 70.,0.,0.,0._ ENTER VALUE FOR R216,R217,R219,R220, 70.,0.,0.,0._ ENTER VALUE FOR R221,R222,R224,R225, 70.,0.,0.,0._ ENTER VALUE FOR R226,R227,R228,R229, 70.,0.,0.,0._ ENTER VALUE FOR R231,R232,R233,R234, 70.,0.,0.,0._ </pre>	Reply Msgs* #9-14

*Call for entry of variables.
Answer required as indicated

FIGURE 2

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

```

ENTER VALUE FOR R235,R239,R240,R241.
70.,0.,0.,0._
ENTER VALUE FOR R242.
70._
ENTER VALUE FOR R304,R306,R307,R309.
732000.,135000.,408159.,0._
ENTER VALUE FOR R310,R311,R312,R314.
750000.,0.,106516.,300000._
ENTER VALUE FOR R315,R316,R317,R318.
790000.,50000.,150000.,0._
ENTER VALUE FOR R319,R320,R323,R324.
72161000.,203000.,0.,0._
ENTER VALUE FOR R325,R327,R328,R329.
70.,0.,0.,0._
ENTER VALUE FOR R330,R331,R332,R333.
70.,1400000.,0.,0._
ENTER VALUE FOR R334,R335,R339,R341.
70.,0.,15257200.,80000._
ENTER VALUE FOR R342,R343,R345,R346.
7221000.,52000.,0.,0._
ENTER VALUE FOR R348,R349,R350,R351.
70.,0.,0.,0._
ENTER VALUE FOR R352,R353,R354.
70.,0.,0._
ENTER VALUE FOR R9,R18,R19,R20.
71000.,14408.,1000.,.86_
ENTER VALUE FOR R10,R11,R109,R110.
70.,0.,0.,0._
ENTER VALUE FOR R57,R75,R26,R28.
710.,16.75,0.,0._
ENTER VALUE FOR R13,R61,R62,R14.
775.,6.,1.,1200._
ENTER VALUE FOR R15,R17,R46,R16.
7.5,1.1,.8,2500._
ENTER VALUE FOR R27,R71,R72,R79.
7.22,.42,.59,8.,85_
ENTER VALUE FOR R21,R22,R24,R25.
7.3,5.,10000.,.05_
ENTER VALUE FOR R29,R47,R50,R51.
76.8,990.,50000.,0._
ENTER VALUE FOR R52,R53,R54,R55.
70.,0.,36100.,0._
ENTER VALUE FOR R56,R76,R77,R78.
70.,2.,2046.,1._
ENTER VALUE FOR R86,R89,R92.
78.,534.,0._
ENTER 4 (REAL *) VALUES FOR R12: SEPARATE BY COMMAS
790.,10.,0.,0._
DO YOU WANT FORMULA R449 OR R347?
ANSWER A OR B
7A_

```

Msq*

-#15-

#38

-Msg #39

-Reply

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

FIGURE 2
SAMPLE PROGRAM OUTPUT (WITH ANNOTATIONS)
(Cont'd)

TRI-TAC LIFE CYCLE COST MODEL				
LIFE CYCLE COSTS CALCULATED FOR THE TACTICAL DIGITAL FACIMILE WITH A DTUPC OF \$ 14408.00 BASED ON 1000.00 EQUIPMENTS AND A PRODUCTION BUY OF 1000.00 EQUIPMENTS				
TRI-TAC LIFE CYCLE COST ELEMENTS STRUCTURE	COSTS IN (M) OF CONSTANT 1978 \$ LEVEL LEVEL SUB 3 2 ELEMENT ELEMENT CAT.			
100 RESEARCH & DEVELOPMENT				6.68
110 CONCEPT FORMULATION & VALIDATION			2.10	
111 CONTRACTOR		2.10		
120 FULL SCALE DEVELOPMENT			4.57	
121 FULL SCALE DEVELOPMENT (NON-RECUR)			4.57	
122.1 CONTRACTOR (N-R)		4.57		
122.11 PRIME MISSION EQUIP (PME)	4.57			
122.111 SUBSYSTEMS (SPECIFY)	4.57			
TOTAL RESEARCH AND DEVELOPMENT COSTS				6.68
200 PRODUCTION				20.77
210 PRODUCTION (NON-RECUR)			5.16	
211.1 CONTRACTOR (N-R)		3.72		
211.11 PRIME MISSION EQUIP	0.08			
211.111 SUBSYSTEMS (SPECIFY)	0.08			
211.12 SYSTEM/PROJECT MNGMNT		0.53		
211.121 SYSTEM ENGINEERING	0.13			
211.122 PROJECT MNGMNT	0.41			
211.13 TRAINING		0.05		
211.132 SERVICES	0.05			
211.14 REGULAR SUPPORT EQUIP		0.11		
211.15 DATA		0.58		
211.151 TECH ORDERS & MANUAL	0.30			
211.152 ENGINEERING	0.08			
211.153 MANAGEMENT	0.05			
211.154 SUPPORT	0.15			
211.16 INITIAL SPARES & APP RPTS		2.16		
211.17 OTHER (SPECIFY)		0.21		
212.1 GOVERNMENT (N-R)		1.44		
212.15 COMMON SUPPORT EQUIP		1.40		
212.18 INVENTORY MANAGEMENT		0.04		
220 PRODUCTION (RECURRING)			15.61	
221.1 CONTRACTOR (RECUR)		15.61		
221.11 PRIME MISSION EQUIP	15.26			
221.111 SUBSYSTEMS (SPECIFY)	15.26			
221.12 SYSTEM/PROJECT MNGMNT		0.30		
221.121 SYSTEM ENGINEERING	0.08			
221.122 PROJECT MANAGEMENT	0.22			
221.13 OTHER (SPECIFY)		0.05		
TOTAL PRODUCTION COSTS				20.77

Data
Lines

FIGURE 2

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

TRI-TAC LIFE CYCLE COST ELEMENTS		COSTS IN (M) OF CONSTANT 1978 \$			CAT.
STRUCTURE		LEVEL 3	LEVEL 2	SUB ELEMENT	
300 OPERATING & SUPPORT					17.12
310 OPERATIONS				6.03	
311 ENERGY CONSUMPTION			0.53		
312 MATERIAL CONSUMPTION			5.00		
314 OPERATIONAL FACILITIES			0.50		
320 LOGISTIC SUPPORT				11.09	
321 MAINTENANCE			2.91		
321.1 PERSONNEL			1.00		
321.11 ORGNZTL MAINT		0.61			
321.12 INTRMDT MAINT		0.19			
321.14 DEPOT MAINT (LRU/MOD RPR)		0.20			
321.2 MAINT FACILITIES			0.04		
321.3 SUPPORT EQUIP MAINT			1.51		
321.4 CONTRACTOR SERVICES			0.36		
322 SUPPLY			8.18		
322.1 PERSONNEL			0.02		
322.11 ORGNZTL SUPPLY		0.02			
322.12 INTRMDT SUPPLY		0.01			
322.2 SUSTAIN INVEST			7.15		
322.21 REPLNMMNT SUPPLIES		5.45			
322.212 INT/DEPOT LEVEL	4.63				
322.213 RPR MATERIAL	0.82				
322.22 MODIFICATIONS		0.72			
322.23 RPLCMNT COMMON SPART EQUIP		0.98			
322.3 INVNTY ADMIN			0.74		
322.31 INVNTY MNGMNT		0.10			
322.32 INVNTY DIST/HOLDING		0.57			
322.33 TECH DATA SUPPORT		0.07			
322.5 TRANSPORTATION			0.27		
TOTAL OPERATING AND SUPPORT COSTS					17.12
TOTAL LIFE CYCLE COSTS					44.57
DO YOU WANT TO MAKE CHANGES TO ANY OF THE					Msg
ASSUMPTIONS AND/OR VARIABLES?					#40
ANSWER WITH N (NO) B (BOTH) A (ASSUMPTIONS ONLY)					
OR V (VARIABLES ONLY)					
?N_					-Reply
END TTLCOM 12.4 SEC.					-*

*(No reply, termination
of program)

VII

INITIATING CONVERSATIONAL OPERATIONS

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

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

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

FORT MONMOUTH TIME SHARING - 02/08, STATION 20

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

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

(Enter your password here)*

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

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

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

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

VIII TERMINATING CONVERSATION OPERATIONS

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

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

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

Remove the phone from the modem and replace the receiver.

Turn the terminal and modem OFF.

SECTION C

EXECUTING THE PROGRAMS

PROGRAM TTLCCM

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

RUN TTLCCM/TRITAC

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

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

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

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

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

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

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

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

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

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

SECTION D

SYSTEM ERROR MESSAGES

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

SECTION E

SAMPLE DATA INPUT SHEETS

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

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

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

TABLE 11

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

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

TABLE 12

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

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

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

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

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

TABLE 12

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

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

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

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

Input Values For

Service	N
---------	---

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

OPR	_____	_____	_____
SWP	_____	_____	_____
OLM	<u>E7-1411</u>	<u>E3</u>	<u>01</u>
ILM	<u>E7-1411</u>	<u>E5</u>	<u>01</u>