

AUTOMATED LIFE CYCLE COST MODELS FOR ARMY WEAPON SYSTEMS

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HEADQUARTERS
U. S. ARMY WEAPONS COMMAND
ROCK ISLAND, ILLINOIS 61201

**AUTOMATED LIFE CYCLE COST MODELS
FOR
ARMY WEAPON SYSTEMS**

PREPARED BY

FREDERICK M. CHAKOUR

**HEADQUARTERS, U. S. ARMY WEAPONS COMMAND
ROCK ISLAND, ILLINOIS
COST ANALYSIS OFFICE**

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FOR ARMY WEAPON SYSTEMS**

**By F. M. Chakour
Chief, Cost Analysis Office
U. S. Army Weapons Command
Rock Island, Illinois**

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SECTION I
INTRODUCTION

Introduction

The U. S. Army Weapons Command is continually required to conduct weapon system cost studies involving the determination of life cycle costs for several alternative courses of action. These alternatives may consist of several weapon systems, one weapon system with several quantities and/or time frames, or a combination of several weapons any many quantities and time frames per system.

In order to conduct such comprehensive cost studies efficiently and thoroughly, the Army Weapons Command, since 1965, has been developing and employing in its cost studies, various automated models and techniques.

This report is a compilation of five automated cost models which are presented in the reverse order of their development.

The WECOM Combat Vehicle Life Cycle Cost Model is presented first since it is the most highly developed and most flexible of the five. This model, which was developed in late 1968 for the TATAWS III Study, develops costs according to the three usual cost categories of Development, Investment, and Operating as well as according to the Budget Program categories of the Army Fiscal Code. The model consists of some 100 equations and approximately 110 elements or sets of input data, schedules and cost factors. The computer program is written in Fortran IV for the IBM 360/65 computer.

The second model presented is that employed in the MBT Secondary Armament Study during September of 1967. This model, which is also written in Fortran, consists of approximately 65 equations requiring about 110 elements of input data, cost factors and schedules. A distinguishing feature of this model, which develops costs according to the Army Fiscal Code Budget Program elements, is that it illustrates

one approach to the life cycle costing of ammunition simultaneously with the weapon costing.

The tank cost model developed for the TATAWS II Study in early 1967 is the third methodology presented. Like the MBT Secondary Armament Model, it develops costs according to Budget Program categories only. The computer program is written in Fortran and the model consists of 22 equations with 45 elements of input data, factors and schedules.

The last two models presented pertain to the life cycle costing of small arms weapons (i.e., rifles, machine guns and grenade launchers) together with their ammunition. These were developed and employed in conjunction with a comprehensive Small Arms Weapons Systems Study conducted during 1965 and 1966 called the SAWS.

The first of these two models presented (i.e., model number four in this report) is the more sophisticated of the two in that it develops costs by year rather than developing total costs for a multi-year time frame as is done in the last model presented in this report. Model number four also contains a cost sensitivity sub-routine which is not contained in any of the other models. This sub-routine is based upon partial differentiation of the total cost equations.

Each of the SAWS models consists of approximately four or five equations which simultaneously develop costs for systems (weapon and ammunition) being phased in as well as those being phased out of the army inventory.

Each of the five methodologies consists of the mathematical model and nomenclature. Some include samples of computer printouts, input data, resultant costs, derivations of pertinent relationships as well as some of the Fortran computer programs employed and other explanatory material.

Questions pertaining to these models and/or their use may be directed to the author at the U. S. Army Weapons Command, Rock Island, Illinois 61201 - (AMSWE-CPD).

SECTION II

WECOM COMBAT VEHICLE LIFE CYCLE COST MODEL
(FOR TATAWS III)

WECOM COMBAT VEHICLE LIFE CYCLE COST MODEL

(For TATAWS III Study)

1. This model is presented in six sections as follows:
 - A. Cost Model Flow Chart and Cost Model.
 - B. List of data names and definitions of factors, data and schedules which are inputs to equations (i.e., appearing on right side of cost equations).
 - C. Listing of definitions of data names appearing on left side of equations.
 - D. TATAWS III Chart of Accounts (annotated with cost model equation numbers and input data names).
 - E. Listing of all data names in sequence consistent with the TATAWS III Chart of Accounts.
 - F. Computer Printouts of FORTRAN Program and Costs.

2. Section A is the mathematical cost model and consists of some 90 equations and FORTRAN statements in the correct order required for computer computation. The last page of this section contains an explanation of the FORTRAN "IF Statement" which is used throughout the model to permit automatic decision-making on the part of the computer. These statements are used to decide whether or not to provide for the provisioning of Army Stock Fund and Selected Repair Parts as well as to overcome certain mathematical difficulties, such as division by zero or preventing the generation of undesirable negative numbers. Otherwise, the model is straightforward and simply consists of equations for the computation of cost elements as they appear in the Chart of Accounts sequence.

3. The contents of Sections B and C are self-explanatory. The Section B listing isolates, defines, and highlights all the elements

of information required as input to the model, while Section C defines each of the cost elements computed with cost equations.

4. Sections D and E serve to explain the relationship between the elements of the mathematical model and the TATAWS III Chart of Accounts. It is also intended that Section E (or a portion of it) will serve as the computer output format for the presentation of cost details which will serve as WECOM backup of the results summarized on the six forms required by ACSFOR.

5. Section F contains computer printouts of the FORTRAN program, listings of input and output data as well as printouts of three of the cost summary forms designed specifically for this study.

SECTION A

COST MODEL FLOW CHART

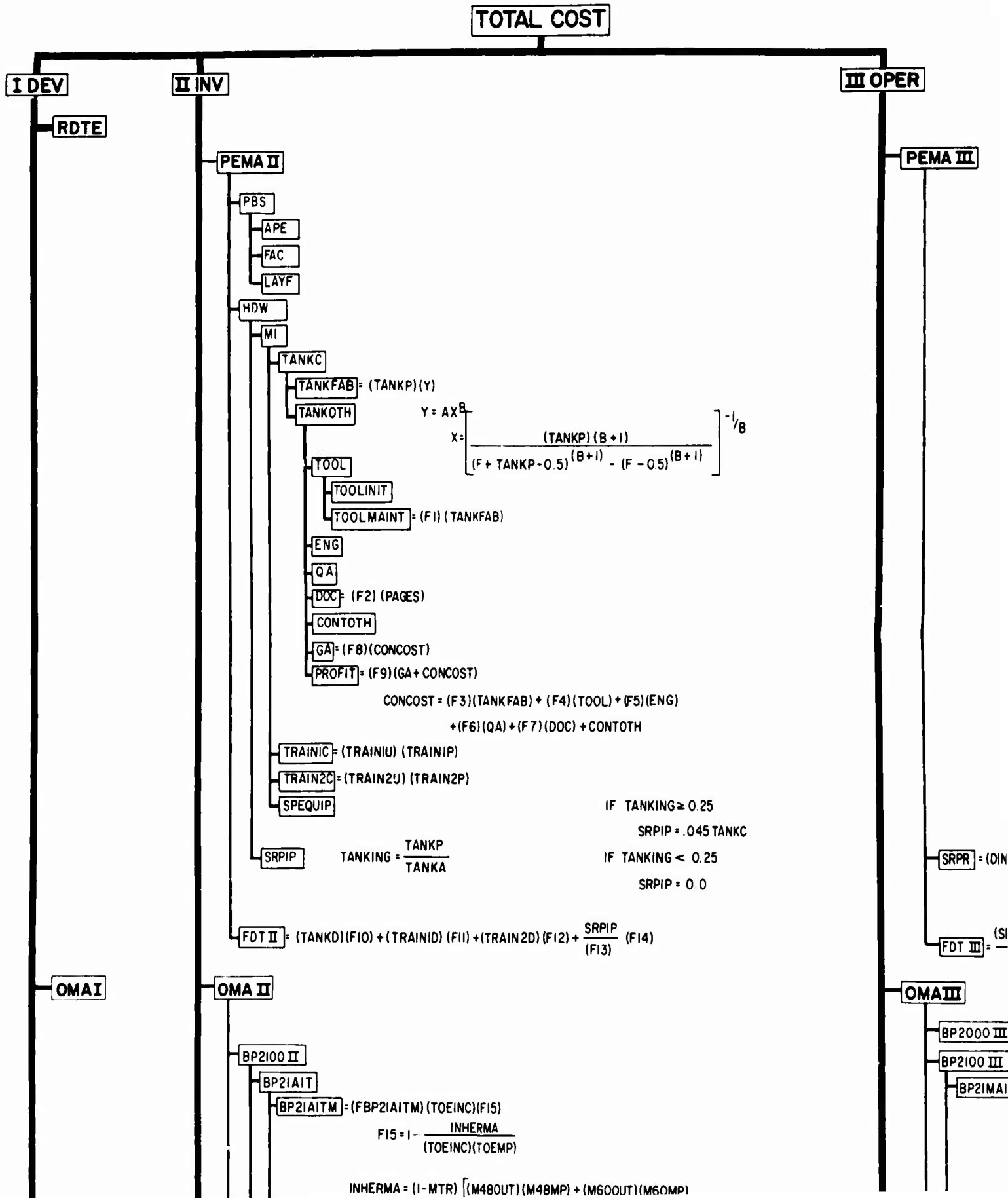
AND

EQUATIONS FOR TATAWS III

(In Correct Computational Order)

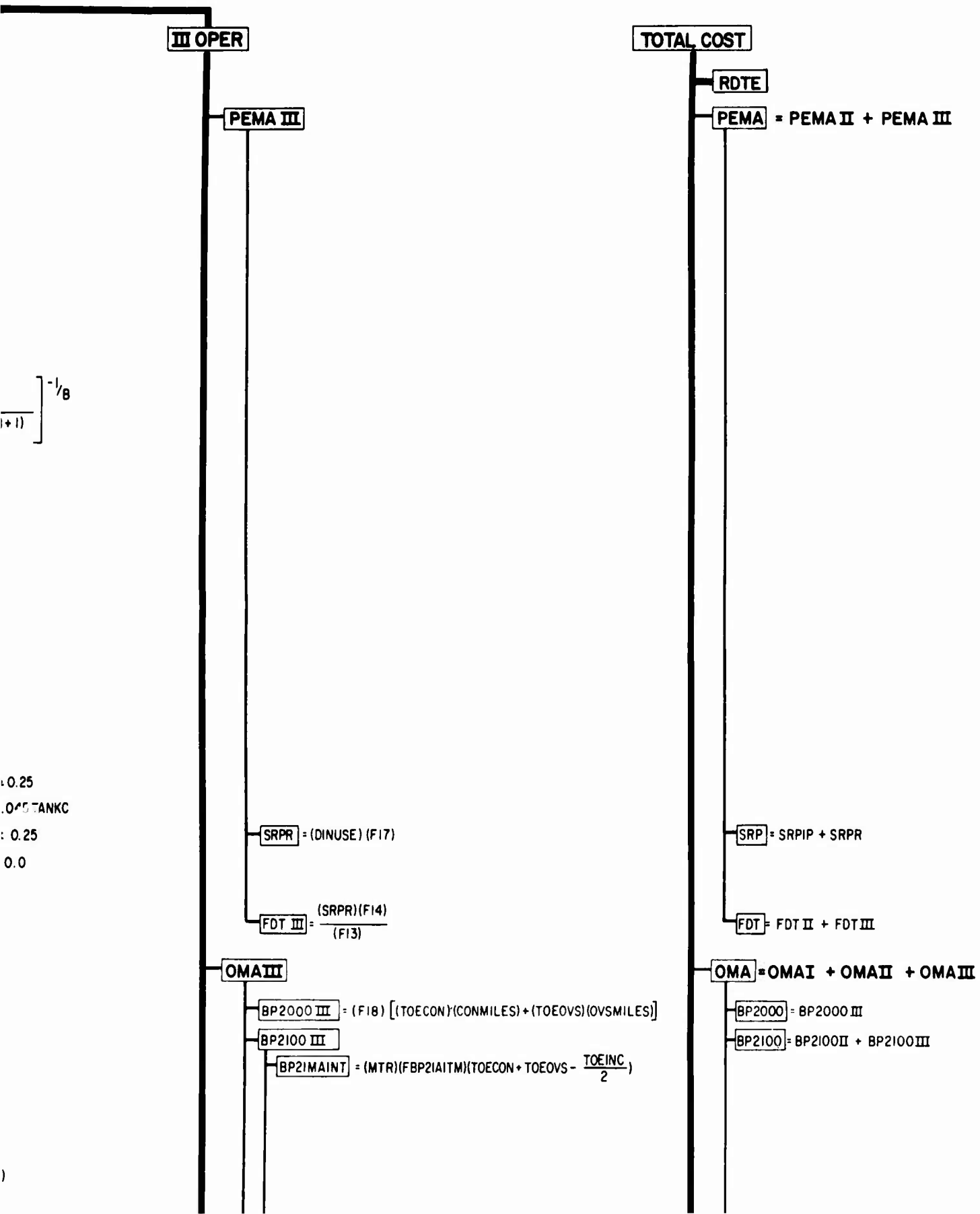
A

WECOM COMBA[®] LIFE CYCLE CO FOR TATA



ECOM COMBAT VEHICLE LIFE CYCLE COST MODEL FOR TATAWS III

B



$\frac{1}{(1+i)^n}$

0.25
0.05 TANKC
0.25
0.0

GA = (F8)(CONCOST)
 PROFIT = (F9)(GA + CONCOST)

CONCOST = (F3)(TANKFAB) + (F4)(TOOL) + (F5)(ENG)
 + (F6)(QA) + (F7)(DOC) + CONTOTH

TRAINIC = (TRAINIU) (TRAINIP)
 TRAIN2C = (TRAIN2U) (TRAIN2P)
 SPEQUIP

IF TANKING ≥ 0.25
 SRPIP = 0.45 TANKC
 IF TANKING < 0.25
 SRPIP = 0.0

SRPIP TANKING = $\frac{TANKP}{TANKA}$

FDT II = (TANKD)(F10) + (TRAINID)(F11) + (TRAIN2D)(F12) + $\frac{SRPIP}{(F13)}$ (F14)

SRPR = (

FDT III =

OMAI

OMA II

OMAI II

BP2100 II

BP21AIT

BP21AITM = (FBP21AITM)(TOEINC)(F15)

F15 = $1 - \frac{INHERMA}{(TOEINC)(TOEMP)}$

INHERMA = (1 - MTR) [(M48OUT)(M48MP) + (M60OUT)(M60MP)
 + (M60SHOUT)(M60SHMP) + (M551OUT)(M551MP)
 + (M48A2COUT)(M48A2CMP) + (M48A3OUT)(M48A3MP)]

BP21AITC = (FBP21AITC)(TOEINC)(F16)

F16 = $1 - \frac{INHERCR}{(TOEINC)(TOECP)}$

INHERCR = (1 - CTR)(4)(M48OUT + M60OUT + M60SHOUT
 + M551OUT + M48A2COUT + M48A3OUT)

BP21AITNET

BP2200 II

BP22PROC = (FBP22PROC)(MYBP22PROC)

BP22SUPPLY = (FBP22SUPPLY)(MYBP22SUPPLY)

BP22MNGT = (FBP22MNGT)(MYBP22MNGT)

BP2300 II

BP2000

BP2100 I

BP21M

BP21CR

BP2200 III

BP22PR

BP22SM

BP22MA

BP22IPF

BP22SDI

SDT

SDTR

SDTO

SD

SD

BP22PE

BP2300 III

BP23REB

BP23SUP

BP230TH

BP2600

MPAI

MPA II

MPA III

MPA2I II

MPA2ITM = (FMPA2ITM)(TOEINC)(F15)

MPA2ITC = (FMPA2ITC)(TOEINC)(F16)

MPA22 II = (FMPA22 II)(MYMPA22 II)

MPA23 II

MPA20 III

MPA20MAI

MPA20CRE

MPA21 III

MPA21MAI

MPA21CRE

MPA22 III

C

NGOMA

0.25
.045 TANKC
0.25
0.0

SRPR = (DINUSE) (F17)

FDT III = $\frac{(SRPR)(F14)}{(F13)}$

OMAII

BP2000 III = (F18) [(TOECON)(CONMILES) + (TOEOVS)(OVSMILES)]

BP2100 III

BP21MAINT = (MTR)(FBP21AITM)(TOECON + TOEOVS - $\frac{TOEINC}{2}$)

BP21CREW = (CTR)(FBP21AIRC)(TOECON + TOEOVS - $\frac{TOEINC}{2}$)

BP2200 III

BP22PROP = (FBP22PROC)(MYBP22PROP)

BP22SMA = (FBP22SUPPLY)(MYBP22SMA)

BP22MAN = (FBP22MNGT)(MYBP22MAN)

BP22IPP

BP22SDOP

SDT

SDTREB = (REBILD)(F19)

SDTOVS

SDTANKS = (OVSHIP)(F20)

SDTPOWP = (SRP)(TOEOVS)(F21)
(F13)(TOEOVS + TOECON)

BP22PE

BP2300 III

BP23REB = (REBILD)(F22) + [(TOECON + TACON)(CONMILES) + (TOEOVS + TAOVS)(OVSMILES)] (F23)

BP23SUP = (FBP23SUP)(MYBP23SUP)

BP230TH

BP2600

MPAIII

MPA20III

MPA20MAINT = (TOECON)(MAINTPACON) + (TOEOVS)(MAINTPAOVS)

MPA20CREW = (TOECON)(CRUPACON) + (TOEOVS)(CRUPAOVS)

MPA21 III

MPA21MAINT = (MTR)(FMPA1TM)(TOECON + TOEOVS - $\frac{TOEINC}{2}$)

MPA21CREW = (CTR)(FMPA1TC)(TOECON + TOEOVS - $\frac{TOEINC}{2}$)

MPA22III

NGOMA

SRP = SRPIP + SRPR

FDT = FDT II + FDT III

OMA = OMAI + OMAII + OMAIII

BP2000 = BP2000 III

BP2100 = BP2100 II + BP2100 III

BP2200 = BP2200 II + BP2200 III

BP2300 = BP2300 II + BP2300 III

BP2600

MPA = MPAI + MPAII + MPAIII

MPA2000 = MPA20 III

MPA2100 = MPA21 II + MPA22 III

MPA2200 = MPA22 II + MPA22 III

MPA2300 = MPA23 II

NGOMA

D

EQUATIONS FOR TATAWS III
(In Correct Computational Order)

$$\text{DEV} = \text{RDTE} + \text{MPAI} + \text{OMAI} \text{ ----- (1)}$$

$$\text{PBS} = \text{APE} + \text{FAC} + \text{LAYF} \text{ ----- (2)}$$

$$\text{TRAIN1C} = (\text{TRAIN1U}) (\text{TRAIN1P}) \text{ ----- (3)}$$

$$\text{TRAIN2C} = (\text{TRAIN2U}) (\text{TRAIN2P}) \text{ ----- (4)}$$

IF (TANKP) 5, 5, 8

$$5 \quad \text{TANKC} = 0 \text{ ----- (5)}$$

$$6 \quad \text{TANKU} = 0 \text{ ----- (6)}$$

$$7 \quad \text{GO TO 20} \text{ ----- (7)}$$

Note 1:

The above IF statement procedure means that if TANKP is zero for any particular year, then TANKOTH (in equation 18) must also be zero for that same year. Hence, for any given year, this model does not provide for production support costs (i.e., TANKOTH) when there is no tank production programmed (TANKP).

Therefore, if production support costs are expected during a year in which TANKP is zero, such TANKOTH costs should be included in the following first year in which TANKP is not zero.

IF (B) 8, 9A, 8

$$8 \quad X = \left[\frac{(\text{TANKP}) (B + 1)}{(\text{F} + \text{TANKP} - 0.5)^{(B + 1)} - (\text{F} - 0.5)^{(B + 1)}} \right]^{-\frac{1}{B}} \text{ (8)}$$

$$Y = AX^B \text{ ----- (9)}$$

$$Y = A \text{ ----- (9A)}$$

$$\text{TANKFAB} = (\text{TANKP}) (Y) \text{ ----- (10)}$$

Note 1A:

If Government Furnished Equipment (GFE) is included in "A", then any GA and Profit contained in this GFE should be subtracted from the GFE before inclusion in A. In doing this, use the same factors for GA and Profit as are used for F8 and F9.

Note 1B:

If Government Furnished Equipment (GFE) contained in "TANKFAB" includes tool maintenance costs, then the basic F1 factor must be modified by multiplying by $(1 - \frac{\text{GFE Costs}}{\text{TANKFAB}})$

$$\text{TOOLMAINT} = (\text{F1}) (\text{TANKFAB}) \text{-----} (11)$$

$$\text{TOOL} = \text{TOOLINIT} + \text{TOOLMAINT} \text{-----} (12)$$

$$\text{DOC} = (\text{F2}) (\text{PAGES}) \text{-----} (13)$$

$$\text{CONTCOST} = (\text{F3}) (\text{TANKFAB}) + (\text{F4}) (\text{TOOL}) + (\text{F5}) (\text{ENG}) + (\text{F6}) (\text{QA}) + (\text{F7}) (\text{DOC}) + \text{CONTOTH} \text{-----} (14)$$

$$\text{GA} = (\text{F8}) (\text{CONTCOST}) \text{-----} (15)$$

$$\text{PROFIT} = (\text{F9}) (\text{CONTCOST} + \text{GA}) \text{-----} (16)$$

$$\text{TANKOTH} = \text{TOOL} + \text{ENG} + \text{QA} + \text{DOC} + \text{CONTOTH} + \text{GA} + \text{PROFIT} \text{-----} (17)$$

$$\text{TANKC} = \text{TANKFAB} + \text{TANKOTH} \text{-----} (18)$$

$$\text{TANKU} = \text{TANKC}/\text{TANKP} \text{-----} (19)$$

$$20 \quad \text{MI} = \text{TANKC} + \text{TRAIN1C} + \text{TRAIN2C} + \text{SPEQUIP} \text{-----} (20)$$

IF (XSRPIP) 22, 22, 21

$$21 \quad \text{SRPIP} = \text{XSRPIP} \text{-----} (21)$$

GO TO 26

$$22 \quad \text{IF (TANKA) 24, 24, 23} \text{-----} (22)$$

$$23 \quad \text{TANKINC} = \text{TANKP}/\text{TANKA} \text{-----} (23)$$

IF (TANKINC - 0.25) 25, 24, 24

$$24 \quad \text{SRPIP} = .045 (\text{TANKC}) \text{-----} (24)$$

GO TO 26

$$25 \quad \text{SRPIP} = 0 \text{-----} (25)$$

$$26 \quad HDW = MI + SRPIP \text{ -----} (26)$$

$$27 \quad FDTII = (TANKD) (F10) + (TRAIN1D) (F11) + \\ (TRAIN2D) (F12) + \frac{SRPIP}{(F13)} (F14) \text{ -----} (27)$$

Note 2:

F13 must always have a positive value greater than zero.

Note 3 - to persons using XSRPIP option:

If XSRPIP = 0 is desired for any year when TANKP/TANKA \geq 0.25, then an input of \$1.00 or less is required for XSRPIP for that year. The idea is that a very low value for XSRPIP should be used instead of zero, since an input of zero for XSRPIP (when TANKP/TANKA \geq 0.25) will result in a large positive number for SRPIP.

$$PEMAII = PBS + HDW + FDTII \text{ -----} (28)$$

IF (TOEINC) 29, 29, 31

$$29 \quad F15 = 0 \text{ -----} (29)$$

$$30 \quad F16 = 0 \text{ -----} (30)$$

GO TO 37

Note 4:

TOEINC can never be a negative number. If TOE tanks are decreased, let the input TOEINC = 0 for that particular year.

$$31 \quad \text{INHERMA} = (1 - \text{MTR}) \left[(\text{M48OUT}) (\text{M48MP}) + (\text{M60OUT}) (\text{M60MP}) + \right. \\ \left. (\text{M60SHOUT}) (\text{M60SHMP}) + (\text{M551OUT}) (\text{M551MP}) + \right. \\ \left. (\text{M48A2COUT}) (\text{M48A2CMP}) + (\text{M48A3OUT}) (\text{M48A3MP}) \right] \text{-----} (31)$$

$$\text{INHERCR} = (1 - \text{CTR}) (4) (\text{M48OUT} + \text{M60OUT} + \text{M60SHOUT} + \\ \text{M551OUT} + \text{M48A2COUT} + \text{M48A3OUT}) \text{-----} (32)$$

$$\text{F15} = 1 - \frac{\text{INHERMA}}{(\text{TOEINC}) (\text{TOEMP})} \text{-----} (33)$$

IF (F15) 34, 35, 35

$$34 \quad \text{F15} = 0 \text{-----} (34)$$

$$35 \quad \text{F16} = 1 - \frac{\text{INHERCR}}{(\text{TOEINC}) (\text{TOECP})} \text{-----} (35)$$

IF (F16) 36, 37, 37

$$36 \quad \text{F16} = 0 \text{-----} (36)$$

Note 5:

The factors TOEMP and TOECP must always be numbers which are greater than zero.

$$37 \quad \text{BP21AITM} = (\text{FBP21AITM}) (\text{TOEINC}) (\text{F15}) \text{-----} (37)$$

$$\text{BP21AITC} = (\text{FBP21AITC}) (\text{TOEINC}) (\text{F16}) \text{-----} (38)$$

$$\text{BP21AIT} = \text{BP21AITM} + \text{BP21AITC} \text{-----} (39)$$

$$\text{BP2100II} = \text{BP21AIT} + \text{BP21NET} \text{-----} (40)$$

$$\text{BP22PROC} = (\text{FBP22PROC}) (\text{MYBP22PROC}) \text{-----} (41)$$

$$\text{BP22SUPPLY} = (\text{FBP22SUPPLY}) (\text{MYBP22SUPPLY}) \text{-----} (42)$$

BP22MNGT = (FBP22MNGT) (MYBP22MNGT) ----- (43)

BP2200II = BP22PROC + BP22SUPLY + BP22MNGT ----- (44)

OMAI = BP2100II + BP2200II + BP2300II ----- (45)

MPAII = (FMPAII) (TOEINC) (F15) ----- (46)

MPAII = (FMPAII) (TOEINC) (F16) ----- (47)

MPA21II = MPAII + MPAII ----- (48)

MPA22II = (FMPA22II) (MYMPA22II) ----- (49)

MPAII = MPA21II + MPA22II + MPA23II ----- (50)

INV = PEMAII + OMAII + MPAII ----- (51)

IF (XASF) 53, 53, 52

52 ASF = XASF ----- (52)

GO TO 56

53 IF (SRPIP-1) 55, 55, 54 ----- (53)

54 ASF = (0.105) (TANKC) ----- (54) (Non-Add)

GO TO 56

55 ASF = 0 ----- (55)

Note 6 - to persons using XASF option:

If it is desired to make XASF equal to zero while XSRPIP or SRPIP > 1 and while TANKC > zero, it is necessary to make XASF equal to \$1.00 or less, but not zero.

Also, ASF is a non-add item and is shown only to indicate Initial Provisioning and Reprovisioning ASF requirements.

$$56 \quad \text{SRPR} = (\text{DINUSE}) (\text{F17}) \text{-----} (56)$$

$$\text{FDTIII} = \frac{(\text{SRPR}) (\text{F14})}{(\text{F13})} \text{-----} (57)$$

$$\text{PEMAIII} = \text{SRPR} + \text{FDTIII} \text{-----} (58)$$

$$\text{BP2000III} = \left[(\text{TOECON}) (\text{CONMILES}) + (\text{TOEOVS}) (\text{OVSMILES}) \right] (\text{F18}) \text{--} (59)$$

$$\text{BP21MAINT} = (\text{MTR}) (\text{FBP21AITM}) \left(\text{TOECON} + \text{TOEOVS} - \frac{\text{TOEINC}}{2} \right) \text{-----} (60)$$

$$\text{BP21CREW} = (\text{CTR}) (\text{FBP21AIRC}) \left(\text{TOECON} + \text{TOEOVS} - \frac{\text{TOEINC}}{2} \right) \text{-----} (61)$$

$$\text{BP2100III} = \text{BP21MAINT} + \text{BP21CREW} \text{-----} (62)$$

$$\text{BP22PROP} = (\text{FBP22PROC}) (\text{MYBP22PROP}) \text{-----} (63)$$

$$\text{BP22SMA} = (\text{FBP22SUPPLY}) (\text{MYBP22SMA}) \text{-----} (64)$$

$$\text{BP22MAN} = (\text{FBP22MNGT}) (\text{MYBP22MAN}) \text{-----} (65)$$

$$\text{SDTREB} = (\text{REBILD}) (\text{F19}) \text{-----} (66)$$

$$\text{SDTANKS} = (\text{OVSHIP}) (\text{F20}) \text{-----} (67)$$

$$\text{SRP} = \text{SRPIP} + \text{SRPR} \text{-----} (68)$$

IF (TOEOVS) 69, 69, 70

69 SDTPOWP = 0 ----- (69)

GO TO 71

70 SDTPOWP = $\frac{(SRP) (TOEOVS) (F21)}{(F13) (TOEOVS + TOECON)}$ ----- (70)

71 SDTOVS = SDTANKS + SDTPOWP ----- (71)

SDT = SDTREB + SDTOVS ----- (72)

BP2200III = BP22PROP + BP22PE + BP22IPP + BP22SDOP +
BP22SMA + SDT + BP22MAN ----- (73)

BP23REB = (REBILD) (F22) + $\frac{[(TOECON + TACON) (CONMILES) + (TOEOVS + TAOVS) (OVSMILES)]}{(F23)}$ ----- (74)

BP23SUP = (FBP23SUP) (MYBP23SUP) ----- (75)

BP2300III = BP23REB + BP23SUP + BP230TH ----- (76)

OMAIII = BP2000III + BP2100III + BP2200III +
BP2300III + BP2600 ----- (77)

MPA20CREW = (TOECON) (CRUPACON) + (TOEOVS) (CRUPAOVS) ----- (78)

MPA20MAINT = (TOECON) (MAINTPACON) + (TOEOVS) (MAINTPAOVS) ----- (79)

MPA20III = MPA20CREW + MPA20MAINT ----- (80)

- MPA21CREW = (CTR) (FMPA1TC) (TOECON + TOEOVS - $\frac{TOEINC}{2}$) ----- (81)
- MPA21MAINT = (MTR) (FMPA1TM) (TOECON + TOEOVS - $\frac{TOEINC}{2}$) ----- (82)
- MPA21III = MPA21CREW + MPA21MAINT ----- (83)
-
- MPA22III = (FMPA22III) (MYMPA22III) ----- (84)
-
- MPAIII = MPA20III + MPA21III + MPA22III ----- (85)
-
- OPER = PEMAIII + OMAIII + NGOMA + MPAIII ----- (86)
-
- FDT = FDTII + FDTIII ----- (87)
- PEMA = PEMAI + PEMAIII ----- (88)
- OMA = OMAI + OMAII + OMAIII ----- (89)
- MPA = MPAI + MPAPII + MPAPIII ----- (90)
- TPC = MI + PBS + SRP + FDT ----- (91)
- TOTFM3 = RDTE + PEMA + OMA + NGOMA + MPA ----- (92)
- TOT = DEV + INV + OPER ----- (93)

Explanation of IF Statement
for TATAWS III Automated Model

<u>IF Statement Number</u>		(- 0 + are understood)
	IF (TANKP)	5, 5, 8
5	TANKC = 0 -----	(5)
6	TANKU = 0 -----	(6)
7	GO TO 20 -----	(7)

The above IF statement is read as follows:

1. If the term in the brackets (in this case "TANKP") represents a negative number, then go to Equation 5 and from there proceed as usual in order of equation number sequence unless (or until) directed otherwise by a statement number.
2. Also, if the term in the brackets equals zero, go to Equation 5 and from there proceed as indicated in paragraph 1 above.
3. If, however, the term in the brackets represents a positive number, go to Equation 8 and from there proceed as indicated in paragraph 1 above.

Accordingly:

If TANKP is zero:

Equation 5 says "set TANKC = 0"

Equation 6 says "set TANKU = 0"

Equation 7 says "GO TO Equation 20 and calculate Total Major Item Hardware Costs", thus bypassing all equations concerned with production costs for tanks.

SECTION B

INPUT DATA AND DEFINITIONS

FOR TATAWS III MODEL

INPUT DATA AND DEFINITIONS
FOR TATAWS III MODEL

Note: The following terms are listed in approximate order of appearance on right side of equations proceeding sequentially from equation 1 to 90.

Item
No.

- 1 RDTE - Yearly RDT&E costs
- 2 MPAI - Yearly MPA costs for Development Phase
- 3 OMAI - Yearly O&MA costs for Development Phase
- 4 APE - Yearly costs for Advanced Production Engineering
- 5 FAC - Yearly costs for production facilities
- 6 LAYF - Yearly facilities layaway costs
- 7 TRAIN1P - Production quantity of No. 1 trainers programmed yearly
- 8 TRAIN1U - Average yearly unit cost for trainer 1.
- 9 TRAIN1D - Delivery schedule for trainer 1.
- 10 TRAIN1A - Trainer 1 assets at end of each year

- 11 TRAIN2P)
- 12 TRAIN2U) ----- These data names apply to trainer 2
- 13 TRAIN2D) ----- as the above apply to trainer 1.
- 14 TRAIN2A)

- 15 TANKP) These apply to production, delivery and
- 16 TANKD)----- year end assets of the primary tank or
- 17 TANKA) vehicle under consideration.

- 18 AAOTANK)
- 19 AAOTRAIN1)----- Army Acquisition Objectives for
- 20 AAOTRAIN2) tank and trainers 1 and 2

- Item
No.
- 21 SPEQUIP - Yearly costs for Special Equipment, Ground Support Equipment, etc.
 - 22 A - First unit mass production cost (Direct Labor, Material and Overhead)
 - 23 B - Learning curve constant associated with slope of curve or with percentage rate of learning
 - 24 F - Cumulative production quantity pertaining to the first unit of each year's tank production
 - 25 TOOLINIT - Yearly Initial Tooling costs for tank production
 - 26 ENG - Yearly Engineering costs associated with tank production
 - 27 QA - Yearly Quality Assurance costs associated with tank production
 - 28 PAGES - Yearly number of documentation pages to be developed for tank
 - 29 CONTOTH - Other miscellaneous (yearly) tank production contractor costs
 - 30 F1 - Factor to be applied to yearly tank fabrication costs to calculate yearly costs for maintenance of production tooling
 - 31 F2 - Documentation costs per page
 - 32 F3) Fractions of total costs for tank fabrication,
 - 33 F4)--- tooling, engineering, quality assurance and
 - 34 F5) documentation applicable to non-government production
 - 35 F6) contractor, respectively.
 - 36 F7)
 - 37 F8 - Factor to be applied to yearly total contractor costs to determine General and Administrative costs
 - 38 F9 - Profit percentage factor

Item
NO.

- 39 XSRPIP ----- Yearly thruput production costs for initial stockage of spare tank engines and transmissions (Selected Repair Parts for Initial Provisioning). X designates thrupt alternative.
- 40 F10)
41 F11)----- Average unit First Destination Transportation costs
42 F12) for tank, trainer 1 and trainer 2, respectively
- 43 F13 - Average production cost for an engine and transmission set. F13 must always have a positive value greater than zero.
- 44 F14 - Average First Destination Transportation cost for an engine-transmission set
- F15 and F16 are calculated with cost equations within the TATAWS III Model, (i.e., Equations 33 and 35).
- 45 MTR - Maintenance Personnel Turnover Rate
- 46 CTR - Crew Turnover Rate
- 47 M48OUT)
48 M48A2COUT)
49 M48A3OUT) ----- Yearly phase-out schedules for M48 Series,
50 M60OUT) M60/M60A1 and M60 Shillelagh tanks as well
51 M60SHOUT) as for the M551 Vehicle, respectively
52 M551OUT)
- 53 M48MP)
54 M48A2CMP)
55 M48A3MP) ----- Average number of maintenance personnel
56 M60MP) required per tank per year for organizational,
57 M60SHMP) direct, and general support
58 M551MP)
- 59 TOEINC - Yearly increase in TOE tanks
(This must be zero or a positive value. If TOE tanks are decreased, then make TOEINC = 0.)
- 60 TOEMP - Average number of maintenance personnel required per TOE tank per year for organizational, direct and general support. (This must always have a positive value and never be zero.)

ITEM
No.

- 61 TOECP - Average number of crew personnel required per TOE tank. (This must always be a positive value and never be zero.)
- 62 FBP21AITM - Tank maintenance training cost factor in \$/tank (i.e., CONARC OM,A costs for Advanced Individual Training)
- 63 FBP21AITC - Tank crew training cost factor in \$/tank (i.e., CONARC OM,A costs for Advanced Individual Training)
- 64 BP21NET - Total yearly CONARC "New Equipment Training" OM,A costs. These costs are for travel of CONARC cadre.
- 65 FBP22PROC) Factors (in \$/man-yr) for Procurement,
66 FBP22SUPPLY)---- Supply and Management activities included
67 FBP22MNGT) in BP2200.
- 68 MYBP22PROC) Estimated total annual civilian Man-Years
69 MYBP22SUPPLY)---- of effort required for Procurement, Supply
70 MYBP22MNGT) and management activities under the Investment
cost phase (i.e., Para II of TATAWS III Chart
of Accounts).
- 71 BP2300II - Yearly estimates of total costs for BP2300 activities under Investmant phase (Par II). Essentially, these costs are associated with New Equipment Training and New Materiel Introductory Briefings.
- 72 FMPAITM - Tank maintenance training cost factor in \$/tank (i.e., CONARC MPA costs for cadre and trainees in Advanced Individual Training)
- 73 FMPAITC - Same as for FMPAITM above except this factor is for tank crew training in \$/tank.
- 74 FMPA22II - Average MPA cost factor (in \$/man yr) for BP2200 activities under Investment Phase II.
- 75 MYMPA22II - Estimated total annual Man-Years of military labor required for investmant (Phase II) BP2200 activities

Item
No.

- 76 MPA23II - Yearly estimates of total MPA costs for BP2300 activities under Investment Phase II. (This is essentially NET MPA costs.)
- 77 XASF - Annual estimates of total Army Stock Fund (Initial Provisioning Parts) costs
(X indicates this estimate is calculated outside the model.) Also, this is a non-add cost element.
- 78 F17 - Average cost of SRPR "Selected Repair Parts for Replenishment" per tank year. These are replenishment spare engines and transmission costs.
- 79 DINUSE - Annual average total of TOE + TA tanks.
- 80 F18 - Average cost of ASF parts and POL per tank mile
- 81 TOECON - TOE tanks in CONUS (yearly average)
- 82 TOEOVS - TOE tanks overseas (yearly average)
- 83 CONMILES - Average miles per tank year in CONUS.
- 84 OVSMILES - Average miles per tank year overseas.
- 85 MYBP22PROP) Estimated total annual civilian man-years of
86 MYBP22SMA) --- effort for Procurement Operations, Supply
87 MYBP22MAN) Management and Project Management and Mid-Command Management activities under the Operating Cost Phase (i.e., Para III of TATAWS III Chart of Accounts)
- 88 REBILD - Rebuild schedule for tanks. Total number of tanks scheduled for overhaul and rebuild each year.
- 89 OVSHIP - Total number of tanks scheduled for overseas shipment each year
- 90 F19 - Average cost to ship a tank to and from a maintenance depot (worldwide average)
- 91 F20 - Average Second Destination Transportation costs (i.e., BP2250) for overseas shipment of a tank (worldwide average)

Item
No.

- 92 F21 - Average Second Destination Transportation costs per powerpack (i.e., per engine and transmission set)
- 93 F22 - Average cost of tank rebuild (exclusive of rebuild of powerpack)
- 94 F23 - Average cost of powerpack rebuild per tank mile
- 95 BP22PE - Total Production Engineering costs for ASF items (BP2270.2)
- 96 BP22IPP - Total Industrial Preparedness Planning cost (BP2240.3)
- 97 BP22SDOP - Total costs for Supply Depot Operations (i.e., costs to receive, store and ship hardware - BP2220.1)
- 98 FBP23SUP - Average cost for civilian labor expended in maintenance support activities in dollars per man-year
- 99 MYBP23SUP - Average yearly number of Man Years of civilian labor effort expended in maintenance support activities
- 100 BP230TH - Total yearly other depot maintenance costs exclusive of rebuild (23A0) and maintenance support (23L0) (i.e., total of BP23BP - BP23K0)
- 101 BP2600 - Total yearly OM,A costs for Army Reserve and ROTC
- 102 TACON - Number of TA tanks in continental United States (yearly average)
- 103 TAOVS - Number of TA tanks overseas (yearly average)
- 104 NGOMA - Yearly estimates of total costs for Operational and Maintenance of tanks in the National Guard under the Operating Cost Phase (III) of the TATAWS III Chart of Accounts
- 105 CRUPACON) --- Average annual crew pay costs per TOE tank
- 106 CRUPAOVS) --- in CONUS and overseas, respectively, in \$/tank year

Item
No.

- 107 MAINTPACON) --- Average annual military labor costs for
108 MAINTPAOVS) --- maintenance of one TOE tank in CONUS and
overseas, respectively (exclusive of
depot maintenance) in \$/tank year
- 109 FMPA22III - Average MPA cost per man-year associated with
BP2200 activities under the Operating Cost
Phase III of the TATAWS III Chart of Accounts
- 110 MYMPA22III - Annual estimates of military man-years of
effort associated with BP2200 activities under
the Operating Cost Phase III of the TATAWS III
Chart of Accounts

SECTION C

DEFINITIONS OF TATAWS III

COST ELEMENT DATA NAMES

(Terms appearing on left side of equations)

DEFINITIONS OF TATAWS III
COST ELEMENT DATA NAMES

(Terms appearing on left side of equations)

- Note: (1) Paragraph numbers refer to TATAWS III Chart of Accounts.
(2) All costs are on an annual basis unless otherwise indicated.
(3) The word "total" means "total annual".

<u>Equa. No.</u>	<u>Cost Element Designation</u>	<u>Paragraph No.</u>	<u>Definitions</u>
1	DEV	I	Total Research & Development Costs
2	PBS	II A 1	Total Production Base Support Costs
3	TRAIN1C	II A 2a (2)	Total Production Costs for Tank Trainer 1
4.	TRAIN2C	same	Total Production Costs for Tank Trainer 2
5.	TANKC	II A 2a (1)	Total Production Costs for Tanks
6.	TANKU	For II A 2a (1)	Average unit production costs for tanks.
7.	(This equation bypasses equations 8-19 if TANKP = 0.)		
8.	X	For II A 2a (1)	Learning curve midpoint of annual tank production quantity. This is the tank which has a unit cost equal to the annual average unit cost.
9.	Y	For II A 2a (1)	Unit cost of the X (or midpoint) tank
10.	TANKFAB	For II A 2a (1)	Total tank fabrication costs - (This includes material, labor and overhead but <u>not</u> production support II A2a(4).
11.	TOOLMAINT	For II A 2a(4) (a)	Costs for maintenance of tooling for tank production
12.	TOOL	IIA 2a (4) (a)	Total tool maintenance costs for tank production
13.	DOC	IIA 2a (4) (d)	Total tank documentation costs
14.	CONTCOST	For IIA 2a (4) (e)	Total tank production contractor costs
15.	GA	IIA 2a (4) (e)	General and Administrative overhead costs for tank production contractor
16.	PROFIT	IIA 2a (4) (e)	Tank production contractor's profit

17.	TANKOTH	IIA 2a (4)	Tank production support costs
18.	TANKC	IIA 2a (1)	Total tank production costs
19.	TANKU	For ACSFOR Forms	Average unit tank production cost
20.	MI	IIA 2a	Total major items hardware production costs
21.	SRPIP	IIA 2b	Selected Repair Parts for Initial Provisioning and Re provisioning (i.e., spare engines and transmissions)
22.	TANKA	For ACSFOR Forms	(See next item.)
23.	TANKINC	For IIA 2b	Ratio of tank production programmed quantity (TANKP) to year end tank assets (TANKA)
24.)			
25.)	- SRPIP	(----See Item 21 above.----)	
26.	HDW	IIA 2	Total hardware production costs
27.	FDTII	IIA 3	First Destination Transportation costs under Investment Phase
28.	PEMAII	IIA	Total PEMA for Investment Phase
29.	F15	For II B 1 and II C 2	Factor for inheritance of trained military personnel for tank maintenance (i.e., percentage of required military maintenance personnel which must undergo CONARC advanced individual training)
30.	F16	(Same as Item 29 except F16 pertains to CONARC training of Tank Crews)	
31.	INHERMA	For II B 1 and II B 2	Total number of tank maintenance personnel inherited from phaseout of other tanks.
32.	INHERCR	(Same as Item 31 except that this refers to tank crew personnel)	
33.)			
34.)	- F15	(----See Item 29 above.----)	
35.)			
36.)	- F16	(----See Item 30 above.----)	
37	BP21AITM	For II B 1	Total initial CONARC OM,A costs for Advanced Individual Training of tank maintenance personnel (Investment Phase)

38.	BP21AITC	(Same as 37 (BPAlAITM) except this refers to tank crews.)	
39.	BP21AIT	For II B 1	Sum of Items 37 and 38
40.	BP2100II	II B 1	Total initial CONARC OM,A costs applicable to tank
41.	BP22PROC	IIB 2(a)(b)(d))	Total Investment Phase BP2200 "Central Supply Activities" costs for Procurement, Supply and Management, respectively
42.	BP22SUPPLY	IIB 2(c))--	
43.	BP22MNGT	IIB 2(e)(f))	
44.	BP2200II	IIB 2	Total Investment Phase BP2200 costs (i.e., sum of items 41, 42 and 43 above)
45.	OMAI	IIB	Total OM,A costs for Investment Phase
46.	MPAITM	For IIC 2	Total initial CONARC MPA costs for Advanced Individual Training of Tank Maintenance Personnel (both cadre and trainee costs) for Investment Phase)
47.	MPAITC	(Same as for Item 46 above except pertains to tank crew.)	
48.	MPA21II	IIC 2	Total initial CONARC MPA costs for Advanced Individual Training of tank crews and maintenance personnel under Investment Phase (Sum of Items 46 and 47 above).
49.	MPA22II	IIC 1	Total initial MPA costs (Investment Phase) associated with BP2200 activities
50.	MPAII	IIC	Total MPA costs for Investment Phase
51.	INV	II	Total Investment Costs
52.	ASF	IID	Total acquisition costs of initial provisioning repair parts (Army Stock Fund) for Tanks. This is a non-add item.
53.	SRPIP	(See item 21 above.)	
54.)	- ASF	(See item 52 above.)	
55.)			
56.	SRPR	For III A	Total production costs for replenishment of spare engines and transmissions (i.e., Selected Repair Parts for Replenishment)

57.	FDTIII	For III A	Total First Destination Transportation costs for SRPR
58.	PEMAIII	III A	Total PEMA costs for Operating Phase (i.e., Phase III)
59.	BP2000III	III B 1	Total cost of repair parts and POL for TOE tanks
60.	BP21MAINT	For III B 2	Total CONARC OM,A costs for replacement training of tank maintenance personnel
61.	BP21CREW	(Same as for Item 60 above except this cost refers to replacement training of tank crews.)	
62.	BP2100III	III B 2	Total BP2100 costs under Operating Phase III. (Sum of Items 60 and 61.)
63.	BP22PROP	III B 3(a))	Total Operating Phase (III) BP2200 "Central Supply Activities" costs for Procurement, Supply and Management, respectively
64.	BP22SMA	III B 3(e)) --	
65.	BP22MAN	III B 3(g), (h))	
66.	SDTREB	For IIIB 3(f)(1)	Total transportation costs for tanks to and from maintenance depots, worldwide (i.e, Second Destination Transportation for rebuild and overhaul of tanks)
67.	SDTANKS	For IIIB 3(f)(2)	Total Second Destination Transportation costs for shipment of tanks overseas
68.	SRP	For ACSFOR Forms	Total costs of Selected Repair Parts (spare/repair engines and transmissions) (Sum of SRPR + SRPIP)
69.) 70.)	- SDTPOWP	For IIIB 3(f)(2)	Total Second Destination Transportation costs for power packs (engine/transmission set) being shipped overseas)
71.	SDTOVS	IIIB 3(f)(2)	Sum of items 67 and 69/70 above. Total of Second Destination Transportation costs for overseas shipments.
72.	SDT	IIIB 3(f)	Total Second Destination Transportation costs (Sum of items 66 and 71 above)
73.	BP2200III	III B 3	Total Operating Phase BP2200 costs

74.	BP23REB	III B 4a	Total costs for rebuild and overhaul of tanks at maintenance depots
75.	BP23SUP	III B 4l	Total maintenance support costs for tanks at depots
76.	BP2300III	III B 4	Total Depot Maintenance Costs (BP2300) under Phase III (Operating Costs)
77.	OMAIII	III B	Total OM,A costs under Phase III (Operating Cost)
78.	MPA20CREW	For IIID	Total MPA costs for TOE tank crews associated with BP2000 (OM,A of Operating Forces)
79.	MPA20MAINT	(Same as for Item 78 above except these costs pertain to MPA costs for tank maintenance personnel)	
80.	MPA20III	For III D	Total MPA costs for TOE tank crews and maintenance personnel associated with BP2000 (OM,A of Operating Forces)
81.	MPA21CREW	For III D	Total CONARC MPA costs for replacement training of tank crews (costs include CONARC cadre as well as crew trainee MPA)
82.	MPA21MAINT	(Same as Item 81 above except this refers to replacement training of tank maintenance personnel)	
83.	MPA21III	For III D	Total MPA costs for CONARC replacement training of tank crews and maintenance personnel. (Sum of Items 81 and 82 above.)
84.	MPA22III	For III D	Total MPA costs associated with BP2200, Operating Phase III for tank "Central Supply Activities"
85.	MPAIII	III D	Total MPA costs associated with the Operations Phase III. (Sum of Items 80, 83 and 84 above.)
86.	OPER	III	Total Operating Costs (Phase III) (Sum of items 58, 77, 85 and National Guard OM,A)
87.	FDT	For ACSFOR Forms	Total First Destination Transportation costs. (Sum of items 27 and 57.)
88.	PEMA	For ACSFOR Forms	Total PEMA costs (Sum of Items 28 and 58.)

89.	OMA	For ACSFOR Forms	Total OM,A costs (Sum of items 45, 77 and OM,A costs under the Development Phase I.)
90.	MPA	For ACSFOR Forms	Total MPA costs (Sum of items 50, 85 and MPA costs under the Development Phase I.)
91.	TPC	For ACSFOR Forms	Total PEMA cost (yearly)
92.	TOTFM3	For ACSFOR Forms	Total of Budget Program Cost Elements (yearly)
93.	TOT	For ACSFOR Forms	Total of Development, Investment and Operating Costs (yearly)

SECTION D
LIFE CYCLE CHART OF ACCOUNTS
TATAWS III

LIFE CYCLE CHART OF ACCOUNTS

TATAWS III

	<u>Appropriation Symbol</u>	<u>Project or AMS Code</u>
I. <u>RESEARCH AND DEVELOPMENT PHASE - (1)</u>		
A. RUT&E - (RDTE)	21X2040	
1. Design and Development		
2. Test and Evaluation		
3. New Equipment Training		
B. MILITARY PERSONNEL, ARMY - (MPAI)	2182010	
1. Project Manager Staff		
2. New Equipment Training (includes CONARC instructor's time plus command personnel).		
C. OPERATION & MAINTENANCE ARMY - (OMAI)	2182020	
1. Special Tactical Activities		2050
2. Procurement Activities		2210.1
3. Pre-Issue Engineering		23L0.1
II. <u>INVESTMENT PHASE - (51)</u>		
A. PEMA - (28)	21X2030	
1. Production Base Support - (2)		4200,4490, 4900
a. APE - (APE)		4200,4490, 4931
b. Provisioning of Industrial Facilities - (FAC)		4200,4490, 4910
c. Layaway of Industrial Facilities - (LAYF)		4200,4490, 4920

Life Cycle Chart of Accts TATAWS III
(cont'd)

	<u>Appropriation Symbol</u>	<u>Project or AMS Code</u>
2. Hardware - (26)		
a. Major Items - (20)		(4200, 4500, (4400
(1) Main weapon system, ammo and missile (18) = (10) + (17) AAO		
(2) Trainers - (3) and (4)		
(3) Special equipment/ground equipment - (SPEQUIP)		
(4) Support costs - (17)		
(a) Tooling (12) = (11) + (TOOLINIT)		
(b) Engineering - (ENG)		
(c) Quality Assurance - (QA)		
(d) Documentation - (13)		
(e) Other - (15) and (16)		
b. Selected Repair Parts - (21), (24) or (25)		(4450, 4460, (4300
(1) Initial Provisioning		
(2) Reprovisioning		
3. First Destination Transportation - (27)		
B. Operation & Maintenance, Army - (45)	2182020	
1. Training Activities (40) = (37) + (38) + (BP21NET)		2100
a. School Training		
(1) Operation of Schools		
(2) Equipment for Schools		

Life Cycle Chart of Accts TATAWS III
(cont'd)

	<u>Appropriation Symbol</u>	<u>Project or AMS Code</u>
2. Central Supply Activities - (44)		2200
a. Procurement operations)		2210.1
) --(41)		
b. Contract Administration)		2210.2
c. Supply Management Activities - (42)		2230.1 & 2230.2
d. Procurement Standardization - (41)		2270.3
e. Project Manager - (43)		2280.3
f. Mid-Management Command - (43)		2280.1
3. Depot Materiel Maint. and Support Act. - (BP2300II)		2300
a. New Equipment Training		2310
b. New Materiel Introductory Briefing		2310
C. MILITARY PERSONNEL ARMY - (50)	2182010	
1. Project Managers - (49)		
2. Schools (48) = (46) + (47)		
a. Cadre		
b. Trainees (initial crews)		
3. New Equipment Training - (MPA23II)		
D. Army Stock Fund (memo entry only) - (52), (54) or (55)	21X4991.XXX	
1. Initial Provisioning		0700.1
2. Reprovisioning		0700.1
III. <u>OPERATING PHASE</u> - (86)		
A. PEMA - (58)		
1. Selected Repair Parts - (56)		(4300,4450,
First Destination Transportation - (57)		(4460)
a. Replenishment		
2. Annual Service Practice Firings		4200,4800
B. Operation & Maintenance Army - (77)		
1. Operating Forces - (59)		2000

Life Cycle Chart of Accts TATAWS III
(cont'd)

	<u>Appropriation Symbol</u>	<u>Project or AMS Code</u>
a. Repair Parts		
b. POL		
c. Other (common maintenance equipment)		
2. Training Activities (62) = (60) + (61)		2100
a. Schools		
(1) Cadre (instructing replacement personnel)		
(2) Trainees (replacement crews)		
b. Repair parts		
c. POL		
3. Central Supply Activities - (73)		2200
a. Procurement Operations - (63)		2210.1
b. Production Engineering for ASF Items - (BP22PE)		2270.2
c. Industrial Preparedness Planning - (BP22IPP)		2240.3
d. Operation of Supply Depot Operations - (BP22SDOP)		2220.1
e. Supply Management Activities - (64)		2230
f. Transportation - (72)		2250
(1) CONUS (in connection with rebuild) - (66)		
(2) Overseas (includes port handling, ocean transportation and O/S inland transportation for items from production. Also could include some rebuild transportation O/S). (71) = (67) + (70)		
g. Project Manager Offices)--(BP22MAN)		2280.3
h. Mid-Management Command)		2280.1
4. Depot Maintenance & Maintenance Support - (76)		2300
a. Overhaul - (74)		23A0

Life Cycle Chart of Accts TATAWS III
(cont'd)

	<u>Appropriation Symbol</u>	<u>Project or AMS Code</u>
b. Progressive Maintenance)		23B0
c. Conversion)		23C0
d. Activation)		23D0
e. Inactivation)		23E0
f. Renovation)		23F0
g. Analytical Rework)	-- (BP230TH)	23G0
h. Modification)		23H0
i. Repair)		23I0
j. Inspection & Test)		23J0
k. Materiel Support)		23K0
l. Maintenance Support - (75)		23L0
5. Army Reserve and ROTC - (BP2600)		2600
C. Operation and Maintenance, National Guard - (NGOMA)	2182065	
1. Training Operations		3710
2. Logistic Support		3730
3. Headquarters & Command Support		3740
D. Military Personnel, Army - (85)	2182010	
1. Project Manager - (84)		
2. Cadre (instructor's training replacement personnel)		
3. Trainees (replacement crews and direct and maintenance personnel)		
		--- (83) = (81) + (82)

SECTION E

RECONCILIATION OF DATA NAMES TO
MATH MODEL AND CHART OF ACCOUNTS

RECONCILIATION OF DATA NAMES TO
 MATHEMATICAL COST MODEL AND CHART OF ACCOUNTS
 (TATAWS III)

Para Numbers
 from Chart
 of Accounts
 (Section D)

	<u>Data Name</u>	<u>Equation Number</u>	<u>Thruput</u>
I	DEV -----	1	
A	RDTE -----		X
B	MPAI -----		X
C	OMAI -----		X
II	INV -----	51	
A	PEMAII -----	28	
1	PBS -----	2	
a	APE -----		X
b	FAC -----		X
c	LAYF -----		X
II A 2	HDW -----	26	
a	MI -----	20	
(1)	TANKC -----	18	
(a)	TANKFAB -----	10	
	TANKP -----		X
	Y -----	9	
	A -----		X
	B -----		X
	X -----	8	
	F -----		X
II A 2 a (2)	TRAIN1C -----	3	
	TRAIN1U -----		X
	TRAIN1P -----		X
	TRAIN2C -----	4	
	TRAIN2U -----		X
	TRAIN2P -----		X

Para Numbers
from Chart of
Accts (Sec D)

	<u>Data Name</u>	<u>Equation Number</u>	<u>Thruput</u>
II A 2 a (3)	SPEQUIP -----		X
(4)	TANKOTH -----	17	
(a)	TOOL -----	12	
	TOOLINIT -----		X
	TOOLMAINT -----	11	
	F1 -----		X
(b)	ENG -----		X
(c)	QA -----		X
(d)	DOC -----	13	
	F2 -----		X
	PAGES -----		X
(e)	GA -----	15	
	F8 -----		X
	CONTCOST -----	14	
	F3 -----		X
	F4 -----		X
	F5 -----		X
	F6 -----		X
	F7 -----		X
	CONTOTH -----		X
(e)	PROFIT -----	16	
	F9 -----		X
II A 2 b	XSRPIP -----		X
b	SRPIP -----	24 or 25	
	TANKINC -----	23	
	TANKA -----		X
A 3	FDTII -----	27	
	TANKD -----		X
	TRAIN1D -----		X
	TRAIN2D -----		X
	F10 -----		X
	F11 -----		X
	F12 -----		X
	F13 -----		X
	F14 -----		X

Para Numbers
from Chart of
Accts (Sec D)

II B

1

<u>Data Name</u>	<u>Equation Number</u>	<u>Thruput</u>
ONAI I -----	45	
BP2100 I I -----	40	
BP21NET -----		X
BP21AIT -----	39	
BP21AITM -----	37	
FBP21AITM -----		X
TOEINC -----		X
F15 -----	33	
TOEMP -----		X
INHERMA -----	31	
MTR -----		X
M48OUT -----		X
M48A2COUT -----		X
M48A3OUT -----		X
M60OUT -----		X
M60SHOUT -----		X
M551OUT -----		X
M48MP -----		X
M48A2CMP -----		X
M48A3MP -----		X
M60MP -----		X
M60SHMP -----		X
M551MP -----		X
BP21AITC -----	38	
FBP21AITC -----		X
F16 -----	35	
TOECP -----		X
INHERCR -----	32	
CTR -----		X

II B 2

a, b, d

c

e, f

BP2200 I I -----	44	
BP22PROC -----	41	
FBP22PROC -----		X
MYBP22PROC -----		X
BP22SUPPLY -----	42	
FBP22SUPPLY -----		X
MYBP22SUPPLY -----		X
BP22MNGT -----	43	
FBP22MNGT -----		X
MYBP22MNGT -----		X

Para Numbers
from Chart of
Accts (Sec D)

	<u>Data Name</u>	<u>Equation Number</u>	<u>Thruput</u>
II B 3	BP2300II -----		X
II C	MPAII -----	50	
1	MPA22II -----	49	
	FMPA22II -----		X
	MYMPA22II -----		X
II C 2	MPA21II -----	48	
	MPA1TM -----	46	
	FMPA1TM -----		X
	MPA1TC -----	47	
	FMPA1TC -----		X
II C 3	MPA23II -----		X
II D	XASF -----		X
	ASF -----	52, 54 or 55	
III	OPER -----	86	
A	PEMAIII -----	58	
1	SRPR -----	56	
	DINUSE -----		X
	F17 -----		X
1	FDTIII -----	57	
	F13 -----		X
	F14 -----		X
III B	OMAIII -----	77	
1	BP20000III -----	59	
	TOECON -----		X
	TOEOVS -----		X
	CONMILES -----		X
	OVSMILES -----		X
	F18 -----		X
III B 2	BP2100III -----	62	
	BP21MAINT -----	60	
	BP21CREW -----	61	

Para Numbers
from Chart of
Accts (Sec D)

	<u>Data Name</u>	<u>Equation Number</u>	<u>Thruput</u>
III B 3	BP2200III -----	73	
a	BP22PROP -----	63	
	MYBP22PROP -----		X
b	BP22PE -----		X
c	BP22IPP -----		X
d	BPSDOP -----		X
e	BP22SMA -----	64	
	MYBP22SMA -----		X
f	SDT -----	72	
	SDTREB -----	66	
	REBILD -----		X
	F19 -----		X
	SDTOVS -----	71	
	SDTANKS -----	67	
	OVSHIP -----		X
	F20 -----		X
	SDTPOWP -----	69 or 70	
	SRP -----	68	
	F21 -----		X
g & h	BP22MAN -----	65	
	MYBP22MAN -----		X
III B 4	BP2300III -----	76	
b - k	BP230TH -----		X
a	BP23REB -----	74	
	F22 -----		X
l	BP23SUP -----	75	
	FBP23SUP -----		X
	MYBP23SUP -----		X
III B 5	BP2600 -----		X
III C	NGOMA -----		X
III D	MPAIII -----	85	
1	MPA20III -----	80	
	MPA20CREW -----	78	
	CRUPACON -----		X
	CRUPAOVS -----		X
	MPA20MAINT -----	79	
	MAINTPACON -----		X
	MAINTPAOVS -----		X

Para Numbers
from Chart of
Accts (Sec D)

	<u>Data Name</u>	<u>Equation Number</u>	<u>Thruput</u>
III D 2	MPA21III -----	83	
	MPA21CREW -----	81	
	MPA21MAINT -----	82	
III D 3	MPA22III -----	84	
	FMPA22III -----		X
	MYMPA22III -----		X

END OF EQUATIONS REQUIRED FOR CHART OF ACCOUNTS

INPUTS AND EQUATIONS REQUIRED FOR ACSFOR FORMS

FDT -----	87	
PEMA -----	88	
OMA -----	89	
MPA -----	90	
TANKU -----	19	
TRAIN1A -----		X
TRAIN2A -----		X

SECTION F
COMPUTER PROGRAM
AND
COMPUTER PRINTOUTS

```

$JOB 'BLOUGH',KR=29,LINES=60,TIME=60
IMPLICIT REAL*8 (A-H), REAL*8 (I-L)
INTEGER ALPHA(4)/A,B,C,D, /
DIMENSION XIN(11,17),NAMEI(11,3),OUT(82,17),NAMOUT (62,3),NYEAR
1(11),SYMBOL(11),TOTIM(11),TOTOUT(42),TOTFM3(17),SHV (3,7,10),DIFF
2(7,11),XDIF(3,4,20),STOR(3,4,20),SAVE(3,6,20),YDIF(3,6,20),TCCOMP(
313),FMT(20)
DO 886 I = 1,3
DO 886 J = 1,6
DO 886 K = 1,20
YDIF(I,J,K) = 0.0
886 SAVE(I,J,K) = 0.0
DO 887 I = 1,7
DO 887 J = 1,10
DO 888 I = 1,3
DO 888 J = 1,4
DO 888 K = 1,20
XDIF(I,J,K) = 0.0
888 STOR(I,J,K) = 0.0
DO 889 I = 1,3
DO 889 J = 1,7
DO 889 K = 1,10
889 SBV(I,J,K) = 0.0
FYEAR = 1970
DO 1 I = 1,11
1 NYEAR(I) = FYEAR + I - 1
READ 2, ((NAMOUT (I,J),J = 1,3),I = 1,72)
READ 2, ((NAMOUT (I,J),J = 1,3),I = 76,81)
2 FORMAT (8(2A4,A2))
3 FORMAT 3, ((NAMEIN(I,J),J=1,3),SYMBOL(I),I=1,110)
3 FORMAT (4(2A4,A3,3X,A1,5X))
830 READ (5,830) FMT
830 FORMAT (20A4)
4 READ 4,NOMIXS,NOVEH
4 FORMAT (11,8X,I1)
DO 315 JJJ = 1,NOMIXS
840 READ 6,MIX
6 FORMAT (A4)
DO 246 JJ = 1,NOVEH
DO 884 I = 1,13
884 TCCOMP(I) = 0.0
DO 885 I = 1,111
DO 885 J = 1,17
885 XIN(I,J) = 0.0
885 READ 7, VEH,NOY
7 FORMAT (A1,8X,I2)
IF (NOY.EQ.0) NOY = 11
PRINT 888,VEH,NOY
888 FORMAT (1H1,VEHICLE NO.,3X,A1/1X,NO. OF YEARS ,3X,I4)
DO 9 I = 1,81
DO 9 J = 1,17
9 OUT(I,J) = 0.0
DO 21 I = 1,110
KSAVE = 0
880 READ (5,FMT,ERR=700) IFLAG,(XIN(I,K),K=1,NOY)
KSAVE = I + 1
IF (IFLAG)16,21,16
16 DO 23 J = 2,NOY
IF (XIN(I,J)) 23,20,23

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57 20 XIN(I,J) = XIN(I,J-1)
58 23 CONTINUE
59 21 CONTINUE
60 DO 98 J = 1,NOY
61   OUT(1,J) = XIN(1,J) + XIN(2,J) + XIN(3,J)
62   OUT(2,J) = XIN(4,J) + XIN(5,J) + XIN(6,J)
63   OUT(3,J) = XIN(7,J)+XIN(8,J)
64   OUT(4,J) = XIN(11,J)+XIN(12,J)
65   IF (XIN(15,J))5,5,8
66   5 OUT(5,J) = 0.0
67   OUT(6,J) = 0.0
68   GO TO 30
69   8 IF (XIN(23,J) .EQ. 0.0 ) GO TO 28
70   OUT(76,J) = (XIN(15,J)*(XIN(23,J)+1.)/(XIN(24,J)+XIN(15,J))-5 )**
71   1(XIN(23,J)+1.)-(XIN(24,J))-5)**(XIN(23,J)+1.))**(-1./XIN(23,J))
72   IOUT = OUT(76,J) + .5
73   OUT(77,J) = IOUT
74   OUT(71,J) = XIN(22,J)*OUT(76,J)**XIN(23,J)
75   GO TO 29
76   28 OUT(71,J) = XIN(22,J)
77   29 OUT(7,J) = XIN(15,J)*OUT(71,J)
78   OUT(8,J) = XIN(30,J)*OUT(7,J)
79   OUT(9,J) = XIN(25,J) + OUT(8,J)
80   OUT(10,J) = XIN(31,J)*XIN(28,J)
81   OUT(11,J) = XIN(32,J)*OUT(7,J) + XIN(33,J)*OUT(9,J) + XIN(34,J)*XI
82   1N(26,J) + XIN(35,J)*XIN(27,J) + XIN(36,J)*OUT(10,J) + XIN(29,J)
83   OUT(12,J) = XIN(37,J)*OUT(11,J)
84   OUT(13,J) = XIN(38,J)*(OUT(11,J) + OUT(12,J))
85   OUT(14,J) = OUT(9,J) + XIN(26,J) + XIN(27,J) + OUT(10,J) + XIN(29,
86   1J) + OUT(12,J) + OUT(13,J)
87   OUT(15,J) = OUT(7,J) + OUT(14,J)
88   OUT(16,J) = OUT(5,J)/XIN(15,J)
89   30 OUT(15,J) = OUT(5,J) + OUT(3,J) + OUT(4,J)+ XIN(21,J)
90   IF (XIN(39,J)) 32,32,31
91   31 OUT(16,J) = XIN(39,J)
92   GO TO 36
93   32 CONTINUE
94   IF (XIN(17,J)) 34,34,33
95   33 OUT(77,J) = XIN(15,J)/XIN(17,J)
96   IF (OUT(77,J) - .25) 35,34,34
97   34 OUT(16,J) = .045*OUT(5,J)
98   GO TO 36
99   35 OUT(16,J) = 0.0
100  36 OUT(17,J) = OUT(15,J) + OUT(16,J)
101  OUT(18,J) = XIN(16,J)*XIN(40,J) + XIN(9,J)*XIN(41,J) + XIN(13,J)*X
102  1N(42,J) + OUT(16,J)*XIN(44,J)/XIN(43,J)
103  OUT(19,J) = OUT(2,J) + OUT(17,J) + OUT(18,J)
104  IF (XIN(59,J)) 39,39,41
105  39 OUT(78,J) = 0.0
106  OUT(79,J) = 0.0
107  GO TO 47
108  41 OUT(80,J) = (1. - XIN(45,J))*(XIN(47,J)*XIN(53,J) + XIN(50,J)*XIN
109  1(56,J) + XIN(51,J)*XIN(57,J) + XIN(52,J)*XIN(58,J) + XIN(48,J)*XIN
110  2(54,J) + XIN(49,J)*XIN(55,J))
111  OUT(81,J) = (1. - XIN(46,J))*4.0*(XIN(47,J) + XIN(50,J) + XIN(51,J)
112  1) + XIN(52,J) + XIN(48,J) + XIN(49,J))
113  OUT(78,J) = 1. -(OUT(80,J) / (XIN(59,J)*XIN(60,J)))
114  IF (OUT(78,J)) 44,45,45
115  44 OUT(78,J) = 0.0
116  45 OUT(79,J) = 1. -(OUT(81,J)/(XIN(59,J)*XIN(61,J)))

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110 IF (OUT(79,J)) 46,47,47
111 46 OUT(79,J) = 0.0
112 47 OUT(20,J) = XIN(62,J)*XIN(59,J)*OUT(78,J)
113 OUT(21,J) = XIN(63,J)*XIN(59,J)*OUT(79,J)
114 OUT(22,J) = OUT(20,J) + OUT(21,J)
115 OUT(23,J) = OUT(22,J) + XIN(64,J)
116 OUT(24,J) = XIN(65,J)*XIN(68,J)
117 OUT(25,J) = XIN(66,J)*XIN(69,J)
118 OUT(26,J) = XIN(67,J)*XIN(70,J)
119 OUT(27,J) = OUT(24,J) + OUT(25,J) + OUT(26,J)
120 OUT(28,J) = OUT(23,J) + OUT(27,J) + XIN(71,J)
121 OUT(29,J) = XIN(72,J)*XIN(59,J)*OUT(78,J)
122 OUT(30,J) = XIN(73,J)*XIN(59,J)*OUT(79,J)
123 OUT(31,J) = OUT(29,J) + OUT(30,J)
124 OUT(32,J) = XIN(74,J)*XIN(75,J)
125 OUT(33,J) = OUT(31,J) + OUT(32,J) + XIN(76,J)
126 OUT(34,J) = OUT(19,J) + OUT(28,J) + OUT(33,J)
127 IF (XIN(77,J)) 63,63,62
128 62 OUT(35,J) = XIN(77,J)
129 GO TO 66
130 63 IF (OUT(16,J)-1.) 65,65,64
131 64 OUT(35,J) = .105*OUT(5,J)
132 GO TO 66
133 65 OUT(35,J) = 0.0
134 66 OUT(36,J) = XIN(79,J)*XIN(78,J)
135 OUT(37,J) = OUT(36,J)*XIN(44,J)/XIN(43,J)
136 OUT(38,J) = OUT(36,J) + OUT(37,J)
137 OUT(39,J) = (XIN(81,J)*XIN(83,J) + XIN(82,J)*XIN(84,J))*XIN(80,J)
138 ITOE2 = XIN(59,J)/2.
139 OUT(40,J) = XIN(45,J)*XIN(62,4)*XIN(81,J)+XIN(82,J)-ITOE2
140 OUT(41,J) = XIN(46,J)*XIN(63,J)*XIN(81,J)+XIN(82,J)-ITOE2
141 OUT(42,J) = OUT(40,J) + OUT(41,J)
142 OUT(43,J) = XIN(65,J)*XIN(85,J)
143 OUT(44,J) = XIN(66,J)*XIN(86,J)
144 OUT(45,J) = XIN(67,J)*XIN(87,J)
145 OUT(46,J) = XIN(88,J)*XIN(90,J)
146 OUT(47,J) = XIN(89,J)*XIN(91,J)
147 OUT(48,J) = OUT(16,J) + OUT(36,J)
148 IF (XIN(82,J)) 79,79,80
149 79 OUT(49,J) = 0.0
150 GO TO 81
151 80 OUT(49,J) = OUT(48,J)*XIN(82,J)*XIN(92,J)/(XIN(43,J)*XIN(82,J) +
    1*XIN(81,J))
152 81 OUT(50,J) = OUT(47,J) + OUT(49,J)
153 OUT(51,J) = OUT(46,J) + OUT(50,J)
154 OUT(52,J) = OUT(43,J) + XIN(95,J) + XIN(96,J) + XIN(97,J) + OUT(44
    1,J) + OUT(51,J) + OUT(45,J)
155 OUT(53,J) = XIN(88,J)*XIN(93,J) + (XIN(81,J) + XIN(102,J))*XIN(83,
    1J) + (XIN(82,J) + XIN(103,J))*XIN(84,J)*XIN(94,J)
156 OUT(54,J) = XIN(98,J)*XIN(99,J)
157 OUT(55,J) = OUT(53,J) + OUT(54,J) + XIN(100,J)
158 OUT(56,J) = OUT(39,J)+OUT(42,J)+OUT(52,J)+XIN(55,J)+XIN(101,J)
159 OUT(57,J) = XIN(81,J)*XIN(105,J) + XIN(82,J)*XIN(106,J)
160 OUT(58,J) = XIN(81,J)*XIN(107,J) + XIN(82,J)*XIN(108,J)
161 OUT(59,J) = OUT(57,J) + OUT(58,J)
162 OUT(60,J) = XIN(46,J)*XIN(73,J)*XIN(81,J)+XIN(82,J)-ITOE2
163 OUT(61,J) = XIN(45,J)*XIN(72,J)*XIN(81,J)+XIN(82,J)-ITOE2
164 OUT(62,J) = OUT(60,J) + OUT(61,J)
165 OUT(63,J) = XIN(109,J)*XIN(110,J)
166 OUT(64,J) = OUT(59,J) + OUT(62,J) + OUT(63,J)

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167 OUT(65,J) = OUT(38,J) + OUT(56,J) + XIN(104,J) + OUT(64,J)
168 OUT(66,J) = OUT(18,J) + OUT(37,J)
169 OUT(67,J) = OUT(19,J) + OUT(38,J)
170 OUT(68,J) = XIN(3,J) + OUT(28,J) + OUT(56,J)
171 OUT(69,J) = XIN(2,J) + OUT(33,J) + OUT(64,J)
172 OUT(70,J) = OUT(1,J) + OUT(34,J) + OUT(65,J)
173 1 + OUT(66,J) + XIN(21,J)
174 TOTFM3(J) = XIN(1,J) + OUT(67,J) + OUT(68,J) + XIN(104,J) + OUT(69,J)
175 STOR(JJJ,1,J) = STOR(JJJ,1,J) + OUT(1,J)
176 STOR(JJJ,2,J) = STOR(JJJ,2,J) + OUT(34,J)
177 STOR(JJJ,3,J) = STOR(JJJ,3,J) + OUT(65,J)
178 STOR(JJJ,4,J) = STOR(JJJ,4,J) + OUT(70,J)
179 SAVE(JJJ,1,J) = SAVE(JJJ,1,J) + XIN(1,J)
180 SAVE(JJJ,2,J) = SAVE(JJJ,2,J) + OUT(67,J)
181 SAVE(JJJ,3,J) = SAVE(JJJ,3,J) + OUT(68,J)
182 SAVE(JJJ,4,J) = SAVE(JJJ,4,J) + XIN(104,J)
183 SAVE(JJJ,5,J) = SAVE(JJJ,5,J) + OUT(69,J)
184 SAVE(JJJ,6,J) = SAVE(JJJ,6,J) + TOTFM3(J)
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98 CONTINUE
101 NN = 1
102 NNN = 55
DO 115 LL = 1,2
PRINT 100,VEH,MIX,(NVEAR(K),K=1,11)
100 FORMAT (I1,I4,A1,1X,A4,156,INPUT DATA'//1X,T6,ITFM/FY,T26,I4,10(6
1X,I4)/)
DO 109 I = NN,NNN
109 PRINT 110, I,(NAMEIN(I,J),J=1,3),SYMBOL(I),(XIN(I,K),K=1,11)
110 FORMAT (1X,I3,2X,2A4,A3,1X,A1,11F10.2)
115 NNN = 110
IF (JJ.NE. 1) GO TO 410
WRITE(6,400)
400 FORMAT (I1, 'INPUT DATA')
DO 402 I = 1,110
402 PRINT 403, (NAMEIN(I,J),J=1,3),(XIN(I,K),K=1,11)
403 FORMAT (1X,2A4,A3,1X,11F10.0)
410 IF (NOY.LE. 11) GO TO 119
WRITE (6,5555)
5555 FORMAT (I1, 'COMPLETION DATA' )
DO 776 I = 1,110
776 PRINT 777,(NAMEIN(I,J),J=1,3),(XIN(I,K),K=12,NOY)
777 FORMAT (I10,2A4,A3,1X,6(F14.5,5X))
119 NN = 1
NNN = 55
DO 128 LL = 1,2
PRINT 120,VEH,MIX,(NVEAR(K),K=1,11)
120 FORMAT (I1,I4,A1,1X,A4,165,'OUTPUT DATA'//1X,T56,'COSTS IN THOUSAN
1DS OF DOLLARS'//T6,ITFM/FY,T26,I4,10(6X,I4)/)
C
DIVIDE OUTPUT VALUES BY 1000.
DO 123 I = NN,NNN
DO 122 J = 1,NOY
122 OUT(I,J) = OUT(I,J)/1000.
123 PRINT 125, I,(NAMEIN(I,J),J=1,3), (OUT(I,K),K=1,11)
125 FORMAT (1X,I3,2X,2A4,A3,2X,11F10.2)
126
127
128 NNN = 72
C
DIVIDE RATE,MPAI,MPAI,1.6604A,TRAIN10,TRAIN20,AND SPEQUIP BY 1000.
DO 130 I = 1,3
DO 130 J = 1,NOY

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222 130 XIN(I,J) = XIN(I,J)/1000.
223 00 J 131 J = 1,NOY
224 XIN(104,J) = XIN(104,J)/1000.
225 XIN(8,J) = XIN(8,J)/1000.
226 XIN(12,J) = XIN(12,J)/1000.
227 XIN(21,J) = XIN(21,J)/1000.
228 IF (NOY .LE. 11) GO TO 134
229 00 99 I = 12,NOY
230 TOCOMP(1) = TOCOMP(1) + XIN(15,I)
231 TOCOMP(2) = TOCOMP(2) + OUT(72,I)
232 TOCOMP(3) = TOCOMP(3) + OUT(34,I)
233 TOCOMP(4) = TOCOMP(4) + OUT(65,I)
234 TOCOMP(5) = TOCOMP(5) + OUT(67,I)
235 TOCOMP(6) = TOCOMP(6) + OUT(68,I)
236 TOCOMP(7) = TOCOMP(7) + OUT(69,I)
237 TOCOMP(8) = TOCOMP(8) + OUT(5,I)
238 TOCOMP(9) = TOCOMP(9) + XIN(7,I)
239 TOCOMP(10) = TOCOMP(10) + OUT(3,I)
240 TOCOMP(11) = TOCOMP(11) + XIN(11,I)
241 TOCOMP(12) = TOCOMP(12) + OUT(4,I)
242 99 TOCOMP(13) = TOCOMP(13) + XIN(21,I)
243 134 CONTINUE
244 PRINT 135, (NYEAR(K),K = 1,11)
245 FORMAT (1H0,T58,'OUTPUT DATA',1X,T47,'COSTS/QUANTITIES IN DOLLARS',
1H11,'UNITS',/1X,T6,'ITEM/FY',T26,I4,10(6X,I4)/)
246 00 138 I = 76,81
247 J = I-3
248 138 PRINT 125, J,(NAMOUT (I,J),J=1,3),(OUT(I,K),K=1,11)
C
249 00 145 I = 1,R1
250 TOTOUT(I) = 0.0
251 00 145 J = 1,11
252 145 TOTOUT(I) = TOTOUT(I) + OUT(I,J)
C
253 00 146 I = 1,110
254 TOTIN(I) = 0.0
255 00 146 J = 1,11
256 146 TOTIN(I) = TOTIN(I) + XIN(I,J)
257 149 PRINT 150,VEH,MIX,(NYEAR(K),K=1,11)
258 150 FORMAT (1H1,T4,A1,1X,A4,T63,COST SUMMARY,/1X,T58,'(THOUSANDS OF DOL
1LARS)',/1X,T24,I4,10(6X,I4)/T27,'TOTALS',/
1),XIN(I,J),J=1,11),TOTIN(I),I=1,3)
259 PRINT 155,(OUT(I,K),K=1,11),TOTIN(I),I=1,3)
260 155 FORMAT(1X,T4,I. DEV,T18,11F10.2/T118,F14.2,3(/5X,A2,1X,2A4,1X,11
1F10.2/T118,F14.2))
261 PRINT 160, (OUT(34,J),J=1,11),TOTOUT(34)
262 160 FORMAT (1H0,/'T3',11. INV,T18,11F10.2/T118,F14.2)
263 N=19
264 00 170 I = 1,4
265 PRINT 165,ALPHA(I),(NAMOUT(N,K),K=1,2),(OUT(N,K),K=1,11),TOTOUT(N)
266 165 FORMAT (1H0,T6,A2,1X,2A4,1L8,11F10.2/T118,F14.2)
267 GO TO (167,168,169,170),I
268 167 N = 28
269 GO TO 170
270 168 N = 33
271 GO TO 170
272 169 N = 35
273 170 CONTINUE
274 PRINT 175, (OUT(65,J),J=1,11),TOTOUT(65)
275 175 FORMAT (1H0,/'T2',11. OPER,T18,11F10.2/T118,F14.2)

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276 N = 38
277 DO 185 I = 1,2
278 PRINT 165,ALPHA(I),(NAMOUT(N,K),K=1,2),(OUT(N,K),K=1,11),TOTOUT(N)
279 185 N = 56
280 N = 104
281 PRINT 165,ALPHA(3),(NAMEIN(N,K),K=1,2),(XIN(N,K),K=1,11),TOTIN(N)
282 N = 64
283 PRINT 165,ALPHA(4),(NAMOUT(N,K),K=1,2),(OUT(N,K),K=1,11),TOTOUT(N)
284 PRINT 190,(OUT(70,J),J=1,11),TOTOUT(70)
285 FORMAT (1H0,///T3'COL. TOTALS: T18,11F10.2/T118,F14.2,/// ,T20'PAR
1AGRAPH II. D.---ASF IS A NON-ADD ITEM')
286 PRINT 200,VEH,MIX,(NYEAR(K),K=1,11)
287 FORMAT (1H1,///T4,A1,X,A4,T58'WEAPON SYSTEM ANALYSIS',T57
1'PEMA PROCUREMENT PROGRAM',T55'(CUST IN $000/QUANTITY-EACH)')/T31,
2F4,T35,I4,10(4X,I4),T123'TOTAL',T131'AAO')
288 PRINT 204,(XIN(15,J),J=1,11),TOTIN(15),XIN(18,1)
289 FORMAT (1H0, T20'QUANTITY',T31,11F8.0,F9.0,F6.0)
290 PRINT 206,(OUT(5,J),J=1,11),TOTOUT(5)
291 FORMAT (1X,T20'COST',T31,11F8.0,F9.0)
292 PRINT 208,(OUT(6,J),J=1,11)
293 FORMAT (1X,T20'UNIT COST',T31,11F8.0)
294 PRINT 210,(XIN(16,J),J=1,11),TOTIN(16)
295 FORMAT (1X,T20'DELIVERY',T31,11F8.0,F9.0)
296 PRINT 212,(XIN(17,J),J=1,11)
297 FORMAT (1X,T20'Y.E.ASSETS',T31,11F8.0)
298 PRINT 204,(XIN(7,J),J=1,11),TOTIN(7),XIN(19,1)
299 PRINT 206,(OUT(3,J),J=1,11),TOTOUT(3)
300 PRINT 208,(XIN(8,J),J=1,11),TOTIN(8)
301 PRINT 210,(XIN(9,J),J=1,11),TOTIN(9)
302 PRINT 212,(XIN(10,J),J=1,11)
303 PRINT 204,(XIN(11,J),J=1,11),TOTIN(11),XIN(20,1)
304 PRINT 206,(OUT(4,J),J=1,11),TOTOUT(4)
305 PRINT 208,(XIN(12,J),J=1,11),TOTIN(12)
306 PRINT 210,(XIN(13,J),J=1,11),TOTIN(13)
307 PRINT 212,(XIN(14,J),J=1,11)
308 PRINT 214,(XIN(21,J),J=1,11),TOTIN(21)
309 FORMAT (1X,///T20'MISC. HDW.',T31,11F8.0,F9.0)
310 PRINT 216,(OUT(2,J),J=1,11),TOTOUT(2),(OUT(48,J),J=1,11),TOTOUT(4
18),(OUT(66,J),J=1,11),TOTOUT(66)
311 FORMAT (1H0,///T9'P8S',T31,11F8.0,F9.0/T9'SRPT',T31,11F8.0,F9.0/TX,
1T9'FDT',T31,11F8.0,F9.0)
312 PRINT 218,(OUT(72,J),J=1,11),TOTOUT(72)
313 FORMAT (1H0,///T5'TOTAL COST',T31,11F8.0,F9.0)
314 TEMPI = TOTOUT(72) + TOCOMP(2)
315 PRINT 219, TOCOMP(1),TOCOMP(2),TEMPI
316 FORMAT (1H0,///T80'QUANTITY TO COMPLETE (VEHICLE ONLY)',T119,F9.0/
11X, T80 'COST TO COMPLETE: T119,F9.0//1H0,T80,'GRAND TOTAL COST',T
2119,F9.0)
C
317 OUTPUT FOR WEAPON SYSTEM--7 FORMS/MIX--TOTAL = 21.*****
318 PRINT 220,VEH,MIX,(NYEAR(I),I=1,11)
1 IN 000'S) BY FISCAL YEARS'//IX,'COST CATEGORY',T18,I4,10(6X,I4),T
1127'TOTAL',/)
N = 1
319 DO 228 NN = 1,3
320 PRINT 222,(NAMOUT(N,K),K=1,2),(OUT(N,K),K=1,11),TOTOUT(N)
321 FORMAT (1X,T4,2A4,T12,11F10.2,F12.2)
322 GO TO (224,226,228),NN
324 N = 34
325 GO TO 228

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326 N = 65
327 CONTINUE
328 PRINT 230, (OUT(70,K),K=1,11), TOTOUT(70)
329 FORMAT (1H0,3X,TOTAL',T12,11F10.2,F12.2)
330 TEMP2 = TOTOUT(70) + TOCOMP(3) + TOCOMP(4)
331 PRINT 231, (TOCOMP(1),I=3,4),TEMP2
332 FORMAT (1H0,7X,T90 'COST TO COMPLETE', T113 'INV', T122,F12.2/1X,
1113 'OPER', T122,F12.2//1X,T90'GRAND TOTAL',T122,F12.2)
333 PRINT 232, (NYEAR(K),K=1,11)
334 FORMAT (1H0,7X,T53 'COSTS BY BUDGET PROGRAM ELEMENTS',/1X,'APPROP
RIATION',/2X,'CATEGORY',T14,FY,T18,I4,10(6X,I4),T127'TOTAL' /)
335 PRINT 234, (NAMEIN(I,K),K=1,2), (XIN(I,K),K=1,11),TOTIN(1)
336 FORMAT (1X,T4,244,T12,11F10.2,F12.2)
337 DO 236 I = 67,68
338 PRINT 234, (NAMEOUT(I,K),K=1,2), (OUT(I,K),K=1,11), TOTOUT(I)
339 FORMAT (1H0,3X,(NAMEIN(104,K),K=1,2), (XIN(104,K),K=1,11),TOTIN(104)
340 PRINT 234, (NAMEOUT(69,K),K=1,2), (OUT(69,K),K=1,11), TOTOUT(69)
341 DO 243 J = 1,11
342 TOTFM3(J) = TOTFM3(J)/1000.
343 GTOTF3 = 0.0
344 DO 235 I = 1,11
345 GTOTF3 = GTOTF3 + TOTFM3(I)
346 PRINT 238, (TOTFM3(K),K=1,11), GTOTF3
347 FORMAT (1H0,T4,TOTAL',T12,11F10.2,F12.2)
348 PRINT 240, (NAMEOUT(35,K),K=1,2), (OUT(35,K),K=1,11),TOTOUT(35)
349 FORMAT (1H0,7X,T4,244,T12,11F10.2,F12.2/1X, (NON-ADD)')
350 DIVIDE TOTOUT BY 1000. TO GET MILLIONS OF DOLLARS.
351 DO 241 L = 1,81
352 TOTOUT(L) = TOTOUT(L)/1000.
353 TEMP3 = GTOTF3 + TOCOMP(5) + TOCOMP(6) + TOCOMP(7)
354 PRINT 245, (TOCOMP(1),I=5,7),TEMP3
355 FORMAT (1H0,7X,T90 'COST TO COMPLETE', T113 'PEMA', T122,F12.2/T11
13 'OMA', T122,F12.2/1X,T113 'MPA', T122,F12.2//1H0,T90 'GRAND TOTAL',
2T122,F12.2)
356 DIVIDE RTE,MPAI,OMAI,TRAINIU,TRAINIU,SFEQUIP,AND NGOMA BY 1000 TO GET
357 MILLIONS OF DOLLARS. *****
358 TOCOMP(8) = TOCOMP(8)/1000.
359 TOCOMP(10) = TOCOMP(10)/1000.
360 TOCOMP(12) = TOCOMP(12)/1000.
361 TOCOMP(13) = TOCOMP(13)/1000.
362 DO 242 L = 1,3
363 TOTIN(L) = TOTIN(L)/1000.
364 TOTIN(8) = TOTIN(8)/1000.
365 TOTIN(12) = TOTIN(12)/1000.
366 TOTIN(21) = TOTIN(21)/1000.
367 TOTIN(104) = TOTIN(104)/1000.
368 SBV(JJJ,JJ,1) = TOTIN(15) + TOCOMP(11)
369 SBV(JJJ,JJ,2) = TOTOUT(5) + TOCOMP(8)
370 SBV(JJJ,JJ,3) = TOTIN(7) + TOCOMP(9)
371 SBV(JJJ,JJ,4) = TOTOUT(3) + TOCOMP(10)
372 SBV(JJJ,JJ,5) = TOTIN(11) + TOCOMP(11)
373 SBV(JJJ,JJ,6) = TOTOUT(4) + TOCOMP(12)
374 SBV(JJJ,JJ,7) = 0.0
375 SBV(JJJ,JJ,8) = TOTIN(21) + TOCOMP(13)
376 SBV(JJJ,JJ,9) = SBV(JJJ,JJ,1) + SBV(JJJ,JJ,3) + SBV(JJJ,JJ,5)
377 SBV(JJJ,JJ,10) = SBV(JJJ,JJ,2) + SBV(JJJ,JJ,4) + SBV(JJJ,JJ,6) + SBV(JJJ,
1J,8)
378 CONTINUE
379 END OF JJ DO LOOP. *****
380 DO 250 J = 1,7

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377 DO 250 K = 1,10
378 DIFF(J,K) = SAV(JJJ,K) - SBV(I,J,K)
379 OUTPUT FOR WEAPON SYSTEM SUMMARY--1 FORM/MIX--TOTAL = 3. *****
380 PRINT 260, MIX
381
382 T51 WEAPON SYSTEM SUMMARY: //IX, T59, A4, //IX, T47,
383 I(COST IN $ MILLIONS/QTY--EACH) //IX, T48, PROPOSED PROGRAM T85, INCRE
384 ASE OR DECREASE (-) //IX, T8, SYSTEM T85, OVER PRESENT PROGRAM //IX, T
385 345, QTY, T64, COST, T85, QTY, T104, COST, /)
386
387 DU 271 M = 1,7
388 PRINT 265, M, (SBV(JJJ,M,K), K=1,2), (DIFF(M,K), K=1,2)
389 FORMAT (IHO, I1, //IX, T6, VEHICLE, T31, 4F20.3)
390 PRINT 267, (SBV(JJJ,M,K), K=3,4), (DIFF(M,K), K=3,4)
391 PRINT 268, (SBV(JJJ,M,K), K=5,6), (DIFF(M,K), K=5,6)
392 FORMAT (I1, //IX, T6, TRAINER, T1, T31, 4F20.3)
393 PRINT 270, (SBV(JJJ,M,K), K=7,8), (DIFF(M,K), K=7,8)
394 FORMAT (I1, //IX, T6, MISC. HDM., T31, 4F20.3)
395 PRINT 272, (SBV(JJJ,M,K), K=9,10), (DIFF(M,K), K=9,10)
396 FORMAT (IHO, T6, TOTAL, T31, 4F20.3 //)
397
398 DO 290 K = 1,4
399 DO 290 L = 1,17
400 STOR(IJJ,K,L) = STOR(IJJ,K,L)/1000000.
401 IF (L .GE. 12) GO TO 280
402 STOR(IJJ,K,18) = STOR(IJJ,K,18) + STOR(IJJ,K,L)
403 GO TO 290
404 STOR(IJJ,K,19) = STOR(IJJ,K,19) + STOR(IJJ,K,L)
405 CONTINUE
406 DO 294 K = 1,6
407 DO 294 L = 1,17
408 SAVE(IJJ,K,L) = SAVE(IJJ,K,L)/1000000.
409 IF (L .GE. 12) GO TO 293
410 SAVE(IJJ,K,18) = SAVE(IJJ,K,18) + SAVE(IJJ,K,L)
411 GO TO 294
412 SAVE(IJJ,K,19) = SAVE(IJJ,K,19) + SAVE(IJJ,K,L)
413 CONTINUE
414 DO 296 K = 1,4
415 STOR(IJJ,K,20) = STOR(IJJ,K,18) + STOR(IJJ,K,19)
416 DO 298 K = 1,6
417 SAVE(IJJ,K,20) = SAVE(IJJ,K,18) + SAVE(IJJ,K,19)
418 DO 300 L = 1,4
419 XDIF(IJJ,K,L) = STOR(IJJ,K,L) - STOR(I,K,L)
420 DO 302 K = 1,6
421 DO 302 L = 1,20
422 YDIF(IJJ,K,L) = SAVE(IJJ,K,L) - SAVE(I,K,L)
423 OUTPUT FOR COST ANALYSIS--1 FORM/MIX--TOTAL = 3. *****
424 PRINT 305, MIX, (NYEAR(K), K=1,11)
425 FORMAT (I1, //IX, T6, COST ANALYSIS, //IX, T15, COST, T22, FY, T26, I4, I
426 20(5X, I4), T127, TOTAL, //IX, T13, CATEGORY, //)
427 PRINT 307, ((STOR(IJJ,K,L), L=1,11), STOR(IJJ,K,18), K=1,4)
428 FORMAT (I1, //IX, T15, LEVEL, T20, I1F9.2, F12.2, //IX, PROPOSED, T15, INVEST,
429 I120, I1F9.2, F12.2, //IX, PROGRAM, //IX, T15, OPER, T20, I1F9.2, F12.2, //IX, T1
430 25, TOTAL, T20, I1F9.2, F12.2, //)
431 PRINT 310, ((XDIF(IJJ,K,L), L=1,11), XDIF(IJJ,K,18), K=1,4)
432 FORMAT (I1, //IX, T15, LEVEL, T20, I1F9.2, F12.2, //IX, INCREASE OR, T15, IN
433 VEST, T20, I1F9.2, F12.2, //IX, DECREASE (-), //IX, OVER CURRENT, T15,
434 20PER, T20, I1F9.2, F12.2, //IX, PROGRAM, //IX, T15, TOTAL, T20, I1F9.2, F1
435 32.2)
436 PRINT 317, (STOR(IJJ, I,19), I=2,3)

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425 317 FORMAT (I10//IX,T97 'CUSTS TO COMPLETION'//IX,T94'PROPOSED' T109
426 1'INV' T119,F12.2//IX,T94 'PROGRAM'/IX,T109 'OPER' T119,F12.2)
427 PRINT 318, (XDIF(JJ,K,19),K=2,3)
318 FORMAT (I10//IX,T94 'INCREASE OR'/IX,T94 'DECREASE (-)'/T109'INV'
2T119,F12.2//IX,T94 'OVER CURRENT'/IX,T94'PROGRAM' T109 'OPER' T119,F
212.2)
428 315 CONTINUE
C END OF JJJ DO LOOP. *****
429 WRITE (6,320)
430 320 FORMAT (I11,9/(I10), T58'COST ANALYSIS SUMMARY' /IX,T55 'TOTAL COS
1T BY COST CATEGORY'/IX, T58'(COSTS IN $ MILLIONS)')//IX, T55 'COS
2T',T66 'CURRENT' T79 'PROPOSED PROGRAM'/IX,T53 'CATEGORY' T66 'PRO
4GRAM' T78 'MIX A' T90 'MIX B'/)
431 PRINT 330, ((STOR(I,J,20),I=1,3),J=1,4)
432 330 FORMAT (IX, T53 'DEVEL' T59,3F12.2//IX,T53 'INVEST' T59,3F12.2//IX
1,T37 'TOTAL COST'/IX,T53 'OPER' T59,3F12.2//IX,T53 'TOTAL' T59,3F1
22.2//)
433 PRINT 340, ((XDIF(I,J,20),I=1,3),J=1,4)
434 340 FORMAT (IX, T53 'DEVEL' T59,3F12.2//IX,T37 'INCREASE OR' T53 'INV
1EST' T59,3F12.2//IX,T37 'DECREASE (-)'/IX,T37 'OVER CURRENT' T53 'O
2PER' T59,3F12.2//IX,T37 'PROGRAM'/IX, T53 'TOTAL' T59,3F12.2)
435 WRITE (6,350)
436 350 FORMAT (I11,7/(I10),T58 'COST ANALYSIS SUMMARY' /IX,T55 'TOTAL COS
1T BY APPROPRIATION'/IX, T58 '(COSTS IN $ MILLIONS)')//IX, T52 'CO
2ST' T66 'CURRENT' T79 'PROPOSED PROGRAM'/IX,T47 'APPROPRIATION' T6
36 'PROGRAM' T78 'MIX A' T90 'MIX B'/)
437 PRINT 360, ((SAVE(I,J,20),I=1,3),J=1,6)
438 360 FORMAT (IX, T53 'RTE' T59,3F12.2//IX,T53 'PEMA' T59,3F12.2//IX,T3
17 'TOTAL COST' T53 'OMA' T59, 3F12.2//IX,T53 'NGOMA' T59,3F12.2//T
253 'MPA' T59,3F12.2//IX,T53 'TOTAL' T59,3F12.2//)
439 PRINT 370, ((YDIF(I,J,20),I=1,3),J=1,6)
440 370 FURNAT (IX,T53 'RTE' T59,3F12.2//IX,T37 'INCREASE OR' T53 'PEMA'
1T59,3F12.2//IX,T37 'DECREASE (-)'/IX,T37 'OVER CURRENT' T53 'OMA' T
259,3F12.2//IX,T37 'PROGRAM' /IX, T53 'NGOMA' T59,3F12.2//IX, T53 'M
3PA' T59,3F12.2//IX, T53 'TOTAL' T59,3F12.2)
441 WRITE (6,555)
442 555 FORMAT (I11, T40 'THIS IS THE END. TRY AGAIN.' )
443 GO TO 702
444 700 PRINT 701, KSAVE
445 701 FORMAT(I11,'ERROR IN LINE NO. ',I5)
446 702 CALL EXIT
447 END

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SENTRY

1

INPUT DATA

ITEM/FY	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
1	\$ 345000.00	226040.00	105000.00	10500000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	\$ 550000.00	467500.00	247500.00	247500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	\$ 232000.00	602000.00	1100000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	\$ 249000.00	486000.00	399000.00	211000.00	3500000.00	5000000.00	0.00	0.00	0.00	0.00	0.00
5	\$ 0.00	1320000.00	39970.00	1000000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	\$ 0.00	0.00	392160.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	\$ 0.00	0.00	0.00	97.00	430.00	450.00	450.00	450.00	450.00	450.00	450.00
16	\$ 0.00	0.00	0.00	0.00	70.00	400.00	450.00	450.00	450.00	450.00	450.00
17	\$ 0.00	0.00	0.00	0.00	70.00	470.00	920.00	1370.00	1820.00	2270.00	2721.00
18	\$ 3147.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	\$ 1442407.00	1442407.00	1442407.00	1442407.00	1442407.00	1442407.00	1442407.00	1442407.00	1442407.00	1442407.00	1442407.00
23	\$ -0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17	-0.17
24	\$ -0.00	-0.00	-0.00	1.00	98.00	728.00	1388.00	2048.00	2708.00	3368.00	4028.00
25	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	\$ 138.61	138.61	138.61	138.61	138.61	138.61	138.61	138.61	138.61	138.61	138.61
32	\$ 0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
33	\$ 0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
34	\$ 0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
35	\$ 0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
36	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37	\$ 0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
38	\$ 0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
39	\$ 1788.00	1788.00	1788.00	1788.00	1788.00	1788.00	1788.00	1788.00	1788.00	1788.00	1788.00
40	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
41	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
42	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
43	\$ 50311.00	50311.00	50311.00	50311.00	50311.00	50311.00	50311.00	50311.00	50311.00	50311.00	50311.00
44	\$ 169.00	169.00	169.00	169.00	169.00	169.00	169.00	169.00	169.00	169.00	169.00
45	\$ 0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
46	\$ 0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
47	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
49	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
51	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
52	\$ 0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
53	\$ 1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
54	\$ 1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
55	\$ 1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37

INPUT DATA

1

ITEM/FY	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
56	Q	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
57	Q	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53
58	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
59	Q	0.00	0.00	0.00	0.00	400.00	600.00	236.00	0.00	540.00	456.00
60	Q	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37	1.37
61	Q	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
62	\$	1188.00	1188.00	1188.00	1188.00	1188.00	1188.00	1188.00	1188.00	1188.00	1188.00
63	\$	1497.00	1497.00	1497.00	1497.00	1497.00	1497.00	1497.00	1497.00	1497.00	1497.00
64	\$	0.00	0.00	0.00	18133.00	0.00	0.00	0.00	0.00	0.00	0.00
65	\$	12500.00	12500.00	12500.00	12500.00	12500.00	12500.00	12500.00	12500.00	12500.00	12500.00
66	\$	13000.00	13000.00	13000.00	13000.00	13000.00	13000.00	13000.00	13000.00	13000.00	13000.00
67	\$	13514.00	13514.00	13514.00	13514.00	13514.00	13514.00	13514.00	13514.00	13514.00	13514.00
68	Q	0.00	0.00	0.00	87.00	86.00	130.00	128.00	128.00	109.00	101.00
69	Q	0.00	0.00	0.00	23.00	0.00	0.00	0.00	0.00	0.00	0.00
70	Q	0.00	22.00	81.00	148.00	148.00	148.00	126.00	104.00	81.00	59.00
71	Q	271000.00	400000.00	646000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72	\$	2313.00	2313.00	2313.00	2313.00	2313.00	2313.00	2313.00	2313.00	2313.00	2313.00
73	\$	7023.00	7023.00	7023.00	7023.00	7023.00	7023.00	7023.00	7023.00	7023.00	7023.00
74	\$	11671.00	11671.00	11671.00	11671.00	11671.00	11671.00	11671.00	11671.00	11671.00	11671.00
75	Q	0.00	7.00	26.00	47.00	43.00	39.00	34.00	30.00	26.00	21.00
76	\$	0.00	0.00	0.00	33755.00	0.00	0.00	0.00	0.00	0.00	0.00
77	\$	0.00	0.00	0.00	262661.30	275168.98	192088.188308080.00	268.00	268.00	268.00	268.00
78	Q	268.00	268.00	268.00	268.00	268.00	268.00	268.00	268.00	268.00	268.00
79	Q	0.00	0.00	0.00	25.46	25.46	25.46	25.46	25.46	25.46	25.46
80	Q	25.46	25.46	25.46	25.46	25.46	25.46	25.46	25.46	25.46	25.46
81	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
82	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
83	Q	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00
84	Q	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00	1200.00
85	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
86	Q	0.00	0.00	0.00	58.00	75.00	73.00	72.00	73.00	73.00	73.00
87	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
88	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
89	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
90	\$	2367.00	2367.00	2367.00	2367.00	2367.00	2367.00	2367.00	2367.00	2367.00	2367.00
91	\$	1765.00	1765.00	1765.00	1765.00	1765.00	1765.00	1765.00	1765.00	1765.00	1765.00
92	\$	184.00	184.00	184.00	184.00	184.00	184.00	184.00	184.00	184.00	184.00
93	\$	37628.00	37628.00	37628.00	37628.00	37628.00	37628.00	37628.00	37628.00	37628.00	37628.00
94	\$	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84	1.84
95	\$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96	\$	0.00	0.00	0.00	93000.00	69000.00	52000.00	52000.00	52000.00	49000.00	41000.00
97	\$	0.00	0.00	0.00	0.00	682000.00	1633000.00	1837000.00	1479000.00	1364000.00	1836000.00
98	\$	13782.00	13782.00	13782.00	13782.00	13782.00	13782.00	13782.00	13782.00	13782.00	13782.00
99	Q	0.00	0.00	0.00	35.00	44.00	37.00	35.00	34.00	24.00	18.00
100	Q	0.00	0.00	0.00	0.00	0.00	474930.00	360595.00	1011425.00	1679845.00	3746670.00
101	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
102	Q	0.00	0.00	0.00	25.00	70.00	90.00	90.00	90.00	90.00	158.00
103	Q	0.00	0.00	0.00	0.00	19.00	39.00	39.00	39.00	39.00	39.00
104	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
105	\$	16591.00	16591.00	16591.00	16591.00	16591.00	16591.00	16591.00	16591.00	16591.00	16591.00
106	\$	17123.00	17123.00	17123.00	17123.00	17123.00	17123.00	17123.00	17123.00	17123.00	17123.00
107	\$	5138.00	5138.00	5138.00	5138.00	5138.00	5138.00	5138.00	5138.00	5138.00	5138.00
108	\$	5353.00	5353.00	5353.00	5353.00	5353.00	5353.00	5353.00	5353.00	5353.00	5353.00
109	\$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
110	Q	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

ITEM/FY	OUTPUT DATA										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
1 DEV	1127.00	1295.54	1452.50	1500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2 PBS	249.00	1806.00	1191.13	1211.00	3500.00	500.00	0.00	0.00	0.00	0.00	0.00
3 TRAINIC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4 TRAIN2C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5 TANKC	0.00	0.00	0.00	102857.56	272212.72	252029.52	224436.13	212875.88	199326.10	192414.12	187001.77
6 TANKU	0.00	0.00	0.00	1060.39	633.05	560.07	498.75	473.06	442.95	427.59	415.56
7 TANKFAB	0.00	0.00	0.00	77337.00	240513.84	205259.33	187650.79	177071.89	169619.38	163914.68	159329.28
8 TOOLMAINT	0.00	0.00	0.00	1044.05	3246.94	2771.00	2533.29	2390.47	2289.86	2212.85	2150.95
9 TOOL	0.00	0.00	0.00	1044.05	3246.94	2771.00	2533.29	2390.47	2289.86	2212.85	2150.95
10 DOC	0.00	0.00	0.00	2198.22	242.84	485.83	242.84	364.41	364.41	145.68	145.68
11 CONTCOST	0.00	0.00	0.00	88854.34	238996.28	219324.86	195306.20	185433.74	173997.48	167909.44	163145.09
12 GA	0.00	0.00	0.00	3720.33	10006.77	9183.13	8177.47	7764.11	7285.27	7030.37	6830.88
13 PROFIT	0.00	0.00	0.00	6114.56	16446.65	15092.95	13440.10	12760.72	11973.73	11554.77	11226.91
14 TANKOTH	0.00	0.00	0.00	25520.56	31698.88	46770.20	36785.94	35803.99	29706.72	28499.43	27672.50
15 MI	0.00	0.00	0.00	109287.95	272395.49	252029.52	224436.73	212875.88	199326.10	192414.12	187001.77
16 SRPIP	0.00	0.00	0.00	25.97	168.67	176.70	176.70	0.00	0.00	0.00	0.00
17 HDW	0.00	0.00	0.00	109313.92	272564.16	252206.22	224613.43	212875.88	199326.10	192414.12	187001.77
18 FDTII	0.00	0.00	0.00	0.09	125.73	715.79	805.19	804.60	804.60	804.60	804.60
19 PEMAII	249.00	1806.00	1191.13	110525.01	276189.88	253422.02	225418.65	213680.48	200130.70	193218.72	187806.37
20 RP2IAITM	0.00	0.00	0.00	0.00	0.00	109.54	244.16	80.24	0.00	230.95	91.62
21 BP2IAITC	0.00	0.00	0.00	0.00	0.00	0.00	95.81	37.68	0.00	86.23	0.00
22 BP2IAIT	0.00	0.00	0.00	0.00	0.00	109.54	339.96	117.92	0.00	317.17	91.62
23 BP2100II	0.00	0.00	0.00	0.00	18.13	109.54	339.96	117.92	0.00	317.17	91.62
24 BP22PROC	0.00	0.00	0.00	0.00	1087.50	1075.00	1625.00	1600.00	1600.00	1362.50	1262.50
25 BP22SUPPLY	0.00	0.00	0.00	299.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26 BP22MNGT	0.00	297.31	1094.63	2000.07	2000.07	2000.07	2000.07	1702.76	1405.46	1094.63	797.33
27 BP2200II	0.00	297.31	1094.63	3124.07	3087.57	3075.07	3625.07	3302.76	3005.46	2457.13	2059.83
28 OMAII	271.00	697.31	1740.63	3124.07	3105.71	3184.62	3965.04	3420.69	3005.46	2774.31	2151.44
29 MPAITM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	156.22	0.00	449.65	178.38
30 MPAITC	0.00	0.00	0.00	0.00	0.00	0.00	449.47	176.79	0.00	404.52	0.00
31 MPA21II	0.00	0.00	0.00	0.00	0.00	213.28	924.84	333.01	0.00	854.17	178.38
32 MPA22II	0.00	81.70	303.45	548.54	548.54	501.85	455.17	396.81	350.13	303.45	245.09
33 MPAII	0.00	81.70	303.45	548.54	582.29	715.13	1380.01	729.83	350.13	1157.62	423.47
34 INV	520.00	2585.00	3235.21	114197.62	279877.88	257321.77	230763.67	217831.00	203486.29	197150.64	190381.29
35 ASF	0.00	0.00	0.00	4044.15	262.66	275.17	192.09	8308.08	0.00	0.00	0.00
36 SRPR	0.00	0.00	0.00	0.00	6.70	77.45	222.17	334.20	365.82	438.18	589.87
37 FDTIII	0.00	0.00	0.00	0.00	0.02	0.26	0.75	1.12	1.23	1.47	1.98
38 PEMAIII	0.00	0.00	0.00	0.00	6.72	77.71	222.92	335.32	367.05	439.65	591.85
39 BP2000III	0.00	0.00	0.00	0.00	0.00	6110.40	21386.40	34157.14	37762.27	46011.31	61226.21
40 BP21MAINT	0.00	0.00	0.00	0.00	0.00	0.00	171.07	427.68	528.61	528.61	759.56
41 BP21CREW	0.00	0.00	0.00	0.00	0.00	0.00	197.60	494.01	610.60	610.60	877.36
42 BP2100III	0.00	0.00	0.00	0.00	0.00	0.00	368.68	921.69	1139.21	1139.21	1636.92
43 BP22PROP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
44 BP22SMA	0.00	0.00	0.00	754.00	923.00	975.00	949.00	936.00	949.00	949.00	949.00
45 BP22MAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
46 SOTRER	0.00	0.00	0.00	0.00	0.00	0.00	130.66	99.89	275.05	454.94	1011.18
47 SDTANKS	0.00	0.00	0.00	0.00	0.00	1027.23	1164.90	1164.90	1164.90	28.24	47.66
48 SRP	0.00	0.00	0.00	25.97	175.37	254.15	398.87	334.20	365.82	438.18	589.87
49 SDTPOMP	0.00	0.00	0.00	0.00	0.00	0.93	1.46	1.22	1.34	1.32	1.33
50 SOTDVS	0.00	0.00	0.00	0.00	0.00	1028.16	1166.36	1166.12	1166.24	29.56	48.00
51 SDI	0.00	0.00	0.00	0.00	0.00	1028.16	1297.02	1266.01	1441.28	484.49	1060.17
52 BP2200III	0.00	0.00	0.00	847.00	1058.00	1275.16	3931.02	4091.01	3921.28	2846.49	3886.17
53 BP23RER	0.00	0.00	0.00	0.00	55.20	638.11	3907.50	4341.28	7386.29	10842.18	20934.49
54 BP23SUP	0.00	0.00	0.00	482.37	647.75	606.41	509.93	482.37	468.59	330.77	248.08
55 RP2300III	0.00	0.00	0.00	482.37	702.95	1244.52	4892.36	5184.24	8866.31	12852.79	24929.24

ITEM/FY	OUTPUT DATA										
	COSTS IN THOUSANDS OF DOLLARS										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
56	0.00	0.00	0.00	1329.37	1760.95	10109.08	30578.45	44354.08	51689.07	62849.81	91678.53
57	0.00	0.00	0.00	0.00	0.00	3424.60	11986.10	19143.51	21164.03	25643.60	33905.92
58	0.00	0.00	0.00	0.00	0.00	1070.60	3747.10	5984.65	6616.31	8003.57	10562.29
59	0.00	0.00	0.00	0.00	0.00	4495.20	15733.20	25128.17	27780.34	33647.17	44468.21
60	0.00	0.00	0.00	0.00	0.00	0.00	927.04	2317.59	2864.54	2864.54	4116.04
61	0.00	0.00	0.00	0.00	0.00	0.00	333.07	832.68	1029.19	1029.19	1478.84
62	0.00	0.00	0.00	0.00	0.00	0.00	1260.11	3150.27	3893.73	3893.73	5594.88
63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
64	0.00	0.00	0.00	0.00	0.00	4495.20	16993.31	28278.44	31674.07	37540.90	50063.09
65	0.00	0.00	0.00	1329.37	1767.68	14681.99	47794.68	72967.83	83730.19	100830.36	142333.47
66	0.00	0.00	0.00	0.09	125.75	716.05	805.94	805.72	805.83	804.07	806.58
67	249.00	1806.00	0.00	0.00	0.00	253499.73	225641.54	214015.80	200497.75	193658.37	188398.22
68	503.00	1299.31	1191.13	4453.44	4866.66	13293.70	34543.49	47774.77	54694.53	65624.12	93829.98
69	550.00	549.20	550.95	548.54	582.29	5210.33	18373.31	29008.27	32024.20	38698.52	50486.56
70	1647.00	3880.54	4687.71	117026.99	281645.56	272003.76	278558.35	290798.83	287216.48	297981.00	332714.76
71	0.00	0.00	0.00	797.29	559.33	456.13	417.00	393.49	376.93	364.25	354.07
72	249.00	1806.00	1191.13	110525.01	276196.61	253499.73	225641.54	214015.80	200497.75	193658.37	188398.22

ITEM/FY	OUTPUT DATA										
	COSTS/QUANTITIES IN DOLLARS/UNITS										
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
73	0.00	0.00	0.00	34.00	280.00	942.00	1606.00	2268.00	2929.00	3590.00	4250.00
74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
75	0.00	0.00	0.00	0.00	0.00	0.23	0.34	0.29	0.00	0.36	0.17
76	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.11	0.00	0.11	0.00
77	0.00	0.00	0.00	0.00	0.00	421.67	540.44	230.79	0.00	473.47	519.07
78	0.00	0.00	0.00	0.00	0.00	1286.40	1608.00	632.48	0.00	1447.20	1586.56

	COST SUMMARY (THOUSANDS OF DOLLARS)										1980 TOTALS		
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979			
I. DEV	1127.00	1295.54	1452.50	1500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5375.04
A. RDTE	345.00	226.04	105.00	1500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2176.04
B. MPAI	550.00	467.50	247.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1265.00
C. OMAI	232.00	602.00	1100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1934.00
II. INV	520.00	2585.00	3235.21	114197.62	279877.88	257321.77	230763.67	217831.00	203486.29	197150.64	190381.29	1697350.37	
A. PEMAI	249.00	1806.00	1191.13	110525.01	276189.88	253422.02	225418.63	213680.48	200130.70	193218.72	187806.37	1663637.95	
B. OMAI	271.00	697.31	1740.63	3124.07	3105.71	3184.62	3965.04	3420.69	3005.46	2774.31	2151.44	27440.27	
C. MPAI	0.00	81.70	303.45	548.54	582.29	715.13	1380.01	729.83	350.13	1157.62	423.47	6272.16	
D. ASF	0.00	0.00	0.00	4044.15	262.66	275.17	192.09	8308.08	0.00	0.00	0.00	13082.15	
III. OPER	0.00	0.00	0.00	1329.37	1767.68	14681.99	47794.68	72967.83	83730.19	100830.36	142333.47	465435.57	
A. PEMAI	0.00	0.00	0.00	0.00	6.72	77.71	222.92	335.32	367.05	439.65	591.85	2041.22	
B. OMAI	0.00	0.00	0.00	1329.37	1760.95	10109.08	30578.45	44354.08	51689.07	62849.81	91578.53	294349.35	
C. NGOMA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
D. MPAI	0.00	0.00	0.00	0.00	0.00	4495.20	16993.31	28278.44	31674.07	37540.90	50063.09	169045.00	
COL. TOTALS	1647.00	3880.54	4687.71	117026.99	281645.56	272003.76	278558.35	290798.83	287216.48	297981.00	332714.76	2168160.94	

PARAGRAPH II. D.----ASF IS A NON-ADD ITEM

WEAPON SYSTEM ANALYSIS
PMA PROCUREMENT PROGRAM
(COST IN \$000/QUANTITY-EACH)

	FY 1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	TOTAL	AAO
QUANTITY	0.	0.	0.	97.	430.	450.	450.	450.	450.	450.	450.	3227.	3147.
COST	0.	0.	0.	102858.	272213.	252030.	224437.	212876.	199326.	192414.	187002.	1643154.	
UNIT COST	0.	0.	0.	1060.	633.	560.	499.	473.	443.	428.	416.		
DELIVERY	0.	0.	0.	0.	70.	400.	450.	450.	450.	450.	450.	2720.	
Y.E.ASSETS	0.	0.	0.	0.	70.	470.	920.	1370.	1870.	2270.	2721.		
QUANTITY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
COST	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNIT COST	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DELIVERY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y.E.ASSETS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
QUANTITY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
COST	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
UNIT COST	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
DELIVERY	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
Y.E.ASSETS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
MISC. HDW.	0.	0.	0.	6430.	183.	0.	0.	0.	0.	0.	0.	6613.	
PBS	249.	1806.	1191.	1211.	3500.	500.	0.	0.	0.	0.	0.	8457.	
SRP	0.	0.	0.	26.	175.	254.	399.	334.	366.	438.	590.	2582.	
FDT	0.	0.	0.	0.	126.	716.	806.	806.	806.	806.	807.	4872.	
TOTAL COST	249.	1806.	1191.	110525.	276197.	253500.	225642.	214016.	200498.	193658.	188398.	1665679.	
QUANTITY TO COMPLETE (VEHICLE ONLY)												0.	0.
COST TO COMPLETE												1665679.	

1 WEAPON SYSTEM (\$ IN 000'S) BY FISCAL YEARS

COST CATEGORY	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	TOTAL
DEV	1127.00	1295.54	1452.50	1500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5375.04
INV	520.00	2585.00	3235.21	114197.62	279877.88	257321.77	230763.67	217831.00	203486.29	197150.64	190381.29	1697350.37
OPER	0.00	0.00	0.00	1329.37	1767.68	14681.99	47794.68	72967.83	83730.19	100830.36	142333.47	465435.57
TOTAL	1647.00	3880.54	4687.71	117026.99	281645.56	272003.76	278558.35	290798.83	287216.48	297981.00	332714.76	2168160.98

COST TO COMPLETE
 INV 0.00
 OPER 0.00
 GRAND TOTAL 2168160.98

4 APPROPRIATION BY BUDGET PROGRAM ELEMENTS

APPROPRIATION CATEGORY	FY 1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	TOTAL
RDTE	345.00	226.04	105.00	1500.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2176.04
PEMA	249.00	1806.00	1191.13	110525.01	276196.61	253499.73	225641.54	214015.80	200497.75	193658.37	188398.22	1665679.17
OMA	503.00	1299.31	2840.63	4453.44	4866.66	13293.70	34543.49	47774.77	54694.53	65624.12	93829.98	323723.62
NGOMA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MPA	550.00	549.20	550.95	548.54	582.29	5210.33	18373.31	29008.27	32024.20	38698.52	50486.56	176582.16
TOTAL	1647.00	3880.54	4687.71	117026.99	281645.56	272003.76	278558.35	290798.83	287216.48	297981.00	332714.76	2168160.98

ASF (NON-ADD)
 0.00 0.00 0.00 4044.15 262.66 275.17 192.09 8308.08 0.00 0.00 0.00 0.00 13082.15

COST TO COMPLETE
 PEMA 0.00
 OMA 0.00
 MPA 0.00
 GRAND TOTAL 2168160.98

SECTION III

**MBT SECONDARY ARMAMENT LIFE CYCLE COST MODEL
(FOR MBT SECONDARY ARMAMENT STUDY)**

1. Narrative:

a. (U) The following automated cost model, which includes costs for ammunition as well as for weapons, was developed specifically for this study by Headquarters, U. S. Army Weapons Command in cooperation with personnel from the U. S. Army Ammunition Procurement and Supply Agency, a subordinate installation of the U. S. Army Munitions Command.

b. (U) The model consists of a series of 66 cost equations presented in paragraph 2 below. Paragraph 3 presents the nomenclature of the 66 data names appearing on the left side of these equations.

c. (U) In addition, the cost equations utilize a set of 106 items of information, or basic data, to calculate RDT&E, PEMA, O&M,A, and MPA costs for each year. The data names for these 106 items are listed under paragraph 4 below and a word description for each is presented with the listing.

d. (U) The listings presented in paragraphs 3 and 4 below are identical to the listings of data in two of the computer output formats presented for each of the fifteen (15) cases in Section V of this report.

2. Cost Equations:

Equation
No.

(1)	TOTBAL	= (BALTOECON)(TA) + (BALTOEUR)(TB) + (BALTACON)(TC) + (BALTAEUR)(TD) + (BALW)(TE)
(2)	TOTTRA	= (TRATOECON)(TA) + (TRATOEUR)(TB) + (TRATACON)(TC) + (TRATEEUR)(TD) + (TRAW)(TE)
(3)	TOTBLA	= (BLATOECON)(TA) + (BLATOEUR)(TB) + (BLATACON)(TC) + (BLATAEUR)(TD) + (BLAW)(TE)
(4)	TOTAP	= (APTOECON)(TA) + (APTOEUR)(TB) + (APTACON)(TC) + (APTAEUR)(TD) + (APW)(TE)
(5)	TOTPEN	= (PENTOECON)(TA) + (PENTOEUR)(TB) + (PENTACON)(TC) + (PENTAEUR)(TD) + (PENW)(TE)
(6)	SHBAL	= TOTBAL - (BALW)(TE)

Equation
No.

(7)	SHTRA	= TOTTRA - (TRAW)(TE)
(8)	SHBLA	= TOTBLA - (BLAW)(TE)
(9)	SHAP	= TOTAP - (APW)(TE)
(10)	SHPEN	= TOTPEN - (PENW)(TE)
(11)	STBAL	= (BALW)(TE) + (F11)(SHBAL)
(12)	STTRA	= (TRAW)(TE) + (F11)(SHTRA)
(13)	STBLA	= (BLAW)(TE) + (F11)(SHBLA)
(14)	STAP	= (APW)(TE) + (F11)(SHAP)
(15)	STPEN	= (PENW)(TE) + (F11)(SHPEN)

Where TA, TB, TC, TD, and TE are defined as follows:

$$TA = TOECON + \frac{TOECOND}{3}$$

$$TB = TOEUR + \frac{TOEURD}{3}$$

$$TC = TACON + \frac{TACOND}{3}$$

$$TD = TAEUR + \frac{TAEURD}{3}$$

$$TE = TOECOND + TOEURD$$

(16)	GUNI	= (GUNI)(GUNIP)
(17)	GUNS	= (GUNS)(GUNSP)
(18)	MTI	= (MTI)(MTIP)
(19)	MTS	= (MTS)(MTSP)
(20)	FDTI	= (GUNIP)(F11)
(21)	FDTS	= (GUNSP)(F1S)

Equation
No.

- (22) F2I = (BALTOECON)(BALUP) + (TRATOECON)(TRAUP)
+ (BLATOECON)(BLAUP) + (APTOECON)(APUP)
+ (PENTOECON)(PENUP)
- (23) F3I = (BALTACON)(BALUP) + (TRATACON)(TRAUP)
+ (BLATACON)(BLAUP) + (APTACON)(APUP)
+ (PENTACON)(PENUP)
- (24) F4I = (BALTOEUR)(BALUP) + (TRATOEUR)(TRAUP)
+ (BLATOEUR)(BLAUP) + (APTOEUR)(APUP)
+ (PENTOEUR)(PENUP)
- (25) F5I = (BALTAEUR)(BALUP) + (TRATAEUR)(TRAUP)
+ (BLATAEUR)(BLAUP) + (APTAEUR)(APUP)
+ (PENTAEUR)(PENUP)
- (26) F6I = (BALW)(BALUW) + (TRAW)(TRAUW) + (BLAW)(BLAUW)
+ (APW)(APUW) + (PENW)(PENUW)
- (27) PAMMI = (ATOECON)(F2I) + (ATACON)(F3I) + (ATOEUR)(F4I)
+ (ATAEUR)(F5I)
- (28) WAMMI = (ATOECOND + ATOEURD)(F6I)
- (29) IPAMMI = [(ATOECOND)(F2I) + (ATACOND)(F3I) + (ATOEURD)(F4I)
+ (ATAEURD)(F5I)] (1/3)
- (30) BP20MIP = (TOECOND + TOEURD)(F10)
- (31) BP20MAR = (TOECON + TOEUR)(F9)
- (32) BP20M = BP20MIP + BP20MAR
- (33) BP20WIP = (TOECOND + TOEURD)(F8)
- (34) BP20WAR = (TOECON + TOEUR)(F7)
- (35) BP20W = BP20WIP + BP20WAR
- (36) BP2000 = BP20W + BP20M
- (37) BP21MIP = (TACOND + TAEURD)(F10)
- (38) BP21MAR = (TACON + TAEUR)(F9)
- (39) BP21M = BP21MIP + BP21MAR
- (40) BP21WIP = (TACOND + TAEURD)(F8)
- (41) BP21WAR = (TACON + TAEUR)(F7)

Equation
No.

(42)	BP21W	= BP21WIP + BP21WAR
(43)	BP2100	= BP21W + BP21M
(44)	BP22AR	= (TOTBAL)(FRBAL) + (TOTTRA)(FRTRA) + (TOTBLA)(FRBLA) + (TOTAP)(FRAP) + (TOTPEN)(FRPEN)
(45)	BP22ASH	= (SHBAL)(FSHBAL) + (SHTRA)(FSHTRA) + (SHBLA)(FSHBLA) + (SHAP)(FSHAP) + (SHPEN)(FSHPEN)
(46)	BP22AST	= (STBAL)(FSTBAL) + (STTRA)(FSTTRA) + (STBLA)(FSTBLA) + (STAP)(FSTAP) + (STPEN)(FSTPEN)
(47)	BP22A	= BP22AR + BP22AST + BP22ASH + BP22AOTH
(48)	BP2200	= BP22W + BP22A
(49)	BP22AREB	= [(BALW)(FMBAL) + (TRAW)(FMTRA) + (BLAW)(FMBLA) + (APW)(FMAP) + (PENW)(FMPEN)] (STOECOND + STOEURD)
(50)	BP23A	= BP23AREB + BP23AOTH
(51)	BP23WREB	= (REBILD)(F12)
(52)	BP23W	= BP23WREB + BP23WOTH
(53)	BP2300	= BP23W + BP23A
(54)	MPA	= (DINUSE)(F13)
(55)	RDI	= RDWI + RDMI + RDAI
(56)	RDS	= RDWS + RDMS + RDAS
(57)	RDTE	= RDI + RDS
(58)	PEMAWI	= PBSWI + GUNI + FDTI
(59)	AMMI	= PAMMI + WAMMI + IPAMMI
(60)	PEMAAI	= PBSAI + AMMI
(61)	PEMAI	= PEMAWI + MTI + PEMAAI
(62)	PEMAWS	= PBSWS + GUNS + FDTS
(63)	PEMAS	= PEMAWS + MTS + PBSAS
(64)	PEMA	= PEMAI + PEMAS
(65)	OMA	= BP2000 + BP2100 + BP2200 + BP2300
(66)	TOTALS	= RDTE + PEMA + OMA + MPA

3. Nomenclature for Data Names on Left Side of Cost Equations:

Note: Many of the data names used in the cost equations begin or end with a sequence of two or three letters used to designate each of the five different types of ammunition. These sequences of letters and the types of cartridges to which they refer are as follows:

BAL - Refers to "Ball" or HEIT ammunition

TRA - Refers to "Tracer" ammunition

(In this study, tracer ammunition is not considered as a separate type of cartridge but is included in the cost of other types, assuming a 4 to 1 ratio in belted ammunition.)

BLA - Refers to "Blank" or "Practice" ammunition

AP - Refers to "Armor Piercing" ammunition

PEN - Refers to ammunition

<u>Equation No.</u>	<u>Data Name</u>	<u>Definition</u> (Yearly Costs or Quantities)
1	TOTBAL)	
2	TOTTRA)	
3	TOTBLA)	-- Quantities of ammunition procured
4	TOTAP)	
5	TOTPEN)	
6	SHBAL)	
7	SHTRA)	
8	SHBLA)	-- Quantities of ammunition shipped
9	SHAP)	
10	SHPEN)	
11	STBAL)	
12	STTRA)	
13	STBLA)	-- Quantities of ammunition stored
14	STAP)	
15	STPEN)	
16	GUNI	Program cost for production of basic (interim)weapons

<u>Equation No.</u>	<u>Data Name</u>	<u>Definition</u> (Yearly Costs or Quantities)
17	GUNS	Same as above for successor weapons
18	MTI	Program costs for production of interim system mounts and associated equipment hardware peculiar to interim system. These include installation and FDT costs, if any.
19	MTS	Same as above for successor system. This also includes labor and overhead costs for retrofit to the successor system.
20	FDTI	First Destination Transportation costs for production quantity of interim weapons.
21	FDTs	Same as above for successor weapons
22	F2I	Average cost of ammunition expended per interim weapon on TOE tanks in CONUS during peacetime training.
23	F3I	Same as above for interim weapons on TA tanks in CONUS
24	F4I	Same as above for interim weapons on TOE tanks in Europe
25	F5I	Same as above for interim weapons on TA tanks in Europe
26	F6I	Average cost of ammunition expended per interim weapon on TOE tanks during wartime for war reserve time frame
27	PAMMI	Program cost for production of peacetime training ammunition for the interim weapon system
28	WAMMI	Program cost for production of war reserve ammunition for the interim system
29	IPAMMI	Program cost for production of initial provisioning ammunition for the interim system
30	BP20MIP	Initial provisioning parts costs for interim mount on TOE tanks
31	BP20MAR	Annual replenishment parts costs for interim mounts on all TOE tanks (for lower four echelons of maintenance)

<u>Equation No.</u>	<u>Data Name</u>	<u>Definition</u> (Yearly Costs or Quantities)
32	BP20M	Cost for parts to maintain the interim gun mounts on TOE tanks for the four lower echelons of maintenance
33	BP20WIP	Initial provisioning parts costs for interim weapons on TOE tanks
34	BP20WAR	Annual replenishment parts costs for interim weapons on all TOE tanks (for lower four echelons of maintenance)
35	BP20W	Cost for parts to maintain the interim guns on TOE tanks for the lower four echelons of maintenance
36	BP2000	Cost of parts to maintain the interim systems (guns and mounts) on TOE tanks for the four lower echelons of maintenance
37	BP21MIP)	
38	BP21MAR)	
39	BP21M)	Same as the corresponding BP20--- data names shown above except that these refer to maintenance parts costs for interim guns and mounts on TA tanks rather than TOE tanks
40	BP21WIP) --	
41	BP21WAR)	
42	BP21W)	
43	BP2100)	
44	BP22AR	Costs to "receive" ammunition
45	BP22ASH	Costs to "ship" ammunition
46	BP22AST	Costs to "store" ammunition
47	BP22A	Central Supply costs for ammunition
48	BP2200	Central Supply costs for interim weapon system (i.e., procurement and supply activities)
49	BP23AREB	Costs for reconditioning and maintenance of ammunition in storage
50	BP23A	Costs for Depot Maintenance and maintenance support activities
51	BP23WREB	Rebuild cost for weapon system
52	BP23W	Costs for Depot Maintenance and maintenance support activities for the interim weapon system (exclusive of ammunition)
53	BP2300	Costs for Depot Maintenance and maintenance support activities for the complete interim weapon system

<u>Equation No.</u>	<u>Data Name</u>	<u>Definition</u> (Yearly Costs or Quantities)
54	MPA	Military Personnel costs for field and organizational maintenance (i.e., four lower echelons) of the interim weapon system on TOE and TA tanks
55	RDI	Total RDTE costs for the interim system
56	RDS	Total RDTE costs for the successor system
57	RDTE	Total RDTE costs (yearly)
58	PEMAWI	Total PEMA costs for interim weapon
59	AMMI	Total program cost for production of interim ammunition
60	PEMAAI	Total PEMA cost for interim ammunition
61	PEMAI	Total PEMA cost for interim system
62	PEMAWS	Total PEMA cost for successor weapon
63	PEMAS	Total PEMA cost for successor system
64	PEMA	Total PEMA costs (yearly)
65	OMA	Total OMA costs (yearly)
66	TOTALS	Totals of all costs (yearly)

4. Input Data Names and Definitions:

<u>Item</u>	<u>Data Name</u>	<u>Definition</u>
1	RDWI	Yearly program RDTE costs for interim weapon
2	RDWS	Same as above for successor weapon
3	RDMI	Same as above for interim mount
4	RDMS	Same as above for successor mount
5	RDAI	Same as above for interim ammunition
6	RDAS	Same as above for successor ammunition
7	PBSWI	Yearly program Production Base Support costs for interim weapon (includes PBS costs for interim mount)

<u>Item</u>	<u>Data Name</u>	<u>Definition</u>
8	PBSWS	Same as above for successor weapon
9	PBSAI	Same as above for interim ammunition
10	PBSAS	Same as above for successor ammunition
11	GUNIU	Yearly average unit production cost of interim weapon
12	GUNSU	Same as above for successor weapon
13	MTIU	Same as above for interim mount
14	MTSU	Same as above for successor mount
15	F1I	Average First Destination Transportation cost per interim weapon
16	F1S	Same as above for successor weapon
17	F7	Average yearly cost of annual replenishment parts for one interim weapon (for four lower echelons of maintenance)
18	F8	Average yearly cost of initial provisioning parts for one interim weapon
19	F9	Same as for F7 but for one interim mount
20	F10	Same as for F8 but for one interim mount
21	BP22W	Yearly central supply costs for the interim weapon system exclusive of ammunition
22	BP23WOTH	Yearly BP2300 costs, exclusive of rebuild, for interim weapon system
23	F12	Average cost to overhaul, rebuild and modify (if necessary) one interim weapon
24	F13	Average yearly military labor maintenance costs per weapon system, for the four lower echelons of maintenance
25	BALUP)	
26	TRAUP)	
27	BLAUP) --	Average unit cartridge costs for peacetime training
28	APUP)	
29	PENUP)	

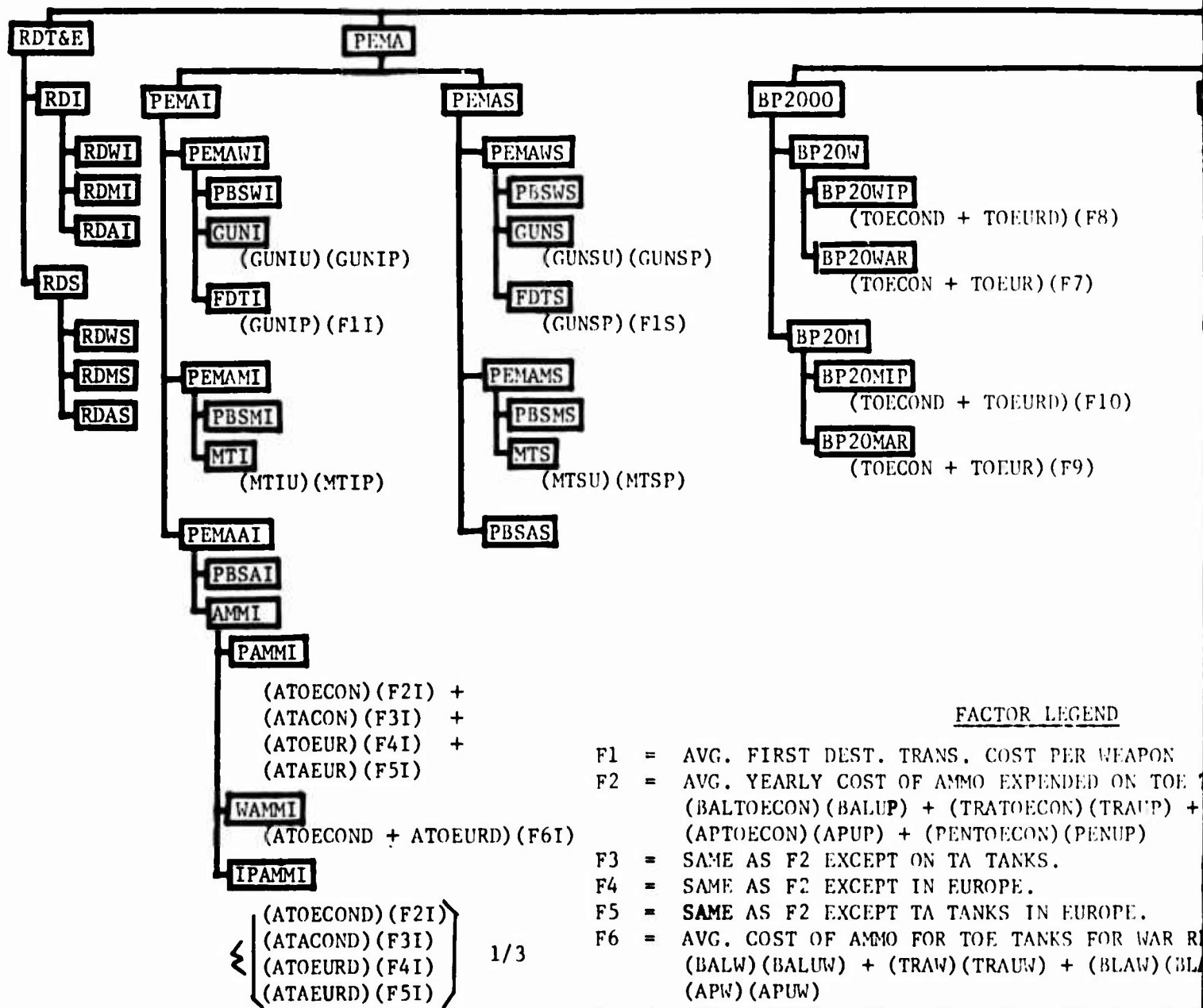
<u>Item</u>	<u>Data Name</u>	<u>Definition</u>
30	BALUW)	
31	TRAUW)	
32	BLAUW) --	Average unit cartridge costs for war reserve
33	APUW)	
34	PENUW)	
35	BP22AOTH	Yearly BP2200 "other" costs for ammunition (i.e., miscellaneous procurement and supply costs not considered elsewhere)
36	BP23AOTH	Yearly BP2300 "other" costs for ammunition not considered elsewhere
37	FRBAL)	
38	FRTRA)	
39	FRBLA) --	Cost to "receive" one cartridge of ammunition
40	FRAP)	
41	FRPEN)	
42	FSTBAL)	
43	FSTTRA)	
44	FSTBLA) --	Cost to "store" one cartridge of ammunition
45	FSTAP)	
46	FSTPEN)	
47	FSHBAL)	
48	FSHTRA)	
49	FSHBLA) --	Cost to "ship" one cartridge of ammunition
50	FSHAP)	
51	FSHPEN)	
52	FMBAL)	
53	FMTRA)	
54	FMBLA) --	Cost to "maintain" in storage one cartridge of ammunition
55	FMAP)	
56	FMPEN)	
57	F11	Fraction of all ammunition, other than war reserve ammunition, which is to be "stored" previous to shipment for Army use
58	GUNIP	Yearly program production quantity of interim weapon
59	GUNSP	Same as above for successor

<u>Item</u>	<u>Data Name</u>	<u>Definition</u>
60	MTIP	Yearly program production quantity of interim mount
61	MTSP	Same as above for successor
62	TOECON	Average quantity of TOE tanks in CONUS
63	TACON	Average quantity of TA tanks in CONUS
64	TOEUR	Average quantity of TOE tanks in Europe
65	TAEUR	Average quantity of TA tanks in Europe
66	REBILD	Quantity of interim weapons to be rebuilt and modified at maintenance depots
67	DINUSE	Average yearly total of in-use-density tanks (i.e., to sum of TOE and TA tanks in the field)
68	TOECOND)	
69	TACOND)	-- Yearly deliveries of tanks as described in
70	TOEURD)	items 62-65 above
71	TAEURD)	
72	BALW)	
73	TRAW)	
74	BLAW)	-- Wartime ammunition usage rates (Rounds per
75	APW)	weapon per war reserve time frame - i.e., 3 months)
76	PENW)	
77	BALTOECON)	
78	BALTOEUR)	Peacetime training usage rates for "ball" or
79	BALTACON)	-- "HEIT" ammunition for TOE and TA tanks in
80	BALTAEUR)	CONUS and Europe
81	TRATOECON)	
82	TRATOEUR)	- Same as above for "tracer" ammunition
83	TRATACON)	
84	TRATAEUR)	
85	BLATOECON)	
86	BLATOEUR)	- Same as above for "blank" ammunition
87	BLATACON)	
88	BLATEEUR)	
89	APTOECON)	
90	APTOEUR)	- Same as above for "AP" (armor piercing) ammunition
91	APTACON)	
92	APTAEUR)	

<u>Item</u>	<u>Data Name</u>	<u>Definition</u>
93	PENTOECON)	
94	PENTOEUR)	Same as above for the ammunition
95	PENTACON)	
96	PENTAEUR)	
97	ATOECON)	
98	ATACON)	
99	ATOEUR)	Same as items 62-65 and items 68-71, except that the quantities are moved back one year (This is to permit ammunition production costs to be programmed one year prior to production.)
100	ATAEUR)	
101	ATOECOND)	
102	ATACOND)	
103	ATOEURD)	
104	ATAEURD)	
105	STOECOND	Yearly cumulative quantities of TOE tanks delivered to CONUS
106	STOEURD	Yearly cumulative quantities of TOE tanks delivered to EUROPE

5. Flow Chart of Cost Model:

For clarification, a pictorial presentation of the cost model is illustrated on the next page. This flow chart illustrates the inter-relationships among the 106 inputs and 66 equations and the manner in which each of these contributes to the total cost shown at the top of the chart.



MBT SECONDARY ARMAMENT COST STUDY METHODOLOGY

TOTAL COST

O&MA

BP2100

BP21W

BP21WIP

(TACOND + TAEURD) (F8)

BP21WAR

(TACON + TAEUR) (F7)

BP21M

BP21MIP

(TACOND + TAEURD) (F10)

BP21MAR

(TACON + TAEUR) (F9)

BP2200

BP22W

BP22A

BP22AR

(TOTBAL) (FRBAL)

TOTBAL = (BALTOECON) (TOECON + TOECOND/3)
 + (BALTOEUR) (TOEUR + TOEURD/3)
 + (BALTACON) (TACON + TACOND/3)
 + (BALTAEUR) (TAEUR + TAEURD/3)
 + (BALW) (TOECOND + TOEURD)

(TOTTRA) (FRTRA)

TOTTRA = (TRATOECON) (TOECON + TOECOND/3)
 + (TRATOEUR) (TOEUR + TOEURD/3)
 + (TRATACON) (TACON + TACOND/3)
 + (TRATAEUR) (TAEUR + TAEURD/3)
 + (TRAW) (TOECOND + TOEURD)

(TOTBLA) (FRBLA)

TOTBLA = (BLATOECON) (TOECON + TOECOND/3)
 + (BLATOEUR) (TOEUR + TOEURD/3)
 + (BLATACON) (TACON + TACOND/3)
 + (BLATAEUR) (TAEUR + TAEURD/3)
 + (BLAW) (TOECOND + TOEURD)

(TOTAP) (FRAP)

TOTAP = (APTOECON) (TOECON + TOECOND/3)
 + (APTOEUR) (TOEUR + TOEURD/3)
 + (APTACON) (TACON + TACOND/3)
 + (APTAEUR) (TAEUR + TAEURD/3)
 + (APW) (TOECOND + TOEURD)

(TOTPEN) (FRPEN)

TOTPEN = (PENTOECON) (TOECON + TOECOND/3)
 + (PENTOEUR) (TOEUR + TOEURD/3)
 + (PENTACON) (TACON + TACOND/3)
 + (PENTAEUR) (TAEUR + TAEURD/3)
 + (PENW) (TOECOND + TOEURD)

BP22AST

(STBAL) (FS

STBAL = (B
 +
 SH

(STTRA) (FS

STTRA = (T
 +
 SH

(STBLA) (FS

STBLA = (I
 +
 S

(STAP) (FS

STAP = (A
 +
 S

(STPEN) (F

STPEN =
 +
 S

OEURD) (F8)

EUR) (F7)

OEURD) (F10)

EUR) (F9)

EDITOR LEGEND

COST PER WEAPON

EXPENDED ON TOE TANKS IN CONUS DURING PEACETIME

(BALTOECON) (TRAUP) + (BLATOECON) (BLAUP) +

(APTOECON) (PENUP)

TANKS.

DPE.

TANKS IN EUROPE.

TOE TANKS FOR WAR RESERVE.

(BALW) (BLAW) + (BLAW) (BLAW) + (PENW) (PENW) +

PROVISIONING PARTS FOR ONE BASIC WEAPON.

INITIAL PROVISIONING PARTS FOR ONE BASIC WEAPON.

WEAPON MOUNT AND ASSOCIATED EQUIPMENT.

WEAPON MOUNT AND ASSOCIATED EQUIPMENT.

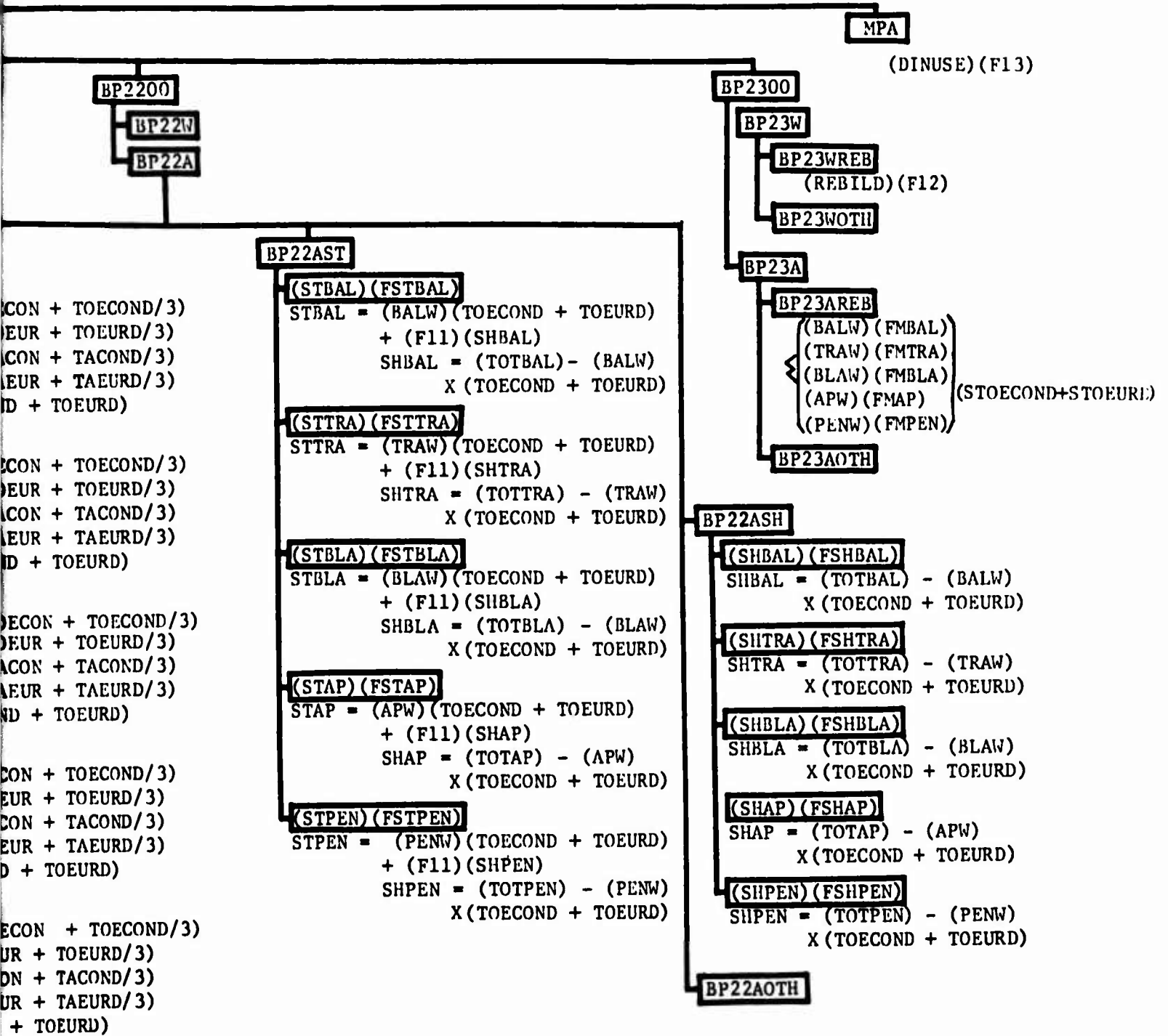
INITIAL PROVISIONING AMMO WHICH IS STORED

TO REBUILD ONE WEAPON.

OR MAINTENANCE COST PER WEAPON.

2

METHODOLOGY



COMPUTER PROGRAM
AND
SAMPLE PRINTOUTS

0194007 AWCOR-SO

\$JOB 0194007 AWCOR-SO
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$IBJOB COSTFC
$IBFTC SECONDARY ARMAMENT COST STUDY -- COST ANALYSIS/DPS. RESEARCH 10/67
C DIMENSION DIN(106,10),DLAB(106,4),DOUT(66,10),CASE(120),
1 TOTALS(15,5),LAB(9),LINE(10),OLAB(66,4),CASENR(15,4)
2 READ 1,NCASE,((DLAB(I,J),J=1,4),I=1,66)
3 1 FORMAT (15/(20A4))
4 IYEAR=68
5 DO 2 I=1,9
6 LAB(I)=IYEAR+I-1
7 DO 3 ICASE=1,NCASE
8 READ 4,CASE
9 4 FORMAT (20A4)
10 DO 5 I=1,106
11 READ 6,IFLAG,(DLAB(I,J),J=1,4),(DIM(I,J),J=1,9)
12 6 FORMAT (11,3A3,A2,5X9F7.0)
13 THIS ZERO-LOGIC IS NECESSARY BECAUSE BLANK IS READ AS A -0.
14 DO 34 J=1,9
15 IF (DIM(I,J))34,35,34
16 35 DIM(I,J)=0.
17 34 CONTINUE
18 IF ((IFLAG)7,5,7
19 7 TEMP=DIM(I,1)
20 DO 8 J=2,9
21 IF (DIM(I,J))8,9,8
22 8 DIM(I,J)=TEMP
23 8 TEMP=DIM(I,J)
24 5 CONTINUE
25 PRINT 10,CASE,LAB
26 10 FORMAT (1H120A4,2X27HINPUT DATA COSTS IN DOLLARS
27 1 /1H04X7HITEM/FY9112)
28 PRINT 11,((DLAB(I,J),J=1,4),(DIM(I,J),J=1,9),I=1,56)
29 11 FORMAT (1H 3A3,A2,9F12.3)
30 PRINT 12,CASE,LAB
31 12 FORMAT (1H120A4,2X20HINPUT DATA-FRACTION
32 1 /1H04X7HITEM/FY 9112)
33 PRINT 13,((DLAB(I,J),J=1,4),(DIM(I,J),J=1,9)
34 13 FORMAT (1H 3A3,A2,9F12.3)
35 PRINT 14
36 14 FORMAT (1H085X10HQUANTITIES/)
37 DO 15 I=58,106
38 DO 16 J=1,9
39 LINE(J)=DIM(I,J)+.5
40 16 PRINT 17,((DLAB(I,J),J=1,4),(LINE(J),J=1,9)
41 17 FORMAT (1H 3A3,A2,9112)
42 C
43 C BEGIN EQUATIONS
44 C
45 C
46 C
    
```

```

47 00 25 J=1,5
50 20 TOTALS(I,CASE,J)=0.
51 00 31 I=1,106
52 DIN(I,10)=0.
53 00 31 J=1,9
54 31 DIN(I,10)=DIN(I,10)+DIN(I,J)
55 00 19 J=1,9
56 TA=DIN(62,J)+DIN(68,J)/3.
57 TB=DIN(64,J)+DIN(70,J)/3.
60 TC=DIN(63,J)+DIN(69,J)/3.
61 TD=DIN(65,J)+DIN(71,J)/3.
62 TE=DIN(68,J)+DIN(70,J)
63 00UT(1,J)=DIN(77,J)*TA+DIN(78,J)*TB+DIN(79,J)*TC+DIN(80,J)*TD
1 +DIN(72,J)*TE
64 00UT(2,J)=DIN(81,J)*TA+DIN(82,J)*TB+DIN(83,J)*TC+DIN(84,J)*TD
1 +DIN(73,J)*TE
65 00UT(3,J)=DIN(85,J)*TA+DIN(86,J)*TB+DIN(87,J)*TC+DIN(88,J)*TD
1 +DIN(74,J)*TE
66 00UT(4,J)=DIN(89,J)*TA+DIN(90,J)*TB+DIN(91,J)*TC+DIN(92,J)*TD
1 +DIN(75,J)*TE
67 00UT(5,J)=DIN(93,J)*TA+DIN(94,J)*TB+DIN(95,J)*TC+DIN(96,J)*TD
1 +DIN(76,J)*TE
70 TA=DIN(68,J)+DIN(70,J)
71 00UT(6,J)=00UT(1,J)-DIN(72,J)*TA
72 00UT(7,J)=00UT(2,J)-DIN(73,J)*TA
73 00UT(8,J)=00UT(3,J)-DIN(74,J)*TA
74 00UT(9,J)=00UT(4,J)-DIN(75,J)*TA
75 00UT(10,J)=00UT(5,J)-DIN(76,J)*TA
76 00UT(11,J)=DIN(72,J)*TA+DIN(57,J)*00UT(6,J)
77 00UT(12,J)=DIN(73,J)*TA+DIN(57,J)*00UT(7,J)
100 00UT(13,J)=DIN(74,J)*TA+DIN(57,J)*00UT(8,J)
101 00UT(14,J)=DIN(75,J)*TA+DIN(57,J)*00UT(9,J)
102 00UT(15,J)=DIN(76,J)*TA+DIN(57,J)*00UT(10,J)
103 00UT(16,J)=DIN(11,J)*DIN(58,J)
104 00UT(17,J)=DIN(12,J)*DIN(59,J)
105 00UT(18,J)=DIN(13,J)*DIN(60,J)
106 00UT(19,J)=DIN(14,J)*DIN(61,J)
107 00UT(20,J)=DIN(58,J)*DIN(15,J)
110 00UT(21,J)=DIN(59,J)*DIN(16,J)
111 00UT(22,J)=DIN(77,J)*DIN(25,J)+DIN(81,J)*DIN(26,J)
1 +DIN(85,J)*DIN(27,J)+DIN(89,J)*DIN(28,J)+DIN(93,J)*DIN(29,J)
112 00UT(23,J)=DIN(79,J)*DIN(25,J)+DIN(83,J)*DIN(26,J)
1 +DIN(87,J)*DIN(27,J)+DIN(91,J)*DIN(28,J)+DIN(95,J)*DIN(29,J)
113 00UT(24,J)=DIN(78,J)*DIN(25,J)+DIN(82,J)*DIN(26,J)
1 +DIN(86,J)*DIN(27,J)+DIN(90,J)*DIN(28,J)+DIN(94,J)*DIN(29,J)
114 00UT(25,J)=DIN(80,J)*DIN(25,J)+DIN(84,J)*DIN(26,J)
1 +DIN(88,J)*DIN(27,J)+DIN(92,J)*DIN(28,J)+DIN(96,J)*DIN(29,J)
115 00UT(26,J)=DIN(72,J)*DIN(30,J)+DIN(73,J)*DIN(31,J)
1 +DIN(74,J)*DIN(32,J)+DIN(75,J)*DIN(33,J)+DIN(76,J)*DIN(34,J)
116 00UT(27,J)=DIN(97,J)*00UT(22,J)+DIN(98,J)*00UT(23,J)
1 +DIN(99,J)*00UT(24,J)+DIN(100,J)*00UT(25,J)
117 00UT(28,J)=(DIN(101,J)+DIN(103,J))*00UT(26,J)
120 00UT(29,J)=(DIN(101,J)*00UT(22,J)+DIN(102,J)*00UT(23,J)
1 +DIN(103,J)*00UT(24,J)+DIN(104,J)*00UT(25,J))/73.
121 TB=DIN(62,J)+DIN(64,J)
122 00UT(30,J)=TA*DIN(20,J)
123 00UT(31,J)=TB*DIN(14,J)
124 00UT(32,J)=00UT(30,J)+00UT(31,J)
125 00UT(33,J)=TA*DIN(18,J)

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126 DOUT(34,J)=I8*DIN(17,J)
127 DOUT(35,J)=DOUT(33,J)+DOUT(34,J)
130 DOUT(36,J)=DOUT(35,J)+DOUT(32,J)
131 TA=DIN(69,J)+DIN(71,J)
132 TB=DIN(63,J)+DIN(65,J)
133 DOUT(37,J)=TA*DIN(20,J)
134 DOUT(38,J)=TB*DIN(19,J)
135 DOUT(39,J)=DOUT(37,J)+DOUT(38,J)
136 DOUT(40,J)=TA*DIN(18,J)
137 DOUT(41,J)=TB*DIN(17,J)
140 DOUT(42,J)=DOUT(40,J)+DOUT(39,J)
141 DOUT(43,J)=DOUT(42,J)+DOUT(39,J)
142 DOUT(44,J)=DOUT(41,J)+DIN(37,J)+DOUT(2,J)*DIN(38,J)
143 1 +DOUT(3,J)*DIN(39,J)+DOUT(4,J)*DIN(40,J)+DOUT(5,J)*DIN(41,J)
144 1 +DOUT(8,J)*DIN(49,J)+DOUT(9,J)+DOUT(7,J)*DIN(48,J)
145 DOUT(46,J)=DOUT(11,J)*DIN(42,J)+DOUT(10,J)*DIN(51,J)
146 1 +DOUT(13,J)*DIN(44,J)+DOUT(14,J)*DIN(45,J)+DOUT(15,J)*DIN(46,J)
147 DOUT(47,J)=DOUT(44,J)+DOUT(46,J)+DOUT(47,J)
148 DOUT(48,J)=DIN(21,J)+DOUT(47,J)
149 DOUT(49,J)=(DIN(72,J)+DIN(52,J)+DIN(73,J)*DIN(53,J)
150 1 +DIN(74,J)*DIN(54,J)+DIN(75,J)*DIN(55,J)+DIN(76,J)*DIN(56,J))
151 2 *(DIN(105,J)+DIN(106,J))
152 DOUT(50,J)=DOUT(49,J)+DIN(36,J)
153 DOUT(51,J)=DIN(66,J)+DIN(23,J)
154 DOUT(52,J)=DOUT(51,J)+DIN(22,J)
155 DOUT(53,J)=DOUT(52,J)+DOUT(50,J)
156 DOUT(54,J)=DIN(67,J)+DIN(24,J)
157 DOUT(55,J)=DIN(1,J)+DIN(3,J)+DIN(5,J)
158 DOUT(56,J)=DIN(2,J)+DIN(4,J)+DIN(6,J)
159 DOUT(57,J)=DOUT(55,J)+DOUT(56,J)
160 DOUT(58,J)=DIN(7,J)+DOUT(16,J)+DOUT(20,J)
161 DOUT(59,J)=DOUT(27,J)+DOUT(28,J)+DOUT(29,J)
162 DOUT(60,J)=DIN(9,J)+DOUT(59,J)
163 DOUT(61,J)=DOUT(58,J)+DOUT(18,J)+DOUT(60,J)
164 DOUT(62,J)=DIN(8,J)+DOUT(17,J)+DOUT(21,J)
165 DOUT(63,J)=DOUT(62,J)+DOUT(19,J)+DIN(10,J)
166 DOUT(64,J)=DOUT(61,J)+DOUT(63,J)
167 DOUT(65,J)=DOUT(36,J)+DOUT(43,J)+DOUT(48,J)+DOUT(53,J)
168 DOUT(66,J)=DOUT(57,J)+DOUT(64,J)+DOUT(65,J)+DOUT(54,J)
169 00 18 I=1,66
170 DOUT(1,10)=0.
171
172
173 00 18 J=1,9
174
175 18 DOUT(1,10)=DOUT(1,10)+DOUT(1,J)
176 TOTALS(ICASE,1)=TOTALS(ICASE,1)+DOUT(57,10)
177 TOTALS(ICASE,2)=TOTALS(ICASE,2)+DOUT(64,10)
178 TOTALS(ICASE,3)=TOTALS(ICASE,3)+DOUT(65,10)
179 TOTALS(ICASE,4)=TOTALS(ICASE,4)+DOUT(54,10)
180 TOTALS(ICASE,5)=TOTALS(ICASE,5)+DOUT(66,10)
181 PRINT 21,CASE,LAB
182
183 21 FORMAT (I120A4,2X30HOUTPUT OF EQUATIONS-QUANTITIES
184 1 /I108X7HITEM/FY1X9I10,3X10HROW TOTALS/)
185
186 00 22 I=1,15
187 00 23 J=1,10
188
189 23 LINE(I)=DOUT(I,J)+5
190 22 PRINT 24,(OLAB(I,J),J=1,4),LINE
191 24 FORMAT (I14A4,9I10,1I3)
192
193 25 PRINT 25,CASE,LAB,(OLAB(I,J),J=1,4),(DOUT(I,J),J=1,10),I=16,66)
194
195 25 FORMAT (I120A4,1X38HOUTPUT OF EQUATIONS-COSTS IN THOUSANDS

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213 1 /1H08X7HITE4/FYIX91IC,3X10HRUM TOTALS//1H 4A4,-3P9F10.3,F13.3)
214 PRINT 26,CASE,LAB
215 FORMAT (1H12A4,2X18HCOSTS IN THOUSANDS
1/1H08X7HITE4/FY 9110,3X10HRUM TOTALS)
216 PRINT 27,(DIN(1,J),J=1,10),(DIN(3,J),J=1,10),(DIN(5,J),J=1,10),
1 (DOUT(55,J),J=1,10),(DIN(2,J),J=1,10),(DIN(4,J),J=1,10),
2 (DIN(6,J),J=1,10),(DOUT(56,J),J=1,10),(DOUT(57,J),J=1,10)
217 27 FORMAT (5H RDTE/1H 7X8WEAPON-1-3P9F10.3,F13.3/1H 8X7HMOUNT-1
1 9F10.3,F13.3/1H 9X6HAMMO-19F10.3,F13.3/1H 8X7HTOTAL-19F10.3,F13.3
2 /1H07X8WEAPON-9F10.3,F13.3/1H 8X7HMOUNT-9F10.3,F13.3/1H 9X
3 6HAMMO-9F10.3,F13.3/1H 8X7HTOTAL-9F10.3,F13.3/1H05X
4 10HTOTAL RDTE9F10.3,F13.3)
218 PRINT 28,(DOUT(58,J),J=1,10),(DOUT(18,J),J=1,10),
1 (DOUT(60,J),J=1,10),(DOUT(61,J),J=1,10),
2 (DOUT(62,J),J=1,10),(DOUT(19,J),J=1,10),(DIN(10,J),J=1,10),
3 (DOUT(63,J),J=1,10),(DOUT(64,J),J=1,10)
219 28 FORMAT (1/5HOPEMA/1H 7X8WEAPON-1-3P9F10.3,F13.3/1H 8X7HMOUNT-1
1 9F10.3,F13.3/1H 9X6HAMMO-19F10.3,F13.3/1H 8X7HTOTAL-19F10.3,F13.3
2 /1H07X8WEAPON-9F10.3,F13.3/1H 8X7HMOUNT-9F10.3,F13.3/1H 9X
3 6HAMMO-9F10.3,F13.3/1H 8X7HTOTAL-9F10.3,F13.3/1H 5X
4 10HTOTAL PEMA9F10.3,F13.3)
220 PRINT 29,(DOUT(35,J),J=1,10),(DOUT(32,J),J=1,10),
1 (DOUT(36,J),J=1,10),(DOUT(42,J),J=1,10),(DOUT(39,J),J=1,10),
2 (DOUT(43,J),J=1,10),(DIN(21,J),J=1,10),(DOUT(47,J),J=1,10),
3 (DOUT(48,J),J=1,10)
221 29 FORMAT (1/4HCOMA/1H02X6HBP2000/1H 9X6WEAPON-3P9F10.3,F13.3/1H 10X
1 5HMOUNT9F10.3,F13.3/1H 10X5HTOTAL9F10.3,F13.3/1H02X6HBP2100/1H
2 9X6WEAPON9F10.3,F13.3/1H 10X5HMOUNT9F10.3,F13.3/1H 10X5HTOTAL
3 9F10.3,F13.3/1H02X6HBP2200/1H 5X10WEAPON/MT.9F10.3,F13.3/1H 11X
4 4HAMMO9F10.3,F13.3/1H 10X5HTOTAL9F10.3,F13.3)
222 PRINT 30,(DOUT(52,J),J=1,10),(DOUT(50,J),J=1,10),
1 (DOUT(53,J),J=1,10),(DOUT(65,J),J=1,10),(DOUT(54,J),J=1,10),
2 (DOUT(66,J),J=1,10)
223 30 FORMAT (1H02X6HBP2300/1H 5X10WEAPON/MT.-3P9F10.3,F13.3/1H 11X
1 4HAMMO9F10.3,F13.3/1H 10X5HTOTAL9F10.3,F13.3/1H06X10HTOTAL OMA
2 9F10.3,F13.3/4HOMPA129F10.3,F13.3/13MOGRAND TOTAL33X9F10.3,
3 F13.3)
224 DO 32 J=1,4
225 32 CASENR(ICASE,J)=CASE(J)
226 3 CONTINUE
227 PRINT 33,((CASENR(ICASE,J),J=1,4),(TOTALS(ICASE,J),J=1,5),
230 1 ICASE=1,NCASE)
231 33 FORMAT (1H10X26HSUMMARY COSTS IN THOUSANDS/1H011X4HCASE17X4HRDTE
1 16X4HPEMA17X3HOMA17X3HMPA15X5HTOTAL/1H04A4,-3P5F20.3))
232 CALL EXIT
233 END
$ENTRY

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COSTS IN THOUSANDS

PEMA WEAPONRY AMMUNITION STUDY

DATE	WEAPON	70	71	72	73	74	75	76	ROW TOTALS
RDIF	WEAPON-T	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	MUNDT-T	250.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	AMMO-T	0.000	0.000	0.000	0.000	0.000	0.000	0.000	750.000
	TOTAL-T	250.000	0.000	0.000	0.000	0.000	0.000	0.000	750.000
PFMA	WEAPON-S	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	MUNDT-S	0.000	750.000	500.000	0.000	0.000	0.000	0.000	1250.000
	AMMO-S	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	TOTAL-S	0.000	750.000	500.000	0.000	0.000	0.000	0.000	1250.000
TOTAL RDIF	250.000	0.000	500.000	0.000	0.000	0.000	0.000	0.000	750.000
PFMA	WEAPON-T	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	MUNDT-T	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	AMMO-T	0.000	1371.302	6847.881	4980.354	303.038	0.000	0.000	0.000
	TOTAL-T	0.000	1371.302	6847.881	4980.354	303.038	0.000	0.000	29177.441
PFMA	WEAPON-S	0.000	0.000	0.000	9481.290	10611.059	0.000	0.000	0.000
	MUNDT-S	0.000	0.000	0.000	4933.500	6341.500	0.000	0.000	0.000
	AMMO-S	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	TOTAL-S	0.000	0.000	0.000	14414.790	16952.559	0.000	0.000	0.000
TOTAL PFMA	0.000	1371.302	6847.881	19395.144	17255.597	0.000	0.000	0.000	60544.790
DPA	WEAPON	0.000	0.000	102.600	148.950	135.450	0.000	0.000	387.000
	MUNDT	0.000	0.000	31.236	45.347	41.237	0.000	0.000	117.820
	TOTAL	0.000	0.000	133.836	194.297	176.687	0.000	0.000	504.820
BP2100	WEAPON	0.000	0.000	124.200	360.450	557.100	135.450	0.000	1177.200
	MUNDT	0.000	0.000	37.812	109.737	169.606	41.237	0.000	358.392
	TOTAL	0.000	0.000	162.012	470.187	726.706	176.687	0.000	1535.592
BP2100	WEAPON	0.000	0.000	102.600	148.950	135.450	0.000	0.000	387.000
	MUNDT	0.000	0.000	31.236	45.347	41.237	0.000	0.000	117.820
	TOTAL	0.000	0.000	133.836	194.297	176.687	0.000	0.000	504.820
BP2200	WEAPON/MT. AMMO	3.000	40.369	18.862	16.164	13.525	0.602	0.000	118.866
	AMMO	0.000	0.000	10.457	14.271	14.940	1.775	0.000	42.190
	TOTAL	3.000	40.369	29.319	30.435	28.465	2.177	0.000	161.056
BP2300	WEAPON/MT. AMMO	1.500	21.000	12.000	12.000	10.000	0.000	0.000	80.500
	AMMO	1.980	1.980	5.095	7.900	10.072	10.072	1.980	43.039
	TOTAL	3.480	22.980	17.095	19.900	20.072	10.072	1.980	123.539
TOTAL DPA	6.480	7.980	342.262	714.819	951.930	188.416	1.980	2325.000	
MPA	TOTAL DPA	0.000	0.000	37.296	83.768	113.886	22.274	0.000	257.224
	GRAND TOTALS	256.480	527.980	7777.630	20193.731	18321.413	211.210	1.980	65127.020

SECTION IV
TANK LIFE CYCLE COST MODEL
(FOR TATAWS II STUDY)

Cost Model for Combat Vehicles:

a. (U) The following automated cost model for combat vehicles was developed by Headquarters, U. S. Army Weapons Command specifically for this phase of the TATAWS Study and was used to compute costs for the five classes of vehicles cited in paragraph a of Section I above. The model consists of a series of 22 cost equations presented, with nomenclature, in paragraphs b and c below. These equations utilize 45 items of information, or basic data, to calculate all RDT&E, PEMA, O&M,A, MPA and MCA costs for a given year. These 45 items are listed and defined under paragraph d below. The package of backup data, which is submitted as a supplement to this report, contains the numerical values by fiscal year (FY 68-79) for each of the 45 input data items for each of the 64 combinations of combat vehicle type and preferred weapon system mix in the form of computer printouts. Correspondingly, the supplementary backup data include, also, 64 computer output listings of essential costs (incurred yearly) for each of the 64 cases by fiscal year (68-79).

b. (U) Equations:

TANK1C	=	(TANK1P) (TANK1U)	(1)
TANK2C	=	(TANK2P) (TANK2U)	(2)
TRAIN1C	=	(TRAIN1P) (TRAIN1U)	(3)
TRAIN2C	=	(TRAIN2P) (TRAIN2U)	(4)
SRP	=	SPPI + SRPR	(5)
SRPR	=	(DINUSE) (F1)	(6)
FDT	=	(TANK1D + TANK2D) F2 + (TRAIN1D + TRAIN2D) F3 + (SRP/F4) F5	(7)
PEMA	=	TANK1C + TANK2C + TRAIN1C + TRAIN2C + PBS + SRP + FDT	(8)
BP2000	=	(TOECON) (F6) (F7) + (TOEOVS) (F6) (F8)	(9)
BP2100	=	BP21TANK + BP210TH	(10)
BP21TANK	=	(TACON) (F6) (F7) + (TAEUR) (F6) (F8)	(11)
BP210TH	=	BP210THC + BP210THE	(12)
BP210THE	=	$\frac{(TAEUR)}{(TACON)}$ (BP210THC)	(13)
BP2200	=	SDT + BP220TH	(14)
SDT	=	(TANK1D + TANK 2D) F9 + (REBILD) (F11)	(15)
BP2300	=	BP23REB + BP230TH = (TOECON + TACON) (F7) (F15) + (TOEOVS + TAEUR) (F8) (F15)	(16)
BP23REB	=	(REBILD) (F10)	(17)
OMA	=	BP2000 + BP2100 + BP2200 + BP2300	(18)
MPA	=	MPATANK + MPAOTH	(19)
MPATANK	=	(TOECON) (F12) + (TOEOVS) (F13)	(20)
MPAOTH	=	MPAOTHC + MPAOTHE	(21)
MPAOTHE	=	$\frac{(TAEUR)}{(TACON)}$ (MPAOTHC)	(22)

c. (U) Nomenclature:

TANK1C)
TANK2C)
TRAIN1C) Yearly tank and trainer production costs
TRAIN2C)

SRP Total yearly "Selected Repair Parts" costs
SRPR "Selected Repair Parts Costs" for replenishment per tank year
SRPI Total yearly Selected Repair Parts Costs for Initial Provisioning
FDT Total yearly costs for First Destination Transportation
PEMA Total yearly PEMA programmed costs
BP2000 Total yearly BP2000 (Operating Forces) costs i.e., POL and ASF Parts)
BP2100 Total yearly BP2100 (Training) costs
BP2000 Total yearly BP2200 (Central Supply) costs
BP2300 Total yearly BP2300 (Depot Maintenance) costs
OMA Total yearly O&M,A costs
BP21TANK Total yearly costs for ASF parts and POL for all TA tanks
BP210TH Total yearly operation and maintenance costs of schools and training centers in CONUS and overseas (Europe)
BP210THC Same as BP210TH but only for CONUS
BP210THE Same as BP210TH but only for Europe
SDT Total yearly second destination transportation costs
BP220TH Total yearly BP2200 costs exclusive of SDT (Procurement and Supply Activities)
BP23REB Total yearly tank rebuild costs
BP230TH Total yearly BP2300 costs exclusive of tank rebuild costs (Maintenance Support Activities)
MPA Total yearly Military Personnel costs
MPATANK Total yearly tank crew costs
MPAOTH Total yearly military cadre and trainee costs for schools and training centers in CONUS and Europe
MPAOTHC Same as for MPAOTH but only for CONUS
MPAOTHE Same as for MPAOTH but only for Europe
MCA Total yearly Military Construction Costs for CONARC

d. (U) Input Data (Yearly, FY 68 - FY 79) - 45 Items:

RDTE	Programmed RDT&E Funds
TANK1U	Yearly Average Unit Cost for Tank No. 1 Production
TANK1P	Production Quantity of No. 1 Tanks Programmed Yearly
TANK1D	Delivery Schedule for Tank No. 1
TANK1A	Tank No. 1 Assets at End of Each Year
TANK2U)	
TANK2P)	
TANK2D)	Refers to Tank No. 2 as above refers to Tank No. 1
TANK2A)	
TRAIN1U)	
TRAIN1P)	
TRAIN1D)	
TRAIN1A)	
)	Refer, as above, to Tank Trainers No. 1 & No. 2, respectively
TRAIN2U)	
TRAIN2P)	
TRAIN2D)	
TRAIN2A)	
PBS	Programmed Costs for Production Base Support
SRPI	Programmed Costs for Selected Repair Parts for Initial Provisioning
DINUSE	In-use Density of Tanks (Total of Tanks 1 & 2)
TOECONUS	TOE Tanks in CONUS
TOEOVS	TOE Tanks Overseas
TACON	TA Tanks in CONUS
TAEUR	TA Tanks Overseas
REBILD	Rebild Schedule
BP210THC	Costs for Operation and Maintenance of CONARC Training Centers and Schools (exclusive of operation and maintenance of TA Tanks)
BP220TH	BP2200 Costs (Procurement and Supply Support Activities) (exclusive of second destination transportation costs)
BP230TH	BP2300 Costs (Depot Maintenance and Maintenance Support) (exclusive of tank rebuild costs)
MPA0THC	Military Cadre and Trainee Costs for CONARC Schools and Training Centers (corresponding to BP210THC)
MCA	Military Construction Costs for CONARC

- F1 Cost of (SRPR) "Selected Repair Parts for Replenishment" per tank year
- F2 Average first destination transportation costs per tank
- F3 Average first destination transportation costs per trainer
- F4 Average cost of an engine/transmission set
- F5 Average first destination transportation cost for an engine/transmission set
- F6 Average cost of ASF parts and POL per tank mile
- F7 Average miles/tank year for CONUS
- F8 Average miles/tank year for overseas
- F9 Average second destination transportation costs for tanks delivered overseas
- F10 Average rebuild cost for tanks
- F11 Average second destination transportation costs for tanks to and from rebuild depot
- F12 Average yearly 4-man crew cost in CONUS
- F13 Average yearly 4-man crew cost overseas
- F14 Fraction of tanks delivered each year (TANK1D + TANK2D) which are shipped overseas
- F15 Average cost of engine and transmission rebuild per tank mile

e. (U) All computed costs are based upon AAO's and U. S. Army world-wide combat vehicle yearly densities (FY 68 - 79) computed for each combination of vehicle type and mix. These vehicle densities, in turn, were based upon the various small unit weapon systems mixes submitted by the U. S. A. Combat Development Command after analysis of their computer combat simulation results.

f. (U) The above cost model uses the various hardware schedules (such as procurement, production, and rebuild) as well as the various vehicle density schedules (such as TOE and TA vehicles in use by area) together with other factors and input data listed in paragraph d above to compute yearly costs according to the twenty-two equations. The model is self-explanatory regarding the interrelationships among the various factors and schedules. The next section (i.e., Section III) is concerned with the details of the cost rationale and explanations of cost factors and cost estimating relationships used for estimating life cycle costs for all vehicles exclusive of the MBT-70. Explanations pertaining to the MBT-70 will be presented in Section IV.

SECTION V

IMPROVED LIFE CYCLE COST MODEL
FOR SMALL ARMS WEAPON SYSTEMS

(FOR SAWS STUDY)

1. Equations

$$(Cnw)_j = Can(Wp)_j + .6 Cmn \sum_{i=1}^j (Wp)_i + Cd \text{ (only for } j=1) \dots \dots \dots (1)$$

$$(Cow)_k = .6 Cmo \left[Wpo - \sum_{i=1}^k Wp(i-1) \right] \text{ for } \sum_{i=1}^j (Wp)_i \leq Wpo \dots \dots \dots (2a)$$

$$(Cow)_k = 0 \dots \dots \dots \text{ for } \sum_{i=1}^k Wp(i-1) > Wpo \dots \dots \dots (2b)$$

$$(Cna)_j = .8 \left[(Awn)(Wp)_j + Apn \sum_{i=1}^j (Wp)_i \right] + Cf \text{ (only for } j=1) \dots \dots \dots (3)$$

$$(Coa)_k = .8 Apo \left[Wpo - \sum_{i=1}^k Wp(i-1) \right] \dots \dots \dots (4)$$

2. Explanation and Nomenclature

$(Cnw)_j$ = Total Cost for new weapons during the j th year.

C_{nw} = Cost to acquire a new weapon.

$(Wp)_j$ = Quantity of new weapons produced and added to Army inventory during the j th year.

C_{mw} = Cost to maintain a new weapon in the field for one year.

$(Wp)_1$ = Quantity of new weapons produced and added to the Army inventory during the 1 th year.

Note:

i -pertains to the year number, having started with the first year under consideration as year 1, and numbering the following year consecutively.

j or k -pertain to the particular year for which costs are being calculated with the equations (1) - (4).

$(C_{ow})_k$ = Total costs for old (existing) weapons during the k th year.

C_{no} = Cost to maintain an old weapon for one year.

W_{po} = Quantity of old weapons in Army inventory just before phase out is initiated.

$(C_{na})_j$ = Total cost for new ammunition during the j th year. (i.e. Cost of ammunition for the new weapons).

A_{wn} and A_{pn} = Cost rate of ammunition usage for new weapons in $\$/half$ $wpn-yr$ for wartime and $\$/wpn yr$ respectively.

$(C_{oa})_k$ = Total cost for old ammunition during the k th year (i.e. Cost of ammunition for existing weapons).

A_{po} = Cost rate of ammunition usage for the old (existing) weapons during peacetime training in $\$/wpn-yr$.

Cd and Cf = Respectively, new weapon and new ammunition miscellaneous initial investment costs such as development and plant facilities costs which are not included in other weapon or ammunition cost factors.

3. Sensitivity Analysis

It is desired to determine the effects on total costs for new weapons (TCnw) and total costs for new ammunition (TCna) when each of the four weapon and ammunition costs parameters are varied by a given percentage (P). This is to be accomplished by partial differentiation of the equations relating the total costs to their cost parameters. If Wpn is the total number of new weapons and $\sum_{j=1}^y \sum_{i=1}^j Wp_i$ represents the total number of weapon years under consideration for the new weapon, the total cost equations are as follows:

$$TCnw = C_{an} Wpn + .6 C_{mn} \sum_{j=1}^y \sum_{i=1}^j Wp_i \dots\dots\dots(5)$$

$$TCna = .8 A_{wn} Wpn + .8 A_{pn} \sum_{j=1}^y \sum_{i=1}^j Wp_i \dots\dots\dots(6)$$

If the normal (original) values are represented by primed letters, the desired equations relating variation in total cost to a given percentage variation (P) in each of the four cost parameters are as follows:

$$\frac{TCnw - TC'_{nw}}{TC'_{nw}} = \frac{C'_{an}}{C'_{an}} P Wpn \dots\dots\dots(7)$$

(where P is the % variation in C'an)

$$\frac{TCnw - TC'_{nw}}{TC'_{nw}} = \frac{C'_{mn}}{C'_{mn}} P (0.6)(TWY)_n \dots\dots\dots(8)$$

(where P is the % variation in C'mn)

$$\frac{TC_{na} - TC'_{na}}{TC'_{na}} = \frac{A'_{wn}}{TC'_{na}} P (0.8) W_{pn} \dots\dots\dots(9)$$

(where P is the % variation in A'wn)

$$\frac{TC_{na} - TC'_{na}}{TC'_{na}} = \left[\frac{A'_{pn}}{TC'_{na}} \right] P (0.8) (TWY)_{na} \dots\dots\dots(10)$$

(where P is the % variation in A'pn)

The sensitivity analysis figures on the computer printouts shown in Annex D assume

$$P = .01 = 1\%$$

4. COMPUTER PROGRAM

COMPUTER PROGRAM DESCRIPTION

The data read into the computer program is nested in so that the analysis proceeds in the following order: An old weapon system is described. A new weapons system is described and its unit cost-quantity relationship is read in. Production schedules are specified.

This appears logically as:

```
Describe old weapon system #1 (2 cards)
  Describe new system #1 (2 cards)
    Describe cost-quantity relations (2 or 3 cards)
      Describe production schedule #1 (1 card)
      Describe production schedule #2 (1 card)
      ...
      Describe production schedule #NPROD (1 card)
    Describe new system #2 (2 cards)
      Describe cost-quantity relation (2 or 3 cards)
        Describe production schedule #1 (1 card)
        (etc.)
```

The indentation shows the level of nesting. The actual description of the systems and data follows a fairly rigid format on punched cards. To describe the old weapon system one needs two cards. The first contains an alpha-numeric description, up to 80 characters in length, of the users' choosing. This will be printed on each output file. The second card contains WPØ, the number of old weapons; CMØ, the cost to maintain an old weapon per year; APØ, the cost of ammo per year of peacetime per old weapon; SYS, the number of second-level nests until the next first-level nest (i.e.,

the number of new weapon systems to be considered with the old one just described); Q0, QN, DQ, initial, final and increment quantities of weapons to be used to construct a total cost-quantity table for the systems. The FORTRAN format is 8F10.0 which means that each number has a 10-column field and may appear anywhere within the field as long as it has its decimal point punched.

To describe the new weapon systems, the following cards are required for each: The first card contains an alpha-numeric description of up to 80 characters of the users' choosing. The second card contains CD, the cost of development; CURVE, the number of points on the cost-quantity relation (usually 3 for rifles and 2 for machine guns); PR0DS, the number of different production schedules to be considered; and FYEAR, the actual number of the year which will be used to start the 14 year costing (if 1970 were given, the program would cost from 1970 thru 1983). Again, the format is 8F10.0 with the decimals punched with the data. The next cards (CURVE of them) will each contain one point from the unit cost-quantity relation. The numbers on the card are WPL, the quantity; CAL, the unit-cost-to-acquire a weapon for the quantity WPL; CML, the unit-cost-to-maintain a weapon for the quantity WPL for a year; APL, the unit-cost-of-ammo per year of peacetime per weapon for the quantity WPL; AWL, the unit-cost-of-ammo per half year of wartime per weapon for the quantity WPL and CFL, the unit-cost-to-field a weapon for the quantity WPL. The format is 8F10.0. The quantities are ordered in increasing WPL.

The production schedules are entered next. If there are PR0DS schedules there will be PR0DS cards punched next. There may be as many as 8 quantities

entered. The first corresponds to production in the first year (FYEAR), the second corresponds to production in the second year (FYEAR + 1) and so on up to a maximum of 8 years. (Usually four or five are all that are needed.) The format is 8F10.0.

This completes level 3 nesting. The next cards would begin either a new second level or a first level.

Note that new weapon systems are costed starting with the year given by FYEAR. The old weapon system is always costed starting in 1967. This is set in the program, near the beginning, by the statement IFY=1967. Both systems must be costed for the same period of time, in our study, 14 years. That is why variables referring to old-system quantities are subscripted with j and new-system quantities are subscripted with k . The computer program increments calendar years starting with IFY=1967 by one thru FYEAR + 14. Therefore, for some given calendar year, j and k may not necessarily take on the same values because they may be in different parts of their respective 14-year spans. After the 14-year span for old weapon systems is complete, the old-system costs are no longer computed. Also during the calendar years from IFY to FYEAR the new weapon systems are not costed. This is how the two 14-year costing periods are superimposed in the printouts.

The FORTRAN function DDM is a routine for performing linear interpolation of costs as a function of quantity in the cost-quantity relations. A more sophisticated quadratic interpolation is also available but cannot be used if there are only two or three points in the curve.

Since the program was written in FORTRAN-II language and successfully run on the most restrictive compiler in our experience, the RCA-301 FORTRAN system, no difficulty should be expected in implementing the program on other systems. Copies of the source program are available upon request from the authors. (The program itself is not classified.)

```

C   S.A.W.S. AUTOMATED COST METHODOLOGY-II A.W.C.-O.R.  8 JUNE 1966
      DIMENSION OLD(16),DNEW(16),WP(25),TCNW(25),TCOW(25),TCNA(25),
1   TCOA(25),WPNT(25),WPL(10),CAL(10),CML(10),APL(10),AWL(10),
2   CFL(10),C(10,25),CMR(10)

      IFY=1967
      PCNT=1.
      IY=14
      JY=IFY-1
00023 READ 1,OLD,WPO,CMO,APO,SYS,QO,OM,DO
00001 FORMAT (16A5/HF10.0)
      NSYS=SYS
      DO 2 ISYS=1,NSYS
      READ 1,DNEW,CD,CURVE,PRODS,FYEAR
      NL=CURVE
      NPROD=PRODS
      NYPR=FYEAR
      READ 3,(WPL(I),CAL(I),CML(I),APL(I),AWL(I),CFL(I),I=1,NL)
00003 FORMAT (6F10.0)
      IYPR=NYPR-IFY
      JEND=NYPR-IFY+IY
      DO 24 IP=1,NPROD
      PRINT 5,OLD,WPO,CMO,APO,CD,DNEW
00005 FORMAT (1H116A5/1H06X9HWPO,UNIT5X10HCHO,$/UNIT2X13HAPO,$/UNIT/YR
) 11X4HCD,$/1H0F15.0,3F15.2//1H016A5)
      DO 6 I=1,25
00006 WP(I)=0.
      IL=IYPR+1
      IH=IYPR+8

```

```

      READ 7, (WP(I), I=1L, 1M)
00007 FORMAT (8F10.0)
      WPN=0.
      DO 8 I=1, 25
00008 WPN=WPN+WP(I)
      CAN=DDM(WPL, CAL, WPN, NL)
      CMN=DDM(WPL, CML, WPN, NL)
      APN=DDM(WPL, APL, WPN, NL)
     AWN=DDM(WPL, AWL, WPN, NL)
      CFN=DDM(WPL, CFL, WPN, NL)
      WPN1(IP)=WPN
      GT=0.
      TCNW(IP)=0.
      TCOV(IP)=0.
      TCNA(IP)=0.
      TCOA(IP)=0.
      DSN=0.
      DSO=0.
      WPN=0.
      DO 9 J=1, JFND
      WPN=WPN+WP(J)
      DO 10 I=1, J
00010 DSN=DSN+WP(I)
      PS=WP(I)
      IF (J-1) 11, 11, 12
00012 IF (J-1) 13, 13, 14
00013 DO 15 I=2, J
      PART=PS-WP(I-1)

```

```
      IF (PART)25,15,15
00025 DSO=DSO+PS
      PS=0.
      GO TO 19
00035 PS=PART
00031 DSO=DSO+PS
      GO TO 19
00034 DSO=0.
      PS=0.
00039 CNW=WP(J)*CAN+.6*WPN*CMN
      COW=.6*CMN*PS
      CNA=.8*(AWN*WP(J)+APN*WPN)
      COA=.4*APN*PS
      IF (J-1YPR-1)18,17,18
00037 CNA=CNA+CFN
      CNW=CNW+CD
00038 TCNW(IP)=TCNW(IP)+CNW
      TCOW(IP)=TCOW(IP)+COW
      TCNA(IP)=TCNA(IP)+CNA
      TCOA(IP)=TCOA(IP)+COA
      TOPY=CNA+CNW
      GT=GT+TOPY+COW+COA
      C(1,J)=CNW
      C(2,J)=TCNW(IP)
      C(3,J)=COW
      C(4,J)=TCOW(IP)
      C(5,J)=CNA
      C(6,J)=TCNA(IP)
```

```

C(7,J)=COA
C(8,J)=TCOA(IP)
C(9,J)=TCPY
00009 C(10,J)=GI
TC=TCNW(IP)+TCNA(IP)
PNWCA=PCNT*CAN*WPN/TC
PNWCM=PCNT*CMN*.6*DSN/TC
PNAAW=PCNT*AWN*.8*WPN/TC
PNAAP=PCNT*APN*.8*DSN/TC
PRINT 16,WPN,CAN,CMN,AWN,APN,CFN,PCNT,PNWCA,PNWCM,PNAAW,PNAAP
00016 FORMAT (1H012X3HWPN12X3HCAN12X3HCMN12X3HAWN12X3HAPN13X2HCF/1H 10X
1 5HUNITS9X6HS/UNIT9X6HS/UNIT4X11HS/UNIT/YR/26X9HS/UNIT/YR14X1HS/
2 1HOF15.0.5F15.2//1H06X9MPARAMETER4X40H PER CENT CHANGE IN NEW SY
SYSTEM COST (ATF5.2,16H PER CENT LEVEL)/1H 12X3HCANF15.4/1H 12X3HCMN
4 F15.4/1H 12X3HAWNF15.4/1H 12X3HAPNF15.4)
PRINT 28
00028 FORMAT (1H010X56HCOSTS PER YEAR B
BASED ON PRODUCTION SCHEDULE IN MEGABUCKS/ 1H02X2H FY2X
2 2H07X3HWPN17X3HCNW3X/HCUM CNW7X3HCOW3X/HCUM COW7X3HCNA3X7HCUM CNA
3 7X3HCOA3X/HCUM COA3X7HNEW SYS5X5HTOTAL)
DO 27 J=1,JEND
KJ=JY+J
DO 29 I=1,10
00029 CMB(I)=C(I,J)*1.E-6
00027 PRINT 30,KJ,J,WP(J),CMB
00030 FORMAT (1H02I4,F10.0,10F10.4)
00024 CONTINUE
NQ=(QM-Q0)/DQ*1.5

```

```

        IF (NQ)2,2,20
00020 PRINT 21,DNEW
00021 FORMAT (1H116A5/61H0COST-QUANTITY CALCULATIONS (BASED ON PREVIOUS
        1COSTS PRINTED)/1H012X3HWPN11X4HTCNW11X4HTCOW11X4HTCNA11X4HTCOARX
        2 /HTOT SYS/1H 10X5HUNITS5(6X9HMEGARUCKS))
        Q=Q0
        DO 4 I=1,NQ
            CNW=DDM(WPNT,ICNW,Q,NPROD)*1.E-6
            COW=DDM(WPNT,ICOW,Q,NPROD)*1.E-6
            CNA=DDM(WPNT,ICNA,Q,NPROD)*1.E-6
            COA=DDM(WPNT,ICOA,Q,NPROD)*1.E-6
            TC=CNW+COW+CNA+COA
            PRINT 22,Q,CNW,COW,CNA,COA,TC
00022 FORMAT (1H F15.0,5F15.3)
00004 Q=Q+DQ
00002 CONTINUE
        GO TO 23
        END
C     SEPARATION CARD BETWEEN PROGRAMS FOR FORTRAN COMPATABILITY
        FUNCTION DDM(XT,YT,X,N)
        DIMENSION XT(100),YT(100)
        IF (N-1)1,1,2
00001 DDM=YT(1)
        RETURN
00002 DO 3 I=2,N
            IF (X-XT(I))4,4,3
00003 CONTINUE
        I=N
    
```


00004 DDM=YT(I-1)+(YT(I)-YT(I-1))*(X-XT(I-1))/(XT(I)-XT(I-1))

IF (DDM)5,6,6

00005 DDM=0.

00006 RETURN

END

•DATA

NOMENCLATURE FOR COMPUTER PRINT-OUTS

The nomenclature for these Annex D computer print-outs is the same as given in Appendix I of Annex E except for the following:

- CF = Same as CFN in Annex E
- WPI = New weapon production quantities (These are listed one year before their production, in each instance)
- CNW = Yearly Costs for new weapons
- CUM = Cumulative Costs
- CNA = Yearly costs for ammo for new weapons
- COW = Yearly costs for old (existing) weapons
- COA = Yearly costs for ammo for old weapons
- NEW SYS = CNW + CNA
- TOTAL = Cumulative totals = (CUM CNW) + (CUM CNA) + (CUM COW) + (CUM COA)

OLD WEAPON M1/M14 RIFLES

MPN UNITS CMO.\$/UNIT APO.\$/UNIT/YR
 13.00 55.00 230500.00

RIFLE REPLACES M1/M14 CASP 1(A)

MPN UNITS CAN \$/UNIT CMN \$/UNIT CUM CMW CUM COM CMA CUM CMA COA CUM COA NEW SYS TOTAL
 100000 153.22 14.21 170.59 64.40 .00

PARAMETER PER CENT CHANGE IN NEW SYSTEM COST (AT 1.00 PER CENT LEVEL)

CAN .1392
 CMN .1043
 AMN .1242
 APN .6299

COSTS PER YEAR BASED ON PRODUCTION SCHEDULE IN MEGABUCKS

FY	NO	MPN	CAN	CUM CAN	CMN	CUM CMN	CMA	CUM CMA	COA	CUM COA	NEW SYS	TOTAL
1967	1	.	.0000	.0000	11.9997	11.9997	.0000	.0000	67.6908	67.6908	.0000	79.6905
1968	2	42938.	7.1756	7.1756	11.9997	23.9995	8.0718	8.0718	67.6908	135.3816	15.2475	174.6285
1969	3	57062.	9.5959	16.7715	11.6648	35.6643	12.9391	21.0110	65.8015	201.1831	22.5350	274.6299
1970	4	.	.8529	17.6244	11.2197	46.8840	5.1520	26.1630	63.2908	264.4739	6.0049	355.1452
1971	5	.	.8529	18.4772	11.2197	58.1037	5.1520	31.3150	63.2908	327.7647	6.0049	435.6606
1972	6	.	.8529	19.3301	11.2197	69.3235	5.1520	36.4670	63.2908	391.0555	6.0049	516.1760
1973	7	.	.8529	20.1829	11.2197	80.5432	5.1520	41.6190	63.2908	454.3463	6.0049	596.6914
1974	8	.	.8529	21.0358	11.2197	91.7629	5.1520	46.7710	63.2908	517.6370	6.0049	677.2067
1975	9	.	.8529	21.8886	11.2197	102.9827	5.1520	51.9230	63.2908	580.9278	6.0049	757.7221
1976	10	.	.8529	22.7415	11.2197	114.2024	5.1520	57.0750	63.2908	644.2186	6.0049	838.2375
1977	11	.	.8529	23.5943	11.2197	125.4221	5.1520	62.2270	63.2908	707.5094	6.0049	918.7528
1978	12	.	.8529	24.4472	11.2197	136.6419	5.1520	67.3790	63.2908	770.8002	6.0049	999.2682
1979	13	.	.8529	25.3000	11.2197	147.8616	5.1520	72.5310	63.2908	834.0910	6.0049	1079.7835
1980	14	.	.8529	26.1529	11.2197	159.0813	5.1520	77.6830	63.2908	897.3818	6.0049	1160.2989
1981	15	.	.8529	27.0057	.0000	159.0813	5.1520	82.8350	.0000	897.3818	6.0049	1166.3039

OLD WEAPON MI/M14 RIFLES

WPN UNITS CUM. \$/UNIT APO. \$/UNIT/YR CD. \$
 13.00 55.00 230500.00

RIFLE REPLACES MI/M14 CASE 1(A)

WPN UNITS CMN \$/UNIT CMN \$/UNIT AMN \$/UNIT/YR/2 APN \$/UNIT/YR COA \$ CF \$
 120.10 14.00 159.73 64.40 .00

PER CENT CHANGE IN NEW SYSTEM COST (AT 1.00 PER CENT LEVEL)

PARAMETER CMN CMW CUM CMW CMW CUM CMW AMN APN
 .1422
 .1031
 .1210
 .6323

COSTS PER YEAR BASED ON PRODUCTION SCHEDULE IN MEGABUCKS

FY	NO	WPI	CMW	CUM CMW	CMW	CUM CMW	AMN	APN	COA	CUM COA	NEW SYS	TOTAL
1967	1	.	.0000	.0000	11.9997	11.9997	.0000	.0000	67.6908	67.6908	.0000	79.6908
1968	2	4293A.	7.0396	7.0396	11.9997	23.9995	7.6990	7.6990	67.6908	135.3816	14.7386	174.1196
1969	3	75000.	12.2542	19.2938	11.6648	35.6643	15.6600	23.3589	65.8015	201.1831	27.9141	279.5001
1970	4	4983A.	4.8940	24.1878	11.0798	46.7441	15.0123	38.3712	62.5015	263.6846	23.9063	376.9877
1971	5	.	1.4093	29.5971	10.6911	57.4352	8.6438	47.0151	60.3086	323.9933	10.0531	458.0406
1972	6	.	1.4093	31.0064	10.6911	68.1262	8.6438	55.6589	60.3086	384.3019	10.0531	539.0934
1973	7	.	1.4093	32.4157	10.6911	78.8173	8.6438	64.3027	60.3086	444.6105	10.0531	620.1463
1974	8	.	1.4093	33.8250	10.6911	89.5084	8.6438	72.9465	60.3086	504.9192	10.0531	701.1992
1975	9	.	1.4093	35.2344	10.6911	100.1995	8.6438	81.5903	60.3086	565.2278	10.0531	782.2520
1976	10	.	1.4093	36.6437	10.6911	110.8906	8.6438	90.2342	60.3086	625.5365	10.0531	865.3049
1977	11	.	1.4093	38.0530	10.6911	121.5816	8.6438	98.8780	60.3086	685.8451	10.0531	944.3577
1978	12	.	1.4093	39.4623	10.6911	132.2727	8.6438	107.5218	60.3086	746.1537	10.0531	1025.4106
1979	13	.	1.4093	40.8716	10.6911	142.9638	8.6438	116.1656	60.3086	806.4624	10.0531	1106.4634
1980	14	.	1.4093	42.2810	10.6911	153.6549	8.6438	124.8094	60.3086	866.7710	10.0531	1187.5162
1981	15	.	1.4093	43.6903	10.6911	164.3460	8.6438	133.4533	60.3086	927.0796	10.0531	1268.5724

OLD WEAPON M1/M14 RIFLES

WPO. UNITS	CMO. \$/UNIT	APC. \$/UNIT/YR	CU. \$
13.00	55.00	230500.00	3

RIFLE REPLACES M1/M14 CASE 1(A)

MPN UNITS	CAN \$/UNIT	CMN \$/UNIT	AWN \$/UNIT/YR/2	APN \$/UNIT/YR	CF \$
200000.	148.73	13.90	154.57	64.40	.00

PARAMETER PER CENT CHANGE IN NEW SYSTEM COST (AT 1.00 PER CENT LEVEL)

CAN
-1430
CMN
.1027
AWN
.1189
APN
.6343

COSTS PER YEAR BASED ON PRODUCTION SCHEDULE IN MEGABUCKS

FY NO	MPI	CNM	CUM CNM	COM	CUM COM	CNA	CUM CNA	COA	CUM COA	NEW SYS	TOTAL
1967	1	.0000	.0000	11.9997	11.9997	.0000	.0000	67.6908	67.6908	.0000	79.6905
1968	2	6.9749	6.9749	11.9997	23.9995	7.5217	7.5217	67.6908	135.3816	14.4966	173.8776
1969	3	12.1386	19.1135	11.6640	35.6643	15.3503	22.8720	65.0015	201.1031	27.4009	278.0320
1970	4	13.8733	32.9868	11.0798	46.7441	20.4514	43.3234	62.5015	263.6046	34.3246	386.7380
1971	5	1.6678	34.6543	10.4397	57.1838	10.3040	53.6274	58.8908	322.5754	11.9718	468.0411
1972	6	1.6678	36.3223	10.4397	67.6236	10.3040	63.9314	58.8908	381.4662	11.9718	549.3434
1973	7	1.6678	37.9901	10.4397	78.0633	10.3040	74.2354	58.8908	440.3570	11.9718	630.6457
1974	8	1.6678	39.6579	10.4397	88.5030	10.3040	84.5394	58.8908	499.2478	11.9718	711.9480
1975	9	1.6678	41.3257	10.4397	98.9427	10.3040	94.8434	58.8908	558.1386	11.9718	793.2503
1976	10	1.6678	42.9934	10.4397	109.3825	10.3040	105.1474	58.8908	617.0294	11.9718	874.5526
1977	11	1.6678	44.6612	10.4397	119.8222	10.3040	115.4514	58.8908	675.9201	11.9718	955.8549
1978	12	1.6678	46.3290	10.4397	130.2619	10.3040	125.7554	58.8908	734.8109	11.9718	1037.1572
1979	13	1.6678	47.9968	10.4397	140.7017	10.3040	136.0594	58.8908	793.7017	11.9718	1118.4595
1980	14	1.6678	49.6646	10.4397	151.1414	10.3040	146.3634	58.8908	852.5925	11.9718	1199.7618
1981	15	1.6678	51.3323	10.4397	161.5811	10.3040	156.6674	.0000	911.4849	11.9718	1211.7336

OLD WEAPON M1/M14 RIFLES

MPD. UNITS CMO. \$/UNIT APO. \$/UNIT/YR CD. \$
 13.00 55.00 230500.00

63 RIFLE REPLACES M1/M14 CASE 1(A)

MPN CAN CMN AMN APN CF
 UNITS \$/UNIT \$/UNIT \$/UNIT/YR/2 \$/UNIT/YR \$
 400000. 139.76 13.27 122.54 64.40 .00

PARAMETER PER CENT CHANGE IN NEW SYSTEM COST (AT 1.00 PER CENT LEVEL)

CAN .1401
 CMN .1319
 AMN .0982
 APN .6593

COSTS PER YEAR BASED ON PRODUCTION SCHEDULE IN MEGABUCKS

FY NO	MPI	CMW	CUM CMW	COM	CUM COM	CNA	CUM CNA	COA	CUM CRA	NEW SYS	TOTAL
1967	1	.0000	.0000	11.9997	11.9997	.0000	.0000	67.6908	67.6908	.0000	79.6905
1968	2	85075.	12.9163	11.9997	23.9995	12.8425	12.8425	67.6908	135.3816	25.7589	185.1399
1969	3	150000.	22.8422	11.3299	35.3294	26.8566	39.6992	63.9123	199.2939	49.6989	310.0810
1970	4	150000.	24.0362	10.1599	45.4893	34.5846	74.2038	57.3123	256.6062	58.6208	436.1740
1971	5	14125.	5.1580	8.9899	54.4792	21.9927	96.2765	50.7123	307.3184	27.1507	523.0268
1972	6	.	3.1839	8.8797	63.3589	20.6080	116.8845	50.0908	357.4092	23.7919	605.7892
1973	7	.	3.1839	8.8797	72.2386	20.6080	137.4925	50.0908	407.5000	23.7919	688.5516
1974	8	.	3.1839	8.8797	81.1184	20.6080	158.1005	50.0908	457.5908	23.7919	771.3140
1975	9	.	3.1839	8.8797	89.9981	20.6080	178.7085	50.0908	507.6816	23.7919	854.0763
1976	10	.	3.1839	8.8797	98.8778	20.6080	199.3165	50.0908	557.7724	23.7919	936.8387
1977	11	.	3.1839	8.8797	107.7576	20.6080	219.9245	50.0908	607.8632	23.7919	1019.6010
1978	12	.	3.1839	8.8797	116.6373	20.6080	240.5325	50.0908	657.9540	23.7919	1102.3634
1979	13	.	3.1839	8.8797	125.5170	20.6080	261.1405	50.0908	708.0448	23.7919	1185.1258
1980	14	.	3.1839	8.8797	134.3968	20.6080	281.7485	50.0908	758.1356	23.7919	1267.8882
1981	15	.	3.1839	8.8797	143.3968	20.6080	302.3565	.0000	758.1356	23.7919	1291.6801

OLD WEAPON M1/M14 RIFLES

APN CMN AMN CD.\$
 15.00 55.00 230500.00

RIFLE REP: ACFS M1/M14 CASE 1(A)

M1N CMN AMN APN CF
 UNITS \$/UNIT \$/UNIT \$/UNIT \$/UNIT \$
 500000. 155.28 12.95 106.52 64.40 .00

PARAMETER PER CENT CHANGE IN NEW SYSTEM COST (AT 1.00 PER CENT LEVEL)

CAN .1411
 CMN .1008
 AMN .0893
 APN .6683

COSTS PER YEAR BASED ON PRODUCTION SCHEDULE IN MEGABUCKS

FY NO	MPI	CMW	CUM CMW	COM	CUM COM	CMA	CUM CMA	COA	CUM COA	NEW SYS	TOTAL
1957	1	.0000	.0000	11.9997	11.9997	.0000	.0000	67.6908	67.6908	.0000	79.6908
1968	2	85875.	12.5149	11.9997	23.9995	11.7422	11.7422	67.6908	135.3816	24.2571	183.6387
1969	3	150000.	27.1247	11.3299	35.3294	24.9347	36.6769	63.9123	199.2939	47.0594	305.9333
1970	4	150000.	23.2902	10.1599	45.4893	32.6627	69.3396	57.3123	256.6062	55.9529	429.3649
1971	5	114125.	19.3238	77.2537	54.4792	35.4853	104.8248	50.7123	307.3184	54.8091	543.8762
1972	6	.0000	3.8850	81.1387	62.5789	25.7600	130.5848	45.6908	353.0092	29.6450	627.3118
1973	7	.0000	3.8850	85.0237	70.6786	25.7600	156.3448	45.6908	398.7000	29.6450	710.7473
1974	8	.0000	3.8850	88.9087	78.7784	25.7600	182.1048	45.6908	444.3908	29.6450	794.1828
1975	9	.0000	3.8850	92.7937	86.8781	25.7600	207.8648	45.6908	490.0816	29.6450	877.6183
1976	10	.0000	3.8850	96.6787	94.9778	25.7600	233.6248	45.6908	535.7724	29.6450	961.0533
1977	11	.0000	3.8850	100.5637	103.0776	25.7600	259.3848	45.6908	581.4632	29.6450	1044.4893
1978	12	.0000	3.8850	104.4487	111.1773	25.7600	285.1448	45.6908	627.1540	29.6450	1127.9248
1979	13	.0000	3.8850	108.3337	119.2770	25.7600	310.9048	45.6908	672.8448	29.6450	1211.3603
1980	14	.0000	3.8850	112.2187	127.3768	25.7600	336.6648	45.6908	718.5356	29.6450	1294.7958
1981	15	.0000	3.8850	116.1037	127.3768	25.7600	362.4248	.0000	718.5356	29.6450	1324.4408

OLD M16/M14 RIFLES

MPI UNITS CMN \$/UNIT APC \$/UNIT/YR CD \$
 13.00 55.00 230500.00

RIFLE REPLACES M1/M14 CASE I(A)

MPN CAN CMN AMN APN CF
 UNITS \$/UNIT \$/UNIT \$/UNIT/YR/2 \$/UNIT/YR \$
 62000 155.05 12.95 104.36 64.40 770395.99

PARAMETER PER CENT CHANGE IN NEW SYSTEM COST (AT 1.00 PER CENT LEVEL)

CAN .1443
 CMN .1002
 AMN .0892
 APN .6645

COSTS PER YEAR BASED ON PRODUCTION SCHEDULE IN MEGABUCKS

FY NO	MPI	CMN	CUM CMN	COM	CUM COM	CNA	CUM CNA	COA	CUM COA	NEW SYS	TOTAL
1967	1	.0000	.0000	11.9997	11.9997	.0000	.0000	67.6908	67.6908	.0000	79.6908
1968	2	05875	12.4953	11.9997	23.9995	12.3639	12.3639	67.6908	135.3816	24.8593	184.2403
1969	3	150000	22.0903	11.3299	35.3294	24.6750	37.0390	63.9123	199.2939	46.7653	306.2478
1970	4	150000	23.2553	10.1599	45.4893	32.4030	69.4420	57.3123	256.6062	55.6504	429.3783
1971	5	150000	24.4204	8.9899	54.4792	40.1310	109.5750	50.7123	307.3184	64.5514	553.6320
1972	6	64125	13.3206	7.8199	62.2991	36.2655	145.8405	44.1123	351.4307	49.5861	655.1503
1973	7	.	4.6603	100.2422	7.3197	69.6188	30.9120	176.7505	41.2908	392.7215	739.3331
1974	8	.	4.6603	104.9022	7.3197	76.9385	30.9120	207.6622	41.2908	434.0123	823.5159
1975	9	.	4.6603	109.5628	7.3197	84.2583	30.9120	238.5742	41.2908	475.3031	907.6986
1976	10	.	4.6603	114.2230	7.3197	91.5780	30.9120	269.4865	41.2908	516.5939	991.8814
1977	11	.	4.6603	118.8833	7.3197	98.8977	30.9120	300.3982	41.2908	557.8847	1076.0641
1978	12	.	4.6603	123.5436	7.3197	106.2175	30.9120	331.3102	41.2908	599.1755	1160.2469
1979	13	.	4.6603	128.2039	7.3197	113.5372	30.9120	362.2222	41.2908	640.4663	1244.4297
1980	14	.	4.6603	132.8641	7.3197	120.8569	30.9120	393.1345	41.2908	681.7571	1328.6125
1981	15	.	4.6603	137.5244	.0000	120.8569	30.9120	424.0465	.0000	681.7571	1364.1848

OLD BEARLY M1/M14 MILES

APP. UNITS CMO. \$/UNIT APP. \$/UNIT/YR CD. \$
 13.00 55.00 238500.00

WHEEL REPLACES M1/M14 CASE 1(A)

MPY CMA CMN APN CFI
 UNITS \$/UNIT \$/UNIT \$/UNIT/YR \$
 500000 134.40 12.94 100.00 64.40 231100.00

PARAMETER PER CENT CHANGE IN NEW SYSTEM COST (AT 1.00 PER CENT LEVEL)

CMA .1423
 CMN .1008
 APN .0846
 APN .6690

COSTS PER YEAR BASED ON PRODUCTION SCHEDULE IN MEGABUCKS

EV NO	MPI	CMA	CUM CMA	CMN	CUM CMN	CMA	CUM CMA	APN	CUM APN	CFI	TOTAL		
1967	1	.0000	.0000	11.9997	11.9997	.0000	.0000	.0000	.0000	67.6908	67.6908	.0000	79.6908
1968	2	85875.	12.4761	12.4561	11.9997	23.9995	13.6074	13.6074	13.6074	67.6908	135.3816	24.0633	185.4446
1969	3	235875.	34.2469	46.7030	11.3299	55.3294	35.4519	49.0594	49.0594	53.9123	199.2939	59.6989	330.3855
1970	4	500000.	45.2068	91.9098	9.4901	44.8194	56.0394	105.0987	105.0987	53.5338	252.8277	131.2462	494.6527
1971	5	792250.	50.2022	122.1121	7.1501	51.9695	55.4801	160.5788	160.5788	40.3338	293.1614	85.6823	627.8218
1972	6		6.2091	128.5211	5.7597	57.7293	41.2160	201.7948	201.7948	32.4908	325.6522	47.4251	713.4974
1973	7		6.2091	134.5302	5.7597	63.4890	41.2160	243.0108	243.0108	32.4908	358.1430	47.4251	799.1730
1974	8		6.2091	140.7393	5.7597	69.2487	41.2160	284.2268	284.2268	32.4908	390.6338	47.4251	904.6444
1975	9		6.2091	146.9484	5.7597	75.0085	41.2160	325.4428	325.4428	32.4908	423.1246	47.4251	970.5242
1976	10		6.2091	153.1574	5.7597	80.7682	41.2160	366.6588	366.6588	32.4908	455.6154	47.4251	1036.1997
1977	11		6.2091	159.3665	5.7597	86.5279	41.2160	407.8748	407.8748	32.4908	488.1062	47.4251	1101.8753
1978	12		6.2091	165.5756	5.7597	92.2876	41.2160	449.0908	449.0908	32.4908	520.5970	47.4251	1227.5509
1979	13		6.2091	171.7846	5.7597	98.0474	41.2160	490.3068	490.3068	32.4908	553.0878	47.4251	1313.2262
1980	14		6.2091	177.9937	5.7597	103.8071	41.2160	531.5228	531.5228	32.4908	585.5786	47.4251	1399.9021
1981	15		6.2091	184.2028	5.7597	109.5668	41.2160	572.7388	572.7388	32.4908	618.0694	47.4251	1486.5772

OLD SYSTEM M1/M14 VALUES

APR 1973 18.00 55.00 250700.00 CD. \$

FIELD REPLACES M1/M14 CASE 1(A)

MPI UNITS CAN \$/UNIT CUM CUM CNA CUM CMA CUM COA CUM COA NEW SYS TOTAL
 1000000. 134.15 12.93 95.77 64.40 3851980.00

PER CENT CHANGE IN NEW SYSTEM COST (AT 1.00 PER CENT LEVEL)

PARAMETER
 CAN .1453
 CUM .1004
 CNA .0429
 CMA .0669

COSTS PER YEAR BASED ON PRODUCTION SCHEDULE IN MEGABUCKS

FY NO	MPI	CAN	CUM CAN	CMA	CUM CMA	CNA	CUM CNA	COA	CUM COA	NEW SYS	TOTAL
1967	1	.0000	.0000	11.9997	11.9997	.0000	.0000	67.6908	67.6908	.0000	79.6908
1968	2	878/5.	12.4169	11.9997	23.9995	14.8509	14.8509	67.6908	135.3816	27.2678	166.6489
1969	3	2458/5.	34.1388	46.5557	35.3294	34.6353	49.4862	63.9123	199.2939	68.7741	330.6651
1970	4	500000.	45.0680	91.6237	44.8194	55.0007	104.4869	53.5338	252.8277	100.0687	493.7577
1971	5	300000.	47.3947	139.0184	7.1504	51.9695	174.9437	40.3336	292.314	117.4514	699.0933
1972	6	78250.	18.2531	157.2714	4.8101	56.7796	232.4545	27.1338	320.2952	75.7639	766.8088
1973	7	.	7.7556	165.0270	4.1997	60.9793	283.9745	23.6908	343.9860	59.2756	853.9669
1974	8	.	7.7556	172.7825	4.1997	65.1791	335.4945	23.6908	367.6768	59.2756	941.1330
1975	9	.	7.7556	180.5381	4.1997	69.3788	387.0145	23.6908	391.3676	59.2756	1028.2990
1976	10	.	7.7556	188.2937	4.1997	73.5785	438.5345	23.6908	415.0584	59.2756	1115.4651
1977	11	.	7.7556	196.0492	4.1997	77.7783	490.0545	23.6908	438.7492	59.2756	1202.6312
1978	12	.	7.7556	203.8048	4.1997	81.9780	541.5745	23.6908	462.4400	59.2756	1289.7973
1979	13	.	7.7556	211.5603	4.1997	86.1777	593.0945	23.6908	486.1308	59.2756	1376.9634
1980	14	.	7.7556	219.3159	4.1997	90.3775	644.6145	23.6908	509.8216	59.2756	1464.1295
1981	15	.	7.7556	227.0715	.0000	90.3775	696.1345	.0000	509.8216	59.2756	1523.4051

SECTION VI

**SIMPLIFIED LIFE CYCLE COST MODEL
FOR SMALL ARMS WEAPON SYSTEMS**

(FOR SAWS STUDY)

ANNEX E

Mathematical Model and Methodology for Weapon System Cost Study

1. (U) Objective. To develop a cost estimating methodology and mathematical model which will provide the means to compute total program costs and perform sensitivity analyses of the cost estimates to variations in the cost assumptions.

2. (U) Discussion. The cost data presented in the previous annexes of this study are based upon certain specific values of the various parameters involved which have been determined by calculation, or otherwise, to be the best present estimates of their true values. The most important of these parameters are weapon quantities (W), weapon acquisition and maintenance costs (C_a and C_m), unit cartridge costs (U), peacetime training ammunition allowances (P_a), wartime day-of-supply rates (D_s), worldwide weapon distributions and various time factors. This annex is concerned principally with the mathematical relationships of these parameters to total weapon system costs (paragraph 3) and with the capability by virtue of such relationships to vary each of these parameters as desired. Such a mathematical model permits not only a relatively ~~cross~~ accuracy and consistency check on all total system costs ~~presented~~ in the previous annexes but permits also a simple and rapid means of calculating new total costs if it is desired to determine such

costs for parameter values which vary from those used in the main study. These are illustrated in paragraph 4 and 5 of this annex.

As illustrated also in paragraph 5, the mathematical model permits an analysis of the sensitivity of total costs to variations in the cost parameters as well as an assessment of the significance of the differences in total costs for various weapon systems as presented in this study.

3 Equations and Nomenclature:

For New Weapons: $TC = W_{pa} C_a + .60 W_{pm} C_m (Y_{at} + \frac{Y_t}{2}) + C_d$ (1)

For Old Weapons:
(Partial Phase-Out
 $W_{pn} < W_{po}$) $TC = .60 W_{pm} C_m \left[Y_{bt} + Y_t \left(1 - \frac{W_{pn}}{2W_{po}}\right) + Y_{at} \left(1 - \frac{W_{pn}}{W_{po}}\right) \right]$ (2)

For Old Weapons:
(Comp Phase-Out,
 $W_{pn} \geq W_{po}$) $TC = .60 W_{pm} C_m (1 + Y_{bt} + \frac{Y_t}{2})$ (3)

Ammo For New Wpn: $TC = \frac{W_{ft} Y_{tp} A_{tp}}{2} + Y_{at} W_{fa} + W_{fw} + C_f$ (4)

Ammo For Old Wpn:
(Partial Phase-Out
 $W_{fn} < W_{fo}$) $TC = W_{fo} Y_{bt} A_{tp} + Y_{tp} A_{tp} (W_{fo} - \frac{W_{fn}}{2}) + Y_{at} A_{tp} (W_{fo} - W_{fn}) + W_{fo} A_{fw}$ (5)

Ammo For New Wpn:
(Comp Phase-Out,
 $W_{fn} \geq W_{fo}$) $TC = W_{fo} A_{tp} (Y_{bt} + \frac{Y_t}{2}) + W_{fo} A_{fw}$ (6)

Nomenclature:

TC = Total cost to the Government from FY67 through FY80.

W_p = Total number of weapons procured. When W_{pn} for new and old (i.e., existing) weapons appear in the same equation, W_{pn} and W_{po} are used to distinguish between them.

- C_a & C_m = Costs to acquire and costs to maintain a weapon in the field each year respectively.
- C_d = Research and development costs for new hardware which have not been included in the hardware costs.
- C_f = Facilities costs for new ammunition which have not been included in the unit cartridge costs used in this study.
- Y_t = Total number of transition years. That is, the number of years required to phase-in and/or phase-out the old weapon.
- Y_{bt} & Y_{at} = Total number of years under consideration before and after the transition period respectively.
- W_f = Total number of weapons fielded on which ammunition requirements are based. When W_f for new and old (i.e., existing) weapons appear in the same equation, W_{fo} and W_{fn} are used to distinguish between them.
- A_p = Worldwide average cost of ammunition used per weapon for peacetime training (in $\$/wpn/yr$).
 $A_p = \sum (P_a U)_x + (P_a U)_y + (P_a U)_z + \dots$. That is, ammunition cost/ wpn/yr is the sum of the products of the peacetime allowance rates (P_a in rds/ wpn/yr) multiplied by the unit cartridge costs (U in dollars) for each different type (x, y, z , etc.) of cartridge used.
- A_w = Worldwide average cost of ammunition used per weapon for the first 6 months of wartime (in $\$/wpn$).
 $A_w = 4.68 \left[\frac{(D U)_x}{\text{day-of-supply}} + (D U)_y + (D U)_z + \dots \right]$
 Where: D_s = Wartime day-of-supply ammunition use rates (in rds/ wpn . mo. for 100% usage.)
 U = Unit cartridge cost in dollars.
 x, y and z refer to different types of cartridges such as ball, tracer, blank or 4 to 1 linked ammunition.
 The constant 4.68 assumes 10% of weapons are *distributed*.

4. (II) Calculation of Weapon System Costs. The equations and data immediately preceding this section were used to calculate the following costs for each of the same twenty different weapons systems considered in Annex D: (all costs are for the FY67-80 period)

- a. Costs to acquire and maintain various quantities of new weapons.
- b. Total costs to supply each of these new weapon quantities with ammunition for peacetime training and for six months of war reserves.
- c. When applicable, costs to maintain the existing weapon system until (and in line with the degree to which) it is replaced by the new system.
- d. Total ammunition costs for existing weapons while they still remain in the system. This also includes six months of war reserves.
- e. Grand total costs for both new and existing weapons and ammunition for each quantity of new weapons considered in "a." above.

The equations and input data were programmed for computer operation. The computerized cost data inputs and outputs are presented in tabular form and the output cost data are presented in graphical form in Appendix 1 for each of the twenty weapons considered. The computer program is presented in Appendix 2.

In general, these data are in exceptionally good agreement with the corresponding costs presented in Annex D. Some errors have been detected in the Annex D data and have been or are being corrected. These discrepancies were in the cost of ammunition for existing weapons only and no errors were detected in the cost data presented in Annex D for new weapons and ammunition. The omission of six months of war reserve ammunition in a few of the figures presented in Annex D account for the remaining large differences between the two sets of costs data.

The graphical data in Appendix 1, this annex, are presented to facilitate interpolation between data points and computerization of the equations will facilitate the calculation of new cost data for any variation of the parameters desired.

5. (U) Parameter Variations and Sensitivity Analysis. Analysis of the data shown in the table below indicates that ammunition costs represent more than 75% of total system costs for total Army rifle replacement with the rifle for the FY67-80 period considered in the study. It is thus quite evident that ammunition usage rates as well as unit cartridge costs (including packaging) are by far the most important of the cost parameters.

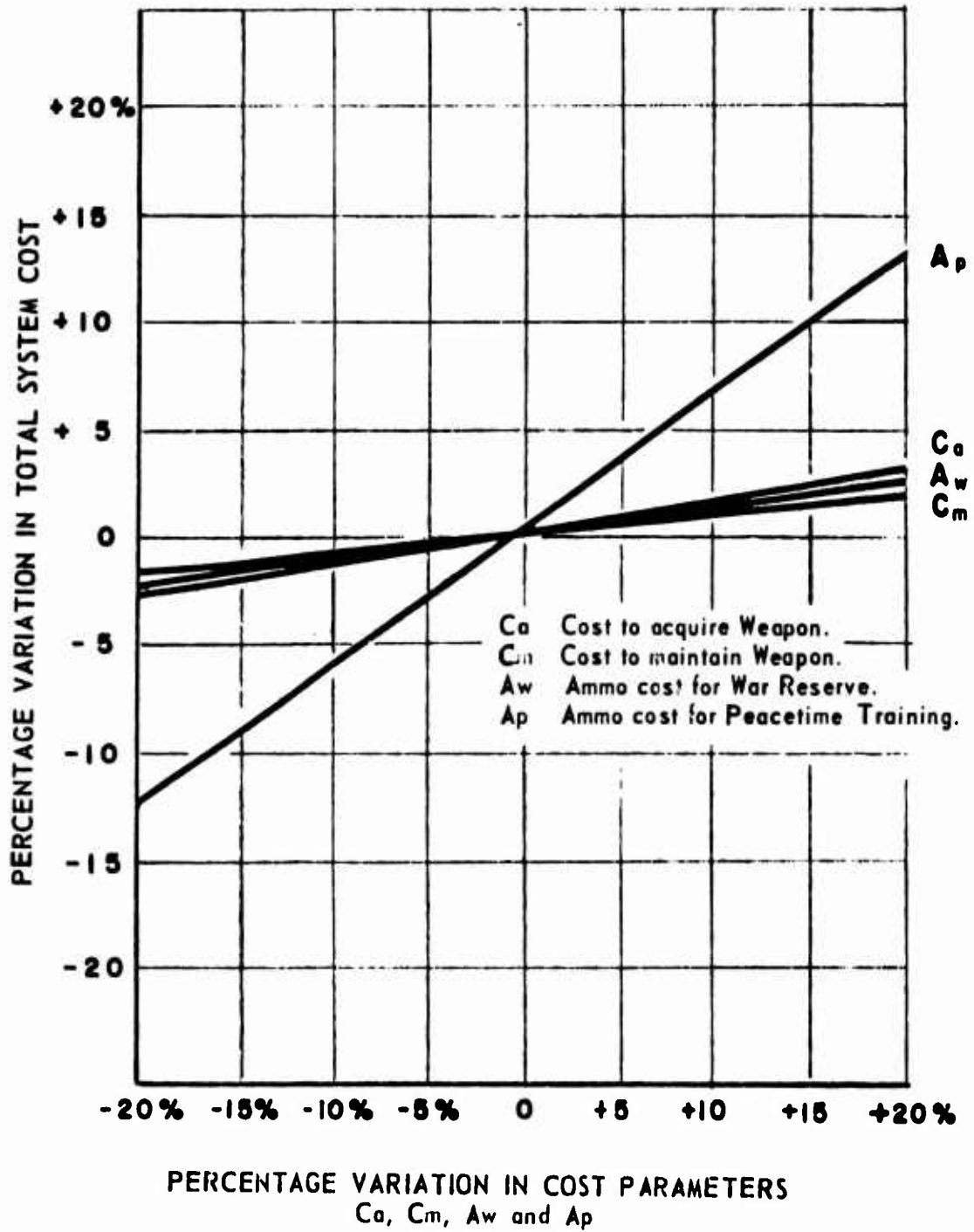
Costs to Acquire, Maintain and Support Total Army Quantity
of Rifles (FY67-80 Including 6 mos War Reserves)

Description of Costs	Parameters	Costs
Weapon Acquisition	$W_1 C_a$	\$204,500,000
Weapon Maintenance	$.6 W_p C_m Y$	136,900,000
Ammo for War Reserve	$W_f A_w$	191,710,000
Ammo for Facilities	C_f	8,000,000
Ammo for Peacetime	$W_f A_p Y$	<u>939,180,000</u>
	TOTAL	\$1,480,290,000

Figure 1, which shows the sensitivity of total system cost to variations in each of the four principal cost parameters A_p , A_w , C_a and C_m , dramatically illustrates that the total cost is much more sensitive to variations in A_p (i.e., ammunition cost for peacetime training in \$/wpn/yr) than it is to any of the other three cost parameters. Since A_p consists essentially of the product of P_a (i.e., peacetime training ammunition usage rate in rds/wpn/yr) and U (unit cartridge cost), one can say that from a total cost point of view, these latter two cost factors are the most important.

Although the data shown in Figure 1 pertain to a specific weapon system, the conclusions regarding the extreme importance of certain cost parameters are quite general for any of the small arms weapons systems considered in this study and are more particularly true for machineguns as a result of their higher rates of ammunition usage.

FIG 1
 SENSITIVITY OF TOTAL ΔC RIFLE SYSTEM
 COST TO VARIATIONS IN COST PARAMETER VALUES



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Having arrived at the conclusion stated above, it is now possible to illustrate the manner in which one might analyze the significance of differences in total costs for the principal competing weapon systems in relation to the uncertainties associated with the specific values chosen for the important cost parameters.

Figure 2 portrays the variation of total system cost as a function of simultaneous variations in unit cartridge costs (U) and peacetime ammunition allowance rate (P_a) for the "A", "B" AND "C" rifles. This diagram considers the maximum possible variations in U and P_a for each system to be $\pm 20\%$. This, in turn, means a maximum possible variation of $\pm 20\%$ in A_v and of $+ 44\%$ and $- 36\%$ in A_p .

Many conclusions can be drawn from the curves shown in Figure 2. Most importantly, it is noted that there is some overlapping of total costs of the various rifle systems. For the variations in P_a and U considered, **A** costs vary from 1.56 to 3.0 billions of dollars, whereas **B** rifle costs vary between 1.1 and 1.93 billions of dollars. These data also show that for the particular values of P_a and U used in this study, total costs for **A** are approximately 50% higher than for the **B** rifle (i.e., 2.21 vs 1.48 billions). However, purely from a hardware cost point of view, the **A rifle** could be competitive with either the **B** or **B'** rifles if the values of P_a and U for the **A** were both

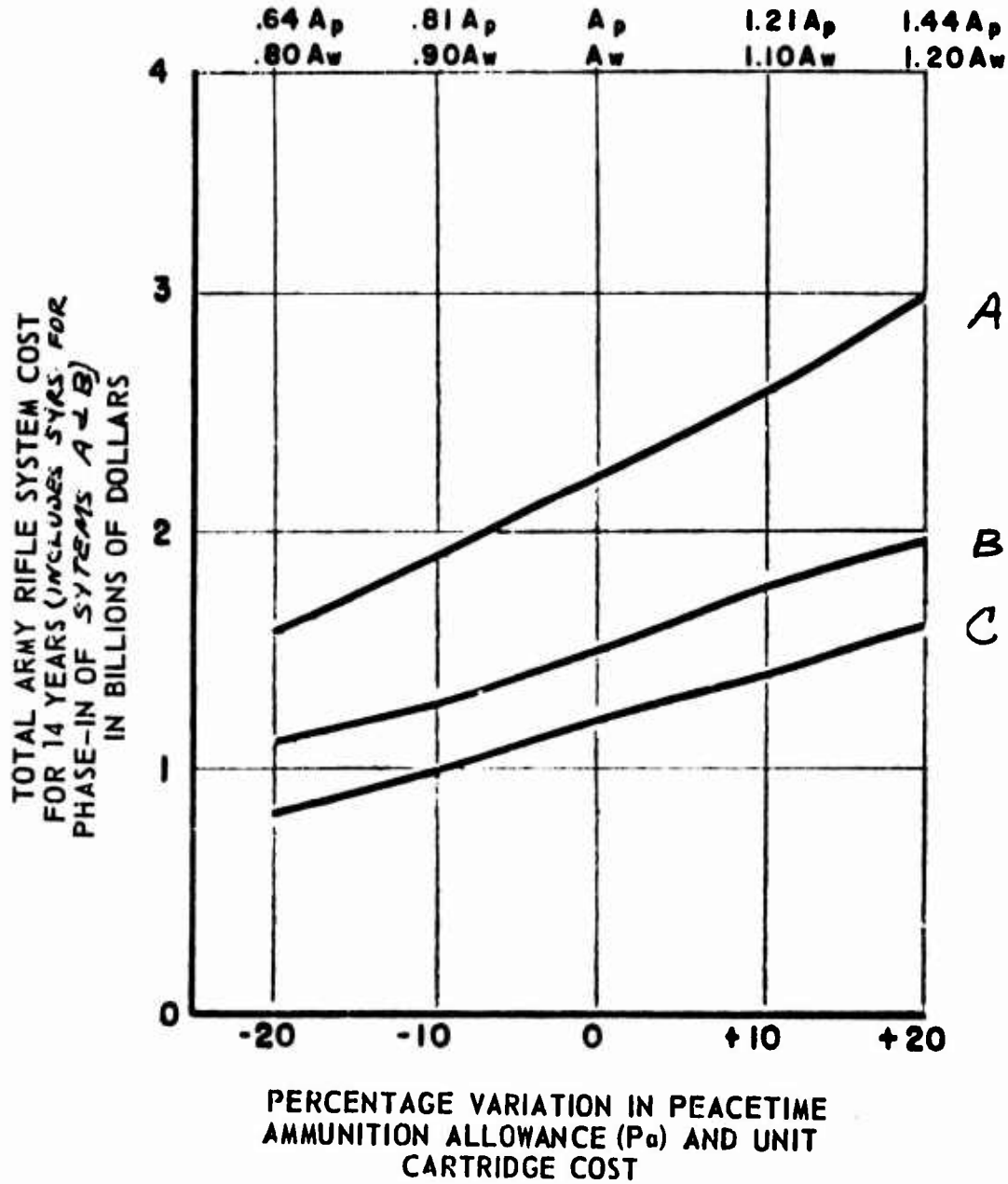
overestimated by approximately 8 to 20% while, for the B rifles, these parameters were underestimated by approximately 2 to 18%. Thus, the significance of the difference between the two rifle system costs would depend upon one's judgment regarding the possible degree of uncertainty of the specific values used in the cost study.

6. Conclusions and Recommendations. In view of the extreme importance of the various ammunition usage rates and unit cartridge costs to total system costs, it is recommended that further study be made of the specific values used in these calculations if total system costs are to be an important criteria in the overall SAWS study. If necessary, these ammunition parameters should be refined and new systems costs determined on the basis of the revised parameter values.

The required calculations can be completed at the Headquarters, U.S. Army Weapons Command within a very short time after the revised data are received since comparison of the systems costs as presented in Annex D and E validate the computerized methodology.

FIG. 2
 VARIATION IN TOTAL RIFLE SYSTEM COSTS
 WITH VARIATIONS IN IMPORTANT AMMUNITION
 PARAMETERS - P_a AND U
 (Considers 14 years for each system, for comparative purposes
 time frame FY 71-84)

spans



Appendix 1 - Nomenclature

For Data Sheets:

- CMN - Cost to maintain new weapon each year.
- CAN - Cost to acquire new weapon.
- CFN - Cost for ammunition manufacturing facilities for new weapons.
- CD - Cost for development of weapon system. (NOTE: Latter 2 costs are those which are not already included in hardware costs.)
- WFO - Total (maximum) number of old (o.e., existing) weapons in the inventory.
- WFO - Total (maximum) number of old weapons in the field or in hands of troops.
- CMO - Cost to maintain old weapon each year.
- APO - Worldwide average cost rate of ammunition usage for old weapon in peacetime (in \$/wpn/yr).
- AWO - Worldwide average cost rate of ammunition usage for old weapon for first six months of war (in \$/wpn).
- YT - Length of transition period in years (i.e., number of years required to phase-in the new weapon and phase-out the old).
- YBT & YAT - Number of years to be considered before transition period and after the transition period, respectively.
- WPN - Total number of new weapons to be produced for Army inventory.
- WFN - Total number of new weapons to be fielded (i.e., in the hands of troops).
- APN - Worldwide average cost rate of ammunition usage for new weapon in peacetime (in \$/wpn/yr).
- AWN - Worldwide average cost rate of ammunition usage for new weapon for first six months of war (in \$/wpn).

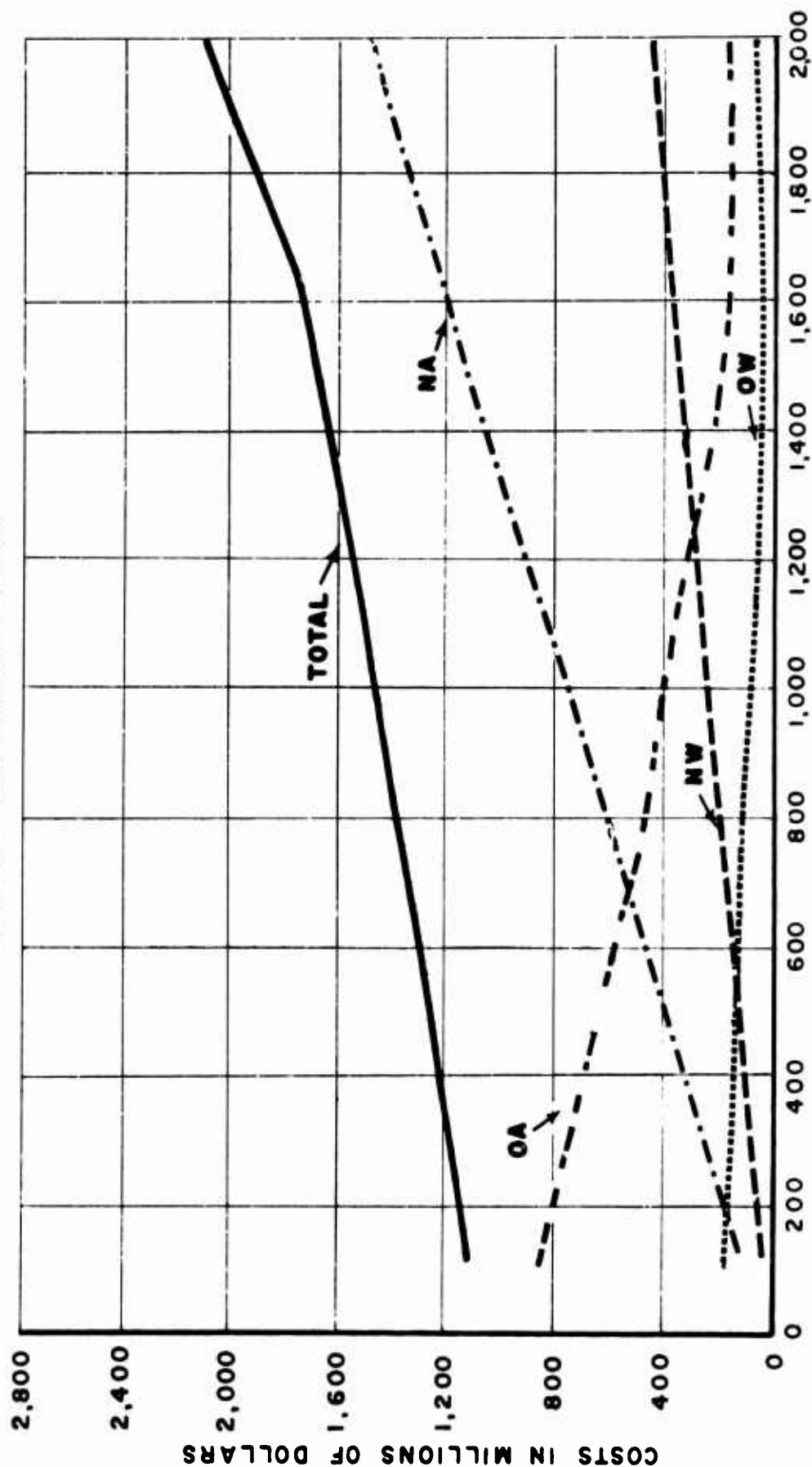
Appendix 1 - Nomenclature (Cont'd)

For Charts:

- NW - New weapon.
- OW - Old (existing weapon.
- NA - New ammunition (i.e., ammo for new weapons).
- OA - Old ammunition (i.e., ammo for old weapons).
- TOTAL - Total costs for all weapons and ammunition.

CASE I. RIFLE B - 5.56 mm

COSTS VS. QUANTITIES



REV 1 WEAPON QUANTITIES IN THOUSANDS

EXISTING RIFLE> (M1-M14-M16)

MPO UNITS	MFO UNITS	CMO DOLLARS	APD \$/M/YR	AMO \$/M/YR/2
1199235.	13.00	55.00	0.00	0.00

REPLACES M14/M1 CASE 1

CD,S	YBT,YRS
0.00	0.00

VARIABLES

MPO UNITS	CMN DOLLARS	CAN DOLLARS	CFM DOLLARS	YT YEARS	YAI YEARS	MFM UNITS	APM \$/M/YR	AMM \$/M/YR/2
100000.	14.21	153.22	0.00	2.00	11.20	40876.	67.00	159.00
200000.	14.00	150.10	0.00	3.00	11.00	135019.	67.00	159.00
400000.	13.90	148.73	0.00	3.10	10.90	160904.	67.00	159.00
600000.	13.27	139.76	0.00	3.70	10.30	321559.	67.00	159.00
800000.	12.95	135.28	0.00	4.00	10.00	401007.	67.00	159.00
1000000.	12.95	135.05	770395.99	4.10	9.90	479071.	67.11	159.00
1200000.	12.94	134.60	231107.98	4.29	9.71	632240.	67.32	159.00
1400000.	12.93	134.15	365194.96	4.48	9.52	785008.	67.53	159.00
1600000.	12.92	133.70	5342771.95	4.67	9.33	939376.	67.74	159.00
1800000.	12.91	133.25	6933503.94	4.87	9.13	1092948.	67.95	159.00
2000000.	12.90	132.94	800000.00	5.00	9.00	1199235.	68.10	159.00
1600000.	12.90	132.80	8474355.71	5.06	8.94	1246513.	68.17	159.00
1600000.	12.89	132.35	10015147.90	5.25	8.75	1400062.	68.34	159.00
2000000.	12.88	131.90	1155934.90	5.44	8.56	1553650.	68.59	159.00

REV. 1

REPLACES M14/M1 CASE 1

WPN, UNITS	COSTS, MILLIONS OF DOLLARS						TOT SYSTEM
	NEW WEAPON	OLD WEAPON	NEW AMMO	OLD AMMO			
100000.	26.070	150.167	60.714	667.563		1132.713	
	42.613	151.638	134.663	630.565		1159.694	
200000.	80.513	148.572	159.956	613.214		1172.269	
400000.	94.591	130.067	313.161	706.520		1246.374	
500000.	114.260	121.196	387.363	658.166		1260.985	
600000.	136.732	112.062	461.204	606.756		1316.753	
800000.	181.295	94.016	607.965	511.156		1346.433	
1000000.	225.353	76.274	753.460	415.183		1470.269	
1200000.	266.905	56.831	697.731	320.636		1546.304	
1400000.	311.954	41.688	1040.699	226.117		1622.450	
	341.454	41.999	1136.691	164.895		1667.230	
1600000.	354.498	42.355	1162.365	166.650		1746.000	
1800000.	396.540	43.510	1322.710	173.202		1835.962	
2000000.	436.079	44.666	1461.716	174.554		2146.015	

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13. ABSTRACT This report is a compilation of five automated mathematical life cycle cost models for small arms weapons and combat vehicles. Each of these methodologies consist of a mathematical model and nomenclature lists. Some of the models include samples of computer printouts, input data, resultant costs, derivations of pertinent relationships as well as some of the FORTRAN computer programs employed, and other explanatory material. The first model presented is the WECOM Combat Vehicle Life Cycle Cost Model. This model is the most highly developed of the five and is described and presented in the most comprehensive manner. This methodology, which develops costs according to two different schemes of categorization, simultaneously, consists of some 100 equations and approximately 110 elements or sets of input data, schedules and cost factors.			

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Automated Cost Model						
Life Cycle Costs						
Weapon System Costs						
Combat Vehicle Costs						
Small Arms Weapons Costs						
Mathematical Models						

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