LIFE CYCLE TIME AND COST ESTIMATES FOR SQUAD AUTOMATIC WEAPON SYSTEM CANDIDATES

BY
R. F. SCHWEGLER

JANUARY 1975

SMALL ARMS WEAPONS
SYSTEMS DIRECTORATE

Distribution Unlimited

GENERAL THOMAS J. RODMAN LABORATORY
ROCK ISLAND ARSENAL
ROCK ISLAND, ILLINOIS 61201

LIFE CYCLE TIME AND COST ESTIMATES

FOR

SQUAD AUTOMATIC WEAPON SYSTEM CANDIDATES

BY

R. F. SCHWEGLER

JANUARY 1975

SMALL ARMS WEAPON SYSTEMS DIRECTORATE
RODMAN LABORATORY
ROCK ISLAND ARSENAL
ROCK ISLAND, ILLINOIS 61201

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

(14) RIA-R-TR-75-030

1. REPORT NUMBER
2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER

(6) 4. TITLE *(and Subtitle)*

Life Cycle Time and Cost Estimates for Squad Automatic Weapon System Candidates,

5. TYPE OF REPORT & PERIOD COVERED

6. PERFORMING ORG. REPORT NUMBER

(10) 7. AUTHOR(s)

R. F. Schwegler

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS

GEN Thomas J.Rodman Laboratory
Rock Island, IL 61201

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS

Small Arms Weapon Systems Directorate
SARRI-LS-C

(11) 12. REPORT DATE

January 1975

13. NUMBER OF PAGES

390

(12) 392 p.

14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*

15. SECURITY CLASS. *(of this report)*

UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

Distribution Unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Squad Automatic Weapon (System)
SAW
SAWS
Life Cycle Cost
Life Cycle Schedule
Trade Off Determination
Advanced Development Time & Cost Estimate
Engineering Development Time & Cost Estimate

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report documents for future reference the steps taken to prepare Life Cycle Cost and Schedule Estimates for the Squad Automatic Weapon System (SAWS) Program. All costs are given in FY75 dollars. The body of the report addresses a program which remains in Advanced Development from FY75 until FY77. The period encompassing FY77, FY78 and FY79 is the time frame for Engineering Development. This is followed by a 12 month Limited Production period and a subsequent Full Scale Production period.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE *(When Data Entered)*

408 247

19. Key Words (Cont'd)

Limited Production Cost Estimate
Full Scale Production Cost Estimate
SAWS Development Program.

20. Abstract (Cont'd)

The Appendix gives the detailed Cost and Schedule Estimates from which the final Trade Off Determinations and Program Costs were derived. Five weapon mechanism concepts and six types of ammunition are approached in a variety of combinations.

TABLE OF CONTENTS

FORWARD

This report is intended to document the steps taken to prepare Life Cycle Cost and Schedule Estimates for the Squad Automatic Weapon System (SAWS) Program.

The original basis for estimation assumed that Advanced Development had been essentially completed and a Weapon Mechanism had been selected to start Engineering Development 1 February 1975. All costs were to be given in FY75 dollars.

On 4 December 1974 the program was redirected to remain in Advanced Development until FY77 (1 October 1976) for the basic purpose of investigating the potential of 7.62mm and 5.56mm ammunition to meet the SAWS requirement.

Following this redirection the SAWS Program was re-evaluated. A Decision Risk Analysis based on the original Engineering Development estimates indicated that most likely elapsed time for Engineering Development was 36 months. Thus the period encompassing FY77, FY78 and FY79 was established as the time frame for Engineering Development.

Due to a shortage of time and existing funding guidance it was decided to prepare a representative Life Cycle Cost and Schedule Analysis in accordance with the new directive and based on the following assumptions:

1. Mechanism-XM235
2. Contractor from high cost area.
3. Advanced Development of the weapon mechanism in 7.62mm NATO ammunition.
4. Investigate 5.56mm ammunition for potential to meet SAWS requirements.

In the following report the Costs and Schedules shown in the first section are those resulting from evaluating the SAWS program as redirected 4 December 1974.

In the Appendix are given the original Life Cycle Cost and Schedule Estimates from which the Trade-Off Determinations and the Redirected Program Costs were derived.

When comparing and tracing the Costs and Schedules contained herein the reader must keep in mind the changes in constraints imposed by the redirected program, especially the changes in performance time, and quantities produced in Limited and Full Production.

RATIONALE FOR SAWS LIFE CYCLE SCHEDULE AND COST ESTIMATES

The estimates of SAWS Schedule and Life Cycle Cost have been prepared in accord with the following regulations:

a. AR 37-18 - Weapon/Support Systems Cost Categories and Elements.

b. AR 70-1 - Army Research and Development.

c. AR 70-32 - Work Breakdown Structures for Defense Material Items.

d. MIL-STD-881 - Work Breakdown Structures for Defense Material Items.

e. Letter of Instructions (LOI) for Implementing the New Material Acquisition Guidelines, dated 23 August 1972.

The bases for the estimates were derived by studying the various contending mechanisms and comparing the results of validation tests of those mechanisms against the requirements as set forth in the Material Need (MN).

After these comparisons were made the deficient areas of the respective weapons were determined and a tentative list was made of tasks necessary to correct the noted deficiencies. Estimates were then made of the types of manpower and the number of man-hours necessary to accomplish those tasks.

Subsequently the required milestone sequence was established and, using the estimates of man-hours, a tentative schedule was determined. The tentative schedule was then revised to insure continuity of effort and efficient use of men and material.

Advanced Development Tasks are identified as:

Task 01-Complete Concept Formulation Package Related Activities.

Task 02-Hardware Design Verification.

Task 03-Program Administration.

Task 04-7.62mm Investigation

Task 05-5.56mm Investigation

Task 06-RAM and Quality Control.

Task 07-System Safety.

Task 08-Human Factors and Reliability Engineering.

Task 09-Lethality Determination.

Task 10-Steel Case Technology.

Task 11-Aluminum Case 7.62mm.

Engineering Development Tasks involve:

a. Finalize weapon configuration.

b. Prepare the Technical Data Package.

c. Fabricate prototype weapons under contract.

d. Conduct Contractor Acceptance Test.

e. Conduct Development Tests and Operational Tests.

f. Conduct In-Process Review.

g. Type Classify for Limited Production.

Limited Production Tasks include:

a. Establish a contractor production facility capable of producing a specified number of weapons per month.

b. Produce under contract a specified quantity of weapons to be used for Development and Operational Testing.

c. Conduct and evaluate Development and Operational Tests.

d. Conduct In-Process Review.

e. Type Classify for Full Scale Production.

Full Scale Production Tasks include:

a. Establish a contractor production facility capable of producing at a specified rate significantly greater than the rate for a Limited Production Facility.

b. Produce a specified quantity of weapons.

c. Establish Initial Operational Capability at a specified date.

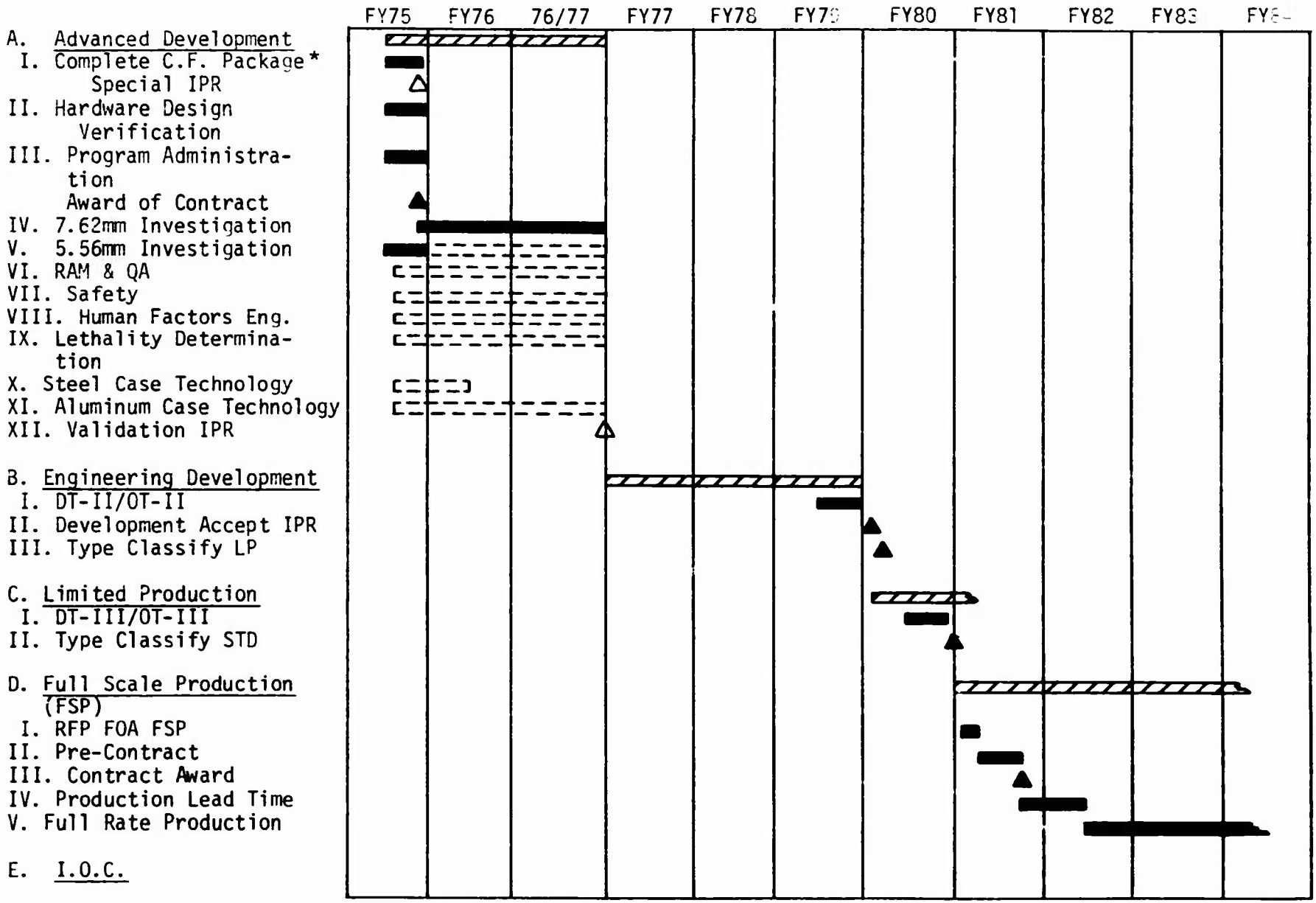
Figure 1 depicts the Schedule and Milestones for the redirected program as estimated and applies to either 6.0mm or 7.62mm caliber.

Also considered under the redirected effort was the effect of selecting 5.56mm ammunition for the SAWS.

Based upon the 6.0mm estimates the Engineering Development period would increase from 3 years to 4 years and the costs would increase accordingly.

Figure 2 depicts the estimated Schedule and Milestones for the redirected program in any 5.56mm ammunition.

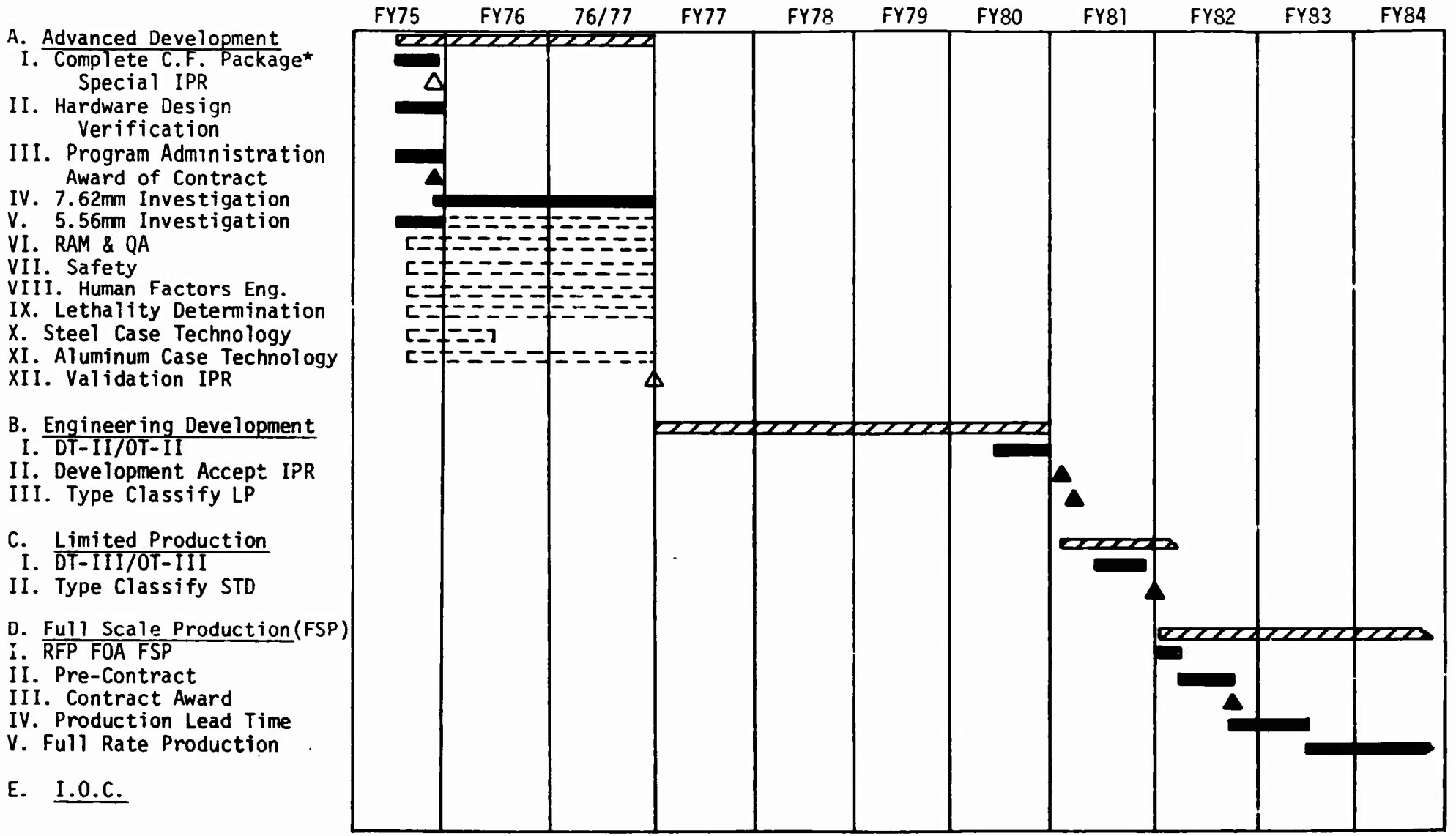
SAWS WEAPON PROGRAM
SCHEDULE FOR 6.00MM/7.62MM



*C.F.P. Concept Formulation Packages

FIGURE 1

SAWS WEAPON PROGRAM
SCHEDULE FOR 5.56MM



*C.F.P. Concept Formulation Packages

FIGURE 2

RATIONALE: ADVANCED DEVELOPMENT
TIME AND COST ESTIMATE

DA Teletype 191750Z, Dec 75 directed the SAWS Program to remain in Advanced Development into FY77 with the specific objective of performing all necessary experimental and analytical analysis to completely define the potential of 7.62mm caliber systems and 5.56mm caliber systems for use as SAWS.

A program addressing the scope of work directed by the teletype is contained in Program Plan 1. The funding requirements to support that program are estimated at $2,360,000 for the remainder of FY75, $3,620,000 for FY76, and $700,000 for the FY76/77 transition period.

Subsequently, informal guidance was received relative to this effort as follows:

FY75 - $915,000

FY76 - $1,900,000

FY76/77 - $700,000

On the basis of this guidance the program mentioned above was reviewed to further evaluate and determine those activities which are essential for the decision data base and minimized risk in successfully meeting program objectives.

The essential activities for the program are considered to be preparation of the Concept Formulation Package, mechanism analysis and hardware design verification of the DT-I/OT-I mechanisms, program administration, RAM, safety, human factors engineering, and the development of experimental lethality data to rank and quantify expected performance of the various SAWS contenders.

Preparation of the Concept Formulation Package, hardware design verification, and experimental lethality data are essential for the forthcoming In-Process Review. Therefore the first two activities have been funded and the lethality investigation has been initiated utilizing available funds.

Relative to the technical activities an assessment of risk indicates that the lowest risk mechanism approach is to utilize the 7.62mm standard family of cartridges. The potential payoff to the program from improved 7.62mm ammunition is judged to be minimal.

Similarly the utilization of 5.56mm standard, M193 etc., cartridges in a mechanism has several potential problem areas which include the compatibility of the M193 projectile in a machine gun bore and the power available in the family of cartridges to power a mechanism reliably through the required operational environments. The maximum payoff in 5.56mm utilization appears to be in the area of improved ammunition.

Thus considering risk and maximum payoff, investigation of 7.62mm mechanisms and quantification of the potential of 5.56mm ammunition as a SAWS caliber are considered to be the essential activities and form the bases for the recommended Advanced Development Progra mshown in Program Plan 2.

This recommended progra m, designated Priority I, is the program incorporated in the Life Cycle Time and Cost Estimate.

Priority II and Priority III efforts have been identified for reference only under Program Plan Supplement.

Figure 3 on the following page summarizes Advanced Development costs and the priority assigned to each task.

Following sections discuss in detail the above Program Plans, i.e.;

1. Program Plan 1
2. Program Plan 2
3. Program Plan Supplement

ADVANCED DEVELOPMENT COST DATA

		FY75 REQ	FY75 RIA	FY75 FA	FY75 CONT	FY75 OGA	FY76 REQ	FY76 RIA	FY76 FA	FY76 CONT	FY76 OGA	FY76T REQ	FY76T RIA	FY76T FA	FY76T CONT	FY76T OGA
1. CFP[1]	I	100	80	20	0											
2. Hdw Dsn VRF[1]	I	93	38		55											
	II	45			45											
3. Prog Admin	I	120	100	20			370	290	80			190	145	45		
4. 7.62	I	390	40	20	330		745	120	25	600		190	30	10	150	
	II	135	40	95			410		40	370						
5. 5.56	I	590	100	255	235		625	60	165	400		190	30	10	150	
	II	390	40	20	330		745	120	25	600						
6. RAM	I	40	20	20			200	160	40			70	55	15		
7. Safety	I	15	15				30	30				10	10			
8. HFE	I	20				20	40				40	50				50
9. Lethality[2]	I	50		10		40	80		20		60					
10. Steel Case[2]	II	70	10	60			75	10	65							
11. Ai Case[3]	III	305	20	285												
12. ADVT-G	I						240	240								
	II						60	60								
TOTALS	I	1403	393	330	620	60	2330	900	330	1000	100	700	270	80	300	50
	II	655	90	190	375		1290	190	130	970	0					
	III	305	20	285	0		0	0	0	0	0					

[1]Priority 1 efforts are funded under FY75 program received.
[2]20K to initiate task funded under FY75 program received
[3]Cmdr FA recommends Pr I - Task is not considered essential to objectives of DA TT and thus is retained as Pr II.

FIGURE 3

PROGRAM PLAN 1

SAWS ADVANCED DEVELOPMENT PHASE

CONTINUATION OR SUPPORTING SHEET (AMCR 11-4, Vol. 4)	PAGE OF PAGES	DATE 28 January 1975
	PRON	AMCMS CODE

TO: AMSAR-RD FROM: SARRI-LS

PROJECT NO: 1J663607D640

PROJECT TITLE: Squad Automatic Weapon Advanced Development (Program Plan 1)

1. The following plan is the recommended FY75 effort based on the redirection that the SAW program is to stay in the Advanced Development category through a balance of FY75, FY76, FY76 transition, and into FY77. Additional guidance received was that equal consideration should be given to the development of hardware and demonstration of potential of both 5.56 and 7.62mm as calibers for the SAW application.

2. Anticipated Phase Slippages: N/A

3. Funding Level Adjustments: N/A

4. Work to be Performed:

a. Task 01 - Complete Concept Formulation Package Related Activities $100,000

The activities within this task include completion of the TOD analysis, support to the ARMCOM activities in conducting the final TOD, conduct and completion of the TOA, BTA, and support to the IPR. Also included are those activities required to support USAIS in the conduct and completion of the COEA.

b. Task 02 - Hardware Design Verification $138,000

The activities within this task are to provide continuity with the hardware developers during the completion of the ARMCOM TOD and the Concept Formulation Package. The recommended hardware modifications to correct problem areas encountered during DT-I/OT-I will be finalized by completing detailed designs and providing in-depth analyses of the expected improvements and the interface with other components within the mechanism. The completion of this element coincides with the completion of the ARMCOM TOD. At this point in time the mechanism selected by the ARMCOM TOD for further development will be conducted in this task through fabrication of hardware and testing of that hardware to validate the design and analysis process.

c. Task 03 - Program Administration $120,000

Normal program administration activities such as updating plans, demonstrations, briefings, coordination and project management will be included in this task area. The program plan calls for development of the SAW system through contractual activities. To accomplish this it is necessary to prepare a Secretarial D&F, a Request For Proposal, evaluation of proposal submissions, and award of contract. Conduct of these administrative and technical actions to arrive at a contract in FY75 are included in this area.

d. Task 04 - 7.62mm Investigation $525,000

(1) The principal activity will be a contract for development of a 7.62mm system utilizing standard M80 family of cartridges. To accomplish this the mechanism identified as having the highest potential during previous SAW activities will be utilized to design, develop and test a 6mm mechanism. The objective of this activity is to identify the minimum weight achievable and to assess the level of performance as a baseline for continuing design activities and program decisions.

(2) Companion with the weapon work will be the investigation of ammunition concepts to identify the potential for improved performance that would upgrade the current M80 family of cartridges and/or 7.62mm as a caliber for SAW utilization.

e. Task 05 - 5.56mm Investigations $980,000

(1) Activities within the SAW program to date have indicated the potential for improvement in ammunition effectiveness and have also indicated areas of concern relative to the utilization of the M193 cartridge as a machine gun cartridge and the achievement of reliability with a mechanism firing a 5.56mm cartridge. This task will identify ammunition concepts and demonstrate their potential as well as investigating the M193 cartridge compatibility with the machine gun role, evaluate and design a bore configuration to be used in a 5.56mm machine gun, investigate powering of a 5.56mm mechanism, and initiate link development. M16 compatibility with ammunition concepts identified in this task will be performed in the future rifle program. Coordination of this compatibility evaluation will be within this subtask.

(2) The guidance provided requires investigation of a 5.56mm system for SAW application. Using the same mechanism as will be used to investigate 7.62 a contract will be prepared for award such that on determination of potential from subtask (1) above the contract can be awarded so that the activities in developing and designing this mechanism can run parallel with and companion to Task 04.

(3) Ammunition development of the cartridge selected as having the most potential will also be accomplished in parallel with the weapon development under this subtask. The concept or concepts pursued in this development and design will be those resulting from subtask (1).

f. Task 06 - RAM and Quality Control $ 40,000

RAM analysis will be conducted on the design and test activities to isolate problem areas, evaluate potential performance, and determine potential reliability performance. The current weapon, ammunition and system RAM plans will be updated and maintained during this period of time.

g. Task 07 - System Safety $ 15,000

Provide a safety analysis of design activities and analysis of test results to maintain an independent assessment of the safety aspects of the system.

h. Task 08 - Human Factors and Reliability Engineering $ 20,000

During the conduct of previous SAW activities advancements have been made in this area relative to the designation of design and evaluation criteria. Proper application of these criteria have been shown to make significant differences in system performance. This task will provide the consultation and coordination with the Human Engineering Laboratory necessary for the application of HFE factors during the design and evaluation process.

i. Task 09 - Lethality Determination $ 50,000

During the conduct of activities in support of the COEA it has been determined that lethality data provided for analysis of the relative effectiveness of these systems has been extrapolated from minimal firings rather than data points empirically determined. A limited test data indicates that these extrapolations cannot be verified by actual test data and it is thus necessary to initiate this task to establish data points for a valid relative ranking of the systems for terminal performance.

j. Task 10 - Steel Case Technology $ 70,000

The steel case activities under the 6mm program have resulted in significant advances in technology relative to the utilization of steel as a cartridge case material and have indicated the feasibility of utilizing steel cartridge cases. Under this task steel case technology will be applied in establishing design criteria for application of steel as a cartridge case material in a caliber of choice.

k. Task 11 - Aluminum Case 7.62mm Ammunition $ 305,000

The principal shortcoming of 7.62 as a caliber is its weight. The system weight at the present time is approximately 7 lbs heavier than required. The application of aluminum can reduce this overweight condition to approximately 3 lbs. This task would involve the application of the aluminum case advancements and technology derived from 6.2 efforts to the 7.62 system.

CONTINUATION OR SUPPORTING SHEET (AMCR 11-4, Vol. 4)	PAGE OF PAGES	DATE 28 January 1975
	PRON	AMCMS CODE

TO: AMSAR-RD FROM: SARRI-LS

PROJECT NO: 1J663607D640

PROJECT TITLE: Squad Automatic Weapon Advanced Development (Program Plan 1)

1. The following plan is the recommended FY76 effort based on the redirection that the SAW program be in Advanced Development category into FY77. This plan also accommodates equal development of hardware including ammunition and demonstration of potential for both 5.56mm and 7.62mm as calibers for the SAW application.

2. Anticipated Phase Slippages: NA

3. Funding Level Adjustments: NA

4. Work to be Performed:

a. Task 03 - Program Administration $ 370,000

(1) Normal program administration activitues such as program documentation, program plans and coordination with other interested agencies will be performed.

(2) The Validation IPR scheduled for January 1975 was replaced by a special IPR and the Validation IPR rescheduled for the FY76 transitionary period. To support the Validation IPR will require an updated concept formulation package including TOD, BTA, DRA and IGCE. In addition support to the user will be required in conduct of his COEA. An Integrated Logistics Support Plan will also be required. The necessary analysis and documentation will be provided from this subtask.

b. Task 04 - 7.62mm Investigation $1,155,000

(1) Hardware development was initiated in FY75. The FY76 effort is a continuation of that activity that will culminate in the delivery of two prototype weapons for engineering type tests to evaluate the predictions of the potential of this system and to establish data to estimate the reliability at this level of development.

(2) Ammunition development was initiated in FY75. The FY76 effort is a continuation of that activity and includes the delivery of 300,000 rounds of ammunition to support hardware development and provide a initial quantity for follow on engineering development activities. The conduct of this task is dependent upon the adoption of a cartridge other than the standard family of ammunition now available.

c. Task 05 - 5.56 Investigation $1,370,000

(1) Hardware development was initiated in FY75. The FY76 effort is a continuation of that activity that will culminate in the delivery of two prototype weapons for engineering type tests to evaluate the predictions of the potential of this system and to establish data to estimate the reliability at this level of development.

(2) Ammunition development was initiated in FY75. The FY76 effort is a continuation of that activity and includes the delivery of 300,000 rounds of

ammunition to support hardware development and provide an initial quantity for follow on engineering development activities. The conduct of this task is dependent upon the adoption of a cartridge other than the standard family of ammunition now available.

d. Task 06 - RAM & QA $ 200,000

RAM analysis of design and test activities and the update and maintenance of the weapon, ammunition and system RAM plans will be conducted. In addition test data will be analyzed to support an updated CFP.

e. Task 07 - System Safety $ 30,000

Continued activities to provide a safety analysis during the design activities and analysis of test results to determine the safety aspects of the system.

f. Task 08 - Human Factors and Reliability Engineering $ 40,000

Provide consultation and coordination by the Human Engineering Laboratory for the application of HFE factors during the design and evaluation process.

g. Task 09 - Lethality Determination $ 80,000

Establishment of a data base was initiated in FY75 to obtain actual performance data as a basis for comparing the lethality of the various projectiles under consideration for the SAW role. The activity under this task will be to complete this data collection and analysis process.

h. Task 10 - Steel Case Technology $ 75,000

Continue steel case technology to establish design criteria for application of steel as a cartridge case material in a caliber of choice.

i. Task 12 - Limited Advanced Development Verification Test-Government (ADVT-G) $ 300,000

In order to demonstrate the potential of the systems that have resulted from the FY75 and FY76 program will be necessary to conduct a limited test to develop comparable data to that derived from the DT-I/OT-I conducted in FY74 and FY75. Of the funds shown $100,000 is for the procurement of ammunition and $200,000 is for test support.

CONTINUATION OR SUPPORTING SHEET (AMCR 11-4, Vol. 4)	PAGE OF PAGES	DATE 28 January 1975
	PRON	AMCMS CODE

TO: AMSAR-RD FROM: SARRI-LS

PROJECT NO: 1J663607D640

PROJECT TITLE: Squad Automatic Weapon Advanced Development (Program Plan 1)

1. The following plan is the recommended FY76 transition period effort for the Squad Automatic Weapon Program. The principal activities during this period will be the completion of the Advanced Development Verification Test-Government, the analysis of data and the preparation of supporting documentation for a Validation IPR.

2. Anticipated Phase Slippages: NA

3. Funding Level Adjustments: NA

4. Work to be Performed:

a. Task 03 - Program Administration $ 190,000

(1) Normal program administration activities such as program documentation, program plans and coordination with other agencies will be performed.

(2) Data analysis and documentation will be provided to support the Validation IPR. This will include an updated Concept Formulation Package including TOD, BTA, DRA, and IGCE, and support to the user in the conduct of a COEA.

b. Task 04 - 7.62 Investigations $ 190,000

Analysis of the ADVT-G test data will be conducted to support the data requirements for the CFP and Validation IPR.

c. Task 05 - 5.56 Investigations $ 190,000

Analysis of the ADVT-G test data will be conducted to support the data requirements for the CFP and Validation IPR.

d. Task 06 - RAM and QA $ 70,000

RAM analysis of the design and test activities and the update and maintenance of the weapon ammunition and system RAM plans will be conducted. Analysis of the test data in support of an updated CFP will also be conducted.

e. Task 07 - Safety $ 10,000

Analysis of the weapon designs under consideration relative to safety to provide inputs required for the CFP.

f. Task 08 - Human Factors Evaluation $ 50,000

To provide an analysis of the ADVT-G and to conduct as necessary supplemental tests to analyze the interface between the weapons under consideration. This data will also be provided to support the CFP.

PROGRAM PLAN 2

SAWS ADVANCED DEVELOPMENT PHASE

CONTINUATION OR SUPPORTING SHEET (AMCR 11-4, Vol. 4)	PAGE OF PAGES	DATE 28 January 1975
	PRON	AMCMS CODE

TO: AMSAR-RD FROM: SARRI-LS

PROJECT NO: 1J663607D640

PROJECT TITLE: Squad Automatic Weapon Advanced Development (Program Plan 2)

1. The following plan is the Priority 1 effort for the third and fourth quarters of FY75. This plan is a compromise between the guidance for technical scope in DA Teletype 191750Z Dec 74 and the tentative funding guidance provided by AMSAR-RDG. The activities in this plan contain the essential program administrative activities, the investigation of technical areas which are essential for program decisions such as lethality for cartridges under consideration, and gun weapon interface, and initiates the development of weapon mechanisms in 7.62 which have been identified as having a high probability of success from a technical viewpoint. The principal questions to be addressed during the technical investigation are the minimum weight that can be achieved with the 7.62 caliber systems and the maximum range potential obtainable with a 5.56mm cartridge that is compatible with the M16A1 Rifle.

2. Anticipated Phase Slippages: N/A

3. Funding Level Adjustments: N/A

4. Work to be Performed:

a. Task 03 - Program Administration $ 120,000

Normal program administration activities such as updating plans, demonstrations, briefings, coordination and project management will be included in this task area. The program plan calls for development of the SAW system through contractual activities. To accomplish this, it is necessary to prepare a Secretarial D&F, a Request For Proposal, evaluation of proposal submissions, and award of contract. Conduct of these administrative and technical actions to arrive at a contract in FY75 are included in this area.

b. Task 04 - 7.62mm Investigations $ 390,000

The guidance provided requires the investigation of minimum weight 7.62 system utilizing the standard M80 family of cartridges. To accomplish this, the mechanism identified as having the highest potential during previous SAW activities will be utilized to design, develop and test a 7.62 mechanism. The objective of this activity is to identify the minimum weight achievable and to assess the level of performance as a baseline for continued design activities. Two prototype weapons will be obtained for engineering type tests as required to validate expected performance predictions utilizing the M80 cartridge.

c. Task 05 - Improved 5.56mm Investigation $ 590,000

The objective of this task is to survey the current state of the art relative to available 5.56mm projectiles and to apply existing technology to further improve the performance of 5.56mm projectiles. Compatibility with existing mechanisms and potential for use in an automatic weapon will be a companion activity. Projectiles will be fabricated and tested to support investigations required to define expected

ballistics performance, ballistic match with tracer, improved tracer performance, and lethality. Companion activities will be undertaken to investigate potential problem areas in the gun ammunition interface area that were identified during previous SAW development activities. These areas include weapon powering and cartridge bore configuration interface.

d. Task 06 - RAM and Quality Control $ 40,000

RAM analysis will be conducted on the design and test activities to isolate problem areas, evaluate potential performance, and determine potential reliability performance. The current weapon, ammunition and system RAM plans will be updated and maintained during this period of time.

e. Task 07 - System Safety $ 15,000

Provide a safety analysis of design activities and analysis of test results to maintain an independent assessment of the safety aspects of the system.

f. Task 08 - Human Factors and Reliability Engineering $ 20,000

During the conduct of previous SAW activities advancements have been made in this area relative to the designation of design and evaluation criteria. Proper application of these criteria have been shown to make significant differences in system performance. This task will provide the consultation and coordination with the Human Engineering Laboratory necessary for the application of HFE factors during the design and evaluation process.

g. Task 09 - Lethality Determination $ 50,000

During the conduct of activities in support of the COEA it has been determined that lethality data provided for analysis of the relative effectiveness of these systems has been extrapolated from minimal firings rather than data points experimentally determined. Limited test data indicates that these extrapolations cannot be verified by actual test data and it is thus necessary to initiate this task to establish data points for a valid relative ranking of the systems for terminal performance.

CONTINUATION OR SUPPORTING SHEET (AMCR 11-4, Vol. 4)	PAGE OF PAGES	DATE 28 January 1975
	PRON	AMCMS CODE

TO: AMSAR-RD FROM: SARRI-LS

PROJECT NO: 1J663607D640

PROJECT TITLE: Squad Automatic Weapon Advanced Development (Program Plan 2)

1. The following plan is the Priority 1 FY76 effort based on the redirection that the SAW program be in Advanced Development category into FY77. This plan also accommodates equal development of hardware including ammunition and demonstration of potential for both 5.56mm and 7.62mm as calibers for the SAW application.

2. Anticipated Phase Slippages: NA

3. Funding Level Adjustments: NA

4. Work to be Performed:

a. Task 03 - Program Administration $ 370,000

(1) Normal program administration activitues such as program documentation, program plans and coordination with other interested agencies will be performed.

(2) The Validation IPR scheduled for January 1975 was replaced by a special IPR and the Validation IPR rescheduled for the FY76 transitionary period. To support the Validation IPR will require an updated concept formulation package including TOD, BTA, DRA and IGCE. In addition support to the user will be required in conduct of his COEA. An Integrated Logistics Support Plan will also be required. The necessary analysis and documentation will be provided from this subtask.

b. Task 04 - 7.62mm Investigation $745,000

(1) Hardware development was initiated in FY75. The FY76 effort is a continuation of that activity that will culminate in the delivery of two prototype weapons for engineering type tests to evaluate the predictions of the potential of this system and to establish data to estimate the reliability at this level of development.

(2) Ammunition development was initiated in FY75. The FY76 effort is a continuation of that activity and includes the delivery of 300,000 rounds of ammunition to support hardware development and provide a initial quantity for follow on engineering development activities. The conduct of this task is dependent upon the adoption of a cartridge other than the standard family of ammunition now available.

c. Task 05 - 5.56 Investigation $625,000

(1) Hardware development was initiated in FY75. The FY76 effort is a continuation of that activity that will culminate in the delivery of two prototype weapons for engineering type tests to evaluate the predictions of the potential of this system and to establish data to estimate the reliability at this level of development.

(2) Ammunition development was initiated in FY75. The FY76 effort is a continuation of that activity and includes the delivery of 300,000 rounds of

ammunition to support hardware development and provide an initial quantity for follow on engineering development activities. The conduct of this task is dependent upon the adoption of a cartridge other than the standard family of ammunition now available.

d. Task 06 - RAM & QA $ 200,000

RAM analysis of design and test activities and the update and maintenance of the weapon, ammunition and system RAM plans will be conducted. In addition test data will be analyzed to support an updated CFP.

e. Task 07 - System Safety $ 30,000

Continued activities to provide a safety analysis during the design activities and analysis of test results to determine the safety aspects of the system.

f. Task 08 - Human Factors and Reliability Engineering $ 40,000

Provide consultation and coordination by the Human Engineering Laboratory for the application of HFE factors during the design and evaluation process.

g. Task 09 - Lethality Determination $ 80,000

Establishment of a data base was initiated in FY75 to obtain actual performance data as a basis for comparing the lethality of the various projectiles under consideration for the SAW role. The activity under this task will be to complete this data collection and analysis process.

h. Task 10 - Steel Case Technology $ 75,000

Continue steel case technology to establish design criteria for application of steel as a cartridge case material in a caliber of choice.

i. Task 12 - Limited Advanced Development Verification Test-Government (ADVT-G) $ 240,000

In order to demonstrate the potential of the systems that have resulted from the FY75 and FY76 program will be necessary to conduct a limited test to develop comparable data to that derived from the DT-I/OT-I conducted in FY74 and FY75. Of the funds shown $100,000 is for the procurement of ammunition and $200,000 is for test support.

CONTINUATION OR SUPPORTING SHEET (AMCR 11-4, Vol. 4)	PAGE OF PAGES	DATE 28 January 1975
	PRON	AMCMS CODE

TO: AMSAR-RD FROM: SARRI-LS

PROJECT NO: 1J663607D640

PROJECT TITLE: Squad Automatic Weapon Advanced Development (Program Plan 2)

1. The following plan is the recommended FY76 transition period effort for the Squad Automatic Weapon Program. The principal activities during this period will be the completion of the Advanced Development Verification Test-Government, the analysis of data and the preparation of supporting documentation for a Validation IPR.

2. Anticipated Phase Slippages: NA

3. Funding Level Adjustments: NA

4. Work to be Performed:

a. Task 03 - Program Administration $ 190,000

(1) Normal program administration activities such as progra documentation, program plans and coordination with other agencies will be performed.

(2) Data analysis and documentation will be provided to support the Validation IPR. This will include an updated Concept Formulation Package including TOD, BTA, DRA, and IGCE, and support to the user in the conduct of a COEA.

b. Task 04 - 7.62 Investigations $ 190,000

Analysis of the ADVT-G test data will be conducted to support the data requirements for the CFP and Validation IPR.

c. Task 05 - 5.56 Investigations $ 190,000

Analysis of the ADVT-G test data will be conducted to support the data requirements for the CFP and Validation IPR.

d. Task 06 - RAM and QA $ 70,000

RAM analysis of the design and test activities and the update and maintenance of the weapon ammunition and system RAM plans will be conducted. Analysis of the test data in support of an updated CFP will also be conducted.

e. Task 07 - Safety $ 10,000

Analysis of the weapon designs under consideration relative to safety to provide inputs required for the CFP.

f. Task 08 - Human Factors Evaluation $ 50,000

To provide an analysis of the ADVT-G and to conduct as necessary supplemental tests to analyze the interface between the weapons under consideration. This data will also be provided to support the CFP.

PROGRAM PLAN SUPPLEMENT

SAWS ADVANCED DEVELOPMENT PHASE

CONTINUATION OR SUPPORTING SHEET (AMCR 11-4, Vol. 4)	PAGE OF PAGES	DATE 28 January 1975
	PRON	AMCMS CODE

TO: AMSAR-RD FROM: SARRI-LS

PROJECT NO: 1J663607D640

PROJECT TITLE: Squad Automatic Weapon Advanced Development (Program Plan Supplement)

1. The following Priority 2 and 3 plan is based on activities which could not be covered within the program guidance. The priority 2 effort is considered essential to investigate 5.56mm and 7.62mm utilization for SAW. The priority 3 effort fully responds to the guidance to investigate the potentials of 7.62 and 5.56mm as SAW contenders including high risk areas.

2. Anticipated Phase Slippages: N/A

3. Funding Level Adjustments: N/A

4. Work to be Performed:

a. Task 04 - Investigation of Improved 7.62mm Ammunition (Priority 2) $ 135,000

A low recoil 7.62mm cartridge utilizing a reduced weight projectile will be investigated to determine performance characteristics.

b. Task 05 - Expanded Improved 5.56mm Investigations (Priority 2) $ 390,000

The priority 1 effort will provide the basic answers to address the potential 5.56mm, however will not provide hardware to demonstrate and validate this potential as a system. The activity in this area will include the design, development, and test of the 5.56mm automatic weapon using the same mechanism as will be utilized in the 7.62mm priority 1 effort.

c. Task 10 - Steel Cased Ammunition (Priority 2) $ 70,000

The SAWS Advanced Development activities have resulted in the demonstration of feasibility of a steel cartridge case with expected performance comparable to that encountered when utilizing brass as a cartridge case material. This task will transfer the technology to either 7.62 or 5.56 to demonstrate the feasibility in the new caliber.

d. Task 11 - Aluminum Case 7.62mm Ammunition (Priority 3) $ 305,000

The principal shortcoming of 7.62 as a caliber is its weight. The system weight at the present time is approximately 7 lbs heavier than required. The application of aluminum can reduce this overweight condition to approximately 3 lbs. This task would involve the application of the aluminum case advancements and technology derived from 6.2 efforts to the 7.62 system. The in-house portion of this program is $85K with $200K in contractual activities.

RATIONALE: ENGINEERING DEVELOPMENT TIME AND COST ESTIMATES

The following estimate of time and cost for the Engineering Development (ED) Phase of the Redirected SAWS Program is based on the following assumptions:

1. The contractor is from a high cost area, i.e., West Coast.

2. The mechanism is the XM235.

3. The time span for ED is 36 months i.e., the caliber is 6.0mm or 7.62mm.

4. The rationale developed in the XM235 mechanism contracted in a High Cost Area can be applied as discussed in the Appendix.

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: Engineering Development as Redirected 4 Dec 74, XM235 in High Cost Area, PEP included

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 18 December 1974

RESEARCH AND DEVELOPMENT			COST	REFERENCE
7	8	9	10	11
COST CATEGORIES	HOURS	RATE	ESTIMATE	SCHEDULE
A . ENGINEERING				
A 1 DIRECT LABOR	86,206	$9.22	794,822	
A 2 MATERIAL			1,975	
A 3 OVERHEAD		110%	874,304	
A 4 OTHER			80,525	
B . TOOLING			389,944	
B 1 DIRECT LABOR				
B 2 MATERIAL				
B 3 OVERHEAD				
B 4 OTHER				
C . PROTOTYPE PRODUCTION			790,000	
D . SYSTEM TEST AND EVALUATION			486,179	
E . DATA			56,957	
F . TOTAL SYSTEMS MANAGEMENT			622,770	
G . CONSTRUCTION				
H . TRAINING			94,002	
I . OTHER (Specify) PEP			1,702,115	
J . TOTAL COST LESS (G AND A)			5,893,593	
K . G AND A 24.6%				
L . TOTAL COST			7,343,417	
M . PROFIT OR FEE 9.1%				
N . TOTAL PRICE			8,011,668	

REMARKS

Total Contractor Man Hours = 219,681.5 as Follows:

Development Engr.	86,206
PEP	80,071.5
Tooling	8,328
System Test & Eval	17,179
Total Syst Mgmt	23,040
Training	4,857

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	18 Dec 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: In-House Monitoring of Redirected SAWS Development Contract, XM235 in High Cost Area-PEP Included

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 16 December 1974

RESEARCH AND DEVELOPMENT			COST	REFERENCE
7	8	9	10	11
COST CATEGORIES	HOURS	RATE	ESTIMATE	SCHEDULE
A. ENGINEERING				
A.1 DIRECT LABOR	56,615	-	475,207	
A.2 MATERIAL			3,600	
A.3 OVERHEAD		85%	403,926	
A.4 OTHER			72,403	
B. TOOLING				
B.1 DIRECT LABOR				
B.2 MATERIAL				
B.3 OVERHEAD				
B.4 OTHER				
C. PROTOTYPE PRODUCTION				
D. SYSTEM TEST AND EVALUATION			138,738	
E. DATA				
F. TOTAL SYSTEMS MANAGEMENT				
G. CONSTRUCTION				
H. TRAINING				
I. OTHER (Specify) PEP			533,978	
J. TOTAL COST LESS (G AND A)			1,627,852	
K. G AND A				
L. TOTAL COST				
M. PROFIT OR FEE				
N. TOTAL PRICE				

REMARKS

36 Month Effort

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	18 Dec 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 71 1011e-R

XM-235
(HIGH COST AREA)
CONTRACTOR
MAN HOUR SUMMARY

Contract PEP Activity	FY77	FY78	FY79	TOTAL
Development Eng.	28,490	28,956	23,760	86,206
*PEP	7,850	64,520.5	7,701	80,071.5
Material	-0-	-0-	-0-	-0-
Tooling	8,328	-0-	-0-	8,328
**Other D.C.	11,237	11,949	21,890	45,076
Total Hours	55,905	105,425.5	58,351	219,681.5
Man Years (1800 Hrs)	31.06	58.57	32.42	122.05
**O.D.C.				
D-3 System Test & Eval.	3,557	4,269	9,353	17,179
E-3 Data		(INCLUDED IN DEV. ENG.)		
F-2 Total Syst Mgmt.	7,680	7,680	7,680	23,040
E-4 Training	-0-	-0-	4,857	4,857
Total O.D.C.	11,237	11,949	21,890	45,076
*PEP				
PEP Dev Eng	7,701	30,802	7,701	46,204
Quality Control	-0-	26,837	-0-	26,837
Indust. Facil.	149	596	-0-	745
O.D.C.	-0-	6,285.5	-0-	6,285.5
Total PEP	7,850	64,520.5	7,701	80,071.5

XM-235
(HIGH COST AREA)
ENG. DEV.
R.D.T.&E.

	FY77	FY78	FY79	TOTAL
1.1 Contract				
1.11 Dev. Eng/Val	564,118	573,128	614,380	1,751,626
1.12 PEP	182,384	1,368,141	151,590	1,702,115
1.13 Tooling	389,944	-0-	-0-	389,944
1.14 Mfg. Proto.	-0-	526,667	263,333	790,000
1.15 Other	346,182	369,630	544,096	1,259,908
FY Cost (Less G&A)	1,482,628	2,837,566	1,573,399	5,893,593
G&A (24.6%)				
FY Cost	1,847,355	3,535,607	1,960,455	7,343,417
Profit (9.1%)				
FY Total Price	2,015,464	3,857,347	2,138,857	8,011,668
1.2 In-House				
1.21 Dev. Eng.	379,361	298,278	277,497	955,136
1.22 PEP	179,774	177,993	176,211	533,978
1.23 Tooling	-0-	-0-	-0-	-0-
**1.24 Mfg.	-0-	-0-	-0-	-0-
1.25 Other			138,738	138,738
In-House Cost	559,135	476,271	592,446	1,627,852
TOTAL R&D PROG.	2,574,599	4,333,618	2,731,303	9,639,520

** DT/OT(ARMCOM) $23,123/MO.-I=4 mos.-II=6 mos.

* Other				
Syst Test & Eval.	81,635	162,040	242,504	486,179
Data	56,957	-0-	-0-	56,957
Total Syst Mgmt.	207,590	207,590	207,590	622,770
Training	-0-	-0-	94,002	94,002
TOTAL	346,182	369,630	544,096	1,259,908

SAW WEAPON
XM-235
(HIGH COST AREA)
PRODUCIBILITY ENGINEERING & PLANNING
ENG. DEV., R.D.T & E.

Contract PEP

	FY77	FY78	FY79	TOTAL
Other Direct Costs				
M.P.E.	-0-	121,700	-0-	121,700
Travel	847	847	1,745	3,439
Reproduction	177	177	708	1,062
Total O.D.C.	1,024	122,724	2,453	126,201
Direct Labor	71,003	283,995	71,003	426,001
Material	30	120	30	180
Overhead	78,104	312,393	78,104	468,601
TOTAL ENGINEERING	150,161	719,232	151,590	1,020,983
Tooling	27,850	111,398	-0-	139,248
Quality Control	-0-	520,018	-0-	520,018
Data	1,488	5,953	-0-	7,441
Indust.Facilities	2,885	11,540	-0-	14,425
TOTAL PEP	182,384	1,368,141	151,590	1,702,115

CONTRACTOR DEVELOPMENT ENG PEP

Rationale:

The Contractor PEP effort is estimated to address the following areas:

a. Producibility Engineering and Planning Studies.

b. Product Engineering and Tolerance Studies.

Tasks are identified in each area, required manhours are estimated for each task and the total estimated manhours determined. These manhours are multiplied by appropriate labor and overhead rates to obtain total values for Direct Labor and Overhead, $150 is estimated for Materials and these values of Direct Labor, Overhead, and Material cost are added to Other Direct Costs which are defined in a separate section.

CONTRACTOR DEVELOPMENT ENG PEP

A. Producibility Engineering and Planning Studies:

	TASK	MANHOURS
1.	Review Part Drawings	2614
2.	Prepare Draft Process Sheets	6532
3.	Determine Unique Operations	224
4.	Conduct Process Capabilities Study	3541
5.	Determine Difficult Items and Make Recommendations	1770
6.	Prepare Reports	52
7.	Maintain Supervision	6035
	TOTAL "A"	20768 hours

B. Product Engineering and Tolerance Studies:

1.	Review Drawings	586
2.	Review Mil. Standards & Specs.	274
3.	Select and Conduct Redesign	3784
4.	Prepare Reports	51
5.	Review Data/Identify Areas for Study	611
6.	Conduct Tolerance/Dimension Study	3399
7.	Determine Revisions and Prepare Report	706
8.	Maintain Supervision	6035
	TOTAL "B"	15446 hours

TOTAL MANHOURS (A & B) 36,214

SAW-XM-235 (HIGH COST AREA)
CONTRACTOR DEVELOPMENT ENG PEP

Total ManHours (A&B)	$ 36,214 hrs
Data Item ManHours	9,990 hrs
Total ManHours	46,204
Direct Labor Rate	$ 9.22/hr.
Direct Labor Cost	$426,000.88
Overhead Rate 110%	
Overhead Cost	$468,600.97

Engineering Cost Summary

Direct Labor	$426,001
Material	180
Overhead	468,601
O.D.C.	126,201
Total Engineering	$1,020,983

	FY77	FY78	FY79	TOTAL
O.D.C.	1,024	122,724	2,453	126,201
Direct Labor	71,003	283,995	71,003	426,001
Material	30	120	30	180
Overhead	78,104	312,393	78,104	468,601
Total Eng.	$150,161	$719,232	$151,590	$1,020,983

OTHER DIRECT COSTS
CONTRACTOR
PRODUCIBILITY ENGINEERING & PLANNING (PEP)

RATIONALE: Other Direct Costs are assumed to consist of three (3) categories:

a. Manufacturing Processing Engineering

b. Travel

c. Reproduction Costs

(1) PEP Studies

(2) Product Engineering and Tolerance Studies

ODC/-1 PEP

XM-235 (HIGH COST AREA)
OTHER DIRECT COSTS
CONTRACTOR
PEP

A. Manufacturing Process Engineering is the Engineering effort to prepare and process routing sheets and other documentation defining in detail the manufacturing processes to be used for each component.

Estimated manufacturing operations		967
Estimated Eng Hrs per operation		6.5 hrs.
Direct Labor Rate		$9.22/hr
Overhead		110%
Required ManHrs.	967 x 6.5	6285.5
Direct Labor	6285.5 x $9.22	$57,952.31
Overhead	$57,952.31 x 1.10	63,747.54
Total M.P.E.		$121,699.85

B. O.D.C. Travel

Estimated travel consists of 2 trips to RIA by 1 man in FY77 at 2 x $449 = $898, plus 2 trips by 2 men at $847 per trip (1 trip in FY76/77 and 1 trip in FY77).

	FY77	FY78	FY79	TOTAL
1 man trip			$898	
2 man trip	$847	$847	$847	
Total Travel	$847	$847	$1745	$3439

XM-235 (HIGH COST AREA)
OTHER DIRECR COSTS
CONTRACTOR
PEP

c. Reproduction

1) Estimated for Producibility Engineering and Planning Studies:

FY77	FY78	FY79	TOTAL
41.00	41.00	164.00	$246.00

2) Estimated for Product Engineering and Tolerance Studies:

FY77	FY78	FY79	TOTAL
136.00	136.00	544.00	$816.00

3) Total Reproduction/FY

FY77	FY78	FY79	TOTAL
177.00	177.00	708.00	$1,062.00

O.D.C. Summary	FY77	FY78	FY79	TOTAL
Total M.P.E.	-0-	121,700	-0-	121,700
Total Travel	847	847	1,745	3,439
Total Reproduction	177	177	708	1,062
TOTAL O.D.C.	1,024	122,724	2,453	$126,201

SAW LIFE CYCLE COST ESTIMATE

APPENDIX

APPENDIX 1

SAW LIFE CYCLE COST ESTIMATES

ESTIMATED COSTS FOR SAWS OPTIONS

Cost Estimations for the various SAW options of weapon mechanisms and ammunition have been developed by preparing Basic Estimated Cost Packages to cover each of the optional mechanism concepts and ammunition types and the conversion efforts required to combine certain mechanism concepts to specific ammunition types. A list of the Basic Estimated Cost Packages for weapons is as follows: (See Appendix 2 for details)

I. Advanced Development (Phase I) Weapon Only

A. 7.62mm conversion from 6.00mm 9 months effort

B. 5.56mm conversion from 6.00mm 12 months effort (also covers Fabrique Nationale 63 grain 5.56mm)

*C. Conceptual effort with extensive changes, 18 months effort

*D. Added cost for Contractor without previous SAW experience, 6 months effort.

II. Full Scale Development (Phase II) (Includes PEP) Weapon Only

A. XM-233 Contracted by Maremont in 6.00mm

B. XM-234 Contracted by Philco-Ford in 6.00mm

C. XM-235 Contracted in a Low Cost Area in 6.0mm.

D. XM-235 Contracted in a High Cost Area in 6.0mm.

E. Conceptual Contracted by an average U.S. Contractor in 6.00mm or F/N Contracted by an average U.S. Contractor in 5.56mm/ 63 grain.

III. Initial Limited Production of 1000 Weapons

A. XM-233

B. XM-234

C. XM-235

D. The average of A., B, & C is used for Conceptual & F/N weapons.

*These packages were not used in the Decision Risk Analysis (DRA)

IV. Full Scale Production - 42,000 Weapons

A. XM-233

B. XM-234

C. XM-235

D. The average of A., B. & C above is used for F/N and Conceptual Weapons.

V. A series of cost estimates for ammunition have been prepared by Frankford Arsenal to cover the various related ammunition options manufactured by NGEP or Conventional means. Cost of manufacture by conventional means is used for the DRA.

By combining the appropriate Weapon and Ammunition estimates, a completion estimate of system costs can be made.

The following assumptions have been made in preparing the cost estimates.

I. The effort is divided between In-House (Government) activities and related cost and Contractor activities and related cost.

II. The In-House activities are to monitor and direct contractor activities, and perform Configuration Management, PEP efforts and conduct Development and Operational Tests.

III. The Contractor is to perform detail engineering and fabrication of hardware.

IV. In-House costs are based on Step 5 labor rates, 150 hours per month, 31% fringe benefits, and 55% Overhead.

V. Contractor labor costs are based on equivalent GS Grade hours of effort with labor rate and overhead rates derived from historical data supplied by the Cost Analysis Section of the Comptrollers Office.

VI. No allowance for overtime has been made.

VII. Total limited production is assumed to be 1000 weapons at a rate of 100 per month.

VIII. Total full scale production is assumed to be 42,000 weapons at 2,000 per month and 609,000,000 rounds of ammunition.

The Decision Risk Analysis considers only certain combinations of options as follows:

1. XM-233 contracted by Maremont in 6.00mm (IIA)

2. XM-234 Contracted by Philco-Ford in 6.00mm (IIB)

*3. XM-235 contracted in a Low Cost Area in 6.0mm (IIC)

*4. XM-235 contracted in a High Cost Area in 6.0mm (IID).

5. Conceptual weapon by average U.S. Contractor in 6.00mm (IIE)

6. Conceptual weapon by average U.S. Contractor in 5.56mm (IIE, IB)

7. Conceptual weapon by average U.S. Contractor in 7.62mm (IIE, IA)

8. Fabrique Nationale weapon by average U.S. Contractor in 5.56mm/63 grain (IIF)

*The cost shown on the Performance Potential Questionnaire for the XM235 is the average of these two costs.

RECOMMENDATIONS
ESTIMATED LIFE CYCLE COSTS FOR THE SAW WEAPONS CANDIDATES

1. It is recommended that the Estimated Life Cycle Costs and the RDT&E Costs shown for the Best Conceptual Weapon (BC) combined with the XM732 ammunition be considered as representative of the costs for the weapon-ammunition combination which most completely addresses the SAW requirements.

2. It is further recommended that the Best Conceptual Weapon (BC) Cost Estimates are most representative of the probable weapon costs which will be incurred in developing a superior SAW weapon regardless of the ammunition selected.

CONCLUSIONS
ESTIMATED LIFE CYCLE COSTS FOR THE SAW WEAPONS CANDIDATES

1. The Life Cycle Cost Estimates are divided into three sections RDT&E Costs, Limited Production Costs and Full Scale Production Costs. (Sunk Costs are not considered in this estimate).

2. The weapons with the lowest Estimated Life Cycle Cost are: (Lowest first)

    a. XM235/XM732 (East Coast Contractor)
    b. XM235/XM732 (West Coast Contractor)
    c. Best Conceptual Weapon/XM732 (Average U.S. Contractor)

3. The weapons with the highest Estimated Life Cycle Cost are: (Highest last)

    a. Fabrique Nationale/M193
    b. Fabrique Nationale/63 grain 5.56
    c. XM233/XM732

4. The weapons with the lowest Estimated RDT&E Cost are: (Lowest first)

    a. XM235/XM732 (East Coast Contractor)
    b. XM233/XM732 (East Coast Contractor)
    c. Best Conceptual Weapon/XM732 (Average U.S. Contractor)

5. The weapons with the highest Estimated RDT&E Cost are: (Highest Last)
    a. XM234/XM732
    b. Best Conceptual Weapon/any caliber other than XM732
    c. Fabrique Nationale/either M193 or 63 grain round

6. The Best Conceptual Weapon is assumed to be a weapon incorporating desirable features selected by the Government from among all of the SAW candidate weapons. No allowance has been made for royalties or licenses when estimating costs for the Best Conceptual Candidates.

    a. The Best Conceptual Candidate having the lowest Life Cycle is the BC/XM732
    b. The Best Conceptual Candidate having the highest Life Cycle Cost is the BC/M80

LIFE CYCLE COSTS WEAPON ONLY (K$)

TABLE 1

Characteristic	M16A1 M193	M16A1 WAMBEE	FN M193	FN 63 gr	BC* M193	BC* 63 gr	BC* XM287	BC* WAMBEE	XM233 XM732	XM234 XM732	XM235 XM732 EAST COAST	WEST COAST	BC* XM732	M14 M60	M14A1 M60	M60 M60	BC* M80	MR Req'mt	Recom'd Value
LIFE CYCLE COSTS-WEAPON			(42,268)	(42,344)	(40,642)	(40,710)	(40,818)	(40,582)	(43,146)	(42,145)	(32,959)	(34,879)	(39,341)				(41,176)		
1. RDT&E (Weapon)			(10,796	(10,796)	(9,740)	(9,740)	(9,740)	(9,740)	(7,495)	(9,401)	(6,989)	(6,909)	(8,218)				9,418)		
Eng. (Contract			7,743	7,743	7,743	7,743	7,743	7,743	5,963	7,878	5,468	7,397	6,656				7,505		
Eng (In-House			2,010	2,010	2,010	2,010	2,010	2,010	1,532	1,523	1,521	1,512	1,522				1,913		
Foreign License & Data Package			1,056	1,056	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-				-0-		
2. Limited Production			(3,524)	(3,525)	(3,510)	(3,501))	(3,513))	(3,509)	(3,655)	(3,663)	(3,226)	(3,224)	(3,514)				3,527)		
Foreign Royalty			14	14	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-				-0-		
Invest Non Recurring Contract			1,097	1,097	1,097	1,097	1,097	1,097	1,098	1,146	1,047	1,047	1,097				1,097		
Invest Recurring Contract			2,116	2,117	2,116	2,117	2,118	2,115	2,260	2,220	1,880	1,880	2,120				2,133		
In-House			297	297	297	297	297	297	297	297	297	297	297				297		
3. Full Scale Production			((27,933))	(28,013))	((27,379))	((27,456))	((27,550))	((27,320)	((31,996)	((28,085)	((22,746)	((28,746)	((27,608)	)			(28,231)		
Contract			(27,179)	(27,256)	(27,179)	(27,256)	(27,350)	(27,120)	(31,796)	(27,885)	(22,546)	(22,546)	(27,409)				(28,031)		
A. Engineering			156	156	156	166	156	156	156	156	156	156	156				156		
B. Tooling			961	861	861	861	861	861	889	940	753	753	861				861		
C. Quality Control			189	189	189	189	189	189	189	189	189	189	189				189		
D. Manufacturing			22,104	22,177	22,104	22,170	22,250	22,053	26,036	23,630	18,238	18,238	22,301				22,834		
General & Administrative 6%			1,399	1,403	1,399	1,403	1,407	1,396	1,636	1,435	1,160	1,160	1,410				1,442		
Profit or Fee 10%			2,470	2,477	2,470	2,477	2,487	2,465	2,890	2,535	2,050	2,050	2,492				2,549		
In-House																			
Eng Support			(300)	(209)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)	(200)				209)		
Royalty			(554	(558)	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-				-0-		

SARRI Form 900-638, 1 Dec 74 (OT)

(Can be used as cut sheets or master copy preparation.)

SUMMARY OF S.A.W. PROGRAM TIME AND COST

Elapsed time for completion of RDT&E, Limited Production (1000 weapons), and Full Scale Production for the various weapons combinations is listed below:

	RDT&E	LP	FSP	TOTAL
1. FN/M193	44 mos.	12 mos.	24 mos.	80 mos.
2. FN/63 gr.	44 mos.	12 mos.	24 mos.	80 mos.
3. BC/M193	44 mos.	12 mos.	24 mos.	80 mos.
4. BC/63 gr.	44 mos.	12 mos.	24 mos.	80 mos.
5. BC/XM287	44 mos.	12 mos.	24 mos.	80 mos.
6. BC/WAMBEE	44 mos.	12 mos.	24 mos.	80 mos.
7. XM233/XM732	32 mos.	12 mos.	24 mos.	68 mos.
8. XM234/XM732	32 mos.	12 mos.	24 mos.	68 mos.
9. XM235/XM732	32 mos.	12 mos.	24 mos.	68 mos.
10. BC/XM732	32 mos.	12 mos.	24 mos.	68 mos.
11. BC/M80	41 mos.	12 mos.	24 mos.	77 mos.

The 32 month RDT&E schedule tasks are:

1. Correct design deficiencies revealed during Validation Testing of Selected weapon mechanism.

2. Confirm that the resultant weapon design meets performance requirements by conducting the Research and Development Acceptance Test (RDAT) and evaluating the results.

3. Complete the Technical Data Package for Limited Production (TDP/LP).

4. Fabricate 100 prototype weapons in accordance with TDP/LP for Development Testing and Operational Testing (DT-II/OT-II).

5. Conduct DT-II/OT-II and evaluate results.

6. Conduct In Process Review for Limited Production (IPR/LP).

7. Type Classify the weapon for Limited Production (TC/LP).

The 41 month RDT&E schedule addresses the same tasks as the 32 month schedule plus the additional tasks required to convert the subject weapon mechanism from the XM732, 6mm round to the M80, 7.62mm round. The 41 month RDT&E schedule tasks are:

1. Redesign the selected mechanism concept to function with the M80 series ammunition.

2. Fabricate 10 prototype weapons, 3 for Preliminary Testing and 7 for DT-I/OT-I.

3. Conduct a limited DT-I/OT-I of approximately 4 months duration to develop data required to confirm the performance potential in accordance with SAW requirements.

4. Evaluate DT-I/OT-I data and determine performance potential and design deficiencies to be corrected.

5. Correct design deficiencies and prepare preliminary TDP.

6. Confirm that the resultant weapon design meets performance requirements by fabricating 4 prototype weapons, conducting the RDAT and evaluating the results.

7. Complete the TDP/LP.

8. Fabricate 100 prototype weapons in accordance with TDP/LP for DT-II/OT-II.

9. Conduct DT-II/OT-II and evaluate results.

10. Conduct IPR/LP.

11. Type Classify the weapon for Limited Production (TC/LP).

The 44 month RDT&E schedule addresses the same tasks as the 32 month schedule plus the additional tasks required to convert the subject weapon mechanism from the XM732 6mm round to the alternate 5.62mm round listed. (Note that this schedule is applicable to both options of the FN weapon because of the lack of indepth performance data and known mechanical failures in limited firing tests). The 44 month RDT&E schedule tasks are:

1. Redesign the selected mechanisms concept to function reliably with the lower impulse of the selected 5.56mm ammunition.

2. Fabricate 11 prototype weapons, 4 for Preliminary Testing and 7 for DT-I/OT-I.

3. Conduct a limited DT-I/OT-I of approximately 4 months duration to develop data required to confirm the performance potential in accordance with SAW requirements.

4. Evaluate DT-I/OT-I data and determine performance potential and design deficiencies to be corrected.

5. Conduct IPR prior to completing Engineering Development.

6. Correct design deficiencies and prepare preliminary TDP.

7. Confirm that the resultant weapon design meets performance requirements by fabricating 4 prototype weapons, conducting the RDAT and evaluating the results.

8. Complete the TDP/LP.

9. Fabricate 100 prototype weapons in accordance with TDP/LP for DT-II/OT-II.

10. Conduct DT-II/OT-II and evaluate results.

11. Conduct IPR/LP.

12. Type Classify the weapon for Limited Production (TC/LP).

The Limited Production schedule includes completion of the following tasks in accordance with the TDP/LP.

1. Fabricate Tooling.

2. Order Materials.

3. Establish a production rate of 100 weapons per month.

4. Produce 1000 weapons.

5. Conduct DT-III/OT-III and evaluate results.

6. Update the TDP for Full Scale Production (TDP/FSP).

7. Conduct IPR for Full Scale Production.

8. Type Classify the weapon for Full Scale Production.

The Full Scale Production (FSP) Schedule includes completion of the following tasks to establish a production rate of 2000 weapons per month and product 42,000 weapons:

1. Prepare Request for Proposal (RFP) for FSP.
2. Conduct Pre-Contract Award Survey.
3. Award Contract.
4. Design, fabricate and install tooling.
5. Procure materials.
6. Product 42,000 weapons.
7. Monitor Production.
8. Accept Weapons.

Representative Life Cycle Cost estimates were prepared for 11 of the 17 combinations of Weapon and Ammunition follows:

1. Estimated Life Cycle Costs for the Weapon only are: ($K)

	Weapon Mechanism	Ammunition	Estimated
1.	M16A1	M193	No
2.	M16A1	WAMBEE	No
3.	Fabrique Nationale (FN)	M193	$42,266
4.	FN	5.56mm 63 gr.	$42,344
5.	Best Conceptual (BC)	M193	$40,642
6.	BC	5.56mm 63 gr.	$40,710
7.	BC	XM287	$40,816
8.	BC	WAMBEE	$40,582
9.	XM233	XM732	$43,146
10.	XM234	XM732	$42,419
11.	XM235 (maremont)	XM732	$32,959
12.	XM235 (Philco-Ford)	XM732	$34,879
13.	BC	XM732	$39,341
14	M14	M80	No
15.	M14A1	M80	No
16.	M60	M80	No
17.	BC	M80	$41,176

2. The following two weapons (considering the weapons only) gave the lowest Life Cycle Weapon Cost (Lowest Cost First):

	SAW Candidates	$K
1.	XM235/XM732	$32,959-$34,879
2.	BC/XM732	$39,341

3. Further examination of the Life Cycle Cost Data reveals the following three weapons (considering the weapons only) had the lowest RDT&E cost prior to entering Limited Production:

		$K
1.	XM235 (East Coast)/XM732	$6,989
2.	XM233/XM732	$7,495
3.	BC/XM732	$8,218

4. Estimated Life Cycle Ammunition Costs for 609,000,000 rounds are:

		$K
1.	5.56mm M193/M196	$48,835.7
2.	5.56mm H&K 68 grain	$55,744.1
3.	5.56mm 68 grain Conceptual	$55,903.9

4.	5.56mm 63 gr. Co[illegible]ual	$61,600.5
5.	5.56mm FN 63 grai	$61,707.1
6.	6.00mm Brass XM732	$63,563.6
7.	7.62mm M80/M62	$74,720.7
8.	6.00mm Steel XM732	$82,474.3

5. An explanation of the rationale used in compiling the estimated program costs is presented in the body of this report.

6. The best Conceptual Weapon (BC) appears in both the most favorable Life Cycle Weapon Cost Group and the most favorable RDT&E Cost Group.

7. The Fabrique Nationale (FN) Weapon is estimated to require about the same development effort and production effort as the BC Weapon but incurs known additional costs in the form of royalties and licenses.

8. The XM235 presents the lowest Life Cycle Cost of all SAW weapons.

9. The original SAW Weapon concepts are known to require some modification to incorporate new or additional design features, however a substantial performance data base and validated performance analysis technique is available to predict the effectiveness of proposed modifications with considerable accuracy and thus minimize unanticipated expenses.

10. The Fabrique Nationale Weapon will require considerable redesign and analysis to correct known mechanical and structural failures experienced in very limited firing tests. At the present there is almost a complete absence of significant Engineering and Production data on this weapon, specifically lacking are:

a. Engineering and/or Production Drawings.
b. Engineering analysis of the weapon mechanism.
c. A substantial weapon performance data base or even adequate test reports.
d. Validated analytical techniques for predicting weapon performance.

The absence of the above information makes accurate prediction of the effectiveness of proposed modifications very difficult and thus maximizes the probability of incurring a substantial unanticipated increase in expense of time and funds.

11. The Best Conceptual Weapon is based on a combination of the features of the original SAW Weapons plus some additional modifications. Since there is a substantial amount of validated Engineering information available on each of these Weapons it appears that adequate prediction of the effectiveness of most proposed modifications may be made and that unanticipated major increases in expense of time and funds will be avoided.

CONCLUSIONS:

1. The Best Conceptual Weapon (BC) compares favorably relative to both Life Cycle Cost and RDT&E Cost.

2. The FN and BC weapons have comparable RDT&E Costs but the FN weapon will incur additional royalty and license costs.

3. The XM235 has the lowest Life Cycle Costs of all Weapons.

4. Development of the XM233, XM234 or the XM235 minimizes risk of unanticipated increases in time or cost.

5. The FN Weapon is presented with negligible supporting engineering data, therefore development invites a maximum risk of unanticipated major increases in time and cost.

6. The BC Weapon development is supported extensively by existing engineering data and promises the features and performance necessary for a superior SAW weapon can be incorporated while avoiding major unanticipated increases in time and cost.

RECOMMENDATIONS:

1. It is recommended that the Estimated Life Cycle Costs and the RDT&E Costs shown for the Best Conceptual Weapon (BC) combined with the XM732 ammunition be considered as representative of the costs for the weapon-ammunition combination which most completely addresses the SAW requirements.

2. It is further recommended that the Best Conceptual Weapon (BC) Cost Estimates are most representative of the probable weapon costs which will be incurred in developing a superior SAW weapon regardless of the ammunition selected.

The following Regulations and Standards were used for guidance in preparing the subject Cost Estimates:

AR37-18	"Weapon/Support Systems Cost Categories and Elements"
AR70-1	"Army Research and Development"
AR70-32	"Work Breakdown Structures for Defense Material Items"
Mil-Std-881	"Work Breakdown Structures for Defense Material Items"

Letter of Instruction (LOI) for Implementing the New Material Acquisition Guidelines dated 23 August 1972.

SUPPORTING RATIONALE
LIFE CYCLE COSTS-WEAPON

The "Summary of Performance/Physical Characteristics-SAWS Candidates" lists the following Mechanism/Ammunition candidate systems:

1. M16A1/M193
2. M16A1/WAMBEE
3. FN/M193
4. FN/63gr.
5. BC/M193
6. BC/ 63 gr.
7. BC/XM287
8. BC/WAMBEE
9. XM233/XM732
10. XM234/XM732
11. XM235/XM732 Low Cost Area Contractor
12. XM235/XM732 High Cost Area Contractor
13. BC/XM732
14. M14/M80
15. M14A1/M80
16. M60/M80
17. BC/M80

Also listed are:

18. MN Requirement
19. Recommended Value

Items numbered 1, 2, 14, 15, 16, 18 and 19 are not addressed.

The following individual Summary Sheets give brief statements of rationale and identify specific Support Packages wherein more detailed information is presented.

FN/M193
SUMMARY SHEET

A. RDT&E

Pack I-B 1) Phase I effort is assumed equivalent to that required to convert an existing 6MM SAW candidate to 5.56MM. Time required 12 months since most of a standard validation effort must be performed to establish data to evaluate performance potential.

Pack II=E 2) Phase II effort is assumed equivalent to that required for a Best Concept weapon contracted by an average U.S. Contractor.

3) A license fee of $660,000 and a data package at $396,000 is required by Fabrique Nationale.

B. Limited Production (1000 weapons)

1) Royalty of $660,000 for first 50,000 weapons is asked by FN, i.e. $13.20 per weapon or $13,200 for 1000 weapons. This is rounded up to $14,000.

Pack III-D 2) Investment Non Recurring is assumed equal to a Best Concept effort and is an average of XM233, XM234, and XM 235 estimated costs.

3) Investment Recurring is assumed equal to a Best Concept effort with material cost reduced proportional to the Impulse ratio of the XM193 and XM732 rounds thus, 27.29 $\frac{(1.3-1.57)}{(1.57)}$=4.69, a conservative $4,000 reduction is assumed.

C. Full Scale Production (42,000 weapons)

Pack IV-D 1) Contract effort is assumed equal to Best Concept effort with the material cost reduced proportional to the Impulse ratio of the XM193 and the XM732 rounds. A $197,000 reduction is assumed.

2) In-house engineering support is assumed to require 2.5 men for 24 months or $200,000.

3) Royalty is prorated at $13.20 per weapon for 42,000 weapons and rounded down to $554,000.

FN/63 GRAIN
SUMMARY SHEET

A. RDT&E

Pack I-B 1) Phase I effort is assumed equivalent to that required to convert a 6.0MM SAW candidate to 5.56MM. Time required 12 months since most of a standard validation effort must be performed to establish data to evaluate performance potential.

Pack II-E 2) Phase II effort is assumed equivalent to that required for a Best Concept Weapon contracted by an average U.S. Contractor.

3) A license fee of $660,000 and a data package at $396,000 is required by Fabrique Nationale.

B. Limited Production (1000 weapons)

1) Royalty of $660,000 for first 50,000 weapons is asked by FN i.e. $13.20 per weapon or $13,200 for 1,000 weapons this is rounded up to $14,000.

Pack III-D 2) Investment Non Recurring is assumed equal to a Best Concept effort and is an average of XM233, XM234 and XM235 estimated costs.

Pack III-D 3) Investment Recurring is assumed equal to a Best Concept effort with material cost reduced proportional to Impulse ratios of the 5.56, 63 grain FN round and the XM732 round thus, $27.29 \left(\frac{1.39-1.57}{1.57}\right) = -3.13$, a conservative $3000 reduction is assumed.

C. Full Scale Production (42,000 weapons)

Pack IV-D 1) Contract effort is assumed equal to Best Concept effort with material cost reduced proportional to Impulse ratio. A $131,000 reduction is assumed.

2) In-House engineering support is assumed to require 2.5 men for 24 months or $200,000.

3) Royalty is prorated at $13.20/weapon for 42,000 weapons and rounded down to $554,000.

BC/M193
SUMMARY SHEET

A. RDT&E

Pack I-13 1) Phase I effort is that required to convert a 6MM SAW candidate to 5.56MM. Time required is 12 months since most of a standard validation effort must be performed to establish data to evaluate performance potential.

Pack II-E 2) Phase II effort is assumed to be the average of the XM233, XM234 and XM235 efforts performed by an average U.S. Contractor.

3) Not applicable.

B. Limited Production (1000 weapons)

1) Not applicable.

Pack III-D 2) Investment Non Recurring is assumed to be the average of XM233, XM234 and XM235 efforts performed by an average U.S. Contractor.

Pack III-D 3) Investment Recurring is assumed to be the average of XM233, XM234 and XM235 efforts with a material cost reduction proportional to the Impulse ratios of M193 versus 6MM thus $27.29 \left(\frac{1.3-1.57}{1.57}\right) = -4.69$, a conservative $4000 reduction is assumed.

C. Full Scale Production (42,000 weapons)

Pack IV-D 1) Contract effort is assumed to be the average of XM233, XM234 and XM235 efforts with the material cost reduced proportional to the Impulse Ratio. A reduction of $197,000 is assumed. (42,000 x -.4169= -$196,980)

2) In-House engineering support is assumed to require 2.5 men for 24 months or $200,000.

3) Not applicable.

BC/63 grain
SUMMARY SHEET

A. RDT&E

Pack I-B 1) Phase I effort is required to convert a 6MM SAW candidate to 5.56MM. Time required is 12 months since most of a standard Validation effort must be performed to establish data to evaluate performance potential.

Pack II-E 2) Phase II effort is assumed to be the average of the XM233, XM234 and XM235 efforts performed by an average U.S. Contractor.

3) Not applied.

B. Limited Production (1000 weapons)

1) Not applied

Pack III-D 2) Investment Non Recurring is assumed to be the average of XM233, XM234 and XM235 efforts performed by an average U.S. Contractor.

Pack III-D 3) Investment Recurring is assumed to be the average of XM233, XM234 and XM235 efforts with a material cost reduction proportional to the Impulse ratio of 5.56, 63 grain versus 6MM. Thus 27.29 $\left(\frac{1.39-1.57}{1.57}\right)$=-3.13, a conservative $3000 reduction is assumed.

C. Full Scale Production (42,000 weapons)

Pack IV-D 1) Contract effort is assumed to be the average of XM233, XM234 and XM235 efforts with the material cost reduced proportional to the Impulse ratio (42000 x -3.13)= -$131,460). A reduction of $131,000 is assumed.

2) In-house engineering support is assumed to require 2.5 men for 24 months or $200,000.

3) Not applied.

BC/XM287
SUMMARY SHEET

A. RDT&E

Pack I-B 1) Phase I effort is required to convert a 6MM SAW candidate to 5.56MM. Time required is 12 months since most of a standard Validation effort must be performed to establish data to evaluate potential performance.

Pack II-E 2) Phase II effort is assumed to be the average of the XM233, XM234 and XM235 efforts performed by an average U.S. Contractor.

3) Not applicable.

B. Limited Production (1000 weapons)

1) Not applicable

Pack III-D 2) Investment Non Recurring is assumed to be the average of XM233, XM234 and XM235 efforts performed by an average U.S. Contractor.

Pack III-D 3) Investment Recurring is assumed to be the average of XM233, XM234 and XM235 efforts with a material cost reduction proportional to the Impulse rations of XM287 vs. XM732 rounds thus 27.29 $\frac{(1.50-1.57)}{1.57}$ = -1.22, a conservative $1000 reduction is assumed.

C. Full Scale Production (42,000 weapons)

Pack IV-D 1) Contract effort is assumed to be the average of XM233, XM234 and XM235 efforts with the material cost reduced proportional to the XM287 versus XM732 Impulse ratio thus, (42,000 x -$1.22= -$51,200). A reduction of $51,000 is assumed.

2) In-house engineering support is assumed to require 2.5 men for 24 months or $200,000.

3) Not applicable.

BC/WAMBEE
SUMMARY SHEET

A. RDT&E

Pack I-B 1) Phase I effort is required to convert a 6MM SAW candidate to the 5.56 WAMBEE. Time required is 12 months since most of a standard Validation effort must be performed to establish data to evaluate potential performance.

Pack II-E 2) Phase II effort is assumed to be the average of the XM 233, XM234 and XM235 efforts performed by an average U.S. Contractor.

3) Not applicable.

B. Limited Production (1000 weapons)

1) Not applicable

Pack III-D 2) Investment Non-Recurring is assumed to be the average of XM233, XM234 and XM235 efforts performed by an average U.S. Contractor.

Pack III-D 3) Investment Recurring is assumed to be the average of XM233, XM234 and XM235 efforts with a material cost reduction proportional to be Impulse ratio of the WAMBEE versus XM732 rounds, thus $27.29 \frac{(1.23-1.57)}{1.57} = -5.91$. A reduction of $5000 is assumed.

C. Full Scale Production (42,000 weapons)

Pack IV-D 1) Contract effort is assumed to be the average of XM233, XM234 and XM235 efforts with the material cost reduced proportional to the WAMBEE versus XM732 Impulse ratio, thus, (42,000 x -$5.91=-$248,200). A reduction of $248,000 is assumed.

2) In-house engineering support is assumed to require 2.5 men for 24 months or $200,000.

3) Not applicable.

XM233/XM732
SUMMARY SHEET

A. RDT&E-To be performed by Maremont Corp.

1) A very minimal Phase I effort is assumed as being part of the Phase II effort.

Pack II-A 2) The Phase II effort is summarized as follows:

	Dev.Eng.Hrs.	PEP Eng.Hrs.	Total Man Hrs.
Contract	83,856	38,503	122,359
In-House	52,526	32,055	84,581
Total	136,382	70,558	206,940

Total elapsed time is 32 months.

3) No foreign license included.

B. Limited Production (1000 weapons)

1) No foreign royalty included.

Pack III-A 2) Investment-Non Recurring is detailed in Package III-A.

3) Investment-Recurring is detailed in Package III-A.

C. Full Scale Production (42,000 weapons)

Pack IV-A 1) Contract effort to produce 42,000 weapons is pro-rated from the 80,000 weapon estimate detailed in Support Package IV-A.

2) In-house engineering support is estimated to require 2.5 men for 24 months or $200,000.

3) No Foreign royaltys are included.

XM234/XM732
SUMMARY SHEET

A. RDT&E-To be performed by Philco-Ford.

1) A very minimal Phase I effort is assumed as being included in the Phase II effort.

Pack II-B 2) The Phase II effort is summarized as follows:

	Dev. Eng. Hrs.	PEP Eng. Hrs.	Total Hrs.
Contract	82,245	38,503	120,748
In-House	51,426	32,055	83,481
Total	133,671	70,558	204,229

3) No foreign license cost included.

B. Limited Production (1000 weapons)

1) No foreign royalty cost included.

Pack III-B 2) Investment-Non Recurring is detailed in Package III-B.

3) Investment Recurring is detailed in Package III-B.

C. Full Scale Production (42,000 weapons)

Pack IV-B 1) Contract effort to produce 42,000 weapons is prorated from the 80,000 weapon estimate detailed in Support Package IV-B.

2) In-house engineering effort is estimated to require 2.5 men for 24 months or $200,000.

3) No foreign royalty is included.

XM235/XM732
SUMMARY SHEET

A. RDT&E-To be performed by a Low Cost Area Contractor.

1) A very minimal Phase I effort is assumed as being included in the Phase II effort.

Pack II-C 2) The Phase II effort is summarized as follows:

	Dev.Eng.Hrs.	PEP Eng. Hrs.	Total Man Hrs.
Contract	75,800	38,503	114,303
In-house	51,426	32,055	83,481
Total	127,226	70,558	197,784

3) No foreign license cost is applicable.

B. Limited Production (1000 weapons)

1) No foreign royalty is applicable.

Pack III-C 2) Investment nonrecurring is detailed in Package III-C.

3) Investment recurring is detailed in Package III-C.

C. Full Scale Production (42,000 weapons)

Pack IV-C 1) Contract effort to produce 42,000 weapons is prorated from the 80,000 weapon estimate detailed in Support Package IV-C.

2) In-house engineering support effort is assumed to require 2.5 men for 24 months or $200,000.

3) No foreign royalty is applicable.

XM235/XM732
SUMMARY SHEET

A. RDT&E-To be performed by a High Cost Area Contractor.

1) A very minimal Phase I effort is assumed as being included in the Phase II effort.

Pack II-D 2) The Phase II effort is summarized as follows:

	Dev.Eng.Hrs.	PEP Hrs.	Total Hrs.
Contractor	75,800	38,503	114,303
In-House	50,788	32,055	82,843
Total	126,588	70,588	197,146

3) No foreign license cost is applicable.

B. Limited Production (1000 weapons)

1) No foreign royalty is applicable.

Pack III-C 2) Investment non-recurring is detailed in Package III-C.

3) Investment recurring is detailed in Package III-C.

C. Full Scale Production (42,000 weapons)

Pack IV-C 1) Contract effort to produce 42,000 weapons is prorated from the 80,000 weapon estimate detailed in Support Package IV-C.

2) In-house engineering support effort is assumed to require 2.5 men for 24 months at a cost of $200,000.

3) No foreign royalty is applicable.

BC/XM732
SUMMARY SHEET

A. RDT&E-To be performed by an average U.S. Contractor located on the West Coast with Engineering hourly rate of $6.69 per hour and Engineering Overhead of 184%.

1) A very minimal Phase I effort is assumed as being included in the Phase II effort.

Pack II-E 2) The Phase II effort is summarized as follows:

	Dev.Eng.Hrs.	PEP Hrs.	Total Man Hrs.
Contract	79,425	38,503	117,928
In-House	51,542	32,055	83,597
Total	130,967	70,558	201,525

3) No foreign license cost is applicable.

B. Limited Production (1000 weapons)

1) No foreign royalty is applicable.

Pack III-D 2) Investment Non-recurring is detailed in Package III-D.

3) Investment recurring is detailed in Package III-D.

C. Full Scale Production (42,000 weapons)

Pack IV-D 1) Contract effort to produce 42,000 weapons is prorated from the average of the 80,000 weapon estimate detailed in Support Packages IV-A, IV-B, and IV-C.

2) In-house engineering support effort is assumed to require 2.5 man hours for 24 months at a cost of $200,000.

3) No foreign royalty is included.

BC/M80
SUMMARY SHEET

A. RDT&E

Pack I-A 1) Phase I effort is required to convert a 6MM SAW candidate to the 7.62MM M80 round. Time required is 9 months since a portion of the Validation effort must be performed to establish data to evaluate potential performance.

Pack II-E 2) Phase II effort is assumed to be the average of the XM233, XM234 and XM235 efforts performed by an average U.S. Contractor.

3) Not applicable.

B. Limited Production (1000 weapons)

1) Not applicable

Pack III-D 2) Investment Non-recurring is assumed to be the average of XM233, XM234 and XM235 efforts performed by an average U.S. Contractor.

Pack III-D 3) Investment Recurring is assumed to be the average of XM233, XM234 and XM235 efforts with a material cost increase proportional to the Impulse ratio of the M80 versus the XM 732 rounds, thus 27.29 $\frac{(2.3-1.57)}{1.57}$=12.69. An increase of $13,000 is assumed.

C. Full Scale Production (42,000 weapons)

Pack IV-D 1) Contract effort is assumed to be the average of XM233, XM234 and XM235 efforts with material cost increased proportional to the M80 versus the XM732 Impulse ratio, thus (42,000 x $12.69=$532,980). An increase of $533,000 is assumed.

2) In-house engineering support is assumed to require 2.5 men for 24 months or $200,000.

3) Not applicable.

APPENDIX 2

BASIC ESTIMATED COST PACKAGES

NUMBER I-A

BASIC ESTIMATED COST PACKAGE
ADVANCED/ENGINEERING DEVELOPMENT
7.62MM CONVERSION FROM 6.00MM

9 MONTHS EFFORT

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: In-House Effort to Monitor Validation Engineering Contract Effort to Convert to 7.62mm from 6.00mm

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 Nov 74

RESEARCH AND DEVELOPMENT			COST	REFERENCE
7	8	9	10	11
COST CATEGORIES	HOURS	RATE	ESTIMATE	SCHEDULE
A. ENGINEERING				
A.1 DIRECT LABOR	17,550	-	144,936	
A.2 MATERIAL			900	
A.3 OVERHEAD		85%	123,196	
A.4 OTHER			29,068	
B. TOOLING				
B.1 DIRECT LABOR				
B.2 MATERIAL				
B.3 OVERHEAD				
B.4 OTHER				
C. PROTOTYPE PRODUCTION				
D. SYSTEM TEST AND EVALUATION			92,492	
E. DATA				
F. TOTAL SYSTEMS MANAGEMENT				
G. CONSTRUCTION				
H. TRAINING				
I. OTHER (Specify)				
J. TOTAL COST LESS (G AND A)			390,592	
K. G AND A				
L. TOTAL COST				
M. PROFIT OR FEE				
N. TOTAL PRICE				

REMARKS

9 Month Effort
See I-H/1 (VAL-ED)-9 through I-H/5 (VAL-ED)-9 for rationale.

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 November 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

PHASE I
-7.62MM-
RATIONALE
IN-HOUSE
VALIDATION ENGINEERING (VAL) FOR
EXTENDED ENGINEERING DEVELOPMENT (ED)

RATIONALE: It is assumed that one type of weapon mechanism has been selected for conversion to 7.62MM NATO from the SAW 6.00MM ammunition.

The major Validation type effort will be contracted as part of the Engineering Development effort and will entail redesign of the mechanism to accept the 7.62MM ammunition and conduct those portions DT-I/OT-I necessary to develop data required to confirm performance potential in accordance with SAW requirements.

Time of this effort 5 months FY75, 4 months FY76, for a total of 9 months.

	FY75	FY76	Total (VAL/ED)
Engineering	155,926	142,174	$298,100
DT-OT/APG		92,492	92,492
TOTAL	155,926	234,667	$390,592

PHASE I
-7.62MM-
RATIONALE
IN-HOUSE
VALIDATION ENGINEERING (VAL) FOR
EXTENDED ENGINEERING DEVELOPMENT (ED)

In-House Staff		FY75 (5 mos)		FY76 (4 mos)	
Title	Grade	Hrs	$	Hrs	$
Project Eng	14	750	9,435	600	7,548
Mech. Eng	13	750	8,048	600	6,434
Mech. Eng	12	1500	13,635	1200	10,908
Mech.Eng.Tech	11	1500	11,445	1200	9,156
Q.A. Tech	11	-0-	-0-	-0-	-0-
Mech.Eng.Tech	9	750	4,748	600	3,798
Draftsman	7	750	3,893	600	3,114
Draftsman	5	750	3,143	600	2,514
Math Analyst	12	750	6,818	600	5,454
RAM Eng	12	750	6,818	600	5,454
Q.A. Eng	12	750	6,818	600	5,454
Q.A. Tech	12	-0-	-0-	-0-	-0-
Model Maker	WB	750	5,723	600	4,578
Direct Labor FY75		9,750	$80,524		
FY76				7800	$64,412
Total Direct Lab (VAL)		17,550 Hrs		$144,936	

Overhead (85%)

FY75	$68,446
FY76	54,750
Total Overhead	$123,196

(VAL/ED) ENGINEERING

RATIONALE: Engineering Material costs cover office supplies, drafting paper, etc. and is estimated at $100/month.

FY75	5 x 100	500
FY76	4 x 100	400
TOTAL		900

(VAL/ED) IN-HOUSE-OTHER DIRECT COSTS

RATIONALE: Other Direct Costs are assumed to consist of Computer Expenses at $600 per month and Travel expenses as broken down on the following page.

A. Computer Expense

FY75	5 x 600	$3,000
FY76	4 x $600	2,400
TOTAL		$5,400

B. Travel Expense

FY75	$ 3,456
FY76	20,212
TOTAL	$23,668

C. Total O.D.C.

FY75	$6,456
FY76	22,612
TOTAL	$29,068

(VAL/ED IN-HOUSE TRAVEL COST

Estimate of Travel Cost (West Coast Contractor)

		FY75	FY76	
1.	Design Reviews at Contractor	3	3	trips
	3 days 3 men x $35/day	$945	$945	
	Car Rental 2 days-$60/trip	$180	$180	
	Air Fare $2 59 x 3 men/trip	$2,331	$2,331	
2.	Support of APG Test (DT-I)		100	days
	1 man x $35/day		$3,500	
	Car Rental $30/day		$3,000	
	Air Fare $141 x 12 trips		$1,692	
3.	Support of Ft. Benning Test (OT-I)		100	days
	1 man x $35/day		$3,500	
	Car Rental $30/day		$3,000	
	Air Fare $172 x 12 trips		$2,064	
	Total/FY	$3,456	$20,212	
	TOTAL(VAL/ED) TRAVEL		$23,668	

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION

SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED

Conversion to 7.62mm from 6.00mm
Validation Engineering Contract

3. QUANTITY

NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT

Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL

4

6. ESTIMATE PREPARED AS OF

30 Nov 74

RESEARCH AND DEVELOPMENT				COST	REFERENCE
7		8	9	10	11
COST CATEGORIES		HOURS	RATE	ESTIMATE	SCHEDULE
A	ENGINEERING				
1	DIRECT LABOR	20,250	$6.69	135,473	
2	MATERIAL			1,800	
3	OVERHEAD		184%	249,270	
4	OTHER			29,748	
B	TOOLING				
1	DIRECT LABOR				
2	MATERIAL				
3	OVERHEAD				
4	OTHER				
C	PROTOTYPE PRODUCTION			45,000	
D	SYSTEM TEST AND EVALUATION			56,000	
E	DATA				
F	TOTAL SYSTEMS MANAGEMENT			62,034	
G	CONSTRUCTION				
H	TRAINING				
I	OTHER (Specify)				
J	TOTAL COST LESS (G AND A)			579,325	
K	G AND A -0-				
L	TOTAL COST			579,325	
M	PROFIT OR FEE 10%				
N	TOTAL PRICE			637,257	

REMARKS

9 Month Effort
See A-1 (VAL/ED)-9 through A-3 (VAL/ED)-9 for rationale.

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 November 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

PHASE I
-7.62MM-
RATIONALE
CONTRACTOR (WEST COAST)
VALIDATION ENGINEERING (VAL) FOR
EXTENDED ENGINEERING DEVELOPMENT (ED)

RATIONALE: It is assumed that the contractor is required to convery one existing 6.00MM SAW candidate weapon mechanism into a 7.62MM weapon and repeat the performance of the Research and Development Acceptance Test. The contractor will supply 3 prototype weapons for contractor tests and 7 prototype weapons for DT-I/OT-I testing plus limited technical support.

This contractor effort will be included in the Engineering Development Contract and will represent the time period of 5 months in FY75 and 4 months in FY76.

The contractor's Engineering Costs are broken down as follows:

	FY75	FY76	TOTAL
1. (VAL/ED) Engineering	220,111	196,180	$416,291
1.1 Direct Labor	75,263	60,210	135,473
1.2 Overhead	138,484	110,786	249,270
1.3 Material	1,000	800	1,800
1.4 O.D.C.	5,364	24,384	29,748
2. Prototypes			$101,000
21. 3 Preliminary	45,000	-0-	45,000
2.2 7 DT/OT	-0-	56,000	56,000
3. System Management (1.7 men)	5 mos.	4 mos.	
150 x 1.7 x $27.03/mo.	34,463	27,571	$62,034
4. Total Contract(VAL/ED)	299,574	279,751	$579,325
5. Contract Price (10% Profit)	329,531	307,726	$637,257

A-1(VAL/ED)-9

PHASE I
-7.62MM-
RATIONALE
CONTRACTOR
VALIDATION ENGINEERING (VAL) FOR
EXTENDED ENGINEERING DEVELOPMENT (ED-9)

Engineering Direct Labor (15x150x5)

An average Contractor's Hourly Rate of $6.69 is assumed.

FY75 (5 months)	11,250 hrs.	$75,268
FY76 (4 months)	9,000 hrs	60,210
Total (VAL/ED)	20,250 hrs	$135,473

Engineering Overhead

An average Contractor's Overhead of 184% is assumed.

FY75	$138,484
FY76	110,786
Total (VAL/ED)	$249,270

Engineering Material (Paper, Supplies, etc) $200/month.

FY75 (5 months)	$ 1,000
FY76 (4 months)	800
Total (VAL/ED)	$ 1,800

Engineering Other Direct Charges.

FY75	$ 5,364
FY76	24,384
Total (VAL/ED)	$ 29,748

PHASE I
-7,62MM-
RATIONALE
CONTRACTOR
(VAL/ED)

RATIONALE: Other Direct Charges to Engineering

A. Computer $600 Month

FY75 (5 months)	$ 3,000
FY76 (4 months)	$ 2,400
Total Computer	$ 5,400

B. Travel

	FY75	FY76
1. Informal Reviews at RIA	3	3
3 days x 2 men x $35/day	$ 630	$ 630
Car Rental 2 day-$60/trip	180	$ 180
Air Fare $259 x 2 men	$1554	$1554
2. Support of APG Test (DT-I)		100 days
1 man x $35/day		$3500
Car Rental-$30/day		$3000
AirFare $355 x 10 trips		$3550
3. Support Ft. Benning Test		100 days
1 man x $35/day		$3500
Car Rental $30/day		$3000
Air Fare $307 x 10 trips		$3070
4. Total Travel/FY	$2364	$21,984

5. TOTAL TRAVEL $24,348

C. Other Direct Charges to Engineering Summary

	FY75	FY76	TOTAL
Computer	3,000	2,400	5,400
Travel	2,364	21,984	24,348
TOTAL O.D.C.	$5,364	$24,384	$29,748

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION

SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED

In-House Effort to Monitor Full Scale Development
Contract to Convert to 7.62mm From 6.00mm

3. QUANTITY

NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT

Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL

4

6. ESTIMATE PREPARED AS OF

30 Nov 74

RESEARCH AND DEVELOPMENT				COST	REFERENCE
	7	8	9	10	11
	COST CATEGORIES	HOURS	RATE	ESTIMATE	SCHEDULE
A	ENGINEERING				
1	DIRECT LABOR	51,554	-	432,022	
2	MATERIAL			3,200	
3	OVERHEAD		85%	367,244	
4	OTHER			85,285	
B	TOOLING				
1	DIRECT LABOR				
2	MATERIAL				
3	OVERHEAD				
4	OTHER				
C	PROTOTYPE PRODUCTION				
D	SYSTEM TEST AND EVALUATION				
E	DATA				
F	TOTAL SYSTEMS MANAGEMENT				
G	CONSTRUCTION				
H	TRAINING				
I	OTHER (Specify)				
J	TOTAL COST LESS (G AND A)			887,751	
K	G AND A				
L	TOTAL COST				
M	PROFIT OR FEE				
N	TOTAL PRICE				

REMARKS

32 Month Effort
See I-H/1 (FSD/ED)-9 through I-H/6 (FSD/ED)-9 for rationale.

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 November 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

PHASE II
-7.62MM-
RATIONALE
IN-HOUSE
FSD - EXTENDED ENGINEERING DEVELOPMENT

RATIONALE: The 7.62mm SAW weapon is judged to have 6 areas requiring major redesign, specifically:

(1) Weight
(2) Receiver
(3) Gas System
(4) Bolt/Operating Group
(5) Firing Mechanism
(6) Magazine

The Major FSD-Engineering effort to redesign these areas will be conducted 8 months of FY76, 3 months of 76/77 and 6 months of FY77.

The final 6 months of FY77 and 9 months of FY78 will be used to finalize detail design, testing, data acquisition, data processing, data evaluation and evaluation of proposed production related modifications in conjunction with the concurrent PEP Effort.

Two basic prob lems appear to exist:

(1) Increasing the size and strength of the weapon to accomodate the 7.62MM round may increase weapon weight to an unacceptable value.

(2) If the locking lug area requires extensive modification to insure adequate weapon life an extensive redesign and testing of the operating mechanism may be required.

PHASE II
-7.62MM-
SUMMARY OF COSTS
FSD-IN-HOUSE ENGINEERING

FY76 (8 months)	$256,281
76/77 (3 months)	92,935
FY77 (12 months)	317,150
FY78 (9 months)	221,385
TOTAL	$887,751

The above totals are broken down as to Direct Labor, Overhead, Material, and Other Direct Charges on the following pages of the section:

PHASE II
-7.62MM-
IN-HOUSE
FSD-IN-HOUSE ENGINEERING

The In-House FSD Engineering Team Effort is summarized as follows:

		FY76 8 mos.		76/77 5 mos.		FY77 12 mos.		FY78 9mos.	
	GRADE	HRS	$	HRS	$	HRS	$	HRS	$
Proj. Eng	14								
Mech. Eng	13								
Mech. Eng	12								
Mech. Tech	12	5x2003=10,015							
		3x1903= 5,709							
Q.A. Tech	11	8 mos. 15,724							
Mech. Tech	9			3x1903=5,709					
Draftsman	7					7x1903=13,321			
						5x1200= 6,000			
Draftsman	5					12 mos. 19,321		9x1200=10,800	
Math.Analy.	12								
RAM Eng.	12								
Q.A. Eng	12								
Q.A. Tech	12								
Model Maker									

Direct Labor	FY76	15,724	$131,761
	FY76/77	5,709	$47,847
	FY77	19,321	$161,910
	FY78	10,800	$90,504
Direct Labor (FSD)		51,554 hrs	$432,022
Overhead (85%)	FY76		$112,002
	FY76/77		40,690
	FY77		137,624
	FY78		76,928
Overhead (FSD)			$367,244

PHASE II
-7.62MM-
IN-HOUSE
GSD-EXTENDED ENGINEERING DEVELOPMENT

RATIONALE: Engineering Material Cost covers office supplies, drafting paper, etc., and is estimated at $100/month.

FY76	8 mos. x $100	$ 800
FY76/77	3 mos. x $100	300
FY77	12 mos. x $100	1200
FY78	9 mos x $100	900
TOTAL		$3200

PHASE II
-7.62MM-
IN-HOUSE
ESTIMATE OF TRAVEL COST
FSD-EXTENDED ENGINEERING DEVELOPMENT

	FY76	FY76/77	FY77	FY78
A. Reviews at West Coast Contractor	6	2	8	6
3daysx3menx$35/day	$1,890	$ 630	$2,520	$1,890
Car Rental $60/trip	360	120	480	360
Air Fare/$259 x 3 men	4,662	1,554	6,216	4,662
B. Support APG (RDAT-DT-II)				275 days
1manx$35/dayx275 days				9,625
1manx$35/dayx30 days				1,050
Car Rental $30/day x 275				8,250
Air Fare $141 x 38 trips				5,358
C. Support Ft. Benning OT-II				180 days
1 man x $35/day x 180 days				6,300
1 man x $35/day x 18 days				630
Car Rental $30/day x 180 days				5,400
Air Fare $172 x 24 trips				4,128
TOTAL/FY	$6,912	$2,304	$9,216	$47,653
TOTAL TRAVEL				$66,085

PHASE II
-7.62MM-
IN-HOUSE
SUMMARY OF OTHER DIRECT COSTS
FSD-EXTENDED ENGINEERING DEVELOPMENT

RATIONALE: Other Direct Costs are assumed to consist of Computer Expenses at $600 per month and Travel Expense based on a West Coast Contractor.

A. Computer Expense

FY76	8 x $600	$4,800
FY76/77	3 x $600	1,800
FY77	12 x $600	7,200
FY78	9 x $600	5,400
TOTAL		$19,200

B. Travel Exepnse

FY76	$ 6,912
FY76/77	2,304
FY77	9,216
FY78	47,653
TOTAL	$66,085

C. O.D.C./FY

FY76	$11,712
FY76/77	4,104
FY77	16,416
FY78	53,053

D. TOTAL OTHER DIRECT CHARGES $85,285

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION

SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED

In-House PEP Extended Engineering Development
7.62mm from 6.00mm

3. QUANTITY

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT

Squad Automatic Weapon Program

5. WORK BREAKDOWN STRUCTURE LEVEL

4

6. ESTIMATE PREPARED AS OF

30 Nov 74

RESEARCH AND DEVELOPMENT			7 COST CATEGORIES	8 HOURS	9 RATE	10 COST ESTIMATE	11 REFERENCE SCHEDULE
A	.		ENGINEERING				
	1		DIRECT LABOR	24,639	-	192,375	
	2		MATERIAL			4,800	
	3		OVERHEAD		85%	163,519	
	4		OTHER in FSD			-	
B	.		TOOLING				
	1		DIRECT LABOR				
	2		MATERIAL				
	3		OVERHEAD				
	4		OTHER				
C	.		PROTOTYPE PRODUCTION				
D	.		SYSTEM TEST AND EVALUATION				
E	.		DATA				
F	.		TOTAL SYSTEMS MANAGEMENT				
G	.		CONSTRUCTION				
H	.		TRAINING				
I	.		OTHER (Specify) Config. Control Board			153,006	
J	.		TOTAL COST LESS (G AND A)			513,700	
K	.		G AND A				
L	.		TOTAL COST				
M	.		PROFIT OR FEE				
N	.		TOTAL PRICE				

REMARKS

32 Month Effort
See I-H/7 (PEP/ED)-9 through I-H/10 (PEP/ED)-9 for rationale.

12.	TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a.	PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 November 74
b.	REVIEWING OFFICIAL			
c.	APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

PHASE II
-7.62MM-
IN-HOUSE
RATIONALE

PEP EXTENDED ENGINEERING DEVELOPMENT

The In-House PEP Engineering Team Effort is summarized as follows:

	GRADE	8mos FY76	3mos FY76/77	12mos FY77	9mos FY78
Project Eng.	14				
Mech. Eng	13				
Mech Eng.	12				
Mech Tech	11			(4816x7.96= 38,835) + (3500x7.59= 26,565)=64,900	
Mech Tech	9	5x1125=5625 3x688= 2064 8 mos. 7689			
Draftsman	7		3x688=2064		
Draftsman	5	(5625x8.32= 46,800) + (2064x7.96= 16,429)=63,229	2064x7.96= 16,429	7x6.88=4816 5x700= 3500 12 8316	9x700=6300
Math Anal.	12				6300x7.59=47,817
*Eng Material		$1200	$450	$1800	$1350
TOTAL ENG MATERIAL			$4800		

Direct Lab						
	FY76	7689	$63,229			
	FY76/77			2064	$16,429	
	FY77					8316 $64,900
	FY78					6300 $47,817

Total Direct Labor (PEP) 24,639 hrs $192,375

*Engineering Material Cost is estimated at $150/month.

Overhead (85%)	
FY76	$53,745
FY76/77	13,965
FY77	55,165
FY78	40,644
Total Overhead (PEP)	$163,519

PHASE II
-7.62MM-
RATIONALE
IN-HOUSE-CONFIGURATION CONTROL BOARD
PEP-EXTENDED ENGINEERING DEVELOPMENT

RATIONALE:

Control of Configuration Management will be assumed by the Government.

A Configuration Control Board (CCB) will be established and will exercise its authority throughout the FSD period and potentially continue in the same manner at somewhat diminished levels of effort through the Limited Production and the Full Scale Production Periods.

During the FSD period from 1 Nov 76 to 1 May 78 (32 months) the CCB will utilize the following people tothe extent indicated:

	Grade	Hrs	$DL	$Overhe
40% Configuration Mgr	14	1920	24,154	20,531
40% Engineer	13	1920	20,602	17,511
20% Procurement Spec.	13	960	10,301	8,756
20% Q.A. Eng (Gages & SQUAPS)	13	960	10,301	8,756
20% Maintenance Spec.	12	960	8,726	7,417
20% Supply Spec.	11	960	7,325	6,226
TOTAL			$81,409	$69,197

These expenses occur as follows:		$DL	$OH	Total
FY76	8 months	20,352	17,299	37,651
FY76/77	3 months	7,632	6,487	14,119
FY77	12 months	30,528	25,949	56,477
FY78	9 months	22,897	19,462	42,359
TOTAL (CCB)				$150,606

PHASE II
-7.62MM-
IN-HOUSE
RATIONALE

PEP SUMMARY-EXTENDED ENGINEERING DEVELOPMENT

	FY76	FY76/77	FY77	FY78	TOTAL
A. Engineering					
Direct Labor	63,229	16,429	64,900	47,817	192,375
Material ($150/ month)	1,200	450	1,800	1,350	4,800
Overhead (85%)	53,745	13,965	55,165	40,644	163,519
O.D.C. (in FSD)	-	-	-	-	-
TOTAL A	118,174	30,844	121,865	89,811	$360,694
B. Configuration Control					
Direct Labor	20,352	7,632	30,528	22,897	81,409
Material ($75/ month)	600	225	900	675	2,400
Overhead (85%)	17,299	6,487	25,949	19,462	69,197
O.D.C. (in FSD)	-	-	-	-	-
TOTAL B	38,251	14,344	57,377	43,034	$153,006
A & B	156,425	45,188	179,242	132,845	
TOTAL IN-HOUSE PEP					$513,700

NUMBER I-8

BASIC ESTIMATED COST PACKAGE
ADVANCED/ENGINEERING DEVELOPMENT
5.56MM CONVERSION FROM 6.00MM
(INCLUDING FABRIQUE NATIONALE 63 GRAIN 5.56MM)

12 MONTHS EFFORT

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: In-House Effort to Monitor Validation Engineering Contract to Convert to 5.56mm from 6.0mm

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT				COST	REFERENCE
7		8	9	10	11
COST CATEGORIES		HOURS	RATE	ESTIMATE	SCHEDULE
A	ENGINEERING				
1	DIRECT LABOR	23,400	-	193,256	
2	MATERIAL			1,200	
3	OVERHEAD		85%	164,267	
4	OTHER			36,628	
B	TOOLING				
1	DIRECT LABOR				
2	MATERIAL				
3	OVERHEAD				
4	OTHER				
C	PROTOTYPE PRODUCTION				
D	SYSTEM TEST AND EVALUATION			92,492	
E	DATA				
F	TOTAL SYSTEMS MANAGEMENT				
G	CONSTRUCTION				
H	TRAINING				
I	OTHER (Specify)				
J	TOTAL COST LESS (G AND A)			287,843	
K	G AND A				
L	TOTAL COST				
M	PROFIT OR FEE				
N	TOTAL PRICE				

REMARKS

12 Month Effort
See I-H/1(Val/ED-12) Through I-H/5 (Val/ED-12) for rationale

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

PHASE I
-5.56MM-
RATIONALE
IN-HOUSE
VALIDATION (VAL) ENGINEERING

RATIONALE: It is assumed that one type of weapon mechanism has been selected for conversion to 5.56mm M193 from the SAW 6.00mm ammunition.

The major Validation effort will be to redesign the mechanism to accept the 5.56mm ammunition and conduct those portions of DT-I and OT-I necessary to develop data required to confirm performance potential in accordance with SAW requirements.

	FY75	FY76	TOTAL
*Engineering	158,229	237,122	395,351
DT-I/OT-I	-0-	92,492	92,492
TOTAL	158,229	329,164	487,843

*Engineering costs are broken down as Direct Labor, Overhead, Materials, and Other Direct Charges on the following pages.

PHASE I
-5.56-
CONCEPTUAL
IN-HOUSE
VALIDATION ENGINEERING

TITLE	GRADE	FY75 (5 mos) HRS	$	(FY76 (7 mos) HRS	$
Project Eng	14	750	9,435	1050	13,209
Mech Eng	13	750	8,048	1050	11,267
Mech Eng	12	1500	13,635	2100	19,089
Mech Eng Tech	11	1500	11,445	2100	16,023
Q.A. Tech	11	-	-	-	-
Mech Eng Tech	9	750	4,748	1050	6,647
Draftsman	7	750	3,893	1050	5,450
Draftsman	5	750	3,143	1050	4,400
Math Analyst	12	750	6,818	1050	9,545
RAM Eng	12	750	6,818	1050	9,545
Q.A. Eng	12	750	6,818	1050	9,545
Q.A. Tech	12	-	-	-	-
Model Maker		750	5,723	1050	8,012
Direct Labor FY75 FY76		9,750	80,524	13650Hrs.	112,732
Total Direct Labor (VAL)		23,400 Hrs.		$193,256	
Overhead (85%)		FY75 $68,445 FY76 95,822			
Total Overhead		164,267 (123,200)			

1-H/2 (VAL/ED-12)

-5.56MM-
IN-HOUSE
(VAL) ENGINEERING MATERIAL

RATIONALE: Engineering Material costs cover office supplies, drafting paper, etc., and is estimated at $100 per month.

FY75	5 x 100	$500
FY76	7 x 100	700
TOTAL		$1200

1-H/3 (VAL/ED-12)

-5.56MM-
IN-HOUSE
(VAL) IN-HOUSE-OTHER DIRECT COSTS

RATIONALE: Other Direct Costs are assumed to consist of Computer Expenses at $600 per month and Travel Expense.

A. Computer Expense

FY75	5 x 600	$3,000
FY76	7 x 600	4,200
TOTAL		$7,200

B. Travel Expense

FY75	$5,760
FY76	23,668
TOTAL	29,428

C. Total O.D.C./FY

FY75	$8,760
FY76	27,868
TOTAL	$36,628

-5.56MM-
IN-HOUSE
(VAL) IN-HOUSE-TRAVEL COST

Estimate of Travel Costs:

	FY75	FY76
Review West Coast Contracts	5	6
3 men x 3 days x $35/day	1575	1890
Car Rental-$60/trip	300	360
Air Fare $259 x 3 men/trip	3885	4662
Support of APG Test (OT-I)		100 days
1 man x $35/day		3500
Car Rental $30/day		3000
Air Fare $141 x 12 trips		1692
Support of Ft. Benning Test (OT-I)		100 days
1 man x $35/day		3500
Car Rental $30/day		3000
Air Fare $172 x 12 trips		2064
TOTAL/FY	$5,760	$23668
TOTAL (VAL) TRAVEL		$29428

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: Conversion to 5.56mm from 6.0mm Validation Engineering Contract

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT			8 HOURS	9 RATE	10 COST ESTIMATE	11 REFERENCE SCHEDULE
7 COST CATEGORIES						
A	.	ENGINEERING				
	1	DIRECT LABOR	27,000	$6.69	180,631	
	2	MATERIAL			2,400	
	3	OVERHEAD		184%	332,360	
	4	OTHER			33,124	
B	.	TOOLING				
	1	DIRECT LABOR				
	2	MATERIAL				
	3	OVERHEAD				
	4	OTHER				
C	.	PROTOTYPE PRODUCTION			116,000	
D	.	SYSTEM TEST AND EVALUATION				
E	.	DATA				
F	.	TOTAL SYSTEMS MANAGEMENT			82,712	
G	.	CONSTRUCTION				
H	.	TRAINING				
I	.	OTHER (Specify)				
J	.	TOTAL COST LESS (G AND A)			747,227	
K	.	G AND A	-0-			
L	.	TOTAL COST			747,227	
M	.	PROFIT OR FEE				
N	.	TOTAL PRICE	10%		821,949	

REMARKS

12 Month Effort
See A-1 (VAL/ED-12) through A-3 (VAL/ED-12) for Rationale

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

PHASE I
-5.56MM-
RATIONALE
CONTRACTOR (WEST COAST)
VALIDATION ENGINEERING (VAL) FOR
12MO EXTENDED ENGINEERING DEVELOPMENT (ED)

RATIONALE: It is assumed that the contractor is required to convert one existing SAW candidate weapon mechanism into a 5.56MM (M193) weapon and repeat the performance of a Research and Development Acceptance Test (RDAT). The contractor will supply 4 prototype weapons for contractor tests and 7 prototype weapons for DT-I/OT-I testing plus limited technical support.

This contractor effort will be included in the Engineering Development Contract and will represent the time period of 5 months in FY75 and 7 months in FY76.

The contractor's Engineering Costs are estimated as follows:

	FY75	FY76	TOTAL
1. (VAL/ED-12) Engineering			
1.1 Direct Labor	75,263	105,368	180,631
1.2 Overhead	138,484	193,876	332,360
1.3 Materials (200/mo)	1,000	1,400	2,400
1.4 O.D.C.	5,364	27,760	33,124
	220,111	328,404	548,515
2. Prototypes			
2.1 4 Preliminary	45,000	15,000	60,000
2.2 7 DT-I/OT-I	-0-	56,000	56,000
		71,000	116,000
3. System Management (1.7 Men) 150 x 1.7 x $27.03/Mo.	5 mos. 34,463	7 mos. 48,249	82,712
4. Total Contract (VAL/ED12)	299,574	447,653	747,227
5. Contract Price (10% Profit)	329,531	492,418	821,949

A-1 (VAL/ED-12)

PHASE I
-5.56MM-
RATIONALE
CONTRACTOR
VALIDATION ENGINEERING (VAL) FOR
12MO EXTENDED ENGINEERING DEVELOPMENT (ED-12)

Engineering Direct Labor (15 men x 150 hr/mo)		$6.69/hr
FY75 (5 months)	11,250 hrs.	$75,263
FY76 (7 months)	15,750 hrs.	105,368
	27,000 hrs.	$180,631
Engineering Overhead (184%)		
FY75		$138,484
FY76		193,877
Total		$332,361
Engineering Material ($200/mo)		
FY75 (5 months)		1,000
FY76 (7 months)		1,400
Total		$2,400
Engineering Other Direct Charges		
FY75		5,364
FY76		27,760
Total		33,124

PHASE I
-5.56MM-
RATIONALE
CONTRACTOR (WEST COAST)

RATIONALE: Other Direct Charges to Engineering:

A. Computer $600/Month

FY75 5 months	$3,000
FY76 7 months	4,200
Total	$7,200

B. Travel

	FY75	FY76
1. Informal Reviews at RIA	3	5
3 days x 2 men x $35/day	630	1,050
Car Rental-$60/trip	180	300
Air Fare $259 x 2 men	1,554	2,590
2. Support of APG (DT-I)		100 days
1 man x $35/day		3,500
Car Rent-$30/day		3,000
Air Fare-$355 x 10 trips		3,550
3. Support Ft. Benning (OT-I)		100 days
1 man x $35/day		3,500
Car Rent-$30/day		3,000
Air Fare-$307 x 10 trips		3,070
4. Total Travel/FY	$2,364	$23,560
5. Total Travel		$25,924

C. Other Direct Charges-Summary

	FY75	FY76	TOTAL
Computer	3,000	4,200	7,200
Travel	2,364	23,560	25,924
Total	5,364	27,760	33,124

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION

SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED	3. QUANTITY
In-House Effort to Monitor Full Scale Development Contract to Convert to 5.56mm from 6.0mm	NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	5. WORK BREAKDOWN STRUCTURE LEVEL	6. ESTIMATE PREPARED AS OF
Squad Automatic Weapon System	4	30 November 1974

RESEARCH AND DEVELOPMENT				COST	REFERENCE
7			8	9	10	11
COST CATEGORIES			HOURS	RATE	ESTIMATE	SCHEDULE
A	.	ENGINEERING				
	1	DIRECT LABOR	51,542	-	432,112	
	2	MATERIAL			3,200	
	3	OVERHEAD		85%	367,296	
	4	OTHER			70,791	
B	.	TOOLING				
	1	DIRECT LABOR				
	2	MATERIAL				
	3	OVERHEAD				
	4	OTHER				
C	.	PROTOTYPE PRODUCTION				
D	.	SYSTEM TEST AND EVALUATION				
E	.	DATA				
F	.	TOTAL SYSTEMS MANAGEMENT				
G	.	CONSTRUCTION				
H	.	TRAINING				
I	.	OTHER (Specify)				
J	.	TOTAL COST LESS (G AND A)			873,399	
K	.	G AND A				
L	.	TOTAL COST				
M	.	PROFIT OR FEE				
N	.	TOTAL PRICE				

REMARKS

32 Month Effort
See I-H/1 (FSD/ED-12) through I-H/6 (FSD/ED-12) for Rationale

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

PHASE II
EXTENDED PROGRAM
RATIONALE
-5.56MM-
IN-HOUSE
FSD-ENGINEERING

RATIONALE: The 5.56mm SAW weapon is judged to have 6 areas requiring major redesign, specifically:

(1) Power
(2) Receiver
(3) Gas System
(4) Bolt/Operating Group
(5) Firing Mechanism
(6) Magazine

The major FSD-Engineering efforts to redesign these areas will be conducted in 5 months of FY76, 3 months 76/77, and 10 months of FY77.

The final 2 months of FY77 and 12 months of FY78 will be used to finalize detail design, testing, data acquisition, data processing, data evaluation, and evaluation of proposed production related modifications in conjunction with the concurrent PEP effort.

Two basic problems appear to exist:

(1) Scaling down the mechanism to operate on the substantially less energy available from the 5.56mm round may severly limit weapon reliability especially under adverse conditions.

(2) If the locking lug areas require extensive modification to insure adequate weapon life an extensive redesign and testing of the operating mechanism may be required.

-5.56MM-
SUMMARY OF COSTS
FSD-IN-HOUSE ENGINEERING

FY76	$163,592
76/77	92,310
FY77	345,045
FY78	272,452
TOTAL	$873,399

The above totals are broken down as to Direct Labor, Overhead, Materials, and Other Direct Charges on the following pages of this section.

-5.56MM-
IN-HOUSE
FSD-ENGINEERING

The In-House FSD Engineering Team Effort is summarized as follows:

		FY76 5 mos		76/77 3 mos		FY77 12mos		FY78 12 mos	
	GRADE	HRS	$	HRS	$	HRS	$	HRS	$
Proj Eng	14								
Mech Eng	13								
Mech Eng	12								
Mech Tech	12								
Q.A. Tech	11								
Mech Tech	9								
Draftsman	7								
Draftsman	5								
Math Analyst	12								
RAM Eng	12								
Q.A. Eng.	12								
Q.A. Tech	12								
Model Maker									
		2003hrs/mo		1903hrs/mo		1785hrs/mo		1200hrs/mo	
Direct Labor	FY76	10,017	$84,406						
	76/77			5710	$47,910				
	FY77					21,416	$179,415		
	FY78							14,400	$120,381

Direct Labor (FSD) 51,542 hrs $432,112 (Average $8.38/hr)

Overhead (85%)	FY76	$71,746
	76/77	$40,724
	FY77	152,502
	FY78	102,324
Overhead (FSD)		$367,296

1-H/3 (FSD/ED-12)

-5.56MM-
FSD-ENGINEERING MATERIAL
IN-HOUSE ENGINEERING

RATIONALE: Engineering Material costs cover office supplies, drafting paper, etc., and is estimated at $100 per month.

FY76	5 x $100	$500
76/77	3 x $100	$300
FY77	12 x $100	$1200
FY78	12 x $100	$1200

-5.56MM-
ESTIMATE OF TRAVEL COSTS
FSD-IN-HOUSE ENGINEERING

	FY76	76/77	FY77	FY78	
A. Reviews at West Coast Contractor	5	2	6	6	
3 days x 2 men x $35/day	1050	420	1260	1260	
Car Rental 2 days-$60/trip	300	120	360	360	
Air Fare-$259 x 2 men	2590	1036	3108	3108	
B. Support of APG Test (RDAT-DT-II)				275	days
1 man x $35/day				9625	
Car Rental @ $30/day				8250	
Air Fare $141 x 28 trips				3948	
C. Support of Ft. Benning Test (OT-II)				180	days
1 man x $35/day				6300	
Car Rental @ $30/day				5400	
Air Fare $172 x 18 trips				3096	
TOTAL/FY	$3940	$1576	$4728	$41347	
TOTAL TRAVEL				$51,591	

1-H/5 (FSD/ED-12)

-5.56MM-
OTHER DIRECT COSTS
FSD-IN-HOUSE ENGINEERING

RATIONALE: Other Direct Costs are assumed to consist of Computer Expense at $600 per month and Travel Expense based on a West Coast Contractor.

A. Computer Expense

FY76	5 x $600	$ 3,000
76/77	3 x $600	1,800
FY77	12 x $600	7,200
FY78	12 x $600	7,200
TOTAL		$19,200

B. Travel Expense

FY76	$ 3,940
76/77	1,576
FY77	4,728
FY78	41,347
TOTAL	$51,591

C. Total O.D.C./FY

FY76	$ 6,940
76/77	3,376
FY77	11,928
FY78	48,547

D. TOTAL O.D.C. $70,791

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: In-House PEP Extended Engineering Development
Convert to 5.56mm from 6.00mm

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT			COST	REFERENCE
7	8	9	10	11
COST CATEGORIES	HOURS	RATE	ESTIMATE	SCHEDULE
A. ENGINEERING				
1 DIRECT LABOR	24,375		192,138	
2 MATERIAL			2,400	
3 OVERHEAD		85%	163,317	
4 OTHER IN FSD				
B. TOOLING				
1 DIRECT LABOR				
2 MATERIAL				
3 OVERHEAD				
4 OTHER				
C. PROTOTYPE PRODUCTION				
D. SYSTEM TEST AND EVALUATION				
E. DATA				
F. TOTAL SYSTEMS MANAGEMENT				
G. CONSTRUCTION				
H. TRAINING				
I. OTHER (Specify) Config. Control Board			153,006	
J. TOTAL COST LESS (G AND A)			510,861	
K. G AND A				
L. TOTAL COST				
M. PROFIT OR FEE				
N. TOTAL PRICE				

REMARKS

32 Month Effort
SEE I-H/7 (PED/ED-12) through I-H/9 (CCB/ED-12) for Rationale

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

PHASE II
EXTENDED PROGRAM
-5.56MM-
IN-HOUSE PEP
SUMMARY

	FY76	76/77	FY77	FY78	Total
A. Engineering					
Direct Labor	46,779	16,419	65,192	63,748	192,138
Material ($75/ month)	375	225	900	900	2,400
Overhead (85%)	39,762	13,956	55,413	54,186	163,317
O.D.C. (in FSD)	-	-	-	-	-
TOTAL A	86,916	30,600	121,505	118,834	357,855
B. Configuration Control Board					
Direct Labor	12,720	7,633	30,528	30,528	81,409
Material ($75/ month)	375	225	900	900	2,400
Overhead (85%)	10,812	6,487	25,949	25,949	69,197
O.D.C. (in FSD)	-	-	-	-	-
TOTAL B	23,907	14,345	57,377	57,377	153,006
A & B	110,823	44,945	178,882	176,211	
TOTAL IN-HOUSE PEP					$510,861

PHASE II
EXTENDED PROGRAM
-5.56MM-
IN-HOUSE
PEP ENGINEERING

TITLE	GRADE	FY75 5mos HRS	$	76/77 3mos HRS	$	FY77 12mos HRS	$	FY78 12mos HRS	$
Project Eng	14								
Mech Eng	13								
Mech Eng.	12								
Mech Tech.	11								
Mech Tech.	9								
Draftsman	7								
Draftsman	5								
Math Analyst	12								
RAM Eng.	12								

Direct Labor

FY76	5625	$46,779							
76/77			2063	$16,419					
FY77					8287	$65,192			
FY78							8400	$63,748	

Total Direct Labor (PEP) 24,375 Manhours $192,138
(Average ManHr $7.88)

Overhead (85%)

FY76	39,762
76/77	13,956
FY77	55,413
FY78	54,186
TOTAL OVERHEAD (PEP)	163,317

1-H/8 (PEP/ED-12)

PHASE II
EXTENDED PROGRAM
-5.56MM-
IN-HOUSE-
CONFIGURATION CONTROL BOARD

RATIONALE:

Control of Configuration Management will be assumed by the Government.

A Configuration Control Board (CCB) will be established and will exercise its authority throughout the FSD period and potentially continue in the same manner at somewhat diminished levels of effort through the Limited Production period and the Full Scale Production period.

During the FSD period from 1 February 1976 to 1 October 1978 (32 months) the CCB will utilize the following people to the extent indicated:

TITLE	Grade	Hours	$DL	$Overhead
40% Configuration Manager	14	1920	24,154	20,531
40% Engineer	13	1920	20,602	17,511
20% Procurement Specialist	13	960	10,301	8,756
20% QA Engineer (Gages & SQAPS)	13	960	10,301	8,756
20% Maintenance Specialist	12	960	8,726	7,417
20% Supply Specialist	11	960	7,325	6,226
	TOTAL		$81,409	$69,197

These Expenses occur as follows:

FY76	$12,720	$10,812
76/77	7,633	6,487
FY77	30,528	25,949
FY78	30,528	25,949

1-H/9 (CCB/ED-12)

NUMBER I-C

BASIC ESTIMATED COST PACKAGE
ADVANCED/ENGINEERING DEVELOPMENT
CONCEPTUAL WEAPON SYSTEM WITH EXTENSIVE CHANGES

18 MONTHS EFFORT

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION

SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED	3. QUANTITY
Develop Best Combined Conceptual Weapon Validation Engineering Contract	NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	5. WORK BREAKDOWN STRUCTURE LEVEL	6. ESTIMATE PREPARED AS OF
Squad Automatic Weapon System	4	30 November 1974

RESEARCH AND DEVELOPMENT				COST	REFERENCE
7			8	9	10	11
	COST CATEGORIES		HOURS	RATE	ESTIMATE	SCHEDULE
A	.	ENGINEERING				
	1	DIRECT LABOR			270,945	
	2	MATERIAL			4,500	
	3	OVERHEAD			498,539	
	4	OTHER			41,988	
B	.	TOOLING				
	1	DIRECT LABOR				
	2	MATERIAL				
	3	OVERHEAD				
	4	OTHER				
C	.	PROTOTYPE PRODUCTION			161,000	
D	.	SYSTEM TEST AND EVALUATION				
E	.	DATA				
F	.	TOTAL SYSTEMS MANAGEMENT			124,068	
G	.	CONSTRUCTION				
H	.	TRAINING				
I	.	OTHER (Specify)				
J	.	TOTAL COST LESS (G AND A)			1,101,040	
K	.	G AND A		-0-		
L	.	TOTAL COST			1,101,040	
M	.	PROFIT OR FEE		10%		
N	.	TOTAL PRICE			1,211,144	

REMARKS

18 month effort
See A-1 (VAL/ED-18) through A-4 (VAL/ED-18) for rationale

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: In-House Monitoring of Contract for Validation Engineering of a Best Conceptual Weapon

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT			COST	REFERENCE
7	8	9	10	11
COST CATEGORIES	HOURS	RATE	ESTIMATE	SCHEDULE
A . ENGINEERING				
A 1 DIRECT LABOR	35,100	-	325,167	
A 2 MATERIAL			1,800	
A 3 OVERHEAD		103%	334,922	
A 4 OTHER			44,836	
B . TOOLING				
B 1 DIRECT LABOR				
B 2 MATERIAL				
B 3 OVERHEAD				
B 4 OTHER				
C . PROTOTYPE PRODUCTION				
D . SYSTEM TEST AND EVALUATION			92,492	
E . DATA				
F . TOTAL SYSTEMS MANAGEMENT				
G . CONSTRUCTION				
H . TRAINING				
I . OTHER (Specify)				
J . TOTAL COST LESS (G AND A)			799,217	
K . G AND A				
L . TOTAL COST				
M . PROFIT OR FEE				
N . TOTAL PRICE				

REMARKS

18 Month Effort
See I-H/1 (VAL/ED-18) Through I-H/7 (VAL) for Rationale

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

SAW CONCEPTUAL WEAPON
-PHASE I-
VALIDATION ENGINEERING-18 MONTH
CONTRACTOR/IN-HOUSE
TASKS

	TASK	CONTRACTOR	IN-HOUSE
1.	Review System Requirements	Perform	Direct
2.	Review Weapon Concepts	Perform	Direct
3.	Review Recommended Additions/Revisions	Perform	Direct
4.	Prepare Revised Weapon Dynamic Model	Perform	Approve
5.	Prepare Revised Weapon Layouts	Perform	Approve
6.	Exercise Model to Establish new Design Parameters	Perform	Direct
7.	Coordinate New Parameters with Revised Design	Perform	Direct
8.	Prepare Detail Drawings	Perform	Approve
9.	Fabricate Preliminary Test Hardware	Perform	Approve
10.	Conduct Preliminary Testing	Perform	Approve
*11.	Prepare "VEAT" Detail Design	Perform	Direct
12.	Fabricate "VEAT" Hardware	Perform	Approve
13.	Conduct "VEAT" Tests	Perform	Approve
14.	Evaluate "VEAT" Test Results	Monitor	Perform
15.	Prepare DT-I/OT-I Detail Design	Perform	Direct
16.	Fabricate DT-I/OT-I Hardware	Perform	Approve
17.	Conduct DT-I/OT-I Tests	Assist	Perform
18.	Evaluate DT-I/OT-I Tests	Monitor	Perform
19.	Conduct Validation IPR	-	Perform

*VEAT - Validation Engineering Acceptance Test

(VAL/ED-18)

SAW CONCEPTUAL WEAPON
-PHASE I-
IN-HOUSE
VALIDATION ENGINEERING

RATIONALE: It is assumed that one type of weapon mechanism has been selected and that various selected features of each of the SAW candidates have been selected to be incorporated into the projected Engineering Development concept. It is also assumed that extensive ammunition development will be on-going during the Weapon Validation Phase. Based on these assumptions revision and verification of the dynamic models will be required and extensive testing will be required to establish a significant data base for RAM evaluation.

	FY75	FY76	76/77	TOTAL
*Engineering	$192,618	$471,394	$42,713	$706,725
**DT-I/OT-I		$ 69,369	$23,123	$ 92,492
TOTAL	$192,618	$540,763	$ 65,836	$799,217

*Engineering Costs are Broken Down as Direct Labor, Materials,
** and Other Direct Charges on the following pages.
DT-I/OT-I costs are based on previous costs rationalized in Appendix.

1-H/1 (VAL/ED-18)

SAW CONCEPTUAL WEAPON
-PHASE I-
IN-HOUSE
VALIDATION ENGINEERING

TITLE	GRADE	FY75 5mos. HRS	FY75 5mos. $	FY76 12mos. HRS	FY76 12mos. $	76/77 1 mo. HRS	76/77 1 mo. $
Proj. Eng.	14	750	10,455				
Mech Eng	13	750	8,918				
Mech Eng	12	1500	15,090				
Mech Eng Tech	11	1500	12,660				
Q.A. Tech	11	-0-	-0-	-0-	-0-	-0-	-0-
Mech Eng Tech	9	750	5,250				
Draftsman	7	750	4,298				
Draftsman	5	750	3,473				
Math Analyst	12	750	7,545				
RAM Eng.	12	750	7,545				
Q.A. Eng.	12	600	6,036				
Q.A. Tech	12	-0-	-0-	-0-	-0-	-0-	-0-
H.F. Eng.	12	150	1,509				
Model Maker	WB	750	7,545				
Direct Labor	FY75	9,750	$90,324				
	FY76			23,400	$216,778		
	76/77					1950	$18,065

Total Direct Labor 35,100 hrs/$325,167
Overhead (1.31 x 1.55)-1=2.03-1=1.03 (103%)

FY75 =	$93,034
FY76 =	223,281
76/77 =	18,607
TOTAL OVERHEAD	$334,922

1/H2 (VAL/ED-18)

SAW CONCEPTUAL WEAPON
-PHASE I-
IN-HOUSE
VALIDATION ENGINEERING

ENGINEERING MATERIAL

RATIONALE: Engineering Material Cost covers office supplies, drafting paper, etc., as is estimated at $100 per month.

FY75	5 x $100	$ 500
FY76	12 x $100	1200
76/77	1 x $100	100
TOTAL		$1800

SAW CONCEPTUAL WEAPON
-PHASE I-
IN-HOUSE
VALIDATION ENGINEERING

(VAL) IN-HOUSE - OTHER DIRECT COSTS

RATIONALE: Other Direct Costs are assumed to consist of Computer Expenses at $600 per month and Travel Expense.

A. Computer Expense

FY75	5 x $600	$ 3,000
FY76	12 x $600	6,200
76/77	1 x $600	600
TOTAL COMPUTER EXPENSE		$10,800

B. Travel Expense (See 1-H/5)

FY75	$ 5,760
FY76	22,935
76/77	5,341
TOTAL TRAVEL	$34,036

C. Total O.D.C./FY

FY75	$ 8,760
FY76	30,135
76/77	5,941
TOTAL O.D.C.	$44,836

SAW CONCEPTUAL WEAPON
-PHASE I-
IN-HOUSE
VALIDATION ENGINEERING

(VAL) IN-HOUSE TRAVEL COST

Estimate of Travel Costs	FY75	FY76	76/77
Review West Coast Contractor (Trips)	5	9	1
3 men x 3 days x $35/day	1575	2835	315
Car Rental-$60/trip	300	540	60
Air Fare	3885	6993	777
Support of APG Test (DT-I)		75 days	25 days
1 man x $35/day		2625	875
Car Rental-$30/day		2250	750
Air Fare $141 per trip (12)		1269	423
Support of Ft. Benning Test (OT-I)		75 days	25 days
1 man x $35/day		2625	875
Car Rental-$30/day		2250	750
Air Fare $172 per trip (12)		1548	516
TOTAL/FY	$5760	$22935	$5341

TOTAL (VAL) TRAVEL $34,036

1-H/5 (VAL/ED-18)

RATIONALE
DT-I/OT-I
VALIDATION ENGINEERING

This estimate is based on experience with DT-I/OT-I as performed on the XM233, XM234 and XM235 candidates. The following values were assumed to be representative of those tests.

DT-I 9 months duration

ARMCOM FUNDING	$180,110
TECOM FUNDING	98,000
TOTAL (Available & Spent)	278,000

OT-I 9 months duration

42,000 MANHOURS

ARMCOM FUNDING	$ 53,000
TECOM FUNDING	192,000
TOTAL AVAILABLE	$245,000

Since the ARMCOM $53K was for construction of special range facilities these facilities are assumed to be still available. (Actually it appears that only $28,000 of this fund was expended).

It also appears that the related Military Payroll amounted to about $268,000.

Summarizing the actual ARMCOM SAW Program Expense experienced for DT-I/OT-I during FY74/FY75 on the Test sites.

DT-I	$180,110
OT-I	28,000
TOTAL	$208,000
DURATION	9 months
EXPENSE RATE	$23,123/month
New DT-I/OT-I DURATION	4 months
Estimated DT-I/OT-I Cost	$92,493

NOTE: Apparently Ft. Benning's facilities may come under control of TRADOC in the near future. At that time this cost estimate will not be valid since undoubtedly accounting procedures will change.

SAW CONCEPTUAL WEAPON
-PHASE I-
CONTRACTOR
VALIDATION ENGINEERING

RATIONALE: It is assumed that the contractor is required to modify one of the existing SAW candidate weapon mechanisms to incorporate selected features from other SAW candidate weapons as well as features suggested by previous SAW efforts. In addition an unspecified amount of modification will be required to accommodate an as yet undefined round of ammunition.

Thus the contractor effort will include extensive preliminary testing, performance of a Validation Engineering Acceptance Test and support for a DT-I/OT-I test. From this testing a data base will be established on which to base a decision to proceed into a Full Scale Development Program.

The time period for this effort will total 18 months including 5 months in FY75, 12 months in FY76 and 1 month of 76/77 transition period.

SAW CONCEPTUAL WEAPON
-PHASE I-
CONTRACTOR
VALIDATION ENGINEERING

The Contractors Engineering Costs are Estimated as:

	FY75 5mos	FY76 12mos	76/77 1 mo.	TOTAL
1. Engineering				
1.1 Direct Labor	75,263	180,630	15,052	270,945
1.2 Overhead	138,483	332,359	27,697	498,539
1.3 Materials	600	3,600	300	4,500
1.4 O.D.C.	5,364	30,000	6,624	41,988
TOTAL ENG.	$219,710	$546,589	$49,673	$815,972
2. Prototypes				
2.1 7 Preliminary	45,000	60,000	-0-	105,000
2.2 7 DT-I/OT-I	-0-	56,000	-0-	56,000
TOTAL PROTOTYPES	$45,000	$116,000	-0-	$161,000
3. System Management (1.7 men) 150x1.7x$27.03/mo	$34,463	$ 82,712	$ 6,893	$124,068
4. Total Contract(VAL)	$299,173	$745,301	$56,566	$1,101,040
5. Total Price (10% Profit)	$329,090	$819,831	$62,223	$1,211,144

A-2 (VAL/ED-18)

SAW CONCEPTUAL WEAPON
-PHASE I-
CONTRACTOR
VALIDATION ENGINEERING

Engineering Direct Labor (15 men x 150/hrs.mo x $6.69/hr)

FY75	(5 mos)	11,250 hrs	$75,263
FY76	(12 mos)	27,000 hrs	180,630
76/77	(1 mo)	2,250 hrs	15,052
TOTAL		40,500 hrs	$270,945

Engineering Overhead (184%)

FY75	$138,483
FY76	332,359
76/77	27,697
TOTAL	$498,539

Engineering Material ($300/mo.)

FY75 (5 mos)	$ 600
FY76 (12 mos)	3,600
76/77 (1 mo)	300
TOTAL	$ 4,500

SAW CONCEPTUAL WEAPON
-PHASE I-
CONTRACTOR
VALIDATION ENGINEERING

RATIONALE: Other Direct Charges to Engineering include Computer and Travel Costs.

A. Computer Costs $600/month

FY75 (5 mos)	$3,000
FY76 (12 mos)	7,200
76/77 (1 mo)	600
TOTAL	$10,800

B. Travel	FY75	FY76	76/77
1) Informal Review at RIA (trips)	3	9	1
3 days x 2 men x $35/day	630	1890	210
Car Rental-$60/day	180	540	60
Air Fare $259 x 2 men	1554	4662	518
2) Support of APG (DT-I)		75 days	75 days
1 man x $35/day		2625	875
Car Rental-$30/day		2250	750
Air Fare-$355 x 12 trips		3195	1065
3) Support Ft. Benning (OT-I)		75 days	25 days
1 man x $35/day		2625	875
Car Rental-$30/day		2250	750
Air Fare $307 x 12 trips		2763	921
4) TOTAL TRAVEL/FY	$2364	$22800	$6024
5) TOTAL TRAVEL			$31,188

C. Other Direct Charges-Summary				TOTAL
Computer	3000	7200	600	10,800
Travel	2364	22800	6024	31,188
Total	$5364	$30000	$6624	$41,988

NUMBER I-D

BASIC ESTIMATED COST PACKAGE
ADVANCED/ENGINEERING DEVELOPMENT
ADDED COST FOR CONTRACTOR WITHOUT
PREVIOUS SAWS PROGRAM EXPERIENCE

6 MONTH EFFORT

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION

SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED

In-House Monitoring of Contractor without Previous SAWS Experience

3. QUANTITY

NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT

Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL

4

6. ESTIMATE PREPARED AS OF

30 November 1974

RESEARCH AND DEVELOPMENT				COST	REFERENCE
7			8	9	10	11
COST CATEGORIES			HOURS	RATE	ESTIMATE	SCHEDULE
A	.	ENGINEERING				
	1	DIRECT LABOR *	960	$317.60	150,158	
	2	MATERIAL			900	
	3	OVERHEAD **		103%	154,738	
	4	OTHER			-0-	
B	.	TOOLING				
	1	DIRECT LABOR				
	2	MATERIAL				
	3	OVERHEAD				
	4	OTHER				
C	.	PROTOTYPE PRODUCTION				
D	.	SYSTEM TEST AND EVALUATION				
E	.	DATA				
F	.	TOTAL SYSTEMS MANAGEMENT				
G	.	CONSTRUCTION				
H	.	TRAINING				
I	.	OTHER (Specify)				
J	.	TOTAL COST LESS (G AND A)			305,796	
K	.	G AND A				
L	.	TOTAL COST				
M	.	PROFIT OR FEE				
N	.	TOTAL PRICE				

REMARKS

6 Month Effort

*Includes entire SARRI-LS-C Staff
6 Months x 160 hours/month=960 staff hours
Staff Rate=$317.60/hr.

**Includes 31% fringe and 55% overhead [(1.31 x 1.55)-1] x 100 = 103%

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: Contract to Familiarize a New Contractor with the SAWS Program

3. QUANTITY: N.A

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT			7 COST CATEGORIES	8 HOURS	9 RATE	10 COST ESTIMATE	11 REFERENCE SCHEDULE
A	.		ENGINEERING				
	1		DIRECT LABOR	9,600	$9,22	88,512	
	2		MATERIAL			15,000	
	3		OVERHEAD		110%	97,363	
	4		OTHER				
B	.		TOOLING				
	1		DIRECT LABOR				
	2		MATERIAL				
	3		OVERHEAD				
	4		OTHER				
C	.		PROTOTYPE PRODUCTION				
D	.		SYSTEM TEST AND EVALUATION			52,175	
E	.		RAM Plan Preparation			80,000	
F	.		TOTAL SYSTEMS MANAGEMENT				
G	.		CONSTRUCTION				
H	.		Weapon Mechanism Program			70,000	
I	.		OTHER (Specify)				
J	.		TOTAL COST LESS (G AND A)			388,050	
K	.		G AND A		24.6%		
L	.		TOTAL COST			483,511	
M	.		PROFIT OR FEE		10%		
N	.		TOTAL PRICE			531,862	

REMARKS

*6 Months Effort

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

NEW CONTRACTOR FAMILIARIZATION
ESTIMATE OF ADDED COST

The estimated cost to familiarize a new contractor with the SAWS program is tabulated as follows:

1.	Contractor Costs		
	Number of men		10
	Period		6 months
	Man hours		9600
	Rate $9.22/Hr.		
	Direct Labor (9600 hrs)		88,512.00
	Overhead 110%		97,363.20
	RAM Plan Preparation		80,000.00
	Weapon Mechanism program		70,000.00
	System Test & Evaluation		
	Labor (1920 hrs)	17,702.40	
	Overhead 110%	19,472.64	
	Material $2500/mo.	15,000.00	
	TOTAL SYSTEM TEST & EVALUATION		52,175.04
	Total Contractor Cost (Less G&A)		388,050.24
	Total Contractor Cost (24.6% G&A)		483,510.60
	Total Contractor Price (10% Profit)		531,861.66
2.	In-House Costs (SARRI-LS-C Staff)		
	Cost/hr		317.60/hr.
	Cost/month (160 hrs)		50,816 .00
	Total In-house Labor (6 months)		304,896.00
	In-house Material ($150/month)		900.00
	Total In-House Cost		$305,796.00

3. Total added Program Cost (1. + 2.) $837,657.66

4. Tasks for Familiarization of New Contractor with SAWS Program.

I. Review System Requirements

II. Review candidate Weapon and Ammunition Performance

III. Review and Design Computer Programs:

a. RAM

b. Dynamic Models

IV. Review Existing Drawings and Specifications

V. Review Trade-Off Determinations.

VI. Determine Weapon and Ammunition Shortcomings.

VII. Review previous configuration changes.

VIII. Establish familiarity with H.F.E. Data.

IX. Establish familiarity with RAM Data.

X. Establish familiarity with Safety Data.

XI. Conduct Trade-Off Determinations.

XII. Prepare RAM Plan.

XIII. Prepare Development Plan.

XIV. Secure Approval of RAM and Development Plans.

NUMBER II-A

BASIC ESTIMATED COST PACKAGE
ENGINEERING DEVELOPMENT
XM233 CONTRACTED IN A LOW COST AREA IN 6.00MM

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22) LOW COST AREA CONTRACT

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: XM233 Low Cost Area Contract (PEP Included)

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT			COST	REFERENCE
7	8	9	10	11
COST CATEGORIES	HOURS	RATE	ESTIMATE	SCHEDULE
A - ENGINEERING			1,640,106	
1 DIRECT LABOR	186,216	-		
2 MATERIAL				
3 OVERHEAD		350%		
4 OTHER				
B - TOOLING			479,149	
1 DIRECT LABOR				
2 MATERIAL				
3 OVERHEAD				
4 OTHER				
C - PROTOTYPE PRODUCTION			912,323	
D - SYSTEM TEST AND EVALUATION			448,515	
E - DATA			56,957	
F - TOTAL SYSTEMS MANAGEMENT			-0-	
G - CONSTRUCTION			-0-	
H - TRAINING			90,886	
I - OTHER (Specify) PEP			1,568,787	
J - TOTAL COST LESS (G AND A)			5,196,723	
K - G AND A 5%				
L - TOTAL COST			5,456,560	
M - PROFIT OR FEE 9.3%				
N - TOTAL PRICE			5,964,020	

REMARKS

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22) IN-HOUSE SUPPORT

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: IN-HOUSE SUPPORT XM233 LOW COST AREA SUPPORT (PEP INCLUDED)

3. QUANTITY: N.A.

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT			COST	REFERENCE
7 COST CATEGORIES	8 HOURS	9 RATE	10 ESTIMATE	11 SCHEDULE
A. ENGINEERING			882,209	
A.1 DIRECT LABOR	52,526	-		
A.2 MATERIAL				
A.3 OVERHEAD		85%		
A.4 OTHER				
B. TOOLING				
B.1 DIRECT LABOR	-	-		
B.2 MATERIAL				
B.3 OVERHEAD		-		
B.4 OTHER				
C. PROTOTYPE PRODUCTION				
D. SYSTEM TEST AND EVALUATION *			138,738	
E. DATA				
F. TOTAL SYSTEMS MANAGEMENT				
G. CONSTRUCTION				
H. TRAINING				
I. OTHER (Specify) PEP			520,173	
J. TOTAL COST LESS (G AND A)			1,541,120	
K. G AND A	NA			
L. TOTAL COST	NA			
M. PROFIT OR FEE	NA			
N. TOTAL PRICE	NA			

REMARKS

*DT/OT-II of 6 months duration

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

6.0MM
XM233 (LOW COST AREA)
RESEARCH & DEVELOPMENT

	FY75	FY76	76/77	FY77	FY78	TOTAL
1.1Contract						
1.11 Dev Eng (Val/Ed)	271,489	650,506	129,903	588,208	-0-	1,640,106
1.12 PEP	-0-	-0-	213,200	1,355,587	-0-	1,568,787
1.13 Tooling	-0-	479,149	-0-	-0-	-0-	479,149
1.14 Mfg. Proto	-0-	-0-	304,108	608,215	-0-	912,323
*1.15 Other	49,492	120,116	99,365	327,385	-0-	596,358
FY-Cost (Less G & A)	320,981	1,249,771	746,576	2,879,395	-0-	5,196,723
G & A (5%)						
FY-Cost	337,030	1,312,260	783,905	3,023,365	-0-	5,456,560
Profit (9.3%)						
FY-Total Price	368,374	1,434,300	856,808	3,304,538	-0-	5,964,020
1.2 In-House						
1.21 Dev Eng	173,312	391,620	60,596	256,681	-0-	882,209
1.22 PEP	110,860	179,774	44,054	185,485	-0-	520,173
1.23 Tooling	-0-	-0-	-0-	-0-	-0-	-0-
1.24 Mfg.	-0-	-0-	-0-	-0-	-0-	-0-
**1.25 Other	-0-	-0-	-0-	138,738	-0-	138,738
In-House Cost	284,172	571,394	104,650	580,904	-0-	1,541,120
Total Prog R&D	652,546	2,005,694	961,458	3,875,709	-0-	7,505,140
* Other/Contract						
Syst. Test & Eval	32,740	79,911	99,365	236,499	-0-	448,515
Data	16,752	40,205	-0-	-0-	-0-	56,957
Total Syst Mg.	-0-	-0-	-0-	-0-	-0-	-0-
Training	-0-	-0-	-0-	90,886	-0-	90,886
Total	49,492	120,116	99,365	327,385	-0-	596,358

**DT/OT (ARMCOM) $23,123/Mo,-I=4 months,-II=6 months

BREAKDOWN OF "OTHER" EXPENSES SHOWN

ON SPREAD SHEET (XM233)

OTHER	FY75	FY76	76/77	FY77	TOTAL
System Test & Evaluation	32,740	79,911	99,365	236,499	448,515
Data (FSD)	16,752	40,205	-0-	-0-	56,957
Total System Management	-0-	-0-	-0-	-0-	-0-
Training	-0-	-0-	-0-	90,886	90,886
TOTAL	49,492	120,116	99,365	327,385	596,358

CONTRACTOR'S
MAN HOUR SUMMARY
XM-233

ACTIVITY	FY75	FY76	76/77	FY77	TOTAL
A-2 Dev Eng	14,220	34,116	6,760	28,760	83,856
*PEP	-0-	-0-	9,418	64,506	73,924
Material	-0-	-0-	-0-	-0-	-0-
B-2 Tooling	-0-	9,473	-0-	-0-	9,473
** Other Direct C.	1,600	3,203	1,600	12,560	18,963
TOTAL HOURS	15,820	46,792	17,778	105,826	186,216
MAN YEARS (1800 HRS)	8.79	26.0	9.88	58.79	103.46
** Other Direct Costs					
D-3 Syst Test & Evaluation	1,600	3,203	1,600	9,353	15,756
E-3 Data		(INCLUDED IN DEV. ENG.)			
F-1 Total Syst Management	-0-	-0-	-0-	-0-	-0-
E-4 Training	-0-	-0-	-0-	3,207	3,207
TOTAL O.D.C.	1,600	3,203	1,600	12,560	18,963
*PEP					
A-3PEP/E-4 PEP Dev Eng	-0-	-0-	7,701	30,802	38,503
C-2 PEP Qual.Cont.	-0-	-0-	-0-	26,837	26,837
G-1 Indust. Facil.	-0-	-0-	149	596	745
ODC-2 O.D.C.	-0-	-0-	1,568	6,271	7,839
TOTAL PEP	-0-	-0-	9,418	64,506	73,924

RATIONALE
XM-233
IN-HOUSE
FSD ENGINEERING

RATIONALE: The XM-233 is judged to have 6 areas requiring major redesign; specifically:

(1) Excessive weight

(2) Bolt

(3) Feed Tray

(4) Feed Mechanism

(5) Firing Mechanism

(6) Magazine

The major FSD Engineering effort to redesign these areas will be conducted in 5 months of FY75 and 12 months of FY76.

The fiscal transition period of 3 months, 76/77 and 12 months of FY77 will be used to finalize detail design, testing, data acquisition, data processing, data evaluation, and evaluation of proposed production related modifications in conjunction with the concurrent PEP effort.

Two basic problems appear to exist:

(1) If the weight of the components is reduced as indicated structural integrity of the weapon may become a problem.

(2) The dynamics of the feed mechanism must be changed to eliminate link failure. This may drastically alter the dynamics of the operating group.

XM233
IN-HOUSE
FSD - ENGINEERING

The In-House FSD-Engineering Team effort is summarized as follows:

		FY75		FY76		76/77		FY77	
	Grade	Hrs	&	Hrs	&	Hrs	&	Hrs	&
Project Eng	14	750	9,435	1800	22,644	450	5,661	900	11,322
Mech Eng	13	750	8,048	1800	19,314	300	3,219	1200	12,876
Mech Eng	12	1500	13,635	3600	32,724	300	2,727	1200	10,908
Mech Eng Tech	12	1500	13,635	3600	32,724	300	2,727	1200	10,908
QA Tech	11	750	5,723	1800	13,734	300	2,289	1200	9,156
Mech Tech	9	750	4,748	1800	11,394	300	1,899	1200	7,596
Draftsman	7	750	3,893	1800	9,342	300	1,557	1200	6,228
Draftsman	5	750	3,143	1800	7,542	300	1,257	1200	5,028
Math Analyst	12	536	5,118	1350	12,272	300	2,727	1200	10,908
RAM Eng	12	563	5,118	1350	12,272	800	2,727	1200	10,908
QA Eng	12	750	6,818	1200	10,908	225	2,046	900	8,181
QA Tech	12	750	6,818	1200	10,908	225	2,046	900	8,181
Model Maker		500	3,8i5	1200	9,156	0	0	0	0

Direct Labor	FY75	10,626	89,947						
	FY76			24,300	204,934				
	76/77					4,100	30,882		
	FY77							13,500	112,200

Total Direct Labor (FSD) 52,526 Man Hours 437,963

Overhead (85)	FY75	$ 76,455
	FY76	174,194
	76/77	26,250
	FY77	95,370

Total Overhead (FSD) $372,269

(ALL CONTENDERS)
FSD-ENGINEERING MATERIAL

RATIONALE: Engineering Material costs cover office supplies, drafting paper, etc., and is estimated at $100 per month.

FY75	5 x $100	$500
FY76	12 x $100	1200
76/77	3 x $100	300
FY77	12 x $100	1200
TOTAL		$3200

Other direct charges are covered in either FSD or PEP.

FSD - ENGINEERING - OTHER DIRECT COSTS

Rationale: Other Direct Costs are assumed to consist of Computer expense at $600 per month and Travel Expense.

A. Computer Expense

FY75	5 x $600	$ 3,000
FY76	12 x $600	7,200
76/77	3 x $600	1,800
FY77	12 x $600	7,200
Total		$19,200

B. Travel Expense

FY75	3,410
FY76	4,092
76/77	1,364
FY77	40,711
Total	49,577

C. Total O.D.C./FY

FY75	6,410
FY76	11,292
76/77	3,164
FY77	47,911

D. Total O.D.C. 68,777

FSD-Engineering - Summary of In-House Costs

Total Eng.

FY75	173,312
FY76	391,620
76/77	60,596
FY77	256,681
Total	$882,209

XM233
IN-HOUSE TRAVEL COSTS
(LOW COST AREA)

Estimate of Travel Costs

		FY75	FY76	76/77	FY77	
Reviews at East Coast		5	6	2	6	
3 days x 2 men x $35/day		1050	1260	420	1260	
Car rental 2 days - $60/trip		300	360	120	360	
Air fare $206 x 2 men		2060	2472	824	2472	
Support of APG Test (RDAT-DT-II)					275	days
1 Man x $35/day					9,625	
Car rental @ $30/day					8,250	
Air fare $141/28 trips					3,948	
Support test Fort Benning (OT-II)					180	days
1 Man x $35/day					6,300	
Car rental @ $30/day					5,400	
Air fare $141/18 trips					3,096	
Total/FY		3,410	4,092	1,364	40,711	
Total ED Travel	$49,577					

XM233
ENGINEERING SECTION
FULL SCALE DEVELOPMENT

1. Introduction:

a. The Engineering Section is divided into four (4) parts:

(1) Engineering Direct Labor.

(2) Engineering Material.

(3) Engineering Overhead.

(4) Other Direct Charges to Engineering.

b. Each Engineering part consists of description of the items included and the rationale for including and evaluating each item.

c. The costs accrued in each part were developed among the weapon elements according to the percentage of peculiar parts of the weapon system which make up the weapon element. Thus for the XM233:

Weapon Element	Peculiar Parts	% Distribution
Receiver & Operating Group	117	65
Barrel Assembly	6	4
Rear Sight	17	9
Magazine	7	4
Bipod	25	14
Sling	3	2
Maintenance Tools	4	2
Total	179	100

2. Rationale for Estimating Engineering Direct Labor Cost (FSDWEDL):

a. Total Engineering Direct Labor hours is the sum of two inputs:

(1) Engineering Direct Labor hours to accomplish the Engineering Tasks involved in finalizing the weapon design.

(2) Engineering Direct Labor hrs to prepare the info required for Data Items.

b. The value for each Direct Labor hour is an average hourly rate applied to all man hours expended in the Engineering effort and was determined for each contractor in coordination with AMSWE-PPX in the following manner:

(1) Estimate the total Direct Labor hours required for each Government GS grade.

(2) Multiply these totals by the respective step 5 hourly rate and add to get a total equivalent Government direct labor cost.

(3) Divide the total equivalent Government direct labor cost by the sum of the diredt labor hours, regardless of grade, to obtain an average Government engineering hourly rate.

(4) Compare the average Government engineering hourly rate with the Step 5 hourly rates in the GS pay scale to determine the average grade level of skill employed.

(5) Compare the average grade level of skill with available information on the contractor's pay scale to estimate the average contractor's engineering hourly rate.

c. The average contractor's engineering hourly rate for Low Cost Area is computed to be $4.16 per hour.

d. Engineering Direct Labor Hours and Costs for Low Cost Area by Fiscal Year are estimated to be:

Fiscal Year	D. L. Hours	D. L. Costs
75	14,220	$ 59,155
76	34,116	141,923
76/66	6,760	28,122
77	28,760	119,642
Total	83,856	$348,842

3. Rationale for Estimating Engineering Material Costs (FSDWEMAT):

a. Engineering Materials are considered to consist of miscellaneous material used in performing the engineering effort for Full Scale Development. Layout paper, drafting supplies, bond paper, vellums, computer cards, and computer paper are typical major cost items in this category.

b. Engineering Material Costs are estimated to be:

FY75	275
FY76	660
FY76/77	160
FY77	660
Total	1,755

4. Rationale for Estimating Engineering Overhead (FSDWEOH):

a. Based on historical data and information available in the Contract Pricing Division, AMSWE-PPX, the Engineering Overhead Rate for Low Cost Area is estimated to be 350% of Engineering Direct Labor Cost:

b. Summary of Overhead costs is as follows:

Total Overhead FY75	$ 207,043
Total Overhead FY76	496,731
Total Overhead 76/77	98,427
Total Overhead FY77	418,747
Total Overhead	$1,220,948

5. Rationale for Estimating other Direct Charges to Engineering (FSDWEOT):

a. This category includes the cost of travel and charges for computer time during Full Scale Development.

(1) The estimated computer costs are for programming and exercising a dynamic model of the weapon, a heat transfer and stress analysis model of the barrel, and analysis of Maintainability and Reliability as follows:

FY75	2,970
FY76	7,100
76/77	1,830
FY77	7,100
Total Computer Cost	19,000

(2) The estimate of travel costs is as follows:

FY75	2,046.00
FY76	4,092.00
76/77	1,364.00
FY77	42,059.00

Supporting computations may be found under "Estimate of Travel Costs".

b. Other Direct Charges to Engineering are summarized as follows:

	FY75	FY76	76/77	FY77
Computer Time	2,970	7,100	1,830	7,100
Travel Costs	2,046	4,092	1,364	42,059
Total by FY	5,016	11,192	3,194	49,159

		TOTAL FSD ENG.
FY75	5,016	271,489
FY76	11,192	650,506
76/77	3,194	129,903
FY77	49,159	588,208
Total O.D.C.	$68,561	1,640,106 FSD ENG.

d. Estimate of Travel Costs:

	FY75	FY76	76/77	FY77
Informal Reviews at Rock Island	3	6	2	6
3 days x 2 men x $35/day	630	1,260	420	1,260
Car Rental 2 days - $60/trip	180	360	120	360
Air Fare $206 x 2 men	1,236	2,472	824	2,472
Support of APG Test (RDAT-DT II)				275 days
1 Man x $35/day				$9,625
Car Rental @ $30/day				$8,250
Air Fare $139/28 days				$3,892
Support Test Fort Benning (OT II)				180 days
1 Man x $35/day				$6,300
Car Rental x $30/day				$5,400
Air Fare $250/18 days				$4,500
TOTAL TRAVEL	$2,046	$4,092	$1,364	$42,059

LOW COST AREA

SUMMARY OF FSDW TOOLING COSTS

ESTIMATED IN 1975 DOLLARS

FSDWTL -

The cost model symbol gives reference to the cost of tooling, gages and manufacturing aids required to produce FSD prototype weapons, supporting equipment, and repair parts. All costs occur in FY76.

LOW COST AREA
FSD - TOOLING COST (LESS GSA)
XM233 (179 UNIQUE PARTS, 1206 OPERATIONS)

Tooling for 104 Prototype Guns Consists of:

		Hours	Amount	
A.	Purchase Tooling (Vendor Price)			
	1206 x $112.48		$135,651	
B.	Purchase Gages (Vendor Price)			
	1206 x $21.54		$ 25,977	
C.	Purchase Expendable Tooling (Vendor Price)			
	1206 x $40.80		$ 49,205	
D.	Manufacture - Jigs & Fixtures			
	D.L. Rate $4.16/hr, O.H. Rate 350%	4191	$ 78,456	
E.	Manufacture - Gages			
	D.L. Rate $4.16/hrs, O.H. Rate 350%	287	$ 5,372	
	Subtotal		$294,661	
F.	Manufacture - Processing	2714	$ 50,806	
	D.L. Rate $4.16/hr, O.H. Rate 350%			
G.	Tool & Gage Design		$ 44,199	
	(15% of Items A thru E above)			
H.	Estimating of Tools	1809	$ 33,865	
	D.L. Rate $4.16/hr, O.H. Rate 350%			
I.	Purchasing Effort (on A-E above)	1397	$ 26,152	
	D.L. Rate $4.16/hr, O.H. Rate 350%			
J.	Tool & Gage Inspection		$ 29,466	
	(10% of Items A thru E above)	___	_____	
	Total Tooling Cost	9473 hrs.	$479,149	(FY76)
	Unit Cost (104 Weapons)		$ 4,607	

XM233
FSD TOOLING
MANUFACTURING PROCESSING

Planning for manufacturing processes is estimated at 2 hours per machine operation. There are 907 machine operations giving:

1206
2
2412 hrs

An additional .25 hour is estimated for methods and standards work per operation giving:

1206
.25
302 hrs

Total

2412 hrs
302 hrs
2714 hrs

TOOL DESIGN

It is estimated from M16 G.M. Hydromatic that 20% design to mfg.

From G.E. (M61) approx. 34%.

It is estimated that 30% is fair and reasonable. In prototype most detailed design would not be made - use 15%.

ESTIMATING OF TOOLS

907 Operations with 3 tools per operation - 1 cutter
1 fixture
1 gage

1206
3
3618 tools

It is estimated that .50 hr will be necessary for each tool.

3618
.5
1809 hrs

TOOL & GAGE INSPECTION

It is estimated that 10% of the purchase price will be used for initial inspection of tools and gages, based upon ARMCOM QA experience.

PURCHASING

Total procurement actions
For items purchased finished
Total operations - 1206
It is assumed that each operation will require: 1 cutter
1 fixture
1 gage

Therefore 3 x 1206 = 3618 items will be procured.

3 Items over $3000
1203 items less than $3000

Use same standards for purchasing as manufacturing

1203 (.5176 hrs) (150%) = 932 hours
3 (17.223 hrs) (150%) = 78 hours
1010 hours

For items manufactured - Manufacturing hours - 4478

Relationship of mfg to purchased = 38.3%

Procurement hours for manufactured items - 1010 (38.3%) = 387 hours

Total procurement effort - Mfg 387 hours
Purchased 1010 hours
1397 hours

PROTOTYPE COSTS

XM233

Based on experience in manufacturing components for the XM235 at the Naval Air Rework Facility (NARF), Pensacola, Florida and assuming that the manufacturing cost is approximately related to the number of unique components in the weapon, the following costs are calculated:

RDAT Weapons	$\frac{179}{155} \times 4 \times \$10{,}000$	46,194
DT/OT-II Weapons	$\frac{179}{155} \times 100 \times \$7{,}500$	866,129
Total Prototype Weapon Cost		912,323

The prototype manufacturing effort continues over a period of three months in the 76/77 period and six months in the FY77 period. The prototype cost is assumed to be distributed proportionately.

76/77 3/9 x 912,323 = 304,108

FY77 6/9 x 912,323 = 608,215

SYSTEM TEST AND EVALUATION SECTION

FULL SCALE DEVELOPMENT

FSDWTE

1. Introduction

a. The figures below represent an estimate of the contractor's cost to conduct System Test and Evaluation.

b. For computational purposes, the Total System Test and Evaluation activity was divided into three parts as follows:

Part I - Acceptance Testing of the Prototype Weapons

Part II - Research and Development Acceptance Test (RDAT)

Part III - Preliminary Testing

c. The following were not included as part of this estimate:

(1) Weapons, spare barrels, and spare parts. These are included in the Prototype Cost, as other Direct Costs.

(2) Ammunition (MUCOM Item)

(3) Range utilization/rental costs, if required. This item was not included due to lack of supporting information as to where and under what arrangement the contractor will conduct testing.

(4) Shipping/transportation costs of materiel/personnel to various test sites, if required. It is assumed that testing would be within close proximity of the contractor's plant.

d. The same direct labor (time) and materials estimate was used for all three contractors. This is considered a reasonable assumption, since

the test requirements are the same. Thus, differences in the cost estimates are the result of the various contractors' equivalent hourly rates and overhead figures. Contractor hourly rates and overhead were obtained from audited historical data.

2. Summary of Costs	TOTAL
Part I - Acceptance Testing	$103,874
Part II - RDAT	$212,016
Part III - Preliminary Testing	$132,625
TOTAL - Weapon System Test and Evaluation Cost (FSDWTE)	$448,515

3. Breakdown by Parts

Part I - Acceptance Testing	FY75	FY76	76/77	FY77	TOTAL
Direct Labor (2950 hrs)	-0-	-0-	-0-	12,272	12,272
Materials	-0-	-0-	-0-	48,650	48,650
Overhead	-0-	-0-	-0-	42,952	42,952
Total				103,874	103,874

Part II - RDAT					
Direct Labor (6403 hrs)	-0-	-0-	-0-	26,637	26,637
Materials	-0-	-0-	79,391	12,760	92,151
Overhead	-0-	-0-	-0-	93,228	93,228
Total	-0-	-0-	79,391	132,625	212,016

**Part III - Prelim. Tstg.					
Direct Labor (6403 hrs)	4,440	17,758	4,439	-0-	26,637
Material	12,760	-0-	-0-	-0-	12,760
Overhead	15,540	62,153	15,535	-0-	93,228
Total	32,740	79,911	19,974	-0-	132,625

* Direct Labor Rate = $4.16/hr

Overhead = 350%

** Preliminary Testing Period - May 1975 through Oct 1976

DATA SECTION

FULL SCALE DEVELOPMENT

1. Introduction:

a. This section summarizes the costs for the FSD Data Items. The section contains a List of FSD Data Items and their costs. These costs make up the totals which are entered under DATA in the FSD Cost Model. The costs for the Functional Direct Labor hours are accounted for in the respective Direct Labor sections for Engineering and Training.

b. The Data Items for the Technical Data Package (TDP) are accounted for in the PEP Program and are so noted on the list of the Data Costs for each Data Item. The TDP Data Items which are started in FSD and continued in PEP are also noted in the list for cross reference and continuity.

c. The section also contains a Data Related Cost Summary for information on the total cost related to data items.

2. DATA RELATED COST SUMMARY

a. Direct Labor plus Overhead to prepare FSD Data Items is carried under the following categories and totals as follows:

Category	
Engineering hours	29,800
Training hours	3,207
Engineering Cost	557,856
Training Cost	60,035
Total $/FY	617,891
b. Data Cost	56,957
a + b	674,848

c. Total Data Related Cost - FSD = $674,848 (MM)

NOTE: Engineering and Training Hourly Rate = $4.16 + 350% Overhead = $4.16 + $14.56 = $18.72/hour

c. Data Cost by Fiscal Year:

FY75 5/17 x 56,957 =$16,752

FY76 12/17 x 56,957 =$40,205

3. SUMMARY OF FSD DATA ITEM LISTING AND DIRECT LABOR TO PRODUCE ENGINEERING DATA ITEMS

List of Engineering Data Item Numbers

B#	DI#	B#	DI#
01	DI-A-1014A (MOD)	32	DI-H-1329A
02	DI-E-1100 (MOD)	37	DI-M-1501 (MOD)
03	DI-E-1101A	38	DI-M-1502
04	DI-E-1103A	39	DI-M-1502
05	DI-E-1104	40	DI-M-1505
06	DI-E-1105	41	DI-M-1510
08	DI-E-1107	42	DI-P-1600
10	DI-E-1116	44	DI-R-1710 (MOD)
11	DI-E-1117	51	DI-R-1730 (MOD)
12	DI-E-1118 (MOD)	52	DI-R-1731 (MOD)
13	DI-E-1119 (MOD)	53	DI-R-1733 (MOD)
14	DI-E-1128	54	DI-R-1734 (MOD)
15	DI-E-11XX (MOD)	55	DI-R-1735 (MOD)
16	DI-E-XXX1	56	DI-R-1740 (MOD)
17	DI-F-6000	57	DI-R-1741 (MOD)
18	DI-F-60001	58	DI-R-1750 (MOD)
18A	DI-F-XXX1	59	DI-S-1800 (MOD)
19	DI-F-6004	60	DI-S-1804A
25	DI-H-1312	61	DI-S-1812
26	DI-H-1314	62	DI-S-1818 (MOD)
27	DI-H-1315	63	DI-S-1819 (MOD)
29	DI-H-1322A (MOD)	64	DI-S-18XX (MOD)
30	DI-H-1326A	65	DI-T-1906 (MOD)
31	DI-H-1327A (MOD)	66	DI-T-XXX1 (NEW)
		67	DI-V-1950 (MOD)

Direct Labor Hours = 29,800

NOTE: These direct labor hours are included under Engineering.

4. SUMMARY OF FSD DATA ITEM LISTING AND DIRECT LABOR TO PRODUCE TRAINING DATA ITEMS

List of Training Data Items

B#	DI#
20	DI-H-1300 (MOD)
21	DI-H-1302
22	DI-H-1304
23	DI-H-1308
24	DI-H-1310

Direct Labor hours = 3,207

NOTE: These direct labor hours are included under Training.

SUMMARY OF COSTS - DATA ITEM CALL ITEMS - FSD

B No.	Data Item No.	Data Item Title		
01	DI-A-1014A(MOD)	PERT		557
02	DI-E-1100(MOD)	Configuration Management Plan		246
03	DI-E-1101A	Configuration Stat Acct & Engr Record		507
04	DI-E-1103A	Engineer Release Record	FSD/PEP	1620
05	DI-E-1104	Specifications	FSD/PEP	91
06	DI-E-1105	Characteristics & Description Book		168
07	DI-E-1106	Specs, Standards, Appl. List	PEP	0
08	EI-E-1107	Drawing Custodianship List	FSD/PEP	30
09	EI-E-1115A(MOD)	Technical Data Package	PEP	0
10	DI-E-1116	Stdz Comp & Select Control	FSD/PEP	58
1	DI-E-1117	Stdz Report of Common Items	PEP	0
12	DI-E-1118(MOD)	Drawings, Engr & Assoc Lists	FSD/PEP	645
13	DI-E-1119(MOD)	Environmental Criteria Report		3172
14	DI-E-1128	Electromagnetic Interference Control Plan		84
15	(X)DI-E-11XX(MOD)	Interface Control Doc. for VRFWS		311
16	DI-E-XXX1	Dynamic Mathematical Model		288
17	DI-F-6000	Cost performance report		353
18	DI-F-6001(MOD)	Procurement Info Functional Cost-Hour Report		5
18A	DI-F-XXX1	Model for Eval of Design-To Unit Production Cost		29
19	DI-F-6004	Contract Funds Status Report		22
20	EI-H-1300(MOD)	Personnel & Training Requirements		150

SUMMARY OF COSTS - DATA CALL ITEMS - FSD
(Continued)

B No.	Data Item No.	Data Item Title	
21	DI-H-1320	New Equipment Training Plan	0
22	DI-H-1304	New Equipment Training Courses	1350
23	DI-H-1308	Training Course Reports	0
24	DI-H-1310	Graphic Aids	31444
25	DI-H-1312	Human Factors Engr Plan	53
26	DI-H-1314	Human Factors Engr Progress Rpt	179
27	DI-H-1315	Human Factors Engr Final Report	59
28	DI-H-1321A	Explosive Hazard Class. Data	See Ammo
29	DI-H-1322A(MOD)	Safety Statement	77
30	DI-H-1326A	Safety Anal. & Hazard Eval Rpts	212
31	DI-H-1327A(MOD)	Surface Danger Area Data	68
32	DI-H-1329A	Accident/Incident Report	20
33	DI-H-1330(MOD)	Facilities Safety Data	0
34	DI-L-1407(MOD)	Preservation & Packaging Data	PEP
35	DI-L-1410	Ammunition Data Cards	Ammo
36	DI-M-1500(MOD)	Firing Table Manuscript	Ammo
37	DI-M-1501(MOD)	Validation Plan for Equip. Publications	1
38	DI-M-1502(MOD)	Equipment Publications	1176
39	DI-M-1502(MOD)	Equipment Publications	Included in B038
40	DI-M-1505(MOD)	Equip. Pub. Progress/Cost Reports	38
41	DI-M-1510	Maintenance Allocation Chart	11
42	DI-P-1600	Value Engr Data Report	135
3	DI-P-1602	Value Engr Plan	No Cost Plan is prepared and paid for in Contractor's Proposal.

SUMMARY OF COSTS - DATA CALL ITEMS - FSD
(Continued)

B No.	Data Item No.	Data Item Title	
44	DI-R-1710(MOD)	Quality Program Plan	128
45	DI-R-1711(MOD)	Qual Engrg Acc Insp Req & Equip List	PEP
46	DI-R-1712(MOD)	Quality Engrg Supp QA Provision	PEP
47			PEP
48			PEP
49	DI-R-1717	Qual Engr Calibration Program Data	PEP
50	DI-R-1722(MOD)	Qual Insp Pamphlet	PEP
51	DI-R-1730(MOD)	Reliability Program Plan	17
52	DI-R-1731(MOD)	Reliability Reports	67
53	DI-R-1733(MOD)	Reliability Qualified Items List	3
54	DI-R-1734(MOD)	Rel Fail Modes Effects & Crit Anal Rpts	21
55	DI-R-1735(MOD)	Rel Failed Item Analysis Report	114
56	DI-R-1740(MOD)	Maintainability Program Plan	17
57	DI-R-1741(MOD)	Maintainability Reports	20
58	DI-R-1750(MOD)	Assessment Program Plan	7
59	DI-S-1800(MOD)	Technical Reports	1179
60	DI-S-1804A	Corrosion Prevention & Matl Deterioration Rpts and/or Studies	49
61	DI-S-1812	Maintenance Engr Des Discrepancy Report	34
62	DI-S-1818(MOD)	Maintenance Engr Analysis	380
63	DI-S-1819(MOD)	Contractor Recommended Support Plan	31
64	(X)DI-S-18XX(MOD)	Support Model Data	6
65	DI-T-1906(MOD)	Test & Demonstration Reports	1105
66	DI-T-XXX1(New)	R&D Acceptance Test Plan	25
	DI-V-1950(MOD)	Provisioning Requirements for US Army Eq.	581
68	DI-V-1951(MOD)	Federal Item Identification Data	No Contractor Performance Reqd

Total converted to FY75 Dollars $48,268 x 1.18 = $56,957

TOTAL $48,268

Total Systems Management Section

The overall systems management team to be employed by Low Cost Area is considered to be a staff function that is responsible for the Contractor's overall program and execution.

Low Cost Area personnel on the management team are not included in the functional areas (i.e., engineering, manufacturing, testing, etc.). Instead because of the relatively small size of the company management team personnel are included in overhead and/or GSA. Thus there is no entry under cost of Total Systems Management.

These conclusions were determined from discussions with AMSWE-PPX.

IN-HOUSE TASKS

PEP RELATED

The major areas of In-House Direction and Support effort required during the PEP period are:

1. Producibility Engineering and Planning Studies.

2. Product Engineering Studies including Tolerance/Dimension Studies.

3. Engineering effort to prepare the Technical Data Package Data Call Items.

4. Engineering effort to enhance Reliability and Maintainability Engineering activities.

Configuration Management will be monitored in detail through acceptance testing.

Starting with RDT, Configuration Management will revert entirely to the Government as an In-House Task requiring effort as follows:

1. Prepare a Configuration Plan.

2. Update the Configuration Plan as required.

3. Review Engineering Change Proposals (ECPs):

   a. Failure Related.

   b. Production Related.

Other specific In-House Task areas are:

1. Review/monitor and direct Contractor and In-House conducted Producibility Engineering and Planning studies as follows:

   a. Review each part/drawing.

   b. Review Contractor Draft Process Sheets.

c. Review unique processing operations.

d. Review current and proposed processing capabilities.

e. Review difficult/uneconomical manufactured items and recommended actions.

f. Review Contractor PEP reports.

2. Review, monitor and direct Contractor and In-House conducted Production Engineering and Tolerance/Dimension Studies as follows:

a. Review components/drawings.

b. Maintain conformity to Military Standards as specification as applicable.

c. Review Contractor and In-House conducted redesign efforts.

d. Review and prepare reports.

e. Analyze available data and identify/approve areas for in-house or by contractor.

f. Conduct and/or monitor tolerance/dimension studies.

g. Review revisions and related reports.

h. Maintain liaison with contractor project related supervision personnel.

3. Maintain cognizance of current and proposed manufacturing processes and procedures.

(ALL CONTENDERS)
IN-HOUSE
PEP-ENGINEERING

The In-House PEP Engineering team effort is summarized as follows:

		FY75		FY76		76/77		FY77	
Title	Grade	Hrs	$	Hrs	$	Hrs	$	Hrs	$
Project Eng	14	750	9,435	900	11,324	225	2,831	900	11,324
Mech Eng	13	750	8,048	750	8,048	450	4,829	1800	19,316
Mech Eng	12	750	6,818	600	5,454	150	1,364	600	5,454
Mech Tech	11	375	2,861	600	4,578	150	1,145	600	4,578
Mech Tech	9	375	2,374	600	3,798	150	950	600	3,798
Draftsman	7	750	3,893	600	3,114	150	779	600	3,114
Draftsman	5	750	3,143	1800	7,542	450	629	1800	7,542
Math Analyst	12	375	3,409	600	5,454	150	1,364	600	5,454
RAM Eng	12	750	6,818	1800	16,362	225	2,046	900	8,181
Direct Labor									
FY75		5,625	46,799						
FY76				8250	65,674				
76/77						2100	15,937		
FY77								8400	68,761

Total Direct Labor (PEP) 24,375 Man Hours $197,171

Overhead (85%)

FY75	$39,779
FY76	55,823
76/77	13,547
FY77	58,447
Total Overhead (PEP)	$167,596

(ALL CONTENDERS)
IN-HOUSE
PEP
SUMMARY

	FY75	FY76	76/77	FY77	TOTAL
A. Engineering					
Direct Labor	46,799	65,674	15,937	68,761	197,171
Material($75/Mo)	375	900	225	900	2,400
Overhead	39,779	55,823	13,547	58,447	167,596
Other D.C. (Included in FSD)	-	-	-	-	-
Total A	86,953	122,397	29,709	128,108	$367,167
B. Configuration Control Board					
Direct Labor	12,720	30,528	7,633	30,528	81,409
Material($75/Mo)	375	900	225	900	2,400
Overhead (85%)	10,812	25,949	6,487	25,949	69,197
Other D.C. (Included in FSD)	-	-	-	-	-
Total B	23,907	57,377	14,345	57,377	$153,006
A plus B	110,860	179,774	44,054	185,485	
TOTAL IN-HOUSE PEP COST					$520,173

PEP ENGINEERING	24,375 Hrs.
C.C. Board	7,680 Hrs.
TOTAL MAN HOURS	32,055 Hrs.

(ALL CONTENDERS)
IN-HOUSE
CONFIGURATION CONTROL BOARD

Control of Configuration Management will be assumed by the Government.

A Configuration Control Board (CCB) will be established and will exercise its authority throughout the FSD period and potentially continue in the same manner but at somewhat diminished levels of effort through the Limited Production period and the Full Scale Production period.

During the FSD period from 1 February 1975 to 1 October 1977 (32 months) the CCB will utilize of the following people to the extent indicated:

	Title	Grade	Hours	$DL	$Overhead
40%	Configuration Mgr	14	1920	24,154	20,531
40%	Engineer	13	1920	20,602	17,511
20%	Procurement Specialist	13	960	10,301	8,756
20%	W.A. Engineer (Gages & SQAPS)	13	960	10,301	8,756
20%	Maintenance Specialist	12	960	8,726	7,417
20%	Supply Specialist	11	960	7,325	6,226
		TOTAL	7,680	$81,409	$69,197
These expenses occur as follows:			FY75	12,720	10,812
			FY76	30,528	25,949
			76/77	7,633	6,487
			FY77	30,528	25,949

SAW WEAPON XM-233 (LOW COST AREA)
PRODUCIBILITY ENGINEERING & PLANNING
SEP/OCT 74

COST CATEGORIES AND ELEMENTS DEVELOPMENT-PEP	PEP TOTAL	FY75	FY76	76/77	FY77
A. Engineering	870,946	-0-	-0-	174,189	696,757
Direct Labor	160,173	-0-	-0-		
Material	150	-0-	-0-		
Overhead	560,604	-0-	-0-		
Other	150,019	-0-	-0-		
B. Tooling(Software)	173,664	-0-	-0-	34,733	138,931
C. Quality Control	502,789	-0-	-0-	-0-	502,789
D. System Test & Evaluation	-0-	-0-	-0-	-0-	-0-
E. Data	7,441	-0-	-0-	1,488	5,953
F. Total System Mgmt.	-0-	-0-	-0-	-0-	-0-
G. Industrial Facilities	13,947	-0-	-0-	2,790	11,157
H. Training	-0-	-0-	-0-	-0-	-0-
I. Miscellaneous	-0-	-0-	-0-	-0-	-0-
TOTAL COST	1,568,787	-0-	-0-	213,200	1,355,587

CONTRACTOR DEVELOPMENT ENG PEP

Rationale:

The Contractor PEP effort is estimated to address the following areas:

a. Producibility Engineering and Planning Studies.

b. Product Engineering and Tolerance Studies.

Tasks are identified in each area, required manhours are estimated for each task and the total estimated manhours determined. These manhours are multiplied by appropriate labor and overhead rates to obtain total values for Direct Labor and Overhead, $150 is estimated for Materials and these values of Direct Labor, Overhead, and Material cost are added to Other Direct Costs which are defined in a separate section.

The total thus obtained is distributed 1/5 in FY76/77 and 4/5 in FY77.

CONTRACTOR DEVELOPMENT ENG PEP

A. Producibility Engineering and Planning Studies:

	TASK	MANHOURS
1.	Review Part Drawings	2058
2.	Prepare Draft Process Sheets	5143
3.	Determine Unique Operations	176
4.	Conduct Process Capabilities Study	2788
5.	Determine Difficult Items and Make Recommendations	1394
6.	Prepare Reports	41
7.	Maintain Supervision	4752
	TOTAL "A"	16352 hours

B. Product Engineering and Tolerance Studies:

1.	Review Drawings	461
2.	Review Mil. Standards & Specs.	216
3.	Select and Conduct Redesign	2979
4.	Prepare Reports	40
5.	Review Data/Identify Areas for Study	481
6.	Conduct Tolerance/Dimension Study	2676
7.	Determine Revisions and Prepare Report	556
8.	Maintain Supervision	4752
	TOTAL "B"	12161 hours

TOTAL MANHOURS (A & B) 28,513

SAW-XM-233 (LOW COST AREA)
CONTRACTOR DEVELOPMENT ENG PEP

Total Manhours (A&B,	28,513 hrs
Data Item Manhours	9,990 hrs
TOTAL MAN HOURS	38,503
Direct Labor Rate	$4.16/hr
Direct Labor Cost	$160,172.48
Overhead Rate 350%	
Overhead Cost	$560,603.68

Engineering Cost Summary	
Direct Labor	$160,173
Material	150
Overhead	560,604
O.D.C.	150,019
Total Engineering	$870,946
FY76/77 $870,946 x 1/5	$174,189
FY77 $870,946 x 4/5	$696,757

OTHER DIRECT COSTS
CONTRACTOR
PRODUCIBILITY ENGINEERING & PLANNING (PEP)

RATIONALE: Other Direct Costs are assumed to consist of three (3) categories.

a. Manufacturing Processing Engineering

b. Travel

c. Reproduction Costs

(1) PEP Studies

(2) Product Engineering and Tolerance Studies

XM-233
OTHER DIRECT COSTS
CONTRACTOR
PEP

A. Manufacturing Process Engineering is the Engineering effort to prepare and process routing sheets and other documentation defining in detail the manufacturing processes to be used for each component.

Estimated manufacturing operations		1206
Estimated Eng. hrs per operation		6.5 hrs.
Direct Labor Rate		$4.16/hr.
Overhead		350%
Required Manhours	1206 x 6.5	7839
Direct Labor	7839 x $4.16	$32,610.24
Overhead	$32,610 x 3.50	$114,135.84
Total M.P.E.		$146,746.08

B. O.D.C. Travel
Estimated travel consists of 2 trips to RIA by 1 man in FY77 at 2x$449.00=$898 plus 2 trips by 2 men at $847.00 per trip (1 trip in FY76/77 and 1 trip in FY77).

	76/77	FY77	TOTAL
1 man trip		$898	
2 man trip	$847	$847	
Total Travel	$847	$1745	$2592

XM-233
OTHER DIRECT COSTS
CONTRACTOR
PEP

C. Reproduction:

(1) Estimated for Producibility Engineering & Planning Studies

	76/77	FY77	Total
$165.00 x (1.24)	40.92	163.68	204.60

(2) Estimated for Product Engineering and Tolerance Studies

$383.52 x (1.24)	95.11	380.45	475.56
Total Reproduction Cost	$136.03	$544.13	$680.16

O.D.C. Summary

	76/77	FY77	Total
Total M.P.E.			$146,746.08
Total Travel			2,592.00
Total Reproduction			680.16
Total O.D.C.			$150,018.24

TOOLING SECTION (SOFTWARE)
XM233 (LOW COST AREA)

Costs are incurred during design of special purpose production equipment and tooling to achieve quantity production. Based on part experience it is estimated that 35% of the initial tooling cost is used for design.

All design costs are shown against the weapon.

On the basis of part estimates for automatic weapons an average tooling cost of $400 per operation is applied to cover the cost of Purchased Tooling, Purchased Gages, Expendable Tooling, Jigs and Fixtures, and Gages.

The corresponding Design Cost is thus estimated at .35 x $400 = $144 per operation.

	No. Operations x $144		76/77	FY77
XM233	1206	$173,664	$34,733	$138,931

QUALITY CONTROL SECTION

The estimates contained herein for Quality Control are for the Quality Documentation that is part of the Technical Data Package. In addition, estimated hours for Quality Control Engineering Supervisor are included at the rate of 160 hours per month for 11 months. The man hours estimated for the preparation of Quality Control Documentation are based on similar work performed by ARMCOM personnel.

Rationale is derived from a similar study performed on proposed Bushmaster weapons. The following Data Items are involved:

DI-E-1104*

DI-E-1118 (Mod)*

DI-R-1711 (Mod)

DI-R-1712 (Mod)

DI-R-1722 (Mod)

* In addition to Quality Control, there are man hours for these Data Items in the Engineering Section.

During the PEP Program, it is estimated all Q. C. software efforts will be accomplished in FY77.

SUMMARY OF MAN HOURS

GS-13	Supervisor	1,760
GS-12	Engineer	790
GS-11	Specialist Gage Designer/Checker	16,434
GS-09	Tech Writer, Illustrator	6,968
GS-05	Document Control Clerk	885
		26,837

SUMMARY OF COSTS
(LOW COST AREA)

Direct Labor Costs	26,837
Hourly Rate	4.16
Total D.L. Cost	111,642
Overhead (350%)	390,747
Material	400
Total Q.C. Cost	502,789

DATA SECTION *

PEPWD

1. This section includes the rationale and a summary of direct labor man-hours and costs for material and reproduction for each Data Call Item considered a part of the total Technical Data Package (TDP).

2. The summary of direct labor man hours for Engineering Data Items is incorporated in the Engineering Section under Data Items. The summary of direct labor man hours for Quality Control Data Items is incorporated in the Quality Control Section under Data Items. Data Call Items DI-E-1104 and DI-E-1118(MOD), which require both Engineering and Quality Control documentation, have separate summaries and rationale contained in this section.

3. The material costs for preparation of the Data Items include the costs of standard forms, such as drawings, supplementary quality assurance provisions, and packaging data sheets. These costs are summarized and shown in their respective functional areas.

4. A summary of Data Costs for all TDP related Data Items is included in this section and entered under Data in the Cost Model.

*Data Section Meets Requirements of the Following:
1. AR700-51
2. DOD Instruction DODO-5010,12
3. TD-3 Listing of DOD Data Items

5. DATA RELATED COST SUMMARY

a. Cost of Direct Labor plus Overhead to prepare data items is as follows:

Category	
Engineering Direct Labor (Manhours)	9,990
Quality Control Direct Labor (Manhours)	26,837
Engineering Cost*	187,013
Quality Control Cost*	502,389
Total Direct Labor & Overhead	689,402
b. Data Cost	7,441
c. Total Related Data Cost - PEP (a + b)	696,843

* Hourly rate = $4.16 + 350% overhead = 18.72/hour

SUMMARY OF DATA COSTS-PEP PROGRAM

B. No.	Data Item No.	Data Item Title	
0004	*DI-E-1103A	Engrg Release Record	$ 203
0005	*DI-E-1104(QC)	Specifications	39
0005	*DI-E-1104(ENGR)	Specifications	93
0007	DI-E-1106	Specs, Stds, Application List	44
0008	*DI-E-1107	Drawing Custodianship List	68
0009	DI-E-1115A(MOD)	Technical Data Package	
010	*DI-E-1116	Standardization, Components, and Selection Control	6
011	DI-E-1117	Standardization-Report of Common Items	6
012	*DI-E-1118(MOD)(QC)	Drawings, Engrg, and Associated Lists	4,130
012	*DI-E-1118(MOD) (ENGR)	Drawings, Engrg, and Associated Lists	1,348
034	DI-L-1407(MOD)	Preservation and Packaging Data	307
045	DI-R-1711(MOD)	Quality Engrg Acc Insp Req & Eq	79
046	DI-R-1712(MOD)	Qual Engrg Supp QA Provisions	766
049	DI-R-1717	Qual Engrg Calibration Prog Data	22
050	DR-R-1722(MOD)	Qual Insp Pamphlet	330
		GRAND TOTAL DATA COST	$7,441
		76/77 DATA COST	1,488
		FY77 DATA COST	5,953

* Started during FSD Phase; continued during PEP Program.

SUMMARY OF DIRECT LABOR MANHOURS FOR ENGRG DATA ITEMS

Data Item No.	Totals
DI-E-1107	2
DI-E-1118(MOD)	1372
Totals	
DI-E-1103A	165
DI-E-1104	1676
DI-E-1106	28
DI-E-1107	10
DI-E-1115A(MOD)	96
DI-E-1116	73
DI-E-1117	5
DI-E-1118(MOD)	5487
DI-E-1407(MOD)	1076
Totals	9,990

Note: Totals are included in Direct Labor in Engineering Section

SUMMARY OF QUALITY CONTROL DIRECT LABOR FOR DATA ITEMS (MANHOURS)

Data Item	GS-12	GS-11	GS-9	GS-5
DI-E-1104	390	-	-	22
DI-E-1118(MOD)	-	14000	-	-
DI-R-1711(MOD)	60	355	-	60
DI-R-1712(MOD)	-	1914	348	348
DI-R-1717	340	165	-	75
DI-R-1722(MOD)	-	-	6620	380
Totals	790	16,434	6,968	885

NOTE: Totals are included in Direct Labor in Quality Control Section.
Grand Total manhours - 25,077 + 1,760 (GS-13 Supervisor) = 26,837

INDUSTRIAL FACILITIES SECTION
(LOW COST AREA)

The estimate is based on the assumption that the contractor has a suitable plant site available for production of the components.

The design and layout of the plant equipment is based on the manufacturing process. Utilization of equipment is on the basis of 80% of the total machine time available. For the conventional machines a 1-8-5 shift is proposed through the first six months and 2-8-5 for the remainder of the program. For the N/C equipment a 1-8-5 shift is proposed through the first 6 months and 3-8-5 shift for the remainder of the program.

The cost of the plans and layouts for this phase is estimated as follows, and will be accomplished during 76/77 and FY77.

Design and layout including electrical, plumbing, sheet metal, air, etc. for space allocation to machining, assembly, bench work and storage of tools and equipment is estimated to require 225 hours for the entire layout of 37,912 square feet.

Preparation of specifications for the procurement of new equipment and bills of materials required for installation of machines, air lines, etc. is estimated to require 520 hours.

Rates used are based on 4.16 per hour rate for design and layout work was escalated by 350% for overhead to 18.72 per hour. Therefore the 745 hour total computes to 13,946.40.

Area required for production approximates 37,912 square feet to be allocated as follows:

Production area, machining	26,584
Assembly, deburring and bench area	1,244
Tool and gage maintenance	1,000
Receiving	800
Packaging and shipping	1,000
Bonded storage	500

Tool storage	900
Final inspection	2,000
Administration	1,500
Metrology Lab	384
Tool Room	2,000
Total Area Required	37,912

It is assumed that chrome plating and surface finishing will be vendor purchased.

	TOTAL	76/77	FY77
Labor Cost	3,099.20	619.84	2,479.36
Overhead Cost	10,847.20	2,169.44	8,677.76
Total Cost	13,946.40	2,789.28	11,157.12

NUMBER II-B

BASIC ESTIMATED COST PACKAGE
ENGINEERING DEVELOPMENT
XM234 CONTRACTED BY HIGH COST AREA IN 6.0MM

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT
(AMCR 715-22) HIGH COST AREA CONTRACT

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: XM234 High Cost Area Contract (PEP Included)

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT			COST	REFERENCE
7	8	9	10	11
COST CATEGORIES	HOURS	RATE	ESTIMATE	SCHEDULE
A . ENGINEERING			1,671,617	
A 1 DIRECT LABOR	204,376.5	-		
A 2 MATERIAL				
A 3 OVERHEAD		110%		
A 4 OTHER				
B . TOOLING			442,861	
B 1 DIRECT LABOR	-	-		
B 2 MATERIAL				
B 3 OVERHEAD		-		
B 4 OTHER				
C . PROTOTYPE PRODUCTION			917,420	
D . SYSTEM TEST AND EVALUATION			458,631	
E . DATA			56,957	
F . TOTAL SYSTEMS MANAGEMENT			553,574	
G . CONSTRUCTION			-0-	
H . TRAINING			94,002	
I . OTHER (Specify) PEP			1,586,831	
J . TOTAL COST LESS (G AND A)			5,781,893	
K . G AND A 24.6%				
L . TOTAL COST			7,204,239	
M . PROFIT OR FEE 10.1%				
N . TOTAL PRICE			7,931,867	

REMARKS

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22) IN-HOUSE SUPPORT

1. PREPARING INSTALLATION

SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED

(PEP Included)
In-House Support XM234 High Cost Area Contractor

3. QUANTITY

NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT

Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL

4

6. ESTIMATE PREPARED AS OF

30 November 1974

RESEARCH AND DEVELOPMENT			7 COST CATEGORIES	8 HOURS	9 RATE	10 COST ESTIMATE	11 REFERENCE SCHEDULE
A	.		ENGINEERING			873,367	
	1		DIRECT LABOR	51,426	-		
	2		MATERIAL				
	3		OVERHEAD		85%		
	4		OTHER				
B	.		TOOLING				
	1		DIRECT LABOR	-	-		
	2		MATERIAL				
	3		OVERHEAD		-		
	4		OTHER				
C	.		PROTOTYPE PRODUCTION				
D	.		SYSTEM TEST AND EVALUATION *			138,738	
E	.		DATA				
F	.		TOTAL SYSTEMS MANAGEMENT				
G	.		CONSTRUCTION				
H	.		TRAINING				
I	.		OTHER (Specify) PEP			520,173	
J	.		TOTAL COST LESS (G AND A)			1,532,278	
K	.		G AND A NA				
L	.		TOTAL COST NA				
M	.		PROFIT OR FEE NA				
N	.		TOTAL PRICE NA				

REMARKS

*DT/OT-II of 6 months duration

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

6.0MM
XM234 HIGH COST AREA
ENG. DEV
RESEARCH & DEVELOPMENT

	FY75	FY76	76/77	FY77	FY78	TOTAL
1.1 Contract						
1.11 Dev Eng (Val/Ed)	271,759	651,025	134,453	614,380	-0-	1,671,617
1.12 PEP	-0-	-0-	186,080	1,400,751	-0-	1,586,831
1.13 Tooling	-0-	442,861	-0-	-0-	-0-	442,861
1.14 Mfg Proto	-0-	-0-	305,807	611,613	-0-	917,420
*1.15 Other	143,652	323,467	151,949	544,096	-0-	1,163,164
FY Cost (Less G & A)	415,411	1,417,353	778,289	3,170,840	-0-	5,781,893
G & A(24.6%)						
FY Cost	517,602	1,766,022	969,748	3,950,867	-0-	7,204,239
Profit(10.1%)						
FY Total Price	569,880	1,944,390	1,067,693	4,349,904	-0-	7,931,867
1.2 In-House						
1.21 Dev Eng	161,229	361,986	72,655	277,497	-0-	873,367
1.22 PEP	110,860	179,774	44,054	185,485	-0-	520,173
1.23 Tooling	-0-	-0-	-0-	-0-	-0-	-0-
1.24 Mfg	-0-	-0-	-0-	-0-	-0-	-0-
**1.25 Other	-0-	-0-	-0-	138,738	-0-	138,738
In-House Cost	272,089	541,760	116,709	601,720		1,532,278
Total Prog (R & D)	841,969	2,486,150	1,184,402	4,951,624		9,464.145
*Other/ Contract Syst.Test & Evaluation	33,424	82,652	100,051	242,504	-0-	458,631
Data	23,732	33,225	-0-	-0-	-0-	56,957
Total Syst Mg.	86,496	207,590	51,898	207,590	-0-	553,574
Training	-0-	-0-	-0-	94,002	-0-	94,002
TOTAL	143,652	323,467	151,949	544,096		1,163,164

**DT/OT (ARMCOM) $23,123/Mo,-I=4 months,-II=6 months

Oct 1974

Break Down of "Other" Expenses Shown on Spread Sheet (XM234)

Other	FY75	FY76	76/77	FY77	Total
System Test & Eval	33,424	82,652	100,051	242,504	458,631
Data	23,732	33,225	0	0	56,957
Total Syst Mgmt	86,496	207,590	51,898	207,590	553,574
Training	0	0	0	94,002	94,002
Total	143,652	323,467	151,949	544,096	1,163,164

CONTRACTOR
MAN HOUR SUMMARY

ACTIVITY	75	76	76/77	77	TOTAL
A-2 Development Engineering	13,746	32,979	6,760	28,760	82,245
* PEP	-0-	-0-	7,276.1	63,939.4	73,215.5
Material	-0-	-0-	-0-	-0-	-0-
B-2 Tooling	-0-	9,473	-0-	-0-	9,473
** Other D.C.	4,800	10,883	3,520	20,240	39,443
TOTAL HOURS	18,546	53,335	17,556.1	112,939.4	204,376.5
MAN YEARS (1800 HOURS)	10.3	29.63	9.75	62.74	113.54
** O.D.C.					
D-3 Syst Test & Evaluation	1,600	3,203	1,600	9,353	15,756
E-3 Data		(INCLUDED IN DEV. ENG.)			
F-2 Total System Management	3,200	7,680	1,920	7,680	20,480
E-4 Training				3,207	3,207
TOTAL O.D.C.	4,800	10,883	3,520	20,240	39,443
*PEP					
A-3 PEP/E-4 PEP Dev Eng			7,701	30,802	38,503
C-2 PEP Qual Cont.				26,837	26,837
G-1 Indust. Facil.			149	596	745
ODC-2			1,426.1	5,704.4	7,130.5
TOTAL PED			9,276.1	63,939.4	73,215.5

RATIONALE
XM-234
IN-HOUSE
FSD-ENGINEERING

RATIONALE: The XM-234 is judged to have 6 areas requiring major redeisgn, specifically:

(1) Upper Receiver

(2) Lower Receiver

(3) Gas System

(4) Bolt/Operating Group

(5) Firing Mechanism

(6) Magazine

The major FSD-Engineering effort to redesign these areas will be conducted in 5 months of FY75 and 12 months of FY76.

The fiscal transition period of 3 months, 76/77 and 12 months of FY77 will be used to finalize detail design, testing, data acquisition, data processing, data evaluation, and evaluation of proposed production related modifications in conjunction with the concurrent PEP effort.

Two basic problems appear to exist:

(1) If the Upper Receiver and Lower Receiver are reinforced to insure structural integrity the weight limit may be exceeded.

(2) If the locking lug areas are modified to eliminate excessive wear or potential failure an extensive redesign and testing of the operating mechanism may be required.

XM-234
IN-HOUSE
FSD-ENGINEERING

The In-House FSD Engineering Team Effort is summarized as follows:

		FY75		FY76		76-77		FY77	
	Grade	Hrs	$	Hrs	$	Hrs	$	Hrs	$
Project Eng	14	750	9,435	1800	22,644	450	5,661	900	11,322
Mech Eng	13	750	8,048	1800	19,314	300	3,219	1200	12,876
Mech Eng	12	1500	13,635	3600	32,724	900	8,181	1800	16,362
Mech Tech	12	750	6,818	1800	16,362	300	2,727	1200	10,908
Q.A. Tech	11	750	5,722	1800	13,734	300	2,289	1200	9,156
Mech Tech	9	750	4,748	1800	11,394	450	2,849	1200	7,596
Draftsman	7	750	3,893	1800	9,342	300	1,557	1200	6,228
Draftsman	5	750	3,143	1800	7,542	300	1,257	1200	5,028
Math Analyst	12	563	5,118	1350	12,272	300	2,727	1200	10,908
RAM Eng	12	563	5,118	1350	12,272	300	2,727	1200	10,908
Q.A. Eng	12	750	6,818	1200	10,908	225	2,046	1200	10,908
Q.A. Tech	12	750	6,818	1200	10,908	225	2,046	1200	10,908
Model Maker		500	3,815	1200	9,156	-0-	-0-	-0-	-0-
Direct Labor	FY75	9876	83,129						
	FY76			22500	188,572				
	76/77					4350	37,286		
	FY77							14700	123,108

Total Direct Labor (FSD) 51,426 Man hours $432,095

Overhead (85%)	FY75	$70,660
	FY76	160,286
	76/77	31,693
	FY77	104,642
Total Overhead (FSD)		$367,281

(ALL CONTENDERS)
FSD-ENGINEERING MATERIAL

RATIONALE: Engineering Material costs cover office supplies, drafting paper, etc., and is estimated at $100 per month.

FY75	5 x $100	$ 500
FY76	12 x $100	1200
76/77	3 x $100	300
FY77	12 x $100	1200
TOTAL		$3200

Other direct charges are covered in either FSD or PEP.

FSD - ENGINEERING - OTHER DIRECT COSTS

Rationale: Other Direct Costs are assumed to consist of Computer expense at $600 per month and Travel Expense.

A. Computer Expense		
FY75	5 x $600	$ 3,000
FY76	12 x $600	7,200
76/77	3 x $600	1,800
FY77	12 x $600	7,200
TOTAL		$19,200
B. Travel Expense		
FY75		3,940
FY76		4,728
76/77		1,576
FY77		41,347
TOTAL		51,591
C. Total O.D.C./FY		
FY75		6,940
FY76		11,928
76/77		3,376
FY77		48,547
D. Total O.D.C.		70,791

FSD - ENGINEERING - SUMMARY OF COSTS

FY75	$161,229
FY76	361,986
76/77	72,655
FY77	277,497
TOTAL	$873,367

XM-234
IN-HOUSE TRAVEL COSTS
(HIGH COST AREA)

Estimate of Travel Costs:

	FY75	FY76	76/77	FY77	
Reviews at West Coast	5	6	2	6	
3 days x 2 men x $35/day	1050	1260	420	1260	
Car rental 2 days -$60/trip	300	360	120	360	
Air fare $259 x 2 men	2590	3108	1036	3108	
Support of APG Test (RDAT-DT-II)				275	days
1 man x $35/day				9625	
Car rental @ $30/day				8250	
Air fare $141/28 trips				3948	
Support Test Fort Benning (OT-II)				180	days
1 man x $35/day				6300	
Car Rental @ $30/day				5400	
Air fare $172/18 trips				3096	
Total/FY	$3940	$4728	$1576	$41347	

Total ED Travel $51,591

XM234
ENGINEERING SECTION

FULL SCALE DEVELOPMENT

1. Introduction:

a. The Engineering Section is divided into four (4) parts;

(1) Engineering Direct Labor.

(2) Engineering Material.

(3) Engineering Overhead.

(4) Other Direct Charges to Engineering.

b. Each Engineering part consists of description of the item included and the rationale for including and evaluating each item.

c. The costs accrued in each part were developed among the weapon elements according to the percentage of peculiar parts of the weapon system which make up the weapon element. Thus for the XM234:

Weapon Element	Peculiar Parts	%Distribution
Receiver & Operating Group	115	64
Barrel Assembly	17	9
Rear Sight	10	5
Magazine	7	4
Bipod	21	12
Sling	3	2
Maintenance Tools	7	4
TOTAL	180	100

2. Rationale for Estimating Engineering Direct Labor Cost (FSDWEDL):

a. Total Engineering Direct Labor hours is the sum of two inputs:

(1) Engineering Direct Labor hours to accomplish the Engineering Tasks involved in finalizing the weapon design.

(2) Engineering Direct Labor hours to prepare the information required for Data Items.

b. The value for each Direct Labor hour is an average hourly rate applied to all man hours expended in the Engineering effort and was determined for each contractor in coordination with AMSWE-PPX in the following manner:

(1) Estimate the total Direct Labor hours required for each Government GS grade.

(2) Multiply these totals by the respective step 5 hourly rate and add to get a total equivalent Government direct labor cost.

(3) Divide the total equivalent Givernment direct labor cost by the sum of the direct labor hours, regardless of grade, to obtain an average Government engineering hourly rate.

(4) Compare the average Government engineering hourly rate with the Step 5 hourly rates in the GS pay scale to determine the average grade level of skill employed.

(5) Compare the average grade level of skill with available information on the contractor's pay scale to estimate the average contractor's engineering hourly rate.

c. The average contractor's engineering hourly rate for the Contractor is computed to be $9.22 per hour.

d. Engineering Direct Labor Hours and Costs for the Contractor by Fiscal Year are estimated to be:

FISCAL YEAR	D. L. HOURS	D. L. COSTS
75	13,746	126,738
76	32,979	304,065
76/77	6,760	62,327
77	28,760	265,167
Total	82,245	$758,297

3. Rationale for Estimating Engineering Material Costs (FSDWEMAT):

a. Engineering Materials are considered to consist of miscellaneous material used in performing the engineering effort for Full Scale Development. Layout paper, drafting supplies, bond paper, vellums, computer cards, and computer paper are typical major cost items in this category.

b. Engineering Material Costs are estimated to be:

FY75	275
FY76	660
76/77	160
FY77	660
Total	1,755

4. Rationale for Estimating Engineering Overhead (FSDWEOH):

a. Based on historical data and information available in the Contract Pricing Division, AMSWE-PPX, the Engineering Overhead Rate for the Contractor is estimated to be 110% of Engineering Direct Labor Cost.

b. Summary of Overhead costs is as follows:

Total Overhead FY75	$139,412
Total Overhead FY76	334,472
Total Overhead 76/77	68,560
Total Overhead FY77	291,684
Total Overhead	$834,128

5. Rationale for Estimating Other Direct Charges to Engineering (FSDWEOT):

a. This category includes the cost of travel and charges for computer time during Full Scale Development.

(1) The estimated computer costs are for programming and exercising a dynamic model of the weapon, a heat transfer and stress analysis model of the barrel, and analysis of Maintainability and Reliability as follows:

FY75	2,970
FY76	7,100
76/77	1,830
FY77	7,100
Total Computer Cost	19,000

(2) The estimate of travel costs is as follows:

FY75	2,364
FY76	4,728
76/77	1,576
FY77	49,769

Supporting computations may be found under "Estimate of Travel Costs".

b. Other Direct Charges to Engineering are summarized as follows:

	FY75	FY76	76/77	FY77	TOTAL
Computer Time	2,970	7,100	1,830	7,100	19,000
Travel Costs	2,364	4,728	1,576	49,769	58,437
Total by FY	5,334	11,828	3,406	56,869	77,437

TOTAL O.D.C.

d. Estimate of Travel Costs:

	FY75	FY76	76/77	FY77	
Informal reviews at Rock Island	3	6	2	6	
3 days x 2 men x $35/trip	630	1260	420	1260	
Car Rental 2 days/$60 trip	180	360	120	360	
Air Fare $259 x 2 men	1554	3108	1036	3108	
Support of APG Test (RDAT-DT-II)				275	days
1 man x $35/day				9625	
Car Rental @ $30/day				8250	
Air Fare $355/28 days				9940	
Support Test Fort Benning (OT-II)				180	days
1 man x $35/day				6300	
Car Rental x $30/day				5400	
Air Fare $307/18 days				5526	
TOTAL FY	$2364	$4728	$1576	$49769	

TOTAL TRAVEL $58,437

6. Total Engineering Cost

FY75	271,759
FY76	651,025
76/77	134,453
FY77	614,380
TOTAL ENG.	$1,671,617

HIGH COST AREA

SUMMARY OF FSDW TOOLING COSTS

ESTIMATED IN 1975 DOLLARS

FSDWTL -

The cost model symbol gives reference to the cost of tooling, gages and manufacturing aids required to produce FSD prototype weapons, supporting equipment, and repair parts. All costs occur in FY76.

HIGH COST AREA
FSD - TOOLING COST (LESS GSA)
XM234 (180 UNIQUE PARTS - 1097 OPERATIONS)

Tooling for 104 Prototype Guns Consists of:

		Hours	Amount	
A.	Purchase Tooling (Vendor Price)			
	1095 x $112.48		$123,391	
B.	Purchase Gages (Vendor Price)			
	1097 x $21.54		$ 23,630	
C.	Purchase Expendable Tooling (Vendor Price)			
	1097 x $40.00		$ 44,758	
D.	Manufacture - Jigs & Fixtures			
	D.L. Rate $9.22/hr, O.H. Rate 110%	3813	$ 73,827	
E.	Manufacture - Gages			
	D.L. Rate $9.22/hr, O.H. Rate 110%	261	$ 5,054	
	Subtotal		$270,660	
F.	Manufacture - Processing	2469	$ 47,805	
	D.L. Rate $9.22/hr, O.H. Rate 110%			
G.	Tool & Gage Design		$ 40,599	
	(15% of Item A thru E above)			
H.	Estimating of Tools	1646	$ 31,870	
	D.L. Rate $9.22/hr, O.H. Rate 110%			
I.	Purchasing Effort (on A-E above)	1284	$ 24,861	
	D.L. Rate $9.22/hr, O.H. Rate 110%			
J.	Tool & Gage Inspection		$ 27,066	
	(10% of Items A thru E above)			
	Total Tooling Cost	9473 Hrs	$442,861	(FY76)
	Unit Cost (104 weapons)		$ 4,259	

XM234
FSD TOOLING
MANUFACTURING PROCESSING

Planning for manufacturing processes is estimated at 2 hours per machine operation. There are 907 machine operations giving:

1097
2
2194 hrs

An additional .25 hours is estimated for methods and standard work per operation giving:

1097
.25
275

Total

2194 hrs
275 hrs
2469 hrs

TOOL DESIGN

It is estimated from M16 G.M. Hydromatic that 20% design to mfg.

From G.E. (M61) Approx. 34%.

It is estimated that 30% is fair and reasonable. In prototype most detailed design would not be made - use 15%.

ESTIMATING OF TOOLS

907 Operations with 3 tools per operation - 1 cutter
1 fixture
1 gage

1097
3
3291 tools

It is estimated that .50 hr will be necessary for each tool.

3291
.5
1646 hrs

XM234

TOOL & GAGE INSPECTION

It is estimated that 10% of the purchase price will be used for initial inspection of tools and gages, based upon ARMCOM QA experience.

PURCHASING

Total procurement actions
For items purchased finished
Total operations - 1097
It is assumed that each operation will require: 1 cutter
1 fixture
1 gage

Therefore 3 x 1097 = 3291 items will be procured.

3 Items over $3000
1094 Items less than $3000

Use same standards for purchasing as manufacturing

1094 (.5176 hrs) (150%) = 850 hours
3 (17.223 hrs) (50%) = 78 hours
928 hours

For Items manufactured - Manufacturing hours - 4074

Relationship to mfg to purchased - 38.3%

Procurement hours for manufactured items - (928) (38.3%) = 356 hours

Total procurement effort - Mfg 356 hours
Purchased 928 hours
1284 hours

PROTOTYPE COSTS

XM234

Based on experience in manufacturing components for the XM235 at the Naval Air Rework Facility (NARF), Pensacola, Florida and assuming that the manufacturing cost is approximately related to the number of unique components in the weapon the following costs are calculated:

RDAT Weapons	$\frac{180}{155} \times 4 \times \$10,000$	46,452
DT/OT-II Weapons	$\frac{180}{155} \times 100 \times \$7,500$	870,968
Total Prototype Weapon Cost		917,420

The prototype manufacturing effort continues over a period of three months in the 76/77 period and six months in the FY77 period. The prototype cost is assumed to be distributed proportionately.

76/77 3/9 x 917,420 = 305,807

FY77 6/9 x 917,420 = 611,613

SYSTEM TEST AND EVALUATION SECTION

FULL SCALE DEVELOPMENT

FSDWTE

1. Introduction

a. The figures below represent an estimate of the contractor's cost to conduct System Test and Evaluation.

b. For computational purposes, the Total System Test and Evaluation activity was divided into three parts as follows:

Part I - Acceptance Testing of the Prototype Weapons

Part II - Research and Development Acceptance Test (RDAT)

Part III - Preliminary Testing

c. The following were not included as part of this estimate:

(1) Weapons, spare barrels, and spare parts. These are included in the Prototype Cost, as other Direct Costs.

(2) Ammunition (MUCOM Item)

(3) Range utilization/rental costs, if required. This item was not included due to lack of supporting information as to where and under what arrangement the contractor will conduct testing.

(4) Shipping/transportation costs of materiel/personnel to various test sites, if required. It is assumed that testing would be within close proximity of the contractor's plant.

d. The same direct labor (time) and materials estimate was used for all three contractors. This is considered a reasonable assumption, since

the test requirements are the same. Thus, differences in the cost estimates are the result of the various contractors' equivalent hourly rates and overhead figures. Contractor hourly rates and overhead were obtained from audited historical data.

2. Summary of Costs	TOTAL
Part I - Acceptance Testing	$105,768
Part II - RDAT	$216,127
Part III - Preliminary Testing	$136,736
TOTAL - Weapon System Test and Evaluation Cost (FSDWTE)	$458,631

3. Breakdown by Parts

Part I - Acceptance Testing	FY75	FY76	76/77	FY77	TOTAL
Direct Labor (2950 hrs)*	-0-	-0-	-0-	27,199	27,199
Materials	-0-	-0-	-0-	48,650	48,650
Overhead	-0-	-0-	-0-	29,919	29,919
Total				105,768	105,768

Part II - RDAT					
Direct Labor (6403 hrs)	-0-	-0-	-0-	59,036	59,036
Materials	-0-	-0-	79,391	12,760	92,151
Overhead	-0-	-0-	-0-	64,940	64,940
Total			79,391	136,736	216,127

**Part III - Prelim. Tstg.					
Direct Labor (6403 hrs)	9,840	39,358	9,838	-0-	59,036
Material	12,760	-0-	-0-	-0-	12,760
Overhead	10,824	43,294	10,822	-0-	64,940
Total	33,424	82,652	20,660	-0-	136,736

* Direct Labor Rate = $9.22/hr

Overhead = 110%

** Preliminary Testing Period - May 1975 through Oct 1976

DATA SECTION

FULL SCALE DEVELOPMENT

1. Introduction:

a. This section summarizes the costs for the FSD Data Items. The section contains a List of FSD Data Items and their costs. These costs make up the totals which are entered under DATA in the FSD Cost Model. The costs for the Functional Direct Labor hours are accounted for in the respective Direct Labor sections for Engineering and Training.

b. The Data Items for the Technical Data Package (TDP) are accounted for in the PEP Program and are so noted on the list of the Data Costs for each Data Item. The TDP Data Items which are started in FSD and continued in PEP are also noted in the list for cross reference and continuity.

c. The section also contains a Data Related Cost Summary for information on the total cost related to data items.

2. DATA RELATED COST SUMMARY

a. Direct Labor plus Overhead to prepare FSD Data Items is carried under the following categories and totals as follows:

Category	
Engineering hours	29,800
Training hours	3,207
Engineering Cost	576,928
Training Cost	62,088
Total $/FY	639,016
b. Data Cost	56,957
a + b	695,973

c. Total Data Related Cost - FSD = $695,973 (P-F)

NOTE: Engineering and Training Hourly Rate = $9.22 + 110% Overhead = $9.22 + $10.14 = $19.36/hour

d. Data Cost by Fiscal Year

FY75 5/17 x 56,957 = $16,752

FY76 12/17 x 56,957 = $40,205

3. SUMMARY OF FSD DATA ITEM LISTING AND DIRECT LABOR TO PRODUCE ENGINEERING DATA ITEMS

List of Engineering Data Item Numbers

B#	DI#	B#	DI#
01	DI-A-1014A (MOD)	32	DI-H-1329A
02	DI-E-1100 (MOD)	37	DI-M-1501 (MOD)
03	DI-E-1101A	38	DI-M-1502
04	DI-E-1103A	39	DI-M-1502
05	DI-E-1104	40	DI-M-1505
06	DI-E-1105	41	DI-M-1510
08	DI-E-1107	42	DI-P-1600
10	DI-E-1116	44	DI-R-1710 (MOD)
11	DI-E-1117	51	DI-R-1730 (MOD)
12	DI-E-1118 (MOD)	52	DI-R-1731 (MOD)
13	DI-E-1119 (MOD)	53	DI-R-1733 (MOD)
14	DI-E-1128	54	DI-R-1734 (MOD)
15	DI-E-11XX (MOD)	55	DI-R-1735 (MOD)
16	DI-E-XXX1	56	DI-R-1740 (MOD)
17	DI-F-6000	57	DI-R-1741 (MOD)
18	DI-F-60001	58	DI-R-1750 (MOD)
18A	DI-F-XXX1	59	DI-S-1800 (MOD)
19	DI-F-6004	60	DI-S-1804A
25	DI-H-1312	61	DI-S-1812
26	DI-H-1314	62	DI-S-1818 (MOD)
27	DI-H-1315	63	DI-S-1819 (MOD)
29	DI-H-1322A (MOD)	64	DI-S-18XX (MOD)
30	DI-H-1326A	65	DI-T-1906 (MOD)
31	DI-H-1327A (MOD)	66	DI-T-XXX1 (NEW)
		67	DI-V-1950 (MOD)

Direct Labor Hours = 29,800

NOTE: These direct labor hours are included under Engineering.

4. SUMMARY OF FSD DATA ITEM LISTING AND DIRECT LABOR TO PRODUCE TRAINING DATA ITEMS

List of Training Data Items

B#	DI#
20	DI-H-1300 (MOD)
21	DI-H-1302
22	DI-H-1304
23	DI-H-1308
24	DI-H-1310

Direct Labor hours = 3,207

NOTE: These direct labor hours are included under Training.

SUMMARY OF COSTS - DATA ITEM CALL ITEMS - FSD

B No.	Data Item No.	Data Item Title		
01	DI-A-1014A(MOD)	PERT		557
02	DI-E-1100(MOD)	Corfiguration Management Plan		246
03	DI-E-1101A	Configuration Stat Acct & Engr Record		507
04	DI-E-1103A	Engineer Release Record	FSD/PEP	1620
05	DI-E-1104	Specifications	FSD/PEP	91
06	DI-E-1105	Characteristics & Description Book		168
07	DI-E-1106	Specs, Standards, Appl. List	PEP	0
08	EI-E-1107	Drawing Custodianship List	FSD/PEP	30
09	EI-E-1115A(MOD)	Technical Data Package	PEP	0
10	DI-E-1116	Stdz Comp & Select Control	FSD/PEP	58
.1	DI-E-1117	Stdz Report of Common Items	PEP	0
12	DI-E-1118(MOD)	Drawings, Engr & Assoc Lists	FSD/PEP	645
13	DI-E-1119(MOD)	Environmental Criteria Report		3172
14	DI-E-1128	Electromagnetic Interference Control Plan		84
15	(X)DI-E-11XX(MOD)	Interface Control Doc. for VRFWS		311
16	DI-E-XXX1	Dynamic Mathematical Model		288
17	DI-F-6000	Cost performance report		353
18	DI-F-6001(MOD)	Procurement Info Functional Cost-Hour Report		5
18A	DI-F-XXX1	Model for Eval of Design-To Unit Production Cost		29
19	DI-F-6004	Contract Funds Status Report		22
20	EI-H-1300(MOD)	Personnel & Training Requirements		150

SUMMARY OF COSTS - DATA CALL ITEMS - FSD
(Continued)

B No.	Data Item No.	Data Item Title	
21	DI-H-1320	New Equipment Training Plan	0
22	DI-H-1304	New Equipment Training Courses	1350
23	DI-H-1308	Training Course Reports	0
24	DI-H-1310	Graphic Aids	31444
25	DI-H-1312	Human Factors Engr Plan	53
26	DI-H-1314	Human Factors Engr Progress Rpt	179
27	DI-H-1315	Human Factors Engr Final Report	59
28	DI-H-1321A	Explosive Hazard Class. Data	See Ammo
29	DI-H-1322A(MOD)	Safety Statement	77
30	DI-H-1326A	Safety Anal. & Hazard Eval Rpts	212
31	DI-H-1327A(MOD)	Surface Danger Area Data	68
32	DI-H-1329A	Accident/Incident Report	20
33	DI-H-1330(MOD)	Facilities Safety Data	0
34	DI-L-1407(MOD)	Preservation & Packaging Data	PEP
35	DI-L-1410	Ammunition Data Cards	Ammo
36	DI-M-1500(MOD)	Firing Table Manuscript	Ammo
37	DI-M-1501(MOD)	Validation Plan for Equip. Publications	1
38	DI-M-1502(MOD)	Equipment Publications	1176
39	DI-M-1502(MOD)	Equipment Publications	Included in B038
40	DI-M-1505(MOD)	Equip. Pub. Progress/Cost Reports	38
41	DI-M-1510	Maintenance Allocation Chart	11
42	DI-P-1600	Value Engr Data Report	135
3	DI-P-1602	Value Engr Plan	No Cost Plan is prepared and paid for in Contractor's Proposal.

SUMMARY OF COSTS - DATA CALL ITEMS - FSD
(Continued)

B No.	Data Item No.	Data Item Title	
44	DI-R-1710(MOD)	Quality Program Plan	128
45	DI-R-1711(MOD)	Qual Engrg Acc Insp Req & Equip List	PEP
46	DI-R-1712(MOD)	Quality Engrg Supp QA Provision	PEP
47			PEP
48			PEP
49	DI-R-1717	Qual Engr Calibration Program Data	PEP
50	DI-R-1722(MOD)	Qual Insp Pamphlet	PEP
51	DI-R-1730(MOD)	Reliability Program Plan	17
52	DI-R-1731(MOD)	Reliability Reports	67
53	DI-R-1733(MOD)	Reliability Qualified Items List	3
54	DI-R-1734(MOD)	Rel Fail Modes Effects & Crit Anal Rpts	21
55	DI-R-1735(MOD)	Rel Failed Item Analysis Report	114
56	DI-R-1740(MOD)	Maintainability Program Plan	17
57	DI-R-1741(MOD)	Maintainability Reports	20
58	DI-R-1750(MOD)	Assessment Program Plan	7
59	DI-S-1800(MOD)	Technical Reports	1179
60	DI-S-1804A	Corrosion Prevention & Matl Deterioration Rpts and/or Studies	49
61	DI-S-1812	Maintenance Engr Des Discrepancy Report	34
62	DI-S-1818(MOD)	Maintenance Engr Analysis	380
63	DI-S-1819(MOD)	Contractor Recommended Support Plan	31
64	(X)DI-S-18XX(MOD)	Support Model Data	6
65	DI-T-1906(MOD)	Test & Demonstration Reports	1105
66	DI-T-XXX1(New)	R&D Acceptance Test Plan	25
	DI-V-1950(MOD)	Provisioning Requirements for US Army Eq.	581
68	DI-V-1951(MOD)	Federal Item Identification Data	No Contractor Performance Reqd

Total converted to FY75 Dollars $48,268 x 1.18 = $56,957 TOTAL $48,268

Total Systems Management Section
Full Scale Development

1. Introduction:

The overall systems management team to be employed by the contractor is considered to be a staff type operation that would be responsible for the contractor's overall program and execution.

Personnel on the management team are not included in the functional areas (i.e., engineering, manufacturing, testing, etc.). Top or executive management, administrative and clerical personnel are included in overhead and/or GSA. Since each of the functional areas would have their own supervision and management the rationale is to keep the Systems Management to a small highly capable team headed by a Project Manager.

2. Systems Management Team:

The team would be a full time effort for four (4) men headed by a Project Manager. It would consist of:

1 - Project Manager

1 - Senior Staff Systems Engineer for engineering activities

1 - Senior Staff Engineer for manufacturing and acceptance.

1 - Program Manager for plans and programs.

This team would be responsible for both the Full Scale Development and PEP Programs which are in the same time frame. Therefore, the costs are scheduled only in the FSD portion of the estimate.

3. The following is the estimated average Government rate:

Title	Grade	FY75 D.L. Rate
Project Manager	GS-15	$15.40
Senior Engineer, Engr.	GS-14	13.21
Senior Engineer, Mfg.	GS-13	11.27
Program Manager	GS-13	11.27
		$51.15

$51.15/4 = $12.79 hr average Government rate.

4. Based on the equivalent Government rate and discussions with AMSWE-PPX the equivalent Contractor hourly rate is estimated to be $12.87/hr and overhead at 110% totaling $27.03/hr D.L.&O.H.

5. Costs by Fiscal Period:

FY75 (5 months, 160 hrs/month)	
5 x 160 x 4 x $27.03 =	86,496
FY76 (12 months, 160 hrs/month)	
12 x 160 x 4 x $27.03 =	207,590
76/77 (3 months, 160 hrs/month)	
3 x 160 x 4 x $27.03 =	51,898
FY77 (12 months, 160 hrs/month)	
12 x 160 x 4 x $27.03 =	207,590
Total	553,574

IN-HOUSE TASKS

PEP RELATED

The major areas of In-House Direction and Support effort required during the PEP period are:

1. Producibility Engineering and Planning Studies.

2. Product Engineering Studies including Tolerance/Dimension Studies.

3. Engineering effort to prepare the Technical Data Package Data Call Items.

4. Engineering effort to enhance Reliability and Maintainability Engineering activities.

Configuration Management will be monitored in detail through acceptance testing.

Starting with RDT, Configuration Management will revert entirely to the Government as an In-House Task requiring effort as follows:

1. Prepare a Configuration Plan.

2. Update the Configuration Plan as required.

3. Review Engineering Change Proposals (ECPs):

    a. Failure Related.

    b. Production Related.

Other specific In-House Task areas are:

1. Review/monitor and direct Contractor and In-House conducted Producibility Engineering and Planning studies as follows:

    a. Review each part/drawing.

    b. Review Contractor Draft Process Sheets.

c. Review unique processing operations.

d. Review current and proposed processing capabilities.

e. Review difficult/uneconomical manufactured items and recommended actions.

f. Review Contractor PEP reports.

2. Review, monitor and direct Contractor and In-House conducted Production Engineering and Tolerance/Dimension Studies as follows:

a. Review components/drawings.

b. Maintain conformity to Military Standards as specification as applicable.

c. Review Contractor and In-House conducted redesign efforts.

d. Review and prepare reports.

e. Analyze available data and identify/approve areas for in-house or by contractor.

f. Conduct and/or monitor tolerance/dimension studies.

g. Review revisions and related reports.

h. Maintain liaison with contractor project related supervision personnel.

3. Maintain cognizance of current and proposed manufacturing processes and procedures.

(ALL CONTENDERS)
IN-HOUSE
PEP-ENGINEERING

The In-House PEP Engineering team effort is summarized as follows:

		FY75		FY76		76/77		FY77	
Title	Grade	Hrs	$	Hrs	$	Hrs	$	Hrs	$
Project Eng	14	750	9,435	900	11,324	225	2,831	900	11,324
Mech Eng	13	750	8,048	750	8,048	450	4,829	1800	19,316
Mech Eng	12	750	6,818	600	5,454	150	1,364	600	5,454
Mech Tech	11	375	2,861	600	4,578	150	1,145	600	4,578
Mech Tech	9	375	2,374	600	3,798	150	950	600	3,798
Draftsman	7	750	3,893	600	3,114	150	779	600	3,114
Draftsman	5	750	3,143	1800	7,542	450	629	1800	7,542
Math Analyst	12	375	3,409	600	5,454	150	1,364	600	5,454
CAM Eng	12	750	6,818	1800	16,362	225	2,046	900	8,181
Direct Labor									
FY75		5,625	46,799						
FY76				8250	65,674				
76/77						2100	15,937		
FY77								8400	68,761

Total Direct Labor (PEP) 24,375 Man Hours $197,171

Overhead (85%)

FY75	$39,779
FY76	55,823
76/77	13,547
FY77	58,447
Total Overhead (PEP)	$167,596

(ALL CONTENDERS)
IN-HOUSE
PEP
SUMMARY

	FY75	FY76	76/77	FY77	TOTAL
A. Engineering					
Direct Labor	46,799	65,674	15,937	68,761	197,171
Material($75/Mo)	375	900	225	900	2,400
Overhead	39,779	55,823	13,547	58,447	167,596
Other D.C. (Included in FSD)	-	-	-	-	-
Total A	86,953	122,397	29,709	128,108	$367,167
B. Configuration Control Board					
Direct Labor	12,720	30,528	7,633	30,528	81,409
Material($75/Mo)	375	900	225	900	2,400
Overhead (85%)	10,812	25,949	6,487	25,949	69,197
Other D.C. (Included in FSD)	-	-	-	-	-
Total B	23,907	57,377	14,345	57,377	$153,006
A plus B	110,860	179,774	44,054	185,485	
TOTAL IN-HOUSE PEP COST					$520,173

PEP ENGINEERING	24,375 Hrs.
C.C. Board	7,680 Hrs.
TOTAL MAN HOURS	32,055 Hrs.

(ALL CONTENDERS)
IN-HOUSE
CONFIGURATION CONTROL BOARD

Control of Configuration Management will be assumed by the Government.

A Configuration Control Board (CCB) will be established and will exercise its authority throughout the FSD period and potentially continue in the same manner but at somewhat diminished levels of effort through the Limited Production period and the Full Scale Production period.

During the FSD period from 1 February 1975 to 1 October 1977 (32 months) the CCB will utilize of the following people to the extent indicated:

	Title	Grade	Hours	$DL	$Overhead
40%	Configuration Mgr	14	1920	24,154	20,531
40%	Engineer	13	1920	20,602	17,511
20%	Procurement Specialist	13	960	10,301	8,756
20%	W.A. Engineer (Gages & SQAPS)	13	960	10,301	8,756
20%	Maintenance Specialist	12	960	8,726	7,417
20%	Supply Specialist	11	960	7,325	6,226
		TOTAL	7,680	$81,409	$69,197
These expenses occur as follows:			FY75	12,720	10,812
			FY76	30,528	25,949
			76/77	7,633	6,487
			FY77	30,528	25,949

SAW WEAPON XM-234
(HIGH COST AREA)
PRODUCIBILITY ENGINEERING & PLANNING
SEP/OCT 74

COST CATEGORIES AND ELEMENTS DEVELOPMENT-PEP	PEP TOTAL	FY75	FY76	76/77	FY77
A. Engineering	886,979	-0-	-0-	150,113	736,866
Direct Labor	354,998				
Material	150				
Overhead	390,498				
Other D.C.	141,333				
B. Tooling(Software)	157,968	-0-	-0-	31,594	126,374
C. Quality Control	520,018	-0-	-0-	-0-	520,018
D. System Test & Evaluation	-0-	-0-	-0-	-0-	-0-
E. Data	7,441	-0-	-0-	1,488	5,953
F. Total Systems Management	-0-	-0-	-0-	-0-	-0-
G. Industrial Facilities	14,425	-0-	-0-	2,885	11,540
H. Training	-0-	-0-	-0-	-0-	-0-
I. Miscellaneous	-0-	-0-	-0-	-0-	-0-
TOTAL COST	1,586,831			186,080	1,400,751

CONTRACTOR DEVELOPMENT ENG PEP

Rationale:

The Contractor PEP effort is estimated to address the following areas:

a. Producibility Engineering and Planning Studies.

b. Product Engineering and Tolerance Studies.

Tasks are identified in each area, required manhours are estimated for each task and the total estimated manhours determined. These manhours are multiplied by appropriate labor and overhead rates to obtain total values for Direct Labor and Overhead, $150 is estimated for Materials and these values of Direct Labor, Overhead, and Material cost are added to Other Direct Costs which are defined in a separate section.

CONTRACTOR DEVELOPMENT ENG PEP

A. Producibility Engineering and Planning Studies:

	TASK	MANHOURS
1.	Review Part Drawings	2058
2.	Prepare Draft Process Sheets	5143
3.	Determine Unique Operations	176
4.	Conduct Process Capabilities Study	2788
5.	Determine Difficult Items and Make Recommendations	1394
6.	Prepare Reports	41
7.	Maintain Supervision	4752
	TOTAL "A"	16352 hours

B. Product Engineering and Tolerance Studies:

1.	Review Drawings	461
2.	Review Mil. Standards & Specs.	216
3.	Select and Conduct Redesign	2979
4.	Prepare Reports	40
5.	Review Data/Identify Areas for Study	481
6.	Conduct Tolerance/Dimension Study	2673
7.	Determine Revisions and Prepare Report	556
8.	Maintain Supervision	4752
	TOTAL "B"	12161 hours

TOTAL MANHOURS (A & B) 28,513

SAW-XM-234 (HIGH COST AREA)
CONTRACTOR DEVELOPMENT ENG PEP

Total ManHours (A&B)	28,513 hrs
Data Item ManHours	9,990 hrs
Total Manhours	38,503

Direct Labor Rate	$9.22/hr
Direct Labor Cost	$354,997.66
Overhead Rate 110%	
Overhead Cost	$390,497.43

Engineering Cost Summary		76/77	FY77
Direct Labor	$354,998	$ 71,000	$283,998
Material	150	30	120
Overhead	390,498	78,100	312,398
O.D.C.	141,333	983	140,350
Total Engineering	$886,979	$150,113	$736,866

A-3 PEP

OTHER DIRECT COSTS
CONTRACTOR
PRODUCIBILITY ENGINEERING & PLANNING (PEP)

RATIONALE: Other Direct Costs are assumed to consist of three (3) categories:

a. Manufacturing Processing Engineering

b. Travel

c. Reproduction Costs

(1) PEP Studies

(2) Product Engineering and Tolerance Studies

XM-234 (HIGH COST AREA)
OTHER DIRECT COSTS
CONTRACTOR
PEP

A. Manufacturing Process Engineering is the Engineering effort to prepare and process routing sheets and other documentation defining in detail the manufacturing processes to be used for each component.

Estimated manufacturing operations		1097
Estimated Eng Hrs per operation		6.5 hrs
Direct Labor Rate		$9.22/hr
Overhead		110%
Required Manhrs	1097 x 6.5	7130.5
Direct Labor	7130.5 x $9.22	$65,743.21
Overhead	$65,743 x 1.10	72,317.53
Total M.P.E.		$138,060.74

B. O.D.C. Travel

Estimated travel consists of 2 trips to RIA by 1 man in FY77 at 2 x $449 = $898 plus 2 trips by 2 men at $847 per trip (1 trip in FY76/77 and 1 trip in FY77.

	76/77	FY77	TOTAL
1 man trip		$898	
2 man trip	$847	$847	
Total Travel	$847	$1745	$2592

XM-234 (HIGH COST AREA)
OTHER DIRECT COSTS
CONTRACTOR
PEP

C. Reproduction:

1) Estimated for Producibility Engineering & Planning Studies:

	76/77	FY77	TOTAL
$165.00 x (1.24)	$40.92	$163.68	$204.60

2) Estimated for Product Engineering and Tolerance Studies:

$369.00 x (1.24)	$95.11	$360.45	$475.56
Total Reproduction Cost	$136.03	$544.13	$680.16

O.D.C. Summary

Total M.P.E.	-0-	$138,060.74	$138,060.74
Total Travel	$847.00	1,745.00	2,592.00
Total Reproduction	136.03	544.13	680.16
Total O.D.C.	$983.03	$140,349.87	$141,332.90

TOOLING SECTION (SOFTWARE)
XM-234 (HIGH COST AREA)

Costs are incurred during design of special purpose production equipment and tooling to achieve quantity production. Based on past experience it is estimated that 35% of the initial tooling cost is used for design.

All design costs are shown against the weapon.

On the basis of past estimates for automatic weapons an average tooling cost of $400 per operation is applied to cover the cost of Purchased Tooling, Purchased Gages, Expendable Tooling, Jigs and Fixtures, and Gages.

The corresponding Design Cost is thus estimated at .35 x $400= $144 per operation.

	No. Operations	x $144	76/77	FY77
XM-234	1097	$157,968	$31,594	$126,374

QUALITY CONTROL SECTION

The estimates contained herein for Quality Control are for the Quality Documentation that is part of the Technical Data Package. In addition, estimated hours for Quality Control Engineering Supervisor are included at the rate of 160 hours per month for 11 months. The man hours estimated for the preparation of Quality Control Documentation are based on similar work performed by ARMCOM personnel.

Rationale is derived from a similar study performed on proposed Bushmaster weapons. The following Data Items are involved:

DI-E-1104*

DI-E-1118 (Mod)*

DI-R-1711 (Mod)

DI-R-1712 (Mod)

DI-R-1717

DI-R-1722 (Mod)

* In addition to Quality Control, there are man hours for these Data Items in the Engineering Section.

During the PEP Program, it is estimated all Q.C. software efforts will be accomplished in FY77.

SUMMARY OF MAN HOURS

GS-13	Supervisor	1,760
GS-12	Engineer	790
GS-11	Specialist Gage Designer/Checker	16,434
GS-09	Tech Writer, Illustrator	6,968
GS-05	Document Control Clerk	885
		26,837

SUMMARY OF COSTS

Direct Labor Hours	26,837
Hourly Rate	9,22
Total D. L. Cost	247,437
Overhead (110%)	272,181
Material	400
Total Q. C. Cost	520,018

DATA SECTION

PEPWD

1. This section includes the rationale and a summary of direct labor man-hours and costs for material and reproduction for each Data Call Item considered a part of the total Technical Data Package (TDP).

2. The summary of direct labor man hours for Engineering Data Items is incorporated in the Engineering Section under Data Items. The summary of direct labor man hours for Quality Control Data Items is incorporated in the Quality Control Section under Data Items. Data Call Items DI-E-1104 and DI-E-1118(MOD), which require both Engineering and Quality Control documentation, have separate summaries and rationale contained in this section.

3. The material costs for preparation of the Data Items include the costs of standard forms, such as drawings, supplementary quality assurance provisions, and packaging data sheets. These costs are summarized and shown in their respective functional areas.

4. A summary of Data Costs for all TDP related Data Items is included in this section and entered under Data in the Cost Model.

5. DATA RELATED COST SUMMARY

a. Cost of Direct Labor plus Overhead to prepare data items is as follows:

Category	
Engineering Direct Labor (Manhours)	9,990
Quality Control Direct Labor (Manhours)	26,837
Engineering Cost*	193,426
Quality Control Cost*	519,618
Total Direct Labor & Overhead	713,044

b. Data Cost 7,441

c. Total Related Data Cost - PEP (a + b) 720,486

*Hourly rate = $9.22 + 110% Overhead = 19.36/hour

SUMMARY OF DATA COSTS-PEP PROGRAM

B. No.	Data Item No.	Data Item Title	
0004	*DI-E-1103A	Engrg Release Record	$ 203
0005	*DI-E-1104(QC)	Specifications	39
0005	*DI-E-1104(ENGR)	Specifications	93
0007	DI-E-1106	Specs, Stds, Application List	44
0008	*DI-E-1107	Drawing Custodianship List	68
0009	DI-E-1115A(MOD)	Technical Data Package	
010	*DI-E-1116	Standardization, Components, and Selection Control	6
011	DI-E-1117	Standardization-Report of Common Items	6
012	*DI-E-1118(MOD)(QC)	Drawings, Engrg, and Associated Lists	4,130
012	*DI-E-1118(MOD) (ENGR)	Drawings, Engrg, and Associated Lists	1,348
034	DI-L-1407(MOD)	Preservation and Packaging Data	307
045	DI-R-1711(MOD)	Quality Engrg Acc Insp Req & Eq	79
046	DI-R-1712(MOD)	Qual Engrg Supp QA Provisions	766
049	DI-R-1717	Qual Engrg Calibration Prog Data	22
050	DR-R-1722(MOD)	Qual Insp Pamphlet	330
		GRAND TOTAL DATA COST	$7,441
		76/77 DATA COST	1,488
		FY77 DATA COST	5,953

* Started during FSD Phase; continued during PEP Program.

SUMMARY OF DIRECT LABOR MANHOURS FOR ENGRG DATA ITEMS

Data Item No.	Totals
DI-E-1107	2
DI-E-1118(MOD)	1372
Totals	
DI-E-1103A	165
DI-E-1104	1676
DI-E-1106	28
DI-E-1107	10
DI-E-1115A(MOD)	96
DI-E-1116	73
DI-E-1117	5
DI-E-1118(MOD)	5487
DI-E-1407(MOD)	1076
Totals	9,990

Note: Totals are included in Direct Labor in Engineering Section

SUMMARY OF QUALITY CONTROL DIRECT LABOR FOR DATA ITEMS (MANHOURS)

Data Item	GS-12	GS-11	GS-9	GS-5
DI-E-1104	390	-	-	22
DI-E-1118(MOD)	-	14000	-	-
DI-R-1711(MOD)	60	355	-	60
DI-R-1712(MOD)	-	1914	348	348
DI-R-1717	340	165	[illegible]	75
DI-R-1722(MOD)	-	-	6620	380
Totals	790	16,434	6,968	885

NOTE: Totals are included in Direct Labor in Quality Control Section.
Grand Total manhours - 25,077 + 1,760 (GS-13 Supervisor) = 26,837

INDUSTRIAL FICILITIES SECTION

The estimate is based on the assumption that the contractor has a suitable plant site available for production of the components.

The design and layout of the plant equipment is based on the manufacturing process. Utilization of equipment is on the basis of 80% of the total machine time available. For the conventional machines a 1-8-5 shift is proposed through the first six months and 2-8-5 for the remainder of the program. For the N/C equipment a 1-8-5 shift is proposed through the first 6 months and a 3-8-5 shift for the remainder of the program.

The cost of the plans and layouts for this phase is estimated as follows, and will be accomplished during 76/77 and FY77.

Design and layout including electrical, plumbing, sheet metal, air, etc. for space allocation to machining, assembly, bench work and storage of tools and equipment is estimated to require 225 hours for the entire layout of 37,912 square feet.

Preparation of specifications for the procurement of new equipment and bills of materials required for installation of machines, air lines, etc. is estimated to require 520 hours.

Rates used are based on 9.22 per hour rate for design and layout work was escalated by 110% for overhead to 19.36 per hour. Therefore the 745 hour total computes to 14,424.69.

Area required for production approximates 37,912 square feet to be allocated as follows:

Production area, machining	26,584
Assembly, deburring and bench area	1,244

Tool and gage maintenance	1,000
Receiving	800
Packaging and shipping	1,000
Bonded storage	500
Tool storage	900
Final inspection	2,000
Administration	1,500
Metrology lab	384
Tool room	2,000
Total Area Required	37,912

It is assumed that chrome plating and surface finishing will be vendor purchased.

	Total	FY-77	76/77
Labor Cost	6868.90	5,495.12	1373.78
Overhead Cost	7555.79	6,044.63	1511.16
Total Cost	14,424.69	11,539.75	2884.94

NUMBER II-C

BASIC ESTIMATED COST PACKAGE
ENGINEERING DEVELOPMENT
XM235 CONTRACTED IN A LOW COST AREA
IN 6.00MM

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22) LOW COST AREA CONTRACT

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: XM235 Low Cost Area Contract (PEP Included)

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT			COST	REFERENCE
7	8	9	10	11
COST CATEGORIES	HOURS	RATE	ESTIMATE	SCHEDULE
A . ENGINEERING			1,489,292	
1 DIRECT LABOR	177,109.5	-		
2 MATERIAL				
3 OVERHEAD		350%		
4 OTHER				
B . TOOLING			383,853	
1 DIRECT LABOR	-	-		
2 MATERIAL				
3 OVERHEAD		-		
4 OTHER				
C . PROTOTYPE PRODUCTION			790,000	
D . SYSTEM TEST AND EVALUATION			448,465	
E . DATA			56,957	
F . TOTAL SYSTEMS MANAGEMENT			-0-	
G . CONSTRUCTION			-0-	
H . TRAINING			90,886	
I . OTHER (Specify)	PEP		1,505,288	
J . TOTAL COST LESS (G AND A)			4,764,741	
K . G AND A	5%			
L . TOTAL COST			5,002,978	
M . PROFIT OR FEE	9.3%			
N . TOTAL PRICE			5,468,255	

REMARKS

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011e-R

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22) IN-HOUSE SUPPORT

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: IN-HOUSE SUPPORT XM235 Low Cost Area Contractor (PEP Included)

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT				COST	REFERENCE
7			8	9	10	11
	COST CATEGORIES		HOURS	RATE	ESTIMATE	SCHEDULE
A	.	ENGINEERING			871,353	
	1	DIRECT LABOR	51,426	-		
	2	MATERIAL				
	3	OVERHEAD		85%		
	4	OTHER				
B	.	TOOLING				
	1	DIRECT LABOR	-	-		
	2	MATERIAL				
	3	OVERHEAD		-		
	4	OTHER				
C	.	PROTOTYPE PRODUCTION				
D	.	SYSTEM TEST AND EVALUATION *			138,738	
E	.	DATA				
F	.	TOTAL SYSTEMS MANAGEMENT				
G	.	CONSTRUCTION				
H	.	TRAINING				
I	.	OTHER (Specify) PEP			520,173	
J	.	TOTAL COST LESS (G AND A)			1,530,264	
K	.	G AND A	NA			
L	.	TOTAL COST	NA			
M	.	PROFIT OR FEE	NA			
N	.	TOTAL PRICE	NA			

REMARKS

*DT/OT-II of 6 months duration

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

6.0MM
XM-235 (LOW COST AREA)
ENG. DEV. (ED)
RESEARCH & DEVELOPMENT

	FY75	FY76	76/77	FY77	FY78	TOTAL
1.1 Contract						
1.11 Dev Eng (Val/ED)	227,123	544,062	129,902	588,205	-0-	1,489,292
1.12 PEP	-0-	-0-	200,501	1,304,787	-0-	1,505,288
1.13 Tooling	-0-	383,853	-0-	-0-	-0-	383,853
1.14 Mfg.Proto	-0-	-0-	263,333	526,667	-0-	790,000
*1.15 Other	49,492	120,116	99,365	327,335	-0-	596,308
FY Cost (Less G & A)	276,615	1,048,031	693,101	2,746,994	-0-	4,764,741
G & A (5%)						
FY-Cost	290,446	1,100,433	727,756	2,884,344	-0-	5,002,978
Profit (9.3%)						
FY-Total Price	317,457	1,202,773	795,437	3,152,588	-0-	5,468,255
1.2 In-House						
1.21 Dev Eng	160,699	361,350	72,443	276,861	-0-	871,353
1.22 PEP	110,860	179,774	44,054	185,485	-0-	520,173
1.23 Tooling	-0-	-0-	-0-	-0-	-0-	-0-
1.24 Mfg.	-0-	-0-	-0-	-0-	-0-	-0-
**1.25 Other	-0-	-0-	-0-	138,738	-0-	138,738
In-House Cost	271,559	541,124	116,497	601,084	-0-	1,530,264
Total Prog R & D	589,016	1,743,897	911,934	3,753,672	-0-	6,998,519
*Other/Contract						
Syst. Test & Evaluation	32,740	79,911	99,365	236,449	-0-	448,465
Data	16,752	40,205	-0-	-0-	-0-	56,957
Total Syst Mgt.	-0-	-0-	-0-	-0-	-0-	-0-
Training	-0-	-0-	-0-	90,886	-0-	90,886
TOTAL	49,492	120,116	99,365	327,335	-0-	596,308

**DT.OT (ARMCOM) $23,123/MO,-I=4 months, -II=6 months

BREAK DOWN OF "OTHER" EXPENSES SHOWN
ON SPREAD SHEET (XM-235, LOW COST AREA)

	FY75	FY76	76/77	FY77	TOTAL
OTHER					
System Test & Evaluation	32,740	79,911	99,365	236,449	448,465
Data	23,732	33,225	-0-	-0-	56,957
Total Systems Management	-0-	-0-	-0-	-0-	-0-
Training	-0-	-0-	-0-	90,886	90,886
	56,472	113,136	99,365	327,335	596,308

XM-235
(LOW COST AREA)
CONTRACTOR
MAN HOURS SUMMARY

ACTIVITY	FY75	FY76	76/77	FY77	TOTAL
A-2 Development Eng	11,850	28,430	6,760	28,760	75,800
*PEP	-0-	-0-	9,107.1	63,263.4	72,370.5
Material	-0-	-0-	-0-	-0-	-0-
B-2 Tooling	-0-	8,328	-0-	-0-	8,328
** Other D.C.	1,067	4,269	1,067	14,208	20,611
TOTAL HOURS	12,917	41,027	16,934.1	106,231.4	177,109.5
MAN YEAR (1800 HRS)	7.18	22.79	9.41	59.02	98.39
** O.D.C.					
D-3 Syst Test & Evaluation	1,067	4,269	1,067	9,353	15,756
E-3 Data		(INCLUDED IN DEV. ENG.)			
F-2 Total Syst Mgmt.	-0-	-0-	-0-	-0-	-0-
E-4 Training	-0-	-0-	-0-	4,855	4,855
TOTAL O.D.C.	1,067	4,269	1,067	14,208	20,611
*PEP					
A-3 PEP Dev.Eng.	-0-	-0-	7,701	30,802	38,503
C-2 PEP Quality Control	-0-	-0-	-0-	26,837	26,837
G-1 Indust. Facil.	-0-	-0-	149	596	745
ODC-2 O.D.C.	-0-	-0-	1,257.1	5,028.4	6,285.5
TOTAL PEP	-0-	-0-	9,107.1	63,263.4	72,370.5

XM-235
IN-HOUSE
MAN HOUR SUMMARY

ACTIVITY	FY75	FY76	76/77	FY77	FY78	TOTAL
FSD Engineering	9,867	22,500	4,350	14,700	-0-	51,426
PEP Engineering	5,625	8,250	2,100	8,400	-0-	24,375
Config. Control Board	1,200	2,880	720	2,880	-0-	7,680
TOTAL	16,701	33,630	7,170	25,980	-0-	83,481

XM-235 IN-HOUSE MAN HOURS

RATIONALE
XM-235
IN-HOUSE
FSD-ENGINEERING

RATIONALE: The XM-235 is judged to have 3 areas requiring major redesign, specifically:

(1) Magazine

(2) Bolt Assembly

(3) Feed Mechanism

The major FSD-Engineering effort to redesign these areas will be conducted in 5 months of FY75 and 12 months of FY76.

The fiscal transition period of 3 months, 76/77, and 12 months of FY77 will see finalization of design, testing, data acquisition, processing, and evaluation, and evaluation of proposed production related modifications in conjunction with the concurrent PEP effort.

One basic problem appears to exist in that the contractor must familiarize his personnel with an unknown weapon concept.

XM-235
IN-HOUSE
FSD-ENGINEERING

The In-House FSD-Engineering Team Effort is summarized as follows:

	Grade	FY75 Hrs	FY75 $	FY76 Hrs	FY76 $	76/77 Hrs	76/77 $	FY77 Hrs	FY77 $
Project Eng	14	750	9,435	1800	22,644	450	5,661	900	11,322
Mech Eng	13	750	8,048	1800	19,314	300	3,219	1200	12,876
Mech Eng	12	1500	13,635	3600	32,724	900	8,181	1800	16,362
Mech Eng Tech	12	750	6,818	1800	16,362	300	2,727	1200	10,908
Q.A. Tech	11	750	5,722	1800	13,734	300	2,289	1200	9,156
Mech Eng Tech	9	750	4,748	1800	11,394	450	2,849	1200	7,596
Draftsman	7	750	3,893	1800	9,342	300	1,557	1200	6,228
Draftsman	5	750	3,143	1800	7,542	300	1,257	1200	5,028
Math Analyst	12	563	5,118	1350	12,272	300	2,727	1200	10,908
M Eng	12	563	5,118	1350	12,272	300	2,727	1200	10,908
Q.A. Eng	12	750	6,818	1200	10,908	225	2,046	1200	10,908
Q.A. Tech	12	750	6,818	1200	10,908	225	2,046	1200	10,908
Model Maker		500	3,815	1200	9,156	-0-	-0-	-0-	-0-
Direct Labor	FY75	9876	83,129						
	FY76			22500	188,572				
	76/77					4350	37,286		
	FY77							14700	123,108

Total Direct Labor (FSD) 51,426 Man hours $432,095

Overhead (85%)

FY75	$ 70,660
FY76	160,286
76/77	31,693
FY77	104,642

Total Overhead (FSD) $367,281

(ALL CONTENDERS)
FSD-ENGINEERING MATERIAL

RATIONALE: Engineering Material costs cover office supplies, drafting paper, etc., and is estimated at $100 per month.

FY75	5 x $100	$ 500
FY76	12 x $100	1200
76/77	3 x $100	300
FY77	12 x $100	1200
TOTAL		$3200

Other direct charges are covered in either FSD or PEP.

FSD - ENGINEERING - OTHER DIRECT COSTS

Rationale: Other Direct Costs are assumed to consist of Computer expense at $600 per month and Travel Expense.

A. Computer Expense

FY75	5 x $600	$3,000
FY76	12 x $600	7,200
76/77	2 x $600	1,800
FY77	12 x $600	7,200
Total		$19,200

B. Travel Expense

FY75	3,410
FY76	4,092
76/77	1,364
FY77	40,711
Total	49,577

C. Total O.D.C./FY

FY75	6,410
FY76	11,292
76/77	3,164
FY77	47,811

D. Total O.D.C. 68,777

FSD-IN-HOUSE ENGINEERING-SUMMARY OF COSTS

FY75	$160,699
FY76	361,350
76/77	72,443
FY77	276,861
Total	$871,353

XM235
IN-HOUSE TRAVEL COSTS
(LOW COST AREA)

Estimate of Travel Costs:

	FY75	FY76	76/77	FY77	
Reviews at East Coast	5	6	2	6	
3 days x 2 men x $35/day	1050	1260	420	1260	
Car rental 2 days - $60/trip	300	360	120	360	
Air fare $206 x 2 men	2060	2472	824	2472	
Support of APG Test (RDAT-DT-II)				275	days
1 Man x $35/day				9,625	
Car rental @ $30/day				8,250	
Air fare $141/28 trips				3,948	
Support Test Fort Benning (CT-II)				180	days
1 Man x $35/day				6,300	
Car rental @ $30/day				5,400	
Air fare $141/18 trips				3,096	
Total/FY	3,410	4,092	1,364	40,711	
Total ED Travel	$49,577				

XM235
ENGINEERING SECTION
FULL SCALE DEVELOPMENT

1. Introduction:

a. The Engineering Section is divided into four (4) parts:

(1) Engineering Direct Labor.

(2) Engineering Material.

(3) Engineering Overhead.

(4) Other Direct Charges to Engineering.

b. Each Engineering part consists of description of the items included and the rationale for including and evaluating each item.

c. The costs accrued in each part were developed among the weapon elements according to the percentage of peculiar parts of the weapon system which make up the weapon element. Thus for the XM235:

Weapon Element	Peculiar Parts	% Distribution
Receiver & Operating Group	95	61
Barrel Assembly	5	3
Rear Sight	12	8
Magazine	8	5
Bipod	23	15
Sling	4	3
Maintenance Tools	8	5
Total	155	100

2. Rationale for Estimating Engineering Direct Labor Cost (FSDWEDL):

a. Total Engineering Direct Labor hours is the sum of two inputs.

(1) Engineering Direct Labor hours to accomplish the Engineering Tasks involved in finalizing the weapon design.

(2) Engineering Direct Labor hours to prepare the information required for Data Items.

b. The value for each Direct Labor hour is an average hourly rate applied to all man hours expended in the Engineering effort and was determined for each contractor in coordination with AMSWE-PPX in the following manner:

(1) Estimate the total Direct Labor hours required for each Government GS grade.

(2) Multiply these totals by the respective step 5 hourly rate and add to get a total equivalent Government direct labor cost.

(3) Divide the total equivalent Government direct labor cost by the sum of the direct labor hours, regardless of grade, to obtain an average Government engineering hourly rate.

(4) Compare the average Government engineering hourly rate with the Step 5 hourly rates in the GS pay scale to determine the average grade level of skill employed.

(5) Compare the average grade level of skill with available information on the contractor's pay scale to estimate the average contractor's engineering hourly rate.

c. The average contractor's engineering hourly rate for the Contractor is computed to be $4.16 per hour.

d. Engineering Direct Labor Hours and Costs for the Contractor by Fiscal Year are estimated to be:

Fiscal Year	D. L. Hours	D. L. Costs
75	11,850	49,296
76	28,430	118,269
76/77	6,760	28,122
77	28,760	119,641
Total	75,800	$315,328

3. Rationale for Estimating Engineering Material Costs (FSDWEMAT):

a. Engineering Materials are considered to consist of miscellaneous material used in performing the engineering effort for Full Scale Development. Layout paper, drafting supplies, bond paper, vellums, computer cards, and computer paper are typical major cost items in this category.

b. Engineering Material Costs are estimated to be:

FY75	275
FY76	660
FY76/77	160
FY77	660
Total	1,755

4. Rationale for Estimating Engineering Overhead (FSDWEOH):

a. Based on historical data and information available in the Contract Pricing Division, AMSWE-PPX, the Engineering Overhead Rate for the Contractor is estimated to be 350% of Engineering Direct Labor Cost.

b. Summary of Overhead costs is as follows:

Total Overhead FY75	172,536
Total Overhead FY76	413,941
Total Overhead 76/77	98,426
Total Overhead FY77	418,745
Total Overhead	1,103,648

5. Rationale for Estimating other Direct Charges to Engineering (FSDWEOT):

a. This category includes the cost of travel and charges for computer time during Full Scale Development.

(1) The estimated computer costs are for programming and exercising a dynamic model of the weapon, a heat transfer and stress analysis model of the barrel, and analysis of Maintainability and Reliability as follows:

FY75	2,970
FY76	7,100
76/77	1,830
FY77	7,100
Total Computer Cost	19,000

(2) The estimate of travel costs is as follows:

FY75	2,046.00
FY76	4,092.00
76/77	1,364.00
FY77	42,059.00

Supporting computations may be found under "Estimate of Travel Costs".

b. Other Direct Charges to Engineering are summarized as follows:

	FY75	FY76	76/77	FY77
Computer Time	2,970	7,100	1,830	7,100
Travel Costs	2,046	4,092	1,364	42,059
Total by FY	5,016	11,192	3,194	49,159

FY75	5,016
FY76	11,192
76/77	3,194
FY77	49,159
Total O.D.C.	$68,561

6. Estimate of Travel Costs:

	FY75	FY76	76/77	FY77
Informal Reviews at Rock Island	3	6	2	6
3 days x 2 men x $35/day	630	1,260	420	1,260
Car Rental 2 days - $60/trip	180	360	120	360
Air Fare $206 x 2 men	1,236	2,472	824	2,472
Support of APG Test (RDAT-DT II)				275 days
1 Man x $35/day				$9,625
Car Rental @ $30/day				$8,250
Air Fare $139/28 days				$3,892
Support Test Fort Benning (OT II)				180 days
1 Man x $35/day				$6,300
Car Rental x $30/day				$5,400
Air Fare $250/18 days				$4,500
TOTAL TRAVEL	$2,046	$4,092	$1,364	$42,059

7. Total Development Engineering

FY75	$227,123
FY76	544,062
76/77	129,902
FY77	588,205
TOTAL	$1,489,292

(LOW COST AREA)

SUMMARY OF FSDW TOOLING COSTS

ESTIMATED IN 1975 DOLLARS

FSDWTL -

The cost model symbol gives reference to the cost of tooling, gages and manufacturing aids required to produce FSD prototype weapons, supporting equipment, and repair parts. All costs occur in FY76.

(LOW COST AREA)
FSD - TOOLING COST (LESS GSA)
XM235 (155 UNIQUE PARTS, 967 OPERATIONS)

Tooling for 104 Prototype Guns consists of:

		Hours	Amount	
A.	Purchase Tooling (Vendor Price)			
	967 x $112.48		$108,768	
B.	Purchase Gages (Vendor Price)			
	967 x $21.54		$ 20,829	
C.	Purchase Expendable Tooling (Vendor Price)			
	967 x $40.80		$ 39,454	
D.	Manufacture - Jigs & Fixtures			
	D.L. Rate $4.16/hr, O.H. Rate 350%	3361	$ 62,918	
E.	Manufacture - Gages			
	D.L. Rate $4.16/hr, O.H. Rate 350%	230	$ 4,306	
	Subtotal		$236,275	
F.	Manufacture - Processing	2176	$ 40,566	
	D.L. Rate $4.16 hr, O.H. Rate 350%			
G.	Tool & Gage Design		$ 35,441	
	(15% of Item A thru E above)			
H.	Estimating of Tools	1452	$ 27,182	
	D.L. Rate $4.16/hr, O.H. Rate 350%			
I.	Purchasing Effort (on A-E above)	1109	$ 20,761	
	D.L. Rate $4.16/hr, O.H. Rate 350%			
J.	Tool & Gage Inspection		$ 23,628	
	(10% of Items A thru E above)			
	Total Tooling Cost		$383,853	(FY76)
	Unit Cost (104 Weapons)		$ 3,691	

XM235
FSD TOOLING
MANUFACTURING PROCESSING

Planning for manufacturing processes is estimated at 2 hours per machine operation. There are 907 machine operations giving:

967
2
1934 hours

An additional .25 hour is estimated for methods and standards work per operation giving:

967
.25
242 hours

Total 1934 hours
242 hours
2176 hours

TOOL DESIGN

It is estimated from M16 G.M. Hydromatic that 20% design to mfg.

From G.E. (M61) approx. 34%.

It is estimated that 30% is fair and reasonable. In prototype most detailed design would not be made - use 15%.

ESTIMATING OF TOOLS

907 Operations with 3 tools per operation - 1 cutter
1 fixture
1 gage

967
3
2901 tools

It is estimated that .50 hr will be necessary for each tool.

2901
.5
1452 hours

XM235
TOOL & GAGE INSPECTION

It is estimated that 10% of the purchase price will be used for initial inspection of tools and gages, based upon ARMCOM QA experience.

PURCHASING

Total procurement actions
For items purchased finished
Total operations - 967
It is assumed that each operation will require: 1 cutter
1 fixture
1 gage

Therefore 3 x 967 = 2901 items will be procured.

2 Items over $3000
965 Items less than $3000

Use same standards for purchasing as manufacturing.

(965) (.5176 hrs) (150%) = 750 hours
(2) (17.223 hrs) (150%) = 52 hours
802 hours

For Items manufactured - Manufacturing hours - 3591

Relationship to mfg to purchased - 38.3%

Procurement hours for manufactured items - (802) (38.3%) = 307 hours

Total procurement effort - Mfg 307 hours
Purchased 802 hours
1109 hours

PROTOTYPE COSTS

XM235

Based on experience in manufacturing components for 18 Validation Phase weapons at the Naval Air Rework Facility (NARF), Pensacola, Florida, the four weapons required for RDAT are estimated to cost $10,000 each. The 100 weapons for DT-II/OT-II are estimated to cost $7,500 each.

Manufacturing elapsed time is estimated at 7 months from 1 July 1976 for four RDAT weapons and 9 months from 1 July 1976 for the remaining 100 weapons. The reporting periods are three months in the 76/77 period and six months in FY77 period.

The prototype manufacturing effort continues over a three month period in 76/77 and a six months period in FY77. The cost is assumed to be distributed in proportion to the time of effort.

RDAT Weapons	4 x $10,000	$ 40,000
DT/OT II Weapons	100 x $7,500	750,000
Total Prototype Weapons Cost		$790,000

76/77	3/9	x	790,000	=	$263,333
FY77	6/9	x	790,000	=	$526,667

SYSTEM TEST AND EVALUATION SECTION

FULL SCALE DEVELOPMENT

FSDWTE

1. Introduction

a. The figures below represent an estimate of the contractor's cost to conduct System Test and Evaluation.

b. For computational purposes, the Total System Test and Evaluation activity was divided into three parts as follows:

Part I - Acceptance Testing of the Prototype Weapons

Part II - Research and Development Acceptance Test (RDAT)

Part III - Preliminary Testing

c. The following were not included as part of this estimate:

(1) Weapons, spare barrels, and spare parts. These are included in the Prototype Cost, as other Direct Costs.

(2) Ammunition (MUCOM Item)

(3) Range utilization/rental costs, if required. This item was not included due to lack of supporting information as to where and under what arrangement the contractor will conduct testing.

(4) Shipping/transportation costs of materiel/personnel to various test sites, if required. It is assumed that testing would be within close proximity of the contractor's plant.

d. The same direct labor (time) and materials estimate was used for all three contractors. This is considered a reasonable assumption, since

the test requirements are the same. Thus, differences in the cost estimates are the result of the various contractors' equivalent hourly rates and overhead figures. Contractor hourly rates and overhead were obtained from audited historical data.

2. Summary of Costs	TOTAL
Part I - Acceptance Testing	$103,874
Part II - RDAT	$212,016
Part III - Preliminary Testing	$132,625
TOTAL - Weapon System Test and Evaluation Cost (FSDWTE)	$448,515

3. Breakdown by Parts

Part I - Acceptance Testing	FY75	FY76	76/77	FY77	TOTAL
Direct Labor (2950 hrs)	-0-	-0-	-0-	12,272	12,272
Materials	-0-	-0-	-0-	48,650	48,650
Overhead	-0-	-0-	-0-	42,952	42,952
Total				103,874	103,874

Part II - RDAT					
Direct Labor (6403 hrs)	-0-	-0-	-0-	26,637	26,637
Materials	-0-	-0-	79,391	12,760	92,151
Overhead	-0-	-0-	-0-	93,228	93,228
Total	-0-	-0-	79,391	132,625	212,016

**Part III - Prelim. Tstg.					
Direct Labor (6403 hrs)	4,440	17,758	4,439	-0-	26,637
Material	12,760	-0-	-0-	-0-	12,760
Overhead	15,540	62,153	15,535	-0-	93,228
Total	32,740	79,911	19,974	-0-	132,625

* Direct Labor Rate = $4.16/hr

Overhead = 350%

** Preliminary Testing Period - May 1975 through Oct 1976

Total Systems Management Section

The overall systems management team to be employed by the Contractor is considered to be a staff function that is responsible for the Contractor's overall program and execution.

Contractorspersonnel on the management team are not included in the functional areas (i.e., engineering, manufacturing, testing, etc.). Instead because of the relatively small size of the company management team personnel are included in overhead and/or GSA. Thus there is no entry under cost of Total Systems Management.

These conclusions were determined from discussions with AMSWE-PPX.

DATA SECTION

FULL SCALE DEVELOPMENT

1. Introduction:

a. This section summarizes the costs for the FSD Data Items. The section contains a List of FSD Data Items and their costs. These costs make up the totals which are entered under DATA in the FSD Cost Model. The costs for the Functional Direct Labor hours are accounted for in the respective Direct Labor sections for Engineering and Training.

b. The Data Items for the Technical Data Package (TDP) are accounted for in the PEP Program and are so noted on the list of the Data Costs for each Data Item. The TDP Data Items which are started in FSD and continued in PEP are also noted in the list for cross reference and continuity.

c. The section also contains a Data Related Cost Summary for information on the total cost related to data items.

2. DATA RELATED COST SUMMARY

a. Direct Labor plus Overhead to prepare FSD Data Items is carried under the following categories and totals as follows:

Category	
Engineering hours	29,800
Training hours	3,207
Engineering Cost	557,856
Training Cost	60,035
Total $/FY	617,891
b. Data Cost	56,957
a + b	674,848

c. Total Data Related Cost - FSD = $674,848 (MM)

NOTE: Engineering and Training Hourly Rate = $4.16 + 350% Overhead = $4.16 + $14.56 = $18.72/hour

c. Data Cost by Fiscal Year:

FY75 5/17 x 56,957 =$16,752

FY76 12/17 x 56,957 =$40,205

3. SUMMARY OF FSD DATA ITEM LISTING AND DIRECT LABOR TO PRODUCE ENGINEERING DATA ITEMS

List of Engineering Item Numbers

B#	DI#	B#	DI#
01	DI-A-10[illegible] (MOD)	32	DI-H-1329A
02	DI-E-1100 (MOD)	37	DI-M-1501 (MOD)
03	DI-E-1101A	38	DI-M-1502
04	DI-E-1103A	39	DI-M-1502
05	DI-E-1104	40	DI-M-1505
06	DI-E-1105	41	DI-M-1510
08	DI-E-1107	42	DI-P-1600
10	DI-E-1116	44	DI-R-1710 (MOD)
11	DI-E-1117	51	DI-R-1730 (MOD)
12	DI-E-1118 (MOD)	52	DI-R-1731 (MOD)
13	DI-E-1119 (MOD)	53	DI-R-1733 (MOD)
14	DI-E-1128	54	DI-R-1734 (MOD)
15	DI-E-11XX (MOD)	55	DI-R-1735 (MOD)
16	DI-E-XXX1	56	DI-R-1740 (MOD)
17	DI-F-6000	57	DI-R-1741 (MOD)
18	DI-F-60001	58	DI-R-1750 (MOD)
18A	DI-F-XXX1	59	DI-S-1800 (MOD)
19	DI-F-6004	60	DI-S-1804A
25	DI-H-1312	61	DI-S-1812
26	DI-H-1314	62	DI-S-1818 (MOD)
27	DI-H-1315	63	DI-S-1819 (MOD)
29	DI-H-1322A (MOD)	64	DI-S-18XX (MOD)
30	DI-H-1326A	65	DI-T-1906 (MOD)
31	DI-H-1327A (MOD)	66	DI-T-XXX1 (NEW)
		67	DI-V-1950 (MOD)

Direct Labor Hours = 29,800

NOTE: These direct labor hours are included under Engineering.

4. SUMMARY OF FSD DATA ITEM LISTING AND DIRECT LABOR TO PRODUCE TRAINING DATA ITEMS

List of Training Data Items

B#	DI#
20	DI-H-1300 (MOD)
21	DI-H-1302
22	DI-H-1304
23	DI-H-1308
24	DI-H-1310

Direct Labor hours = 3,207

NOTE: These direct labor hours are included under Training.

SUMMARY OF COSTS - DATA ITEM CALL ITEMS - FSD

B No.	Data Item No.	Data Item Title		
01	DI-A-1014A(MOD)	PERT		557
02	DI-E-1100(MOD)	Configuration Management Plan		246
03	DI-E-1101A	Configuration Stat Acct & Engr Record		507
04	DI-E-1103A	Engineer Release Record	FSD/PEP	1620
05	DI-E-1104	Specifications	FSD/PEP	91
06	DI-E-1105	Characteristics & Description Book		168
07	DI-E-1106	Specs, Standards, Appl. List	PEP	0
08	EI-E-1107	Drawing Custodianship List	FSD/PEP	30
09	EI-E-1115A(MOD)	Technical Data Package	PEP	0
10	DI-E-1116	Stdz Comp & Select Control	FSD/PEP	58
1	DI-E-1117	Stdz Report of Common Items	PEP	0
12	DI-E-1118(MOD)	Drawings, Engr & Assoc Lists	FSD/PEP	645
13	DI-E-1119(MOD)	Environmental Criteria Report		3172
14	DI-E-1128	Electromagnetic Interference Control Plan		84
15	(X)DI-E-11XX(MOD)	Interface Control Doc. for VRFWS		311
16	DI-E-XXX1	Dynamic Mathematical Model		288
17	DI-F-6000	Cost performance report		353
18	DI-F-6001(MOD)	Procurement Info Functional Cost-Hour Report		5
18A	DI-F-XXX1	Model for Eval of Design-To Unit Production Cost		29
19	DI-F-6004	Contract Funds Status Report		22
20	EI-H-1300(MOD)	Personnel & Training Requirements		150

SUMMARY OF COSTS - DATA CALL ITEMS - FSD
(Continued)

B No.	Data Item No.	Data Item Title	
21	DI-H-1320	New Equipment Training Plan	0
22	DI-H-1304	New Equipment Training Courses	1350
23	DI-H-1308	Training Course Reports	0
24	DI-H-1310	Graphic Aids	31444
25	DI-H-1312	Human Factors Engr Plan	53
26	DI-H-1314	Human Factors Engr Progress Rpt	179
27	DI-H-1315	Human Factors Engr Final Report	59
28	DI-H-1321A	Explosive Hazard Class. Data	See Ammo
29	DI-H-1322A(MOD)	Safety Statement	77
30	DI-H-1326A	Safety Anal. & Hazard Eval Rpts	212
31	DI-H-1327A(MOD)	Surface Danger Area Data	68
32	DI-H-1329A	Accident/Incident Report	20
33	DI-H-1330(MOD)	Facilities Safety Data	0
34	DI-L-1407(MOD)	Preservation & Packaging Data	PEP
35	DI-L-1410	Ammunition Data Cards	Ammo
36	DI-M-1500(MOD)	Firing Table Manuscript	Ammo
37	DI-M-1501(MOD)	Validation Plan for Equip. Publications	1
38	DI-M-1502(MOD)	Equipment Publications	1176
39	DI-M-1502(MOD)	Equipment Publications	Included in B038
40	DI-M-1505(MOD)	Equip. Pub. Progress/Cost Reports	38
41	DI-M-1510	Maintenance Allocation Chart	11
42	DI-P-1600	Value Engr Data Report	135
3	DI-P-1602	Value Engr Plan	No Cost Plan is prepared and paid for in Contractor's Proposal.

SUMMARY OF COSTS - DATA CALL ITEMS - FSD
(Continued)

B No.	Data Item No.	Data Item Title	
44	DI-R-1710(MOD)	Quality Program Plan	128
45	DI-R-1711(MOD)	Qual Engrg Acc Insp Req & Equip List	PEP
46	DI-R-1712(MOD)	Quality Engrg Supp QA Provision	PEP
47			PEP
48			PEP
49	DI-R-1717	Qual Engr Calibration Program Data	PEP
50	DI-R-1722(MOD)	Qual Insp Pamphlet	PEP
51	DI-R-1730(MOD)	Reliability Program Plan	17
52	DI-R-1731(MOD)	Reliability Reports	67
53	DI-R-1733(MOD)	Reliability Qualified Items List	3
54	DI-R-1734(MOD)	Rel Fail Modes Effects & Crit Anal Rpts	21
55	DI-R-1735(MOD)	Rel Failed Item Analysis Report	114
56	DI-R-1740(MOD)	Maintainability Program Plan	17
57	DI-R-1741(MOD)	Maintainability Reports	20
58	DI-R-1750(MOD)	Assessment Program Plan	7
59	DI-S-1800(MOD)	Technical Reports	1179
60	DI-S-1804A	Corrosion Prevention & Matl Deterioration Rpts and/or Studies	49
61	DI-S-1812	Maintenance Engr Des Discrepancy Report	34
62	DI-S-1818(MOD)	Maintenance Engr Analysis	380
63	DI-S-1819(MOD)	Contractor Recommended Support Plan	31
64	(X)DI-S-18XX(MOD)	Support Model Data	6
65	DI-T-1906(MOD)	Test & Demonstration Reports	1105
66	DI-T-XXX1(New)	R&D Acceptance Test Plan	25
	DI-V-1950(MOD)	Provisioning Requirements for US Army Eq.	581
68	DI-V-1951(MOD)	Federal Item Identification Data	No Contractor Performance Reqd

Total converted to FY75 Dollars $48,268 x 1.18 = $56,957

TOTAL $48,268

IN-HOUSE TASKS

PEP RELATED

The major areas of In-House Direction and Support effort required during the PEP period are:

1. Producibility Engineering and Planning Studies.

2. Product Engineering Studies including Tolerance/Dimension Studies.

3. Engineering effort to prepare the Technical Data Package Data Call Items.

4. Engineering effort to enhance Reliability and Maintainability Engineering activities.

Configuration Management will be monitored in detail through acceptance testing.

Starting with RDT, Configuration Management will revert entirely to the Government as an In-House Task requiring effort as follows:

1. Prepare a Configuration Plan.

2. Update the Configuration Plan as required.

3. Review Engineering Change Proposals (ECPs):

   a. Failure Related.

   b. Production Related.

Other specific In-House Task areas are:

1. Review/monitor and direct Contractor and In-House conducted Producibility Engineering and Planning studies as follows:

   a. Review each part/drawing.

   b. Review Contractor Draft Process Sheets.

c. Review unique processing operations.

d. Review current and proposed processing capabilities.

e. Review difficult/uneconomical manufactured items and recommended actions.

f. Review Contractor PEP reports.

2. Review, monitor and direct Contractor and In-House conducted Production Engineering and Tolerance/Dimension Studies as follows:

a. Review components/drawings.

b. Maintain conformity to Military Standards as specification as applicable.

c. Review Contractor and In-House conducted redesign efforts.

d. Review and prepare reports.

e. Analyze available data and identify/approve areas for in-house or by contractor.

f. Conduct and/or monitor tolerance/dimension studies.

g. Review revisions and related reports.

h. Maintain liaison with contractor project related supervision personnel.

3. Maintain cognizance of current and proposed manufacturing processes and procedures.

(ALL CONTENDERS)
IN-HOUSE
PEP-ENGINEERING

The In-House PEP Engineering team effort is summarized as follows:

		FY75		FY76		76/77		FY77	
Title	Grade	Hrs	$	Hrs	$	Hrs	$	Hrs	$
Project Eng	14	750	9,435	900	11,324	225	2,831	900	11,324
Mech Eng	13	750	8,048	750	8,048	450	4,829	1800	19,316
Mech Eng	12	750	6,818	600	5,454	150	1,364	600	5,454
Mech Tech	11	375	2,861	600	4,578	150	1,145	600	4,578
Mech Tech	9	375	2,374	600	3,798	150	950	600	3,798
Draftsman	7	750	3,893	600	3,114	150	779	600	3,114
Draftsman	5	750	3,143	1800	7,542	450	629	1800	7,542
Math Analyst	12	375	3,409	600	5,454	150	1,364	600	5,454
RAM Eng	12	750	6,818	1800	16,362	225	2,046	900	8,181
Direct Labor									
FY75		5,625	46,799						
FY76				8250	65,674				
76/77						2100	15,937		
FY77								8400	66,761

Total Direct Labor (PEP) 24,375 Man Hours $197,171

Overhead (85%)

FY75	$39,779
FY76	55,823
76/77	13,547
FY77	58,447
Total Overhead (PEP)	$167,596

(ALL CONTENDERS)
IN-HOUSE
PEP
SUMMARY

	FY75	FY76	76/77	FY77	TOTAL
A. Engineering					
Direct Labor	46,799	65,674	15,937	68,761	197,171
Material($75/Mo)	375	900	225	900	2,400
Overhead	39,779	55,823	13,547	58,447	167,596
Other D.C. (Included in FSD)	-	-	-	-	-
Total A	86,953	122.397	29,709	128,108	$367,167
B. Configuration Control Board					
Direct Labor	12,720	30,528	7,633	30,528	81,409
Material($75/Mo)	375	900	225	900	2,400
Overhead (85%)	10,812	25,949	6,487	25,949	69,197
Other D.C. (Included in FSD)	-	-	-	-	-
Total B	23,907	57,377	14,345	57,377	$153,006
A plus B	110,860	179,774	44,054	185,485	
TOTAL IN-HOUSE PEP COST					$520,173

PEP ENGINEERING	24,375 Hrs.
C.C. Board	7,680 Hrs.
TOTAL MAN HOURS	32,055 Hrs.

(ALL CONTENDERS)
IN-HOUSE
CONFIGURATION CONTROL BOARD

Control of Configuration Management will be assumed by the Government.

A Configuration Control Board (CCB) will be established and will exercise its authority throughout the FSD period and potentially continue in the same manner but at somewhat diminished levels of effort through the Limited Production period and the Full Scale Production period.

During the FSD period from 1 February 1975 to 1 October 1977 (32 months) the CCB will utilize of the following people to the extent indicated:

Title	Grade	Hours	$DL	$Overhead
40% Configuration Mgr	14	1920	24,154	20,531
40% Engineer	13	1920	20,602	17,511
20% Procurement Specialist	13	960	10,301	8,756
20% W.A. Engineer (Gages & SQAPS)	13	960	10,301	8,756
20% Maintenance Specialist	12	960	8,726	7,417
20% Supply Specialist	11	960	7,325	6,226
	TOTAL	7,680	$81,409	$69,197
These expenses occur as follows:		FY75	12,720	10,812
		FY76	30,528	25,949
		76/77	7,633	6,487
		FY77	30,528	25,949

SAW WEAPON XM-235
(LOW COST AREA)
PRODUCIBILITY ENGINEERING & PLANNING
SEP/OCT 74

COST CATEGORIES AND ELEMENTS DEVELOPMENT-PEP	PEP TOTAL	FY75	FY76	76/77	TOTAL
A. Engineering	841,864	-0-	-0-	168,373	673,491
Direct Labor	160,173				
Material	150				
Overhead	560,604				
Other O.C.	120,937				
B. Tooling(Software)	139,248	-0-	-0-	27,850	111,398
C. Quality Control	502,788	-0-	-0-	-0-	502,788
D. System Test & Evaluation	-0-	-0-	-0-	-0-	-0-
E. Data	7,441	-0-	-0-	1,488	5,953
F. Total Systems Mgt.	-0-	-0-	-0-	-0-	-0-
G. Industrial Facilities	13,947	-0-	-0-	2,790	11,157
H. Training	-0-	-0-	-0-	-0-	-0-
I. Miscellaneous	-0-	-0-	-0-	-0-	-0-
TOTAL COST	1,505,288	-0-	-0-	200,501	1,304,787

CONTRACTOR DEVELOPMENT ENG PEP

Rationale:

The Contractor PEP effort is estimated to address the following areas:

a. Producibility Engineering and Planning Studies.

b. Product Engineering and Tolerance Studies.

Tasks are identified in each area, required manhours are estimated for each task and the total estimated manhours determined. These manhours are multiplied by appropriate labor and overhead rates to obtain total values for Direct Labor and Overhead, $150 is estimated for Materials and these values of Direct Labor, Overhead, and Material cost are added to Other Direct Costs which are defined in a separate section.

The total thus obtained is distributed 1/5 in FY76/77 and 4/5 in FY77.

CONTRACTOR DEVELOPMENT ENG PEP

A. Producibility Engineering and Planning Studies:

	TASK	MANHOURS
1.	Review Part Drawings	2058
2.	Prepare Draft Process Sheets	5143
3.	Determine Unique Operations	176
4.	Conduct Process Capabilities Study	2788
5.	Determine Difficult Items and Make Recommendations	1394
6.	Prepare Reports	41
7.	Maintain Supervision	4752
	TOTAL "A"	16352 hours

B. Product Engineering and Tolerance Studies:

1.	Review Drawings	461
2.	Review Mil. Standards & Specs.	216
3.	Select and Conduct Redesign	2979
4.	Prepare Reports	40
5.	Review Data/Identify Areas for Study	481
6.	Conduct Tolerance/Dimension Study	2676
7.	Determine Revisions and Prepare Report	556
8.	Maintain Supervision	4752
	TOTAL "B"	12161 hours

TOTAL MANHOURS (A & B) 28,513

SAW-XM-235 (LOW COST AREA)
CONTRACTOR DEVELOPMENT ENG PEP

Total ManHours (A&B)	$ 28,513 hrs
Data Item ManHours	9,990 hrs
Total ManHours	38,503
Direct Labor Rate	$4.16/hr
Direct Labor Cost	$160,172.48
Overhead Rate 350%	
Overhead Cost	$560,603.68

Engineering Cost Summary

Direct Labor	$160,173
Material	150
Overhead	560,604
O.D.C.	120,937
Total Engineering	$841,864

FY-76/77	$841,864 x 1/5	$168,373
FY-77	$841,864 x 4/5	$673,491

A-3 PEP

OTHER DIRECT COSTS
CONTRACTOR
PRODUCIBILITY ENGINEERING & PLANNING (PEP)

RATIONALE: Other Direct Costs are assumed to consist of three (3) categories:

a. Manufacturing Processing Engineering

b. Travel

c. Reproduction Costs

(1) PEP Studies

(2) Product Engineering and Tolerance Studies

XM-235 (LOW COST AREA)
OTHER DIRECT COSTS
CONTRACTOR
PEP

A. Manufacturing Process Engineering is the Engineering effort to prepare and process routing sheets and other documentation defining in detail the manufacturing processes to be used for each component.

Estimated manufacturing operations		967
Estimated Eng Hrs per operation		6.5 hrs
Direct Labor Rate		$4.16/hr
Overhead		350%
Required ManHrs.	967x6.5	6285.5
Direct Labor	6285.5 x $4.16	$26,147.68
Overhead	$27,136 x 3.50	91,516.83
Total M.P.E.		$117,664.56

B. O.D.C. Travel

Estimated travel consists of 2 trips to RIA by 1 man in FY77 at 2 x $449 = $898, plus 2 trips by 2 men at $847 per trip (1 trip in FY76/77 and 1 trip in FY77.

	76/77	FY77	TOTAL
1 man trip		$898	
2 man trip	$847	$847	
Total Travel	$847	$1745	$2592

XM-235 (LOW COST AREA)
OTHER DIRECT COSTS
CONTRACTOR
PEP

C. Reproduction

1) Estimated for Producibility Engineering & Planning Studies:

	76/77	FY77	TOTAL
$165.00 X (1.24)	$40.92	$163.68	$204.60

2) Estimated for Product Engineering and Tolerance Studies:

$369.00 X (1.24)	$136.03	$544.13	$680.16

O.D.C. SUMMARY

	76/77	FY77	TOTAL
Total M.P.E.			$117,664.56
Total Travel			2,592.00
Total Reproduction			680.16
Total O.D.C.			$120,936.72

Tooling Section (Software)

Costs are incurred during design of special purpose production equipment and tooling to achieve quantity production. Based on past experience it is estimated that 35% of the initial tooling cost is used for design.

All design costs are shown against the weapon.

On the basis of past estimates for automatic weapons an average tooling cost of $400 per operation is applied to cover the cost of Purchased Tooling, Purchased Gages, Expendable Tooling, Jigs and Fixtures, and Gages.

The corresponding Design Cost is thus estimated at .35 x $400 = $144 per operation.

	No. Operations x $144		76/77	FY77
XM235	967	$139,248	$27,850	$111,398

QUALITY CONTROL SECTION

The estimates contained herein for Quality Control are for the Quality Documentation that is part of the Technical Data Package. In addition, estimated hours for Quality Control Engineering Supervisor are included at the rate of 160 hours per month for 11 months. The man hours estimated for the preparation of Quality Control Documentation are based on similar work performed by ARMCOM personnel.

Rationale is derived from a similar study performed on proposed Bushmaster weapons. The following Data Items are involved:

DI-E-1104*

DI-E-1118 (Mod)*

DI-R-1711 (Mod)

DI-R-1712 (Mod)

DI-R-1722 (Mod)

* In addition to Quality Control, there are man hours for these Data Items in the Engineering Section.

During the PEP Program, it is estimated all Q. C. software efforts will be accomplished in FY77.

SUMMARY OF MAN HOURS

GS-13	Supervisor	1,760
GS-12	Engineer	790
GS-11	Specialist Gage Designer/Checker	16,434
GS-09	Tech Writer, Illustrator	6,968
GS-05	Document Control Clerk	885
		26,837

SUMMARY OF COSTS
(LOW COST AREA)

Direct Labor Costs	26,837
Hourly Rate	4.16
Total D.L. Cost	111,642
Overhead (350%)	390,747
Material	400
Total Q.C. Cost	502,789

DATA SECTION *

PEPWD

1. This section includes the rationale and a summary of direct labor man-hours and costs for material and reproduction for each Data Call Item considered a part of the total Technical Data Package (TDP).

2. The summary of direct labor man hours for Engineering Data Items is incorporated in the Engineering Section under Data Items. The summary of direct labor man hours for Quality Control Data Items is incorporated in the Quality Control Section under Data Items. Data Call Items DI-E-1104 and DI-E-1118(MOD), which require both Engineering and Quality Control documentation, have separate summaries and rationale contained in this section.

3. The material costs for preparation of the Data Items include the costs of standard forms, such as drawings, supplementary quality assurance provisions, and packaging data sheets. These costs are summarized and shown in their respective functional areas.

4. A summary of Data Costs for all TDP related Data Items is included in this section and entered under Data in the Cost Model.

*Data Section Meets Requirements of the Following:
1. AR700-51
2. DOD Instruction DODO-5010,12
3. TD-3 Listing of DOD Data Items

5. DATA RELATED COST SUMMARY

a. Cost of Direct Labor plus Overhead to prepare data items is as follows:

Category	
Engineering Direct Labor (Manhours)	9,990
Quality Control Direct Labor (Manhours)	26,837
Engineering Cost*	187,013
Quality Control Cost*	502,389
Total Direct Labor & Overhead	689,402
b. Data Cost	7,441
c. Total Related Data Cost - PEP (a + b)	696,843

* Hourly rate = $4.16 + 350% overhead = 18.72/hour

SUMMARY OF DATA COSTS-PEP PROGRAM

B. No.	Data Item No.	Data Item Title	
0004	*DI-E-1103A	Engrg Release Record	$ 203
0005	*DI-E-1104(QC)	Specifications	39
0005	*DI-E-1104(ENGR)	Specifications	93
0007	DI-E-1106	Specs, Stds, Application List	44
0008	*DI-E-1107	Drawing Custodianship List	68
0009	DI-E-1115A(MOD)	Technical Data Package	
010	*DI-E-1116	Standardization, Components, and Selection Control	6
011	DI-E-1117	Standardization-Report of Common Items	6
012	*DI-E-1118(MOD)(QC)	Drawings, Engrg, and Associated Lists	4,130
012	*DI-E-1118(MOD) (ENGR)	Drawings, Engrg, and Associated Lists	1,348
034	DI-L-1407(MOD)	Preservation and Packaging Data	307
045	DI-R-1711(MOD)	Quality Engrg Acc Insp Req & Eq	79
046	DI-R-1712(MOD)	Qual Engrg Supp QA Provisions	766
049	DI-R-1717	Qual Engrg Calibration Prog Data	22
050	DR-R-1722(MOD)	Qual Insp Pamphlet	330
		GRAND TOTAL DATA COST	$7,441
		76/77 DATA COST	1,488
		FY77 DATA COST	5,953

* Started during FSD Phase; continued during PEP Program.

SUMMARY OF DIRECT LABOR MANHOURS FOR ENGRG DATA ITEMS

Data Item No.	Totals
DI-E-1107	2
DI-E-1118(MOD)	1372
Totals	
DI-E-1103A	165
DI-E-1104	1676
DI-E-1106	28
DI-E-1107	10
DI-E-1115A(MOD)	96
DI-E-1116	73
DI-E-1117	5
DI-E-1118(MOD)	5487
DI-E-1407(MOD)	1076
Totals	9,990

Note: Totals are included in Direct Labor in Engineering Section

SUMMARY OF QUALITY CONTROL DIRECT LABOR FOR DATA ITEMS (MANHOURS)

Data Item	GS-12	GS-11	GS-9	GS-5
DI-E-1104	390	-	-	22
DI-E-1118(MOD)	-	14000	-	-
DI-R-1711(MOD)	60	355	-	60
DI-R-1712(MOD)	-	1914	348	348
DI-R-1717	340	165	-	75
DI-R-1722(MOD)	-	-	6620	380
Totals	790	16,434	6,968	885

NOTE: Totals are included in Direct Labor in Quality Control Section.
Grand Total manhours - 25,077 + 1,760 (GS-13 Supervisor) = 26,837

INDUSTRIAL FACILITIES SECTION
(LOW COST AREA)

The estimate is based on the assumption that the contractor has a suitable plant site available for production of the components.

The design and layout of the plant equipment is based on the manufacturing process. Utilization of equipment is on the basis of 80% of the total machine time available. For the conventional machines a 1-8-5 shift is proposed through the first six months and 2-8-5 for the remainder of the program. For the N/C equipment a 1-8-5 shift is proposed through the first 6 months and 3-8-5 shift for the remainder of the program.

The cost of the plans and layouts for this phase is estimated as follows, and will be accomplished during 76/77 and FY77.

Design and layout including electrical, plumbing, sheet metal, air, etc. for space allocation to machining, assembly, bench work and storage of tools and equipment is estimated to require 225 hours for the entire layout of 37,912 square feet.

Preparation of specifications for the procurement of new equipment and bills of materials required for installation of machines, air lines, etc. is estimated to require 520 hours.

Rates used are based on 4.16 per hour rate for design and layout work was escalated by 350% for overhead to 18.72 per hour. Therefore the 745 hour total computes to 13,946.40.

Area required for production approximates 37,912 square feet to be allocated as follows:

Production area, machining	26,584
Assembly, deburring and bench area	1,244
Tool and gage maintenance	1,000
Receiving	800
Packaging and shipping	1,000
Bonded storage	500

Tool storage	900
Final inspection	2,000
Administration	1,500
Metrology lab	384
Tool Room	2,000
Total Area Required	37,912

It is assumed that chrome plating and surface finishing will be vendor purchased.

	TOTAL	76/77	FY77
Labor Cost	3,099.20	619.84	2,479.36
Overhead Cost	10,847.20	2,169.44	8,677.76
Total Cost	13,946.40	2,789.28	11,157.12

NUMBER II-D

BASIC ESTIMATED COST PACKAGE
ENGINEERING DEVELOPMENT
XM235 CONTRACTED IN HIGH COST AREA IN 6.0MM

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22) HIGH COST AREA CONTRACT

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: XM235 High Cost Area Contract (PEP Included)

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT				COST	REFERENCE
	7 COST CATEGORIES	8 HOURS	9 RATE	10 ESTIMATE	11 SCHEDULE
A	ENGINEERING			1,546,832	
A 1	DIRECT LABOR	195,941.5	-		
A 2	MATERIAL				
A 3	OVERHEAD		110%		
A 4	OTHER				
B	TOOLING			389,944	
B 1	DIRECT LABOR	-	-		
B 2	MATERIAL				
B 3	OVERHEAD		-		
B 4	OTHER				
C	PROTOTYPE PRODUCTION			790,000	
D	SYSTEM TEST AND EVALUATION			458,631	
E	DATA			56,957	
F	TOTAL SYSTEMS MANAGEMENT			553,574	
G	CONSTRUCTION			-0-	
H	TRAINING			94,002	
I	OTHER (Specify) PEP			1,551,750	
J	TOTAL COST LESS (G AND A)			5,441,690	
K	G AND A 24.6%				
L	TOTAL COST			6,780,345	
M	PROFIT OR FEE 9.1%				
N	TOTAL PRICE			7,397,357	

REMARKS

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22) IN-HOUSE SUPPORT

1. PREPARING INSTALLATION

SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED
IN-HOUSE SUPPORT XM235 HIGH COST AREA CONTRACTOR (PEP INCLUDED)

3. QUANTITY
NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT
Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL
4

6. ESTIMATE PREPARED AS OF
30 November 1974

RESEARCH AND DEVELOPMENT			7 COST CATEGORIES	8 HOURS	9 RATE	10 COST ESTIMATE	11 REFERENCE SCHEDULE
A	-		ENGINEERING			862,637	
	1		DIRECT LABOR	50,788	-		
	2		MATERIAL				
	3		OVERHEAD		85%		
	4		OTHER				
B	-		TOOLING				
	1		DIRECT LABOR	-	-		
	2		MATERIAL				
	3		OVERHEAD		-		
	4		OTHER				
C	-		PROTOTYPE PRODUCTION				
D	-		SYSTEM TEST AND EVALUATION *			138,738	
E	-		DATA				
F	-		TOTAL SYSTEMS MANAGEMENT				
G	-		CONSTRUCTION				
H	-		TRAINING				
I	-		OTHER (Specify) PEP			520,173	
J	-		TOTAL COST LESS (G AND A)			1,521,548	
K	-		G AND A	NA			
L	-		TOTAL COST	NA			
M	-		PROFIT OR FEE	NA			
N	-		TOTAL PRICE	NA			

REMARKS

* DT/OT-II of 6 months duration

12. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

6.0MM
XM-235 HIGH COST AREA
ENG. DEV.
RESEARCH & DEVELOPMENT

	FY75	FY76	76/77	FY77	FY78	TOTAL
1.1 Contract						
1.11 Dev Eng (Val/Ed)	235,049	562,950	134,453	614,380	-0-	1,546,832
1.12 PEP	-0-	-0-	182,336	1,369,414	-0-	1,551,750
1.13 Tooling	-0-	389,944	-0-	-0-	-0-	389,944
1.14 Mfg Proto	-0-	-0-	263,333	526,667	-0-	790,000
*1.15 Other	136,672	330,447	151,949	544,096	-0-	1,163,164
FY Cost (Less G & A)	371,721	1,283,341	732,071	3,054,557	-0-	5,441,690
G & A (24.6%)						
FY Cost	463,164	1,599,043	912,160	3,805,978	-0-	6,780,345
Profit (9.1%)						
FY-Total Price	505,312	1,744,556	995,167	4,152,322	-0-	7,397,357
1.2 In-House						
1.21 Dev Eng	158,067	354,418	72,655	277,497	-0-	862,637
1.22 PEP	110,860	179,774	44,054	185,485	-0-	520,173
1.23 Tooling					-0-	
1.24 Mfg					-0-	
**1.25 Other				138,738	-0-	138,738
In-House Cost	268,927	534,192	116,709	601,720	-0-	1,521,548
Total Prog R & D	774,239	2,278,748	1,111,876	4,752,042		8,918,905
*Other/ Contract Syst.Test & Evaluation	33,424	82,652	100,051	242,504	-0-	458,631
Data	16,752	40,205	-0-	-0-		56,957
Total Syst. Mg	86,496	207,590	51,898	207,590	-0-	553,574
Training	-0-	-0-	-0-	94,002	-0-	94,002
TOTAL	136,672	330,447	151,949	544,096	-0-	1,163,164

**DT/OT (ARMCOM) $23,123/Mo,-I=4 months,-II=6 months

Breakdown of "Other" Expenses Shown On Spread Sheet (XM235, High Cost Area)

Other	FY75	FY76	76/77	FY77	Total
System Test & Eval	33,424	82,652	100,051	242,504	458,631
Data	16,752	40,205	0	0	56,957
Total Systems Mgmt	86,496	207,590	51,898	207,590	553,574
Training	0	0	0	94,002	94,002
	136,672	330,447	151,949	544,096	1,163,164

XM-235
(HIGH COST AREA)
CONTRACTOR
MAN HOURS SUMMARY

ACTIVITY	FY75	FY76	76/77	FY77	TOTAL
A-2 Development Eng	11,850	28,430	6,760	28,760	75,800
* PEP	-0-	-0-	9,107.1	63,263.4	72,370.5
Material	-0-	-0-	-0-	-0-	-0-
B-2 Tooling	-0-	8,328	-0-	-0-	8,328
**Other D.C.	4,267	11,949	2,987	20,240	39,443
Total Hours	16,117	48,707	18,854.1	112,263.4	195,941.50
Man Years (1800 Hrs)	8.95	27.06	10.47	62.37	108.86
**O.D.C.					
D-3 System Test & Evaluation	1,067	4,269	1,067	9,353	15,756
E-3 Data		(INCLUDED IN DEV. ENG.)			
F-2 Total Syst Mgmt.	3,200	7,680	1,920	7,680	20,480
E-4 Training	-0-	-0-	-0-	3,207	3,207
Total O.D.C.	4,267	11,949	2,987	20,240	39,443
*PEP					
A-3PEP					
E-4 PEP Dev. Eng.	-0-	-0-	7,701	30,802	38,503
C-2PEP Quality Control	-0-	-0-	-0-	26,837	26,837
G-1 Indust. Facil.	-0-	-0-	149	596	745
O.D.C.-2 O.D.C.	-0-	-0-	1,257.1	5,028.4	6,285.5
Total PEP	-0-	-0-	9,107.1	63,263.4	72,370.5

RATIONALE
XM-235
IN-HOUSE
FSD-ENGINEERING

RATIONALE: The XM-235 is judged to have 3 areas requiring major redesign, specifically:

(1) Magazine

(2) Bolt Assembly

(3) Feed Mechanism

The major FSD-Engineering effort to redesign these areas will be conducted in 5 months of FY75 and 12 months of FY76.

The fiscal transition period of 3 months, 76/77, and 12 months of FY77 will see finalization of design, testing, data acquisition, processing, and evaluation, and evaluation of proposed production related modifications in conjunction with the concurrent PEP effort.

One basic problem appears to exist in that the contractor must familiarize his personnel with an unknown weapon concept.

XM235
IN-HOUSE
FSD-ENGINEERING

The In-House FSD-Engineering Team Effort is summarized as follows:

		FY75		FY76		76/77		FY77	
	Grade	Hrs	$	Hrs	$	Hrs	$	Hrs	$
Project Eng	14	750	9,435	1800	22,644	450	5,661	900	11,322
Mech Eng	13	750	8,048	1800	19,314	300	3,219	1200	12,876
Mech Eng	12	1500	13,635	3600	32,724	900	8,181	1800	16,362
Mech Eng Tech	12	750	6,818	1800	16,362	300	2,727	1200	10,908
QA Tech	11	750	5,722	1800	13,734	300	2,289	1200	9,156
Mech Eng Tech	9	750	4,748	1800	11,394	450	2,849	1200	7,596
Draftsman	7	750	3,893	1800	9,342	300	1,557	1200	6,228
Draftsman	5	750	3,143	1800	7,542	300	1,259	1200	5,028
Math Analyst	12	375	3,409	900	8,181	300	2,727	1200	10,908
RAM Eng	12	536	5,118	1350	12,272	300	2,727	1200	10,908
QA Eng	12	750	6,818	1200	10,908	225	2,046	1200	10,908
QA Tech	12	750	6,818	1200	10,908	225	2,046	1200	10,908
Model Maker		500	3,815	1200	9,156	0	0	0	0
Direct Labor FY75		9,688	81,420						
FY76				22,050	184,481				
76/77						4,350	37,286		
FY77								14,700	123,108

Total Direct Labor (FSD) 50,788 Man Hours $426,295

Overhead (85%)

FY75	$ 69,207
FY76	156,808
76/77	31,693
FY77	104,642

Total Overhead (FSD) $362,351

(ALL CONTENDERS)
FSD-ENGINEERING MATERIAL

RATIONALE: Engineering Material costs cover office supplies, drafting paper, etc , and is estimated at $100 per month.

FY75	5 x 100	$ 500
FY76	12 x $100	1,200
76/77	3 x $100	300
FY77	12 x $100	1,200
Total		$3,200

Other direct charges are covered in either FSD or PEP.

FSD - ENGINEERING - OTHER DIRECT COSTS

Rationale: Other Direct Costs are assumed to consist of Computer expense at $600 per month and Travel Expense.

A.	Computer Expense	
	FY75 5 x $600	$ 3,000
	FY76 12 x $600	7,200
	76/77 3 x $600	1,800
	FY77 12 x $600	7,200
	Total	$19,200
B.	Travel Expense	
	FY75	3,940
	FY76	4,728
	76/77	1,576
	FY77	41,347
	Total	51,591
C.	Total O.D.C./FY	
	FY75	6,940
	FY76	11,928
	76/77	3,376
	FY77	48,547
D.	Total O.D.C.	70,791

FSD - IN HOUSE ENGINEERING - SUMMARY OF COSTS

FY75	$158,067
FY76	354,418
76/77	72,655
FY77	277,497
Total	$862,637

XM235
IN-HOUSE TRAVEL COSTS
HIGH COST AREA

Estimate of Travel Costs:

		FY75	FY76	76/77	FY77	
Reviews at West Coast		5	6	2	6	
3 days x 2 men x $35/day		1050	1260	420	1260	
Car rental 2 days - $60/trip		300	360	120	360	
Air Fare $259 x 2 men		2590	3108	1036	3108	
Support of APG Test (RDAT-DT-II)					275	days
1 Man x $35/day					9,625	
Car rental @ $30/day					8,250	
Air Fare $141/28 trips					3,948	
Support Test Fort Benning (OT-II)					180	days
1 Man x $35/day					6,300	
Car rental @ $30/day					5,400	
Air fare $172/18 trips					3,096	
Total/FY		$3,940	$4,728	$1,576	$41,347	
Total ED Travel	$51,591					

XM235
ENGINEERING SECTION
FULL SCALE DEVELOPMENT

1. Introduction:

a. The Engineering Section is divided into four (4) parts:

(1) Engineering Direct Labor.

(2) Engineering Material.

(3) Engineering Overhead.

(4) Other Direct Charges to Engineering.

b. Each Engineering part consists of description of the items included and the rationale for including and evaluating each item.

c. The costs accrued in each part were developed among the weapon elements according to the percentage of peculiar parts of the weapon system which make up the weapon element. Thus for the XM235:

Weapon Element	Peculiar Parts	% Distribution
Receiver & Operating Group	95	61
Barrel Assembly	5	3
Rear Sight	12	8
Magazine	8	5
Bipod	23	15
Sling	4	3
Maintenance Tools	8	5
Total	155	100

2. Rationale for Estimating Engineering Direct Labor Cost (FSDWEDL):

a. Total Engineering Direct Labor hours is the sum of two inputs.

(1) Engineering Direct Labor hours to accomplish the Engineering Tasks involved in finalizing the weapon design.

(2) Engineering Direct Labor hours to prepare the information required for Data Items.

b. The value for each Direct Labor hour is an average hourly rate applied to all man hours expended in the Engineering effort and was determined for each contractor in coordination with AMSWE-PPX in the following manner:

(1) Estimate the total Direct Labor hours required for each Government GS grade.

(2) Multiply these totals by the respective step 5 hourly rate and add to get a total equivalent Government direct labor cost.

(3) Divide the total equivalent Government direct labor cost by the sum of the direct labor hours, regardless of grade, to obtain an average Government engineering hourly rate.

(4) Compare the average Government engineering hourly rate with the Step 5 hourly rates in the GS pay scale to determine the average grade level of skill employed.

(5) Compare the average grade level of skill with available information on the contractor's pay scale to estimate the average contractors engineering hourly rate.

c. The average contractor's engineering hourly rate for the Contractor is computed to be 9.22 per hour.

d. Engineering Direct Labor Hours and Costs for the Contractor by Fiscal Year are estimated to be:

Fiscal Year	D. L. Hours	D. L. Costs
75	11,850	$109,257
76	28,430	262,125
76/77	6,760	62,327
77	28,760	265,167
Total	75,800	$698,876

3. Rationale for Estimating Engineering Material Costs (FSDWEMAT):

a. Engineering Materials are considered to consist of miscellaneous material used in performing the engineering effort for Full Scale Development. Layout paper, drafting supplies, bond paper, vellums, computer cards, and computer paper are typical major cost items in this category.

b. Engineering Material Costs are estimated to be:

FY75	275
FY76	660
FY76/77	160
FY77	660
Total	1,755

4. Rationale for Estimating Engineering Overhead (FSDWEOH):

a. Based on historical data and information available in the Contract Pricing Division, AMSWE-PPX, the Engineering Overhead Rate for the Contractor is estimated to be 110% of Engineering Direct Labor Cost.

b. Summary of Overhead costs is as follows:

Total Overhead FY75	$120,183
Total Overhead FY76	288,337
Total Overhead FY76/77	68,560
Total Overhead FY77	291,684
Total Overhead	768,764

5. Rationale for Estimating Other Direct Charges to Engineering (FSDWEOT):

a. This category includes the cost of travel and charges for computer time during Full Scale Development.

(1) The estimated computer costs are for programming and exercising a dynamic model of the weapon, a heat transfer and stress analysis model of the barrel, and analysis of Maintainability and Reliability as follows:

FY75	2,970
FY76	7,100
76/77	1,830
FY77	7,100
Total Computer Cost	19,000

(2) The estimate of travel costs is as follows:

FY75	2,364.00
FY76	4,728.00
76/77	1,576.00
FY77	49,769.00

Supporting computations may be found under "Estimate of Travel Costs".

b. Other Direct Charges to Engineering are summarized as follows:

	FY75	FY76	76/77	FY77
Computer Time	2,970	7,100	1,830	47,100
Travel Costs	2,364	4,728	1,576	49,769
Total by FY	5,334	11,828	3,406	56,869

FY75	5,334
FY76	11,828
76/77	3,406
FY77	56,869
Total ODC	$77,437

6. Estimate of Travel Costs:

	FY75	FY76	76/77	FY77	
Informal reviews at Rock Island	3	6	2	6	
3 days x 2 men x $35/day	630	1,260	420	1,260	
Car Rental 2 days - $60/trip	180	360	120	360	
Air Fare $259 x 2 men	1,554	3,108	1,036	3,108	
Support of APG Test (RDAT-DT II)				275	days
1 Man x $35/day				$9,265	
Car Rental @ $30/day				$8,250	
Air Fare $355/28 days				$9,940	
Support Test Fort Benning (OT-II)				180	days
1 Man x $35/day				$6,300	
Car Rental x $30/day				$5,400	
Air Fare $307/18 days				$5,526	
TOTAL TRAVEL	$2,364	$4,728	$1,576	$49,769	

7. Total Development Engineering

FY75	$235,049
FY76	562,950
76/77	134,453
FY77	614,380
TOTAL	$1,546,832

HIGH COST AREA

SUMMARY OF FSDW TOOLING COSTS

ESTIMATED IN 1975 DOLLARS

FSDWTL -

The cost model symbol gives reference to the cost of tooling, gages and manufacturing aids required to produce FSD prototype weapons, supporting equipment, and repair parts. All costs occur in FY76.

HIGH COST AREA
FSD - TOOLING COST (LESS GSA)
XM235 (155 UNIQUE PARTS, 967 OPERATIONS)

Tooling for 104 Prototype Guns consists of:

		Hours	Amount	
A.	Purchase Tooling (Vendor Price)		$108,768	
	967 x $112.48			
B.	Purchase Gages (Vendor Price)		$ 20,829	
	967 x $21.54			
C.	Purchase Expendable Tooling (Vendor Price)		$ 39,454	
	967 x $40.80			
D.	Manufacture - Jigs & Fixtures			
	D.L. Rate $9.22/hr, O.H. Rate 110%	3361	$ 65,076	
E.	Manufacture - Gages			
	D.L. Rate $9.22/hr. O.H. Rate 110%	230	$ 4,453	
	Subtotal		$238,580	
F.	Manufacture - Processing	2176	$ 42,132	
	D.L. Rate $9.22/hr, O.H. Rate 110%			
G.	Tool & Gage Design		$ 35,787	
	(15% of A thru E above)			
H.	Estimating of Tools	1452	$ 28,114	
	D.L. Rate $9.22/hr, O.H. Rate 110%			
I.	Purchasing Effort (or A-E above)	1109	$ 21,473	
	D.L. Rate $9.22/hr, O.H. Rate 110%			
J.	Tool & Gage Inspection		$ 23,858	
	(10% of Items A thru E above)			
	Total Tooling Cost	8328	$389,944	(FY76)
	Unit Cost (104 weapons)		$ 3,750	

XM235
FSD TOOLING
MANUFACTURING PROCESSING

Planning for manufacturing processes is estimated at 2 hours per machine operation. There are 907 machine operations giving:

967
2
1934 hours

An additional .25 hour is estimated for methods and standards work per operation giving:

967
.25
242 hours

Total

1934 hours
242 hours
2176 hours

TOOL DESIGN

It is estimated from M16 G.M. Hydromatic that 20% design to mfg.

From G.E. (M61) approx. 34%.

It is estimated that 30% is fair and reasonable. In prototype most detailed design would not be made - use 15%.

ESTIMATING OF TOOLS

907 Operations with 3 tools per operation - 1 cutter
1 fixture
1 gage

967
3
2901 tools

It is estimated that .50 hr will be necessary for each tool.

2901
.5
1452 hours

XM235
TOOL & GAGE INSPECTION

It is estimated that 10% of the purchase price will be used for initial inspection of tools and gages, based upon ARMCOM QA experience.

PURCHASING

Total procurement actions
For items purchased finished
Total operations - 967
It is assumed that each operation will require: 1 cutter
1 fixture
1 gage

Therefore 3 x 967 = 2901 items will be procured.

2 Items over $3000
965 Items less than $3000

Use same standards for purchasing as manufacturing.

(965) (.5176 hrs) (150%) = 750 hours
(2) (17.223 hrs) (150%) = 52 hours
802 hours

For Items manufactured - Manufacturing hours - 3591

Relationship to mfg to purchased - 38.3%

Procurement hours for manufactured items - (802) (38.3%) = 307 hours

Total procurement effort - Mfg 307 hours
Purchased 802 hours
1109 hours

PROTOTYPE COSTS

XM235

Based on experience in manufacturing components for 18 Validation Phase weapons at the Naval Air Rework Facility (NARF), Pensacola, Florida, the four weapons required for RDAT are estimated to cost $10,000 each. The 100 weapons for DT-II/OT-II are estimated to cost $7,500 each.

Manufacturing elapsed time is estimated at 7 months from 1 July 1976 for four RDAT weapons and 9 months from 1 July 1976 for the remaining 100 weapons. The reporting periods are three months in the 76/77 period and six months in FY77 period.

The prototype manufacturing effort continues over a three month period in 76/77 and a six months period in FY77. The cost is assumed to be distributed in proportion to the time of effort.

RDAT Weapons	4 x $10,000	$ 40,000
DT/OT II Weapons	100 x $7,500	750,000
Total Prototype Weapons Cost		$790,000
76/77	3/9 x 790,000 =	$263,333
FY77	6/9 x 790,000 =	$526,667

SYSTEM TEST AND EVALUATION SECTION

FULL SCALE DEVELOPMENT

FSDWTE

1. Introduction

a. The figures below represent an estimate of the contractor's cost to conduct System Test and Evaluation.

b. For computational purposes, the Total System Test and Evaluation activity was divided into three parts as follows:

Part I - Acceptance Testing of the Prototype Weapons

Part II - Research and Development Acceptance Test (RDAT)

Part III - Preliminary Testing

c. The following were not included as part of this estimate:

(1) Weapons, spare barrels, and spare parts. These are included in the Prototype Cost, as other Direct Costs.

(2) Ammunition (MUCOM Item)

(3) Range utilization/rental costs, if required. This item was not included due to lack of supporting information as to where and under what arrangement the contractor will conduct testing.

(4) Shipping/transportation costs of materiel/personnel to various test sites, if required. It is assumed that testing would be within close proximity of the contractor's plant.

d. The same direct labor (time) and materials estimate was used for all three contractors. This is considered a reasonable assumption, since

the test requirements are the same. Thus, differences in the cost estimates are the result of the various contractors' equivalent hourly rates and overhead figures. Contractor hourly rates and overhead were obtained from audited historical data.

2. Summary of Costs	TOTAL
Part I - Acceptance Testing	$105,768
Part II - RDAT	$216,127
Part III - Preliminary Testing	$136,736
TOTAL - Weapon System Test and Evaluation Cost (FSDWTE)	$458,631

3. Breakdown by Parts

Part I - Acceptance Testing	FY75	FY76	76/77	FY77	TOTAL
Direct Labor (2950 hrs)*	-0-	-0-	-0-	27,199	27,199
Materials	-0-	-0-	-0-	48,650	48,650
Overhead	-0-	-0-	-0-	29,919	29,919
Total				105,768	105,768

Part II - RDAT					
Direct Labor (6403 hrs)	-0-	-0-	-0-	59,036	59,036
Materials	-0-	-0-	79,391	12,760	92,151
Overhead	-0-	-0-	-0-	64,940	64,940
Total			79,391	136,736	216,127

**Part III - Prelim. Tstg.					
Direct Labor (6403 hrs)	9,840	39,358	9,838	-0-	59,036
Material	12,760	-0-	-0-	-0-	12,760
Overhead	10,824	43,294	10,822	-0-	64,940
Total	33,424	82,652	20,660	-0-	136,736

* Direct Labor Rate = $9.22/hr

Overhead = 110%

** Preliminary Testing Period - May 1975 through Oct 197

DATA SECTION

FULL SCALE DEVELOPMENT

1. Introduction:

a. This section summarizes the costs for the FSD Data Items. The section contains a List of FSD Data Items and their costs. These costs make up the totals which are entered under DATA in the FSD Cost Model. The costs for the Functional Direct Labor hours are accounted for in the respective Direct Labor sections for Engineering and Training.

b. The Data Items for the Technical Data Package (TDP) are accounted for in the PEP Program and are so noted on the list of the Data Costs for each Data Item. The TDP Data Items which are started in FSD and continued in PEP are also noted in the list for cross reference and continuity.

c. The section also contains a Data Related Cost Summary for information on the total cost related to data items.

2. DATA RELATED COST SUMMARY

a. Direct Labor plus Overhead to prepare FSD Data Items is carried under the following categories and totals as follows:

Category	
Engineering hours	29,800
Training hours	3,207
Engineering Cost	576,928
Training Cost	62,088
Total $/FY	639,016
b. Data Cost	56,957
a + b	695,973

c. Total Data Related Cost - FSD = $695,973 (P-F)

NOTE: Engineering and Training Hourly Rate = $9.22 + 110% Overhead = $9.22 + $10.14 = $19.36/hour

d. Data Cost by Fiscal Year

FY75 5/17 x 56,957 = $16,752

FY76 12/17 x 56,957 = $40,205

3. SUMMARY OF FSD DATA ITEM LISTING AND DIRECT LABOR TO PRODUCE ENGINEERING DATA ITEMS

List of Engineering Data Item Numbers

B#	DI#	B#	DI#
01	DI-A-1014A (MOD)	32	DI-H-1329A
02	DI-E-1100 (MOD)	37	DI-M-1501 (MOD)
03	DI-E-1101A	38	DI-M-1502
04	DI-E-1103A	39	DI-M-1502
05	DI-E-1104	40	DI-M-1505
06	DI-E-1105	41	DI-M-1510
08	DI-E-1107	42	DI-P-1600
10	DI-E-1116	44	DI-R-1710 (MOD)
11	DI-E-1117	51	DI-R-1730 (MOD)
12	DI-E-1118 (MOD)	52	DI-R-1731 (MOD)
13	DI-E-1119 (MOD)	53	DI-R-1733 (MOD)
14	DI-E-1128	54	DI-R-1734 (MOD)
15	DI-E-11XX (MOD)	55	DI-R-1735 (MOD)
16	DI-E-XXX1	56	DI-R-1740 (MOD)
17	DI-F-6000	57	DI-R-1741 (MOD)
18	DI-F-60001	58	DI-R-1750 (MOD)
18A	DI-F-XXX1	59	DI-S-1800 (MOD)
19	DI-F-6004	60	DI-S-1804A
25	DI-H-1312	61	DI-S-1812
26	DI-H-1314	62	DI-S-1818 (MOD)
27	DI-H-1315	63	DI-S-1819 (MOD)
29	DI-H-1322A (MOD)	64	DI-S-18XX (MOD)
30	DI-H-1326A	65	DI-T-1906 (MOD)
31	DI-H-1327A (MOD)	66	DI-T-XXX1 (NEW)
		67	DI-V-1950 (MOD)

Direct Labor Hours = 29,800

NOTE: These direct labor hours are included under Engineering.

4. SUMMARY OF FSD DATA ITEM LISTING AND DIRECT LABOR TO PRODUCE TRAINING DATA ITEMS

List of Training Data Items

B#	DI#
20	DI-H-1300 (MOD)
21	DI-H-1302
22	DI-H-1304
23	DI-H-1308
24	DI-H-1310

Direct Labor hours = 3,207

NOTE: These direct labor hours are included under Training.

SUMMARY OF COSTS - DATA ITEM CALL ITEMS - FSD

B No.	Data Item No.	Data Item Title		
01	DI-A-1014A(MOD)	PERT		557
02	DI-E-1100(MOD)	Configuration Management Plan		246
03	DI-E-1101A	Configuration Stat Acct & Engr Record		507
04	DI-E-1103A	Engineer Release Record	FSD/PEP	1620
05	DI-E-1104	Specifications	FSD/PEP	91
06	DI-E-1105	Characteristics & Description Book		168
07	DI-E-1106	Specs, Standards, Appl. List	PEP	0
08	EI-E-1107	Drawing Custodianship List	FSD/PEP	30
09	EI-E-1115A(MOD)	Technical Data Package	PEP	0
10	DI-E-1116	Stdz Comp & Select Control	FSD/PEP	58
11	DI-E-1117	Stdz Report of Common Items	PEP	0
12	DI-E-1118(MOD)	Drawings, Engr & Assoc Lists	FSD/PEP	645
13	DI-E-1119(MOD)	Environmental Criteria Report		3172
14	DI-E-1128	Electromagnetic Interference Control Plan		84
15	(X)DI-E-11XX(MOD)	Interface Control Doc. for VRFWS		311
16	DI-E-XXX1	Dynamic Mathematical Model		288
17	DI-F-6000	Cost performance report		353
18	DI-F-6001(MOD)	Procurement Info Functional Cost-Hour Report		5
18A	DI-F-XXX1	Model for Eval of Design-To Unit Production Cost		29
19	DI-F-6004	Contract Funds Status Report		22
20	EI-H-1300(MOD)	Personnel & Training Requirements		150

SUMMARY OF COSTS - DATA CALL ITEMS - FSD
(Continued)

B No.	Data Item No.	Data Item Title	
21	DI-H-1320	New Equipment Training Plan	0
22	DI-H-1304	New Equipment Training Courses	1350
23	DI-H-1308	Training Course Reports	0
24	DI-H-1310	Graphic Aids	31444
25	DI-H-1312	Human Factors Engr Plan	53
26	DI-H-1314	Human Factors Engr Progress Rpt	179
27	DI-H-1315	Human Factors Engr Final Report	59
28	DI-H-1321A	Explosive Hazard Class. Data	See Ammo
29	DI-H-1322A(MOD)	Safety Statement	77
30	DI-H-1326A	Safety Anal. & Hazard Eval Rpts	212
31	DI-H-1327A(MOD)	Surface Danger Area Data	68
32	DI-H-1329A	Accident/Incident Report	20
33	DI-H-1330(MOD)	Facilities Safety Data	0
34	DI-L-1407(MOD)	Preservation & Packaging Data	PEP
35	DI-L-1410	Ammunition Data Cards	Ammo
36	DI-M-1500(MOD)	Firing Table Manuscript	Ammo
37	DI-M-1501(MOD)	Validation Plan for Equip. Publications	1
38	DI-M-1502(MOD)	Equipment Publications	1176
39	DI-M-1502(MOD)	Equipment Publications	Included in B038
40	DI-M-1505(MOD)	Equip. Pub. Progress/Cost Reports	38
41	DI-M-1510	Maintenance Allocation Chart	11
42	DI-P-1600	Value Engr Data Report	135
43	DI-P-1602	Value Engr Plan	No Cost Plan is prepared and paid for in Contractor's Proposal.

SUMMARY OF COSTS - DATA CALL ITEMS - FSD
(Continued)

B No.	Data Item No.	Data Item Title	
44	DI-R-1710(MOD)	Quality Program Plan	128
45	DI-R-1711(MOD)	Qual Engrg Acc Insp Req & Equip List	PEP
46	DI-R-1712(MOD)	Quality Engrg Supp QA Provision	PEP
47			PEP
48			PEP
49	DI-R-1717	Qual Engr Calibration Program Data	PEP
50	DI-R-1722(MOD)	Qual Insp Pamphlet	PEP
51	DI-R-1730(MOD)	Reliability Program Plan	17
52	DI-R-1731(MOD)	Reliability Reports	67
53	DI-R-1733(MOD)	Reliability Qualified Items List	3
54	DI-R-1734(MOD)	Rel Fail Modes Effects & Crit Anal Rpts	21
55	DI-R-1735(MOD)	Rel Failed Item Analysis Report	114
56	DI-R-1740(MOD)	Maintainability Program Plan	17
57	DI-R-1741(MOD)	Maintainability Reports	20
58	DI-R-1750(MOD)	Assessment Program Plan	7
59	DI-S-1800(MOD)	Technical Reports	1179
60	DI-S-1804A	Corrosion Prevention & Matl Deterioration Rpts and/or Studies	49
61	DI-S-1812	Maintenance Engr Des Discrepancy Report	34
62	DI-S-1818(MOD)	Maintenance Engr Analysis	380
63	DI-S-1819(MOD)	Contractor Recommended Support Plan	31
64	(X)DI-S-18XX(MOD)	Support Model Data	6
65	DI-T-1906(MOD)	Test & Demonstration Reports	1105
66	DI-T-XXX1(New)	R&D Acceptance Test Plan	25
67	DI-V-1950(MOD)	Provisioning Requirements for US Army Eq.	581
68	DI-V-1951(MOD)	Federal Item Identification Data	No Contractor Performance Reqd

Total converted to FY75 Dollars $48,268 x 1.18 = $56,957

TOTAL $48,268

Total Systems Management Section
Full Scale Development

1. Introduction:

The overall systems management team to be employed by the contractor is considered to be a staff type operation that would be responsible for the contractor's overall program and execution.

Personnel on the management team are not included in the functional areas (i.e., engineering, manufacturing, testing, etc.). Top or executive management, administrative and clerical personnel are included in overhead and/or GSA. Since each of the functional areas would have their own supervision and management the rationale is to keep the Systems Management to a small highly capable team headed by a Project Manager.

2. Systems Management Team:

The team would be a full time effort for four (4) men headed by a Project Manager. It would consist of:

1 - Project Manager

1 - Senior Staff Systems Engineer for engineering activities

1 - Senior Staff Engineer for manufacturing and acceptance.

1 - Program Manager for plans and programs.

This team would be responsible for both the Full Scale Development and PEP Programs which are in the same time frame. Therefore, the costs are scheduled only in the FSD portion of the estimate.

3. The following is the estimated average Government rate:

Title	Grade	FY75 D.L. Rate
Project Manager	GS-15	$15.40
Senior Engineer, Engr.	GS-14	13.21
Senior Engineer, Mfg.	GS-13	11.27
Program Manager	GS-13	11.27
		$51.15

$51.15/4 = $12.79 hr average Government rate.

4. Based on the equivalent Government rate and discussions with AMSWE-PPX the equivalent contractor hourly rate is estimated to be $12.87/hr and overhead at 110% totaling $27.03/hr D.L.&O.H.

5. Costs by Fiscal Period:

FY75 (5 months, 160 hrs/month)

5 x 160 x 4 x $27.03 = 86,496

FY76 (12 months, 160 hrs/month)

12 x 160 x 4 x $27.03 = 207,590

76/77 (3 months, 160 hrs/month)

3 x 160 x 4 x $27.03 = 51,898

FY77 (12 months, 160 hrs/month)

12 x 160 x 4 x $27.03 = 207,590

Total 553,574

SAW WEAPON XM-235
(HIGH COST AREA)
PRODUCIBILITY ENGINEERING & PLANNING
SEP/OCT 74

COST CATEGORIES AND ELEMENTS DEVELOPMENT-PEP	PEP TOTAL	FY75	FY76	76/77	FY77
A. Engineering	870,618	-0-	-0-	150,113	720,505
Direct Labor	354,998				
Material	150				
Overhead	390,498				
Other O.C.	124,972				
B. Tooling(Software)	139,248	-0-	-0-	27,850	111,398
C. Quality Control	520,018	-0-	-0-	-0-	520,018
D. System Test & Evaluation	-0-	-0-	-0-	-0-	-0-
E. Data	7,441	-0-	-0-	1,488	5,953
F. Total System Mgmt.	-0-	-0-	-0-	-0-	-0-
G. Industrial Facilities	14,425	-0-	-0-	2,885	11,540
H. Training	-0-	-0-	-0-	-0-	-0-
I. Miscellaneous	-0-	-0-	-0-	-0-	-0-
TOTAL COST	1,551,750	-0-	-0-	182,336	1,369,414

IN-HOUSE TASKS

PEP RELATED

The major areas of In-House Direction and Support effort required during the PEP period are:

1. Producibility Engineering and Planning Studies.

2. Product Engineering Studies including Tolerance/Dimension Studies.

3. Engineering effort to prepare the Technical Data Package Data Call Items.

4. Engineering effort to enhance Reliability and Maintainability Engineering activities.

Configuration Management will be monitored in detail through acceptance testing.

Starting with RDT, Configuration Management will revert entirely to the Government as an In-House Task requiring effort as follows:

1. Prepare a Configuration Plan.

2. Update the Configuration Plan as required.

3. Review Engineering Change Proposals (ECPs):

   a. Failure Related.

   b. Production Related.

Other specific In-House Task areas are:

1. Review/monitor and direct Contractor and In-House conducted Producibility Engineering and Planning studies as follows:

   a. Review each part/drawing.

   b. Review Contractor Draft Process Sheets.

c. Review unique processing operations.

d. Review current and proposed processing capabilities.

e. Review difficult/uneconomical manufactured items and recommended actions.

f. Review Contractor PEP reports.

2. Review, monitor and direct Contractor and In-House conducted Production Engineering and Tolerance/Dimension Studies as follows:

a. Review components/drawings.

b. Maintain conformity to Military Standards as specification as applicable.

c. Review Contractor and In-House conducted redesign efforts.

d. Review and prepare reports.

e. Analyze available data and identify/approve areas for in-house or by contractor.

f. Conduct and/or monitor tolerance/dimension studies.

g. Review revisions and related reports.

h. Maintain liaison with contractor project related supervision personnel.

3. Maintain cognizance of current and proposed manufacturing processes and procedures.

(ALL CONTENDERS)
IN-HOUSE
PEP-ENGINEERING

The In-House PEP Engineering team effort is summarized as follows:

		FY75		FY76		76/77		FY77	
Title	Grade	Hrs	$	Hrs	$	Hrs	$	Hrs	$
Project Eng	14	750	9,435	900	11,324	225	2,831	900	11,324
Mech Eng	13	750	8,048	750	8,048	450	4,829	1800	19,316
Mech Eng	12	750	6,818	600	5,454	150	1,364	600	5,454
Mech Tech	11	375	2,861	600	4,578	150	1,145	600	4,578
Mech Tech	9	375	2,374	600	3,798	150	950	600	3,798
Draftsman	7	750	3,893	600	3,114	150	779	600	3,114
Draftsman	5	750	3,143	1800	7,542	450	629	1800	7,542
Math Analyst	12	375	3,409	600	5,454	150	1,364	600	5,454
NAM Eng	12	750	6,818	1800	16,362	225	2,046	900	8,181
Direct Labor									
FY75		5,625	46,799						
FY76				8250	65,674				
76/77						2100	15,937		
FY77								8400	68,761

Total Direct Labor (PEP) 24,375 Man Hours $197,171

Overhead (85%)	
FY75	$39,779
FY76	55,823
76/77	13,547
FY77	58,447
Total Overhead (PEP)	$167,596

(ALL CONTENDERS)
IN-HOUSE
PEP
SUMMARY

	FY75	FY76	76/77	FY77	TOTAL
A. Engineering					
Direct Labor	46,799	65,674	15,937	68,761	197,171
Material($75/Mo)	375	900	225	900	2,400
Overhead	39,779	55,823	13,547	58,447	167,596
Other D.C. (Included in FSD)	-	-	-	-	-
Total A	86,953	122,397	29,709	128,108	$367,167
B. Configuration Control Board					
Direct Labor	12,720	30,528	7,633	30,528	81,409
Material($75/Mo)	375	900	225	900	2,400
Overhead (85%)	10,812	25,949	6,487	25,949	69,197
Other D.C. (Included in FSD)	-	-	-	-	-
Total B	23,907	57,377	14,345	57,377	$153,006
A plus B	110,860	179,774	44,054	185,485	
TOTAL IN-HOUSE PEP COST					$520,173

PEP ENGINEERING	24,375 Hrs.
C.C. Board	7,680 Hrs.
TOTAL MAN HOURS	32,055 Hrs.

(ALL CONTENDERS)
IN-HOUSE
CONFIGURATION CONTROL BOARD

Control of Configuration Management will be assumed by the Government.

A Configuration Control Board (CCB) will be established and will exercise its authority throughout the FSD period and potentially continue in the same manner but at somewhat diminished levels of effort through the Limited Production period and the Full Scale Production period.

During the FSD period from 1 February 1975 to 1 October 1977 (32 months) the CCB will utilize of the following people to the extent indicated:

	Title	Grade	Hours	$DL	$Overhead
40%	Configuration Mgr	14	1920	24,154	20,531
40%	Engineer	13	1920	20,602	17,511
20%	Procurement Specialist	13	960	10,301	8,756
20%	W.A. Engineer (Gages & SQAPS)	13	960	10,301	8,756
20%	Maintenance Specialist	12	960	8,726	7,417
20%	Supply Specialist	11	960	7,325	6,226
		TOTAL	7,680	$81,409	$69,197
These expenses occur as follows:			FY75	12,720	10,812
			FY76	30,528	25,949
			76/77	7,633	6,487
			FY77	30,528	25,949

CONTRACTOR DEVELOPMENT ENG PEP

Rationale:

The Contractor PEP effort is estimated to address the following areas:

a. Producibility Engineering and Planning Studies.

b. Product Engineering and Tolerance Studies.

Tasks are identified in each area, required manhours are estimated for each task and the total estimated manhours determined. These manhours are multiplied by appropriate labor and overhead rates to obtain total values for Direct Labor and Overhead, $150 is estimated for Materials and these values of Direct Labor, Overhead, and Material cost are added to Other Direct Costs which are defined in a separate section.

The total thus obtained is distributed 1/5 in FY76/77 and 4/5 in FY77.

A. Producibility Engineering and Planning Studies:

	TASK	MANHOURS
1.	Review Part Drawings	2058
2.	Prepare Draft Process Sheets	5143
3.	Determine Unique Operations	176
4.	Conduct Process Capabilities Study	2788
5.	Determine Difficult Items and Make Recommendations	1394
6.	Prepare Reports	41
7.	Maintain Supervision	4752
	TOTAL "A"	16352 hours

B. Product Engineering and Tolerance Studies:

1.	Review Drawings	461
2.	Review Mil. Standards & Specs.	216
3.	Select and Conduct Redesign	2979
4.	Prepare Reports	40
5.	Review Data/Identify Areas for Study	481
6.	Conduct Tolerance/Dimension Study	2676
7.	Determine Revisions and Prepare Report	556
8.	Maintain Supervision	4752
	TOTAL "B"	12161 hours

TOTAL MANHOURS (A & B) 28,513

SAW-XM235 (HIGH COST AREA)
CONTRACTOR DEVELOPMENT ENG PEP

Total ManHours (A&B)	28,513 hrs
Data Item ManHours	9,990 hrs
Total ManHours	38,503
Direct Labor Rate	$9.22/hr
Direct Labor Cost	$354,997.66
Overhead Rate 110%	
Overhead Cost	$390,497.43

Engineering Cost Summary		76/77	FY77
Direct Labor	$354,998	71,000	283,998
Material	150	30	120
Overhead	390,498	78,100	312,393
O.D.C.	124,972	983	123,989
Total Engineering	$870,618	$150,113	$720,505

A-3 PEP

OTHER DIRECT COSTS
CONTRACTOR
PRODUCIBILITY ENGINEERING & PLANNING (PEP)

RATIONALE: Other Direct Costs are assumed to consist of three (3) categories:

a. Manufacturing Processing Engineering

b. Travel

c. Reproduction Costs

(1) PEP Studies

(2) Product Engineering and Tolerance Studies

XM-235 (HIGH COST AREA)
OTHER DIRECT COSTS
CONTRACTOR
PEP

A. Manufacturing Process Engineering is the Engineering effort to prepare and process routing sheets and other documentation defining in detail the manufacturing processes to be used for each component.

Estimated manufacturing operations		967
Estimated Eng Hrs per operation		6.5 hrs
Direct Labor Rate		$9.22/hr
Overhead		110%
Required Manhours	967 x 6.5	6285.5
Direct Labor	6285.5 x $9.22	$57,952.31
Overhead	$57,952 x 1.10	$63,747.54
Total M.P.E.		$121,699.85

B. O.D.C.Travel

Estimated travel consists of 2 trips to RIA by 1 man in FY77 at 2 x $449 = $898 plus 2 trips by 2 men at $847 per trip (1 trip in FY76/77 and 1 trip in FY77

	76/77	FY77	TOTAL
1 man trip		$898	
2 man trip	$847	$847	
Total Travel	$847	$1745	$2592

XM-235 (HIGH COST AREA)
OTHER DIRECT COSTS
CONTRACTOR
PEP

C. Reproduction:

1) Estimated for Producibility Engineering & Planning Studies:

	76/77	FY77	TOTAL
$165.00 x (1.24)	$40.92	$163.68	$204.60

2) Estimated for Product Engineering and Tolerance Studies:

$369.00 x (1.24)	$ 95.11	$380.45	$475.56
Total Reproduction Cost	$136.03	$544.13	$680.16

O.D.C. Summary

Total M.P.E.	-0-	121,699.85	$121,699.85
Total Travel	847.00	1,745.00	2,592.00
Total Reproduction	136.03	544.13	680.16
TOTAL O.D.C.	$983.03	$123,986.98	$124,972.01

Tooling Section (Software)

Costs are incurred during design of special purpose production equipment and tooling to achieve quantity production. Based on past experience it is estimated that 35% of the initial tooling cost is used for design.

All design costs are shown against the weapon.

On the basis of past estimates for automatic weapons an average tooling cost of $400 per operation is applied to cover the cost of Purchased Tooling, Purchased Gages, Expendable Tooling, Jigs and Fixtures, and Gages.

The corresponding Design Cost is thus estimated at .35 x $400 = $144 per operation.

	No. Operations x $144		76/77	FY77
XM235	967	$139,248	$27,850	$111,398

QUALITY CONTROL SECTION

The estimates contained herein for Quality Control are for the Quality Documentation that is part of the Technical Data Package. In addition, estimated hours for Quality Control Engineering Supervisor are included at the rate of 160 hours per month for 11 months. The man hours estimated for the preparation of Quality Control Documentation are based on similar work performed by ARMCOM personnel.

Rationale is derived from a similar study performed on proposed Bushmaster weapons. The following Data Items are involved:

DI-E-1104*

DI-E-1118 (Mod)*

DI-R-1711 (Mod)

DI-R-1712 (Mod)

DI-R-1717

DI-R-1722 (Mod)

* In addition to Quality Control, there are man hours for these Data Items in the Engineering Section.

During the PEP Program, it is estimated all Q.C. software efforts will be accomplished in FY77.

SUMMARY OF MAN HOURS

GS-13	Supervisor	1,760
GS-12	Engineer	790
GS-11	Specialist Gage Designer/Checker	16,434
GS-09	Tech Writer, Illustrator	6,968
GS-05	Document Control Clerk	885
		26,837

SUMMARY OF COSTS

Direct Labor Hours	26,837
Hourly Rate	9.22
Total D. L. Cost	247,437
Overhead (110%)	272,181
Material	400
Total Q. C. Cost	520,018

DATA SECTION

PEPWD

1. This section includes the rationale and a summary of direct labor man-hours and costs for material and reproduction for each Data Call Item considered a part of the total Technical Data Package (TDP).

2. The summary of direct labor man hours for Engineering Data Items is incorporated in the Engineering Section under Data Items. The summary of direct labor man hours for Quality Control Data Items is incorporated in the Quality Control Section under Data Items. Data Call Items DI-E-1104 and DI-E-1118(MOD), which require both Engineering and Quality Control documentation, have separate summaries and rationale contained in this section.

3. The material costs for preparation of the Data Items include the costs of standard forms, such as drawings, supplementary quality assurance provisions, and packaging data sheets. These costs are summarized and shown in their respective functional areas.

4. A summary of Data Costs for all TDP related Data Items is included in this section and entered under Data in the Cost Model.

5. DATA RELATED COST SUMMARY

a. Cost of Direct Labor plus Overhead to prepare data items is as follows:

Category	
Engineering Direct Labor (Manhours)	9,990
Quality Control Direct Labor (Manhours)	26,837
Engineering Cost*	193,426
Quality Control Cost*	519,618
Total Direct Labor & Overhead	713,044
b. Data Cost	7,441
c. Total Related Data Cost - PEP (a + b)	720,486

*Hourly rate = $9.22 + 110% Overhead = 19.36/hour

SUMMARY OF DATA COSTS-PEP PROGRAM

B. No.	Data Item No.	Data Item Title	
0004	*DI-E-1103A	Engrg Release Record	$ 203
0005	*DI-E-1104(QC)	Specifications	39
0005	*DI-E-1104(ENGR)	Specifications	93
0007	DI-E-1106	Specs, Stds, Application List	44
0008	*DI-E-1107	Drawing Custodianship List	68
0009	DI-E-1115A(MOD)	Technical Data Package	
010	*DI-E-1116	Standardization, Components, and Selection Control	6
011	DI-E-1117	Standardization-Report of Common Items	6
012	*DI-E-1118(MOD)(QC)	Drawings, Engrg, and Associated Lists	4,130
012	*DI-E-1118(MOD) (ENGR)	Drawings, Engrg, and Associated Lists	1,348
034	DI-L-1407(MOD)	Preservation and Packaging Data	307
045	DI-R-1711(MOD)	Quality Engrg Acc Insp Req & Eq	79
046	DI-R-1712(MOD)	Qual Engrg Supp QA Provisions	766
049	DI-R-1717	Qual Engrg Calibration Prog Data	22
050	DR-R-1722(MOD)	Qual Insp Pamphlet	330
		GRAND TOTAL DATA COST	$7,441
		76/77 DATA COST	1,488
		FY77 DATA COST	5,953

* Started during FSD Phase; continued during PEP Program.

SUMMARY OF DIRECT LABOR MANHOURS FOR ENGRG DATA ITEMS

Data Item No.	Totals
DI-E-1107	2
DI-E-1118(MOD)	1372
Totals	
DI-E-1103A	165
DI-E-1104	1676
DI-E-1105	28
DI-E-1107	10
DI-E-1115A(MOD)	96
DI-E-1116	73
DI-E-1117	5
DI-E-1118(MOD)	5487
DI-E-1407(MOD)	1076
Totals	9,990

Note: Totals are included in Direct Labor in Engineering Section

SUMMARY OF QUALITY CONTROL DIRECT LABOR FOR DATA ITEMS (MANHOURS)

Data Item	GS-12	GS-11	GS-9	GS-5
DI-E-1104	390	-	-	22
DI-E-1118(MOD)	-	14000	-	-
DI-R-1711(MOD)	60	355	-	60
DI-R-1712(MOD)	-	1914	348	348
DI-R-1717	340	165		75
DI-R-1722(MOD)	-	-	6620	380
Totals	790	16,434	6,968	885

NOTE: Totals are included in Direct Labor in Quality Control Section.
Grand Total manhours - 25,077 + 1,760 (GS-13 Supervisor) = 26,837

INDUSTRIAL FICILITIES SECTION

The estimate is based on the assumption that the contractor has a suitable plant site available for production of the components.

The design and layout of the plant equipment is based on the manufacturing process. Utilization of equipment is on the basis of 80% of the total machine time available. For the conventional machines a 1-8-5 shift is proposed through the first six months and 2-8-5 for the remainder of the program. For the N/C equipment a 1-8-5 shift is proposed through the first 6 months and a 3-8-5 shift for the remainder of the program.

The cost of the plans and layouts for this phase is estimated as follows, and will be accomplished during 76/77 and FY77.

Design and layout including electrical, plumbing, sheet metal, air, etc. for space allocation to machining, assembly, bench work and storage of tools and equipment is estimated to require 225 hours for the entire layout of 37,912 square feet.

Preparation of specifications for the procurement of new equipment and bills of materials required for installation of machines, air lines, etc. is estimated to require 520 hours.

Rates used are based on 9.22 per hour rate for design and layout work was escalated by 110% for overhead to 19.36 per hour. Therefore the 745 hour total computes to 14,424.69.

Area required for production approximates 37,912 square feet to be allocated as follows:

Production area, machining	26,584
Assembly, deburring and bench area	1,244

Tool and gage maintenance	1,000
Receiving	800
Packaging and shipping	1,000
Bonded storage	500
Tool storage	900
Final inspection	2,000
Administration	1,500
Metrology lab	384
Tool room	2,000
Total Area Required	37,912

It is assumed that chrome plating and surface finishing will be vendor purchased.

	Total	FY-77	76/77
Labor Cost	6868.90	5,495.12	1373.78
Overhead Cost	7555.79	6,044.63	1511.16
Total Cost	14,424.69	11,539.75	2884.94

NUMBER II-E

BASIC ESTIMATED COST PACKAGE
ENGINEERING DEVELOPMENT
BEST CONCEPTUAL WEAPON CONTRACTED BY
AN AVERAGE US CONTRACTOR IN 6.00MM
(OR FABRIQUE NATIONALE CONTENDER CONTRACTED
BY AN AVERAGE US CONTRACTOR IN 5.56MM/
63 GRAIN PROJECTILE)

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22) AVERAGE US CONTRACTOR

1. PREPARING INSTALLATION

SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED	3. QUANTITY
FN or BC, Average US Contractor (PEP Included)	NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	5. WORK BREAKDOWN STRUCTURE LEVEL	6. ESTIMATE PREPARED AS OF
Squad Automatic Weapon System	4	30 November 1974

RESEARCH AND DEVELOPMENT				7 COST CATEGORIES	8 HOURS	9 RATE	10 COST ESTIMATE	11 REFERENCE SCHEDULE
A	.			ENGINEERING			1,586,962	
	1			DIRECT LABOR *	190,910.9	6.69		
	2			MATERIAL				
	3			OVERHEAD		184%		
	4			OTHER				
B	.			TOOLING			413,802	
	1			DIRECT LABOR				
	2			MATERIAL				
	3			OVERHEAD				
	4			OTHER				
C	.			PROTOTYPE PRODUCTION			852,436	
D	.			SYSTEM TEST AND EVALUATION			453,561	
E	.			DATA			56,957	
F	.			TOTAL SYSTEMS MANAGEMENT			276,787	
G	.			CONSTRUCTION			-0-	
H	.			TRAINING			92,444	
I	.			OTHER (Specify) PEP			1,553,064	
J	.			TOTAL COST LESS (G AND A)			5,286,013	
K	.			G AND A 16%				
L	.			TOTAL COST			6,131,775	
M	.			PROFIT OR FEE 9.2%				
N	.			TOTAL PRICE			6,695,898	

REMARKS

*Hours shown are total for all cost categories

12 TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

INDEPENDENT GOVERNMENT COST ESTIMATE--RESEARCH AND DEVELOPMENT

(AMCR 715-22) IN-HOUSE SUPPORT

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: In-House Support FN or BC Avg. US Contractor (Includes PEP)

3. QUANTITY: NA

4. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

5. WORK BREAKDOWN STRUCTURE LEVEL: 4

6. ESTIMATE PREPARED AS OF: 30 November 1974

RESEARCH AND DEVELOPMENT				COST	REFERENCE
	7 COST CATEGORIES	8 HOURS	9 RATE	10 ESTIMATE	11 SCHEDULE
A	ENGINEERING			872,392	
1	DIRECT LABOR	51,542	-		
2	MATERIAL				
3	OVERHEAD		85%		
4	OTHER				
B	TOOLING				
1	DIRECT LABOR	-	-		
2	MATERIAL				
3	OVERHEAD		-		
4	OTHER				
C	PROTOTYPE PRODUCTION				
D	SYSTEM TEST AND EVALUATION *			138,738	
E	DATA				
F	TOTAL SYSTEMS MANAGEMENT				
G	CONSTRUCTION				
H	TRAINING				
I	OTHER (Specify) PEP			510,899	
J	TOTAL COST LESS (G AND A)			1,522,029	
K	G AND A	NA			
L	TOTAL COST	NA			
M	PROFIT OR FEE	NA			
N	TOTAL PRICE	NA			

REMARKS

*DT/OT-II of 6 months duration

12 TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011a-R

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)
ENG. DEV.
RESEARCH & DEVELOPMENT

	FY75	FY76	76/77	FY77	FY78	TOTAL
1.1 Contract						
1.11 Dev. Eng. (Val./ED)	251,355	602,136	132,178	601,293	-0-	1,586,962
1.12 PEP	-0-	-0-	208,353	1,344,711	-0-	1,553,064
1.13 Tooling	-0-	413,802	-0-	-0-	-0-	413,802
1.14 Mfg. Proto.	-0-	-0-	284,145	568,291	-0-	852,436
*1.15 Other	98,317	220,047	125,657	435,728	-0-	879,749
FY-Cost (Less G & A)	349,672	1,235,985	750,333	2,950,023	-0-	5,286,013
G & A (16%)						
FY-Cost	405,620	1,433,743	870,386	3,422,027	-0-	6,131,775
Profit (9.2%)						
FY-Total Price	422,937	1,565,647	950,461	3,736,853	-0-	6,695,898
1.2 In-House						
1.21 Dev Eng	163,327	367,344	69,587	272,134	-0-	872,392
1.22 PEP	110,860	179,774	44,054	176,211	-0-	510,899
1.23 Tooling	-0-	-0-	-0-	-0-	-0-	-0-
1.24 Mfg.	-0-	-0-	-0-	-0-	-0-	-0-
**1.25 Other	-0-	-0-	-0-	138,738	-0-	138,738
In-House Cost	274,187	547,118	113,641	587,083	-0-	1,522,029
Total Prog. R & D	717,124	2,112,765	1,064,102	4,323,936		8,217,927
*Other/Contract						
Syst. Test & Evaluation	33,082	81,282	99,708	239,489	-0-	453,561
Data	21,987	34,970	-0-	-0-	-0-	56,957
Total Syst. Mfg.	43,248	103,795	25,949	103,795	-0-	276,787
Training	-0-	-0-	-0-	92,444	-0-	92,444
Total	98,317	220,047	125,657	435,728	-0-	879,749

**DT/OT (ARMCOM) $23,123/Mo.,-I=4 months, -II=6 months

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)
SUPPORTING CALCULATIONS SHEET 1

	FY75	FY76	76/77	FY77	TOTAL
1.1 Contract					
1.11 Dev Eng					
XM233	271,489	650,506	129,903	588,208	1,640,106
XM234	271,759	651,025	134,453	614,380	1,671,617
XM235M	227,123	544,062	129,902	588,205	1,489,292
XM235P	235,049	562,950	134,453	614,380	1,546,832
/4	251,355	602,136	132,178	601,293	1,586,962
1.12 PEP					
XM233	-0-	-0-	213,200	1,355,187	1,568,387
XM234	-0-	-0-	213,363	1,373,468	1,586,831
XM235M	-0-	-0-	200,501	1,304,787	1,505,288
XM235P	-0-	-0-	206,347	1,345,403	1,551,750
/4	-0-	-0-	208,353	1,344,711	1,553,064
1.13 Tool					
XM233	-0-	479,149	-0-	-0-	479,149
XM234	-0-	402,262	-0-	-0-	402,262
XM235M	-0-	383,853	-0-	-0-	383,853
XM235P	-0-	389,944	-0-	-0-	389,944
/4	-0-	413,802	-0-	-0-	413,802
1.14 MFG.					
XM233	-0-	-0-	304,108	608,215	912,323
XM234	-0-	-0-	305,807	611,613	917,420
XM235M	-0-	-0-	263,333	526,667	790,000
XM235P	-0-	-0-	263,333	526,667	790,000
/4	-0-	-0-	284,145	568,291	852,436

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)
SUPPORTING CALCULATIONS SHEET 2

	FY75	FY76	76/77	FY77	TOTAL
1.15 Other					
XM233	49,492	120,116	99,365	327,385	596,358
XM234	143,652	323,467	151,949	544,096	1,163,164
XM235M	56,472	113,136	99,365	327,335	596,308
XM235P	143,652	323,467	151,949	544,096	1,163,164
/4	98,317	220,047	125,657	435,728	879,749
1.2 In-House					
1.21 Dev Eng					
XM233	173,312	391,620	60,596	256,681	882,209
XM234	161,229	361,986	72,655	277,497	873,367
XM235M	160,699	361,350	72,443	276,861	871,353
XM235P	158,067	354,418	72,655	277,497	862,637
/4	163,327	367,344	69,587	272,134	872,392
1.22 PEP					
XM233	110,860	179,774	44,054	176,211	510,899
XM234	110,860	179,744	44,054	176,211	510,899
XM235M	110,860	179,744	44,054	176,211	510,899
XM235P	110,860	170,744	44,054	176,211	510,899
/4	110,860	170,744	44,054	176,211	510,899
1.23 Tool					
1.24 Mfg.					
1.25 Other				138,738	138,738

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)
SUPPORTING CALUCLATIONS SHEET 3

	FY75	FY76	76/77	FY77	TOTAL
Other-Contract Syst. Test					
XM233	32,740	79,911	99,365	236,499	448,515
XM234	33,424	82,652	100,051	242,504	458,631
XM235M	32,740	79,911	99,365	236,449	448,465
XM235P	33,424	82,652	100,051	242,504	458,631
/4	33,082	81,282	99,703	239,489	453,561
Data					
XM233	16,752	40,205	-0-	-0-	56,957
XM234	23,732	33,225	-0-	-0-	56,957
XM235M	23,732	22,225	-0-	-0-	56,957
XM235P	23,732	33,225	-0-	-0-	56,957
/4	21,987	34,970	-0-	-0-	56,957
Syst. Mgmt.					
XM233	-0-	-0-	-0-	-0-	-0-
XM234	86,496	207,590	51,898	207,590	553,574
XM235M	-0-	-0-	-0-	-0-	-0-
XM235P	86,496	207,590	51,898	207,590	553,574
/4	43,248	103,795	25,949	103,795	276,787
Training					
XM233	-0-	-0-	-0-	90,886	90,886
XM234	-0-	-0-	-0-	94,002	94,002
XM235M	-0-	-0-	-0-	90,886	90,886
XM235P	-0-	-0-	-0-	94,002	94,002
/4				92,444	92,444

TOTAL ( )

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)
SUPPORTING CALCULATIONS SHEET 4

	DEV. ENG. HRS.	PEP HRS.
XM233	83,856	38,503
XM234	82,245	38,503
XM235(M)	75,800	38,503
XM235(P)	75,800	38,503
Contract Avg. /4	79,425	38,503
XM233	52,526	32,055
XM234	51,426	32,055
XM235(M)	51,426	32,055
XM235(P)	50,788	32,055
In-House Avg. /4	51,542	32,055

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)

RATIONALE
FSD-ENGINEERING

RATIONALE: The Fabrique Nationale or (BC) Weapon is judged to have 6 areas requiring major redesign and/or extensive analysis, specifically:

(1) Receiver

(2) Buffer Assembly

(3) Gas System

(4) Bolt/Operating Group

(5) Firing Mechanism

(6) Magazine

The major FSD-Engineering effort to address these areas will be conducted in 5 months of FY75 and 12 months of FY76.

The fiscal transition period of 3 months, 76/77 and 12 months of FY77 will be used to finalize detail design, testing, data acquisition, data processing, data evaluation, and evaluation of proposed production related modifications in conjunction with the concurrent PEP effort.

Two basic problems appear to exist:

(1) If the Receiver Assembly is strong enough to insure structural integrity the weight limit may be exceeded.

(2) If the locking lug areas and/or Buffer components are modified to eliminate excessive wear or potential failure an extensive redesign and testing of the operating mechanism may be required.

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)

IN-HOUSE
FSD-ENGINEERING

The In-House FSD Engineering Team Effort is summarized as follows:

		FY75		FY76		76/77		FY77	
	Grade	Hrs	$	Hrs	$	Hrs	$	Hrs	$
Project Eng	14								
Mech Eng	13								
Mech Eng	12								
Mech Tech	12								
Q.A. Tech	11								
Mech Tech	9								
Draftsman	7								
Draftsman	5								
Math Analyst	12								
Ram Eng	12								
Q.A. Eng	12								
Q.A. Tech	12								
Model Maker									
Direct Labor	FY75	9898	83,028						
	FY76			22551	188,342				
	76/77					4360	37,240		
	FY77							14733	122,958

Total Direct Labor (FSD) 51,542 Man Hours $431,568

Overhead (85%)	FY75	$ 70,574
	FY76	160,091
	76/77	31,654
	FY77	104,514
Total Overhead (FSD)		$366,833

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)

FSD-ENGINEERING MATERIAL

RATIONALE: Engineering Material costs cover office supplies, drafting paper, etc., and is estimated at $100 per month.

FY75	5 x $100	$ 500
FY76	12 x $100	1200
76/77	3 x $100	300
FY77	12 x $100	1200
TOTAL		$3200

Other direct charges are covered in either FSD or PEP.

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)
FSD - ENGINEERING - OTHER DIRECT COSTS

Rationale: Other Direct Costs are assumed to consist of Computer expense at $600 per month and Travel Expense.

A.	Computer Expense	
	FY75 5 x $600	$ 3,000
	FY76 12 x $600	7,200
	76/77 3 x $600	1,800
	FY77 12 x $600	7,200
	TOTAL	$19,200
B.	Travel Expense	
	FY75	3,940
	FY76	4,728
	76/77	1,576
	FY77	41,347
	TOTAL	51,591
C.	Total O.D.C./FY	
	FY75	6,940
	FY76	11,928
	76/77	3,376
	FY77	48,547
D.	Total O.D.C.	70,791

FSD - ENGINEERING - SUMMARY OF COSTS

FY75	$161,042
FY76	361,561
76/77	72,570
FY77	277,219
TOTAL	$872,392

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)
IN-HOUSE TRAVEL COSTS
WEST COAST CONTRACTOR

Estimate of Travel Costs:

	FY75	FY76	76/77	FY77	
Reviews at Los Angeles Area	5	6	2	6	
3 days x 2 men x $35/day	1050	1260	420	1260	
Car rental 2 days -$60/trip	300	360	120	360	
Air fare $259 x 2 men	2590	3108	1036	3108	
Support of APG test (RDAT-DT-II)				275	days
1 Man x $35/day				9,625	
Car rental @ $30/day				8,250	
Air fare $141/28 trips				3,948	
Support Test Fort Benning (OT-II)				180	days
1 Man x $35/day				6,300	
Car rental @ $30/day				5,400	
Air fare $172/18 trips				3,096	
Total FY	$3,940	$4,728	$1,576	$41,347	
Total ED Travel	$51,591				

FABRIQUE NATIONALE
OR
CONCEPTUAL CANDIDATE (BC)
ENGINEERING SECTION

FULL SCALE DEVELOPMENT

1. Introduction:

a. The Engineering Section is divided into four (4) parts:

(1) Engineering Direct Labor.

(2) Engineering Material.

(3) Engineering Overhead.

(4) Other Direct Charges to Engineering.

b. Each Engineering part consists of description of the item included and the rationale for including and evaluating each item.

c. Since technical information on the subject is severly limited the costs accrued in each part are the average of the costs for XM233, XM234 and XM235 as developed among the weapon elements according to the percentage of peculiar parts of the weapon system which make up the weapon element. Thus the weapon elements were identified as follows:

Weapon Element

Receiver & Operating Group
Barrel Assembly
Rear Sight
Magazine
Bipod
Sling
Maintenance Tools

2. Rationale for Estimating Engineering Direct Labor Costs Used to Determine the Average Direct Labor Cost.

a. Total Engineering Direct Labor hours is the sum of two inputs:

(1) Engineering Direct Labor hours to accomplish the Engineering Tasks involved in finalizing the weapon design.

(2) Engineering Direct Labor hours to prepare the information required for Data Items.

b. The value for each Direct Labor hour is an average hourly rate applied to all man hours expended in the Engineering effort and was determined for each contractor in coordination with AMSWE-PPX in the following manner:

(1) Estimate the total Direct Labor hours required for each Government GS grade.

(2) Multiply these totals by the respective step 5 hourly rate and add to get a total equivalent Government direct labor cost.

(3) Divide the total equivalent Government direct labor cost by the sum of the direct labor hours, regardless of grade, to obtain an average Government engineering hourly rate.

(4) Compare the average Government engineering hourly rate with the Step 5 hourly rates in the GS pay scale to determine the average grade level of skill employed.

(5) Compare the average grade level of skill with available information on the contractor's pay scale to estimate the average contractors engineering hourly rate.

c. The average contractor's engineering hourly rate is estimated to be $6.69 per hour.

d. Engineering Direct Labor Hours and Costs for Fabrique Nationale or Conceptual Candidate are estimated to be 79,425.

3. Rationale for Estimating Engineering Material Costs (FSDWEMAT):

a. Engineering Materials are considered to consist of miscellaneous material used in performing the engineering effort for Full Scale Development. Layout paper, drafting supplied, bond paper, vollums, computer cards, and computer paper are typical major cost items in this category.

b. Engineering Material Costs are estimated to be:

FY75	275
FY76	660
FY76/77	160
FY77	660
TOTAL	1,755

4. Rationale for Estimating Engineering Overhead (FSDWEOH):

Based on historical data and information available in the Contract Pricing Division, AMSWE-PPX, the average Engineering Overhead Rate is estimated to be 184% of Engineering Direct Labor Cost.

5. Rationale for Estimating Other Direct Charges to Engineering (FSDWEOT):

a. This category includes the cost of travel and charges for computer time during Full Scale Development.

(1) The estimated computer costs are for programming and exercising a dynamic model of the weapon, a heat transfer and stress analysis model of the barrel, and analysis of Maintainability and Reliability as follows:

FY75	2,970
FY76	7,100
76/77	1,830
FY77	7,100
Total Computer Cost	19,000

(2) The estimate of travel costs is as follows:

FY75	2,364.00
FY76	4,728.00
76/77	1,576.00
FY77	49,769.00

Supporting computations may be found under "Estimate of Travel Costs".

b. Other direct Charges to Engineering are summarized as follows:

	FY75	FY76	76/77	FY77
Computer Time	2,970	7,100	1,830	7,100
Travel Costs	2,364	4,728	1,576	49,769
Total by FY	5,334	11,828	3,406	56,869

FY75	5,334	Total ODC	77,437
FY76	11,828	Total Material	1,755
76/77	3,406	Total Overhead	976,417
FY77	56,869	Total Direct Labor	531,353
Total ODC	$77,437	Total Dev. Eng.	1,586,962

d. Estimate of Travel Costs:

	FY75	FY76	76/77	FY77
Informal reviews at Rock Island	3	6	2	6
3 days x 2 men x $35/day	630	1,260	420	1,260
Car Rental 2 days-$60/trip	180	360	120	360
Air Fare $259 x 2 men	1,554	3,108	1,036	3,108
Support of APG Test (RDAT-DT-II)				275 days
1 man x $35/day				$9,265
Car Rental @ $30/day				$8,250
Air Fare $355/28 days				$9,940
Support Test Fort Benning (OT-II)				180 days
1 Man x $35/day				$6,300
Car Rental x $30/day				$5,400
Air Fare $307/18 days				$5,526
Total Travel	$2,364	$4,728	1,576	$49,769

NUMBERS III-A, B, C, AND D

BASIC ESTIMATED COST PACKAGE
INITIAL LIMITED PRODUCTION OF 1000 WEAPONS

A. XM233
B. XM234
C. XM235
D. BEST CONCEPTUAL AND FABRIQUE NATIONALE CONTENDER WEAPONS

LIMITED PRODUCTION RATIONALE

Purpose of the Estimate:

To project the costs of four candidate designs.

Status of Development:

Presently the four candidate weapons are in Advanced Development. Approximately 10 weapons of each type have been built. Limited Production occurs after Full Scale Development during which approximately 100 weapons are to be built.

Assumptions:

1. Estimates were based on existing designs subject to the projected use of castings, forgings, stampings, moldings, extrusions, etc. where part configuration is amenable to these materials.

2. Estimates include jigs, fixtures, dies, etc. It is assumed that no tooling is available from prior development phases.

3. Plant facilities including general purpose equipment such as machine tools, presses, etc., will be available.

4. Production rate will be 100 weapons per month.

5. Costs for Package III-D are considered to be the average of III-A, III-B, and III-C costs.

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED	3. QUANTITY	4. PRODUCTION RATE
Limited Production Contract XM233	1000	100/mo.

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	6. WORK BREAKDOWN STRUCTURE LEVEL	7. ESTIMATE PREPARED AS OF
Squad Automatic Weapon System	4	30 Nov 74

		PRODUCTION			ESTIMATED COSTS				REFERENCE
		8	9	10	11	12	13	14	15
		COST CATEGORIES	HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDULE
A	.	ENGINEERING							
	1	DIRECT LABOR			326,676	131,870	458,546		
	2	MATERIAL			4,000	2,000	6,000		
	3	OVERHEAD			414,671	160,427	575,098		
	4	OTHER			9,039	9,039	18,078		
B	.	TOOLING							
	1	DIRECT LABOR			25,627	128,706	154,333		
	2	MATERIAL			12,600	367,891	380,491		
	3	OVERHEAD			28,189	141,577	169,766		
	4	OTHER			-0-	-0-	-0-		
C	.	QUALITY CONTROL							
	1	DIRECT LABOR			56,602		56,602		
	2	MATERIAL			-0-		-0-		
	3	OVERHEAD			62,262		62,262		
	4	OTHER			-0-		-0-		
D	.	MANUFACTURING							
	1	DIRECT LABOR			426,318		426,318		
	2	MATERIAL			103,820		103,820		
	3	OVERHEAD			468,950		468,950		
	4	OTHER			-0-				
E	.	PURCHASED EQUIPMENT							
F	.	SUBCONTRACT							
G	.	MATERIAL OVERHEAD							
H	.	OTHER							
I	.	TOTAL COST LESS (G AND A)			1938,754	941,510	2880,264		
J	.	GENERAL AND ADMINISTRATIVE	6%						
K	.	TOTAL COST							
L	.	PROFIT OR FEE	10%						
M	.	TOTAL PRICE			2260,587	1097,801	3358,388		

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 1011-R 30 JUN 70 REPLACES AMC FORM 1011-R, 28 MAR 68, WHICH IS OBSOLETE

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED	3. QUANTITY	4. PRODUCTION RATE
In-House Monitoring of XM233 Limited Production Contract	1000	100

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	6. WORK BREAKDOWN STRUCTURE LEVEL	7. ESTIMATE PREPARED AS OF
Squad Automatic Weapon System	4	30 Nov 74

PRODUCTION			ESTIMATED COSTS				REFERENCE
8	9	10	11	12	13	14	15
COST CATEGORIES	HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDULE
A . ENGINEERING							
1 DIRECT LABOR			149,440		149,440		
2 MATERIAL			-0-		-0-		
3 OVERHEAD			146,152		146,152		
4 OTHER			-0-		-0-		
B . TOOLING							
1 DIRECT LABOR							
2 MATERIAL							
3 OVERHEAD							
4 OTHER							
C . QUALITY CONTROL							
1 DIRECT LABOR							
2 MATERIAL							
3 OVERHEAD							
4 OTHER							
D . MANUFACTURING							
1 DIRECT LABOR							
2 MATERIAL							
3 OVERHEAD							
4 OTHER							
E . PURCHASED EQUIPMENT							
F . SUBCONTRACT							
G . MATERIAL OVERHEAD							
H . OTHER							
I . TOTAL COST LESS *(G AND A)*			295,592		295,592		
J . GENERAL AND ADMINISTRATIVE							
K . TOTAL COST							
L . PROFIT OR FEE							
M . TOTAL PRICE							

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 1011-R 30 JUN 70 REPLACES AMC FORM 1011-R, 28 MAR 68, WHICH IS OBSOLETE

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED	3. QUANTITY	4. PRODUCTION RATE
Limited Production Contract XM234	1000	100/mo

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	6. WORK BREAKDOWN STRUCTURE LEVEL	7. ESTIMATE PREPARED AS OF
Squad Automatic Weapon System	4	30November 1974

PRODUCTION				ESTIMATED COSTS				REFERENCE
8			9	10	11	12	13	14	15
COST CATEGORIES			HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDULE
A	.	ENGINEERING							
	1	DIRECT LABOR			327,960	132,515	460,475		
	2	MATERIAL			4,000	2,000	6,000		
	3	OVERHEAD			415,888	161,315	577,203		
	4	OTHER			9,083	9,083	18,166		
B	.	TOOLING							
	1	DIRECT LABOR			25,609	155,532	181,141		
	2	MATERIAL			12,600	351,503	364,103		
	3	OVERHEAD			28,168	171,085	199,253		
	4	OTHER			-0-	-0-	-0-		
C	.	QUALITY CONTROL							
	1	DIRECT LABOR			56,567		56,567		
	2	MATERIAL			-0-		-0-		
	3	OVERHEAD			62,234		62,234		
	4	OTHER			-0-		-0-		
D	.	MANUFACTURING							
	1	DIRECT LABOR			426,148		426,148		
	2	MATERIAL			67,200		67,200		
	3	OVERHEAD			468,763		468,763		
	4	OTHER			-0-		-0-		
E	.	PURCHASED EQUIPMENT							
F	.	SUBCONTRACT							
G	.	MATERIAL OVERHEAD							
H	.	OTHER							
I	.	TOTAL COST LESS (G AND A)			1904,220	983,033	2887,253		
J	.	GENERAL AND ADMINISTRATIVE							
K	.	TOTAL COST							
L	.	PROFIT OR FEE							
M	.	TOTAL PRICE			2220,321	1146,216	3366,537		

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011-R REPLACES AMC FORM 1011-R, 28 MAR 60, WHICH IS OBSOLETE

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED	3. QUANTITY	4. PRODUCTION RATE
In-House Monitoring of XM234 Limited Production Contract	1000	100/mo

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	6. WORK BREAKDOWN STRUCTURE LEVEL	7. ESTIMATE PREPARED AS OF
Squad Automatic Weapon System	4	30 November 1974

PRODUCTION			ESTIMATED COSTS				REFERENCE
8	9	10	11	12	13	14	15
COST CATEGORIES	HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDULE
A - ENGINEERING							
1 DIRECT LABOR			149,440		149,440		
2 MATERIAL							
3 OVERHEAD			146,152		146,152		
4 OTHER							
B - TOOLING							
1 DIRECT LABOR							
2 MATERIAL							
3 OVERHEAD							
4 OTHER							
C - QUALITY CONTROL							
1 DIRECT LABOR							
2 MATERIAL							
3 OVERHEAD							
4 OTHER							
D - MANUFACTURING							
1 DIRECT LABOR							
2 MATERIAL							
3 OVERHEAD							
4 OTHER							
E - PURCHASED EQUIPMENT							
F - SUBCONTRACT							
G - MATERIAL OVERHEAD							
H - OTHER							
I - TOTAL COST LESS (G AND A)			295,592		295,592		
J - GENERAL AND ADMINISTRATIVE							
K - TOTAL COST							
L - PROFIT OR FEE							
M - TOTAL PRICE							

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011-R

REPLACES AMC FORM 1011-R, 28 MAR 68, WHICH IS OBSOLETE

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED	3. QUANTITY	4. PRODUCTION RATE
Limited Production Contract XM235	1000	100/mo.

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	6. WORK BREAKDOWN STRUCTURE LEVEL	7. ESTIMATE PREPARED AS OF
Squad Automatic Weapon System	4	30 Nov 74

PRODUCTION			ESTIMATED COSTS				REFERENCE
8	9	10	11	12	13	14	15
COST CATEGORIES	HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDULE
A - ENGINEERING			275,978	111,976	387,954		
1 DIRECT LABOR			4,000	2,000	6,000		
2 MATERIAL			348,439	135,691	484,130		
3 OVERHEAD			8,089	8,089	16,178		
4 OTHER							
B - TOOLING							
1 DIRECT LABOR			21,169	123,726	144,895		
2 MATERIAL			10,400	380,009	390,409		
3 OVERHEAD			23,285	136,097	159,382		
4 OTHER			-0-	-0-	-0-		
C - QUALITY CONTROL							
1 DIRECT LABOR			46,748		46,748		
2 MATERIAL			-0-		-0-		
3 OVERHEAD			51,423		51,423		
4 OTHER			-0-		-0-		
D - MANUFACTURING							
1 DIRECT LABOR			351,712		351,712		
2 MATERIAL			84,000		84,000		
3 OVERHEAD			386,883		386,883		
4 OTHER							
E - PURCHASED EQUIPMENT							
F - SUBCONTRACT							
G - MATERIAL OVERHEAD							
H - OTHER							
I - TOTAL COST LESS (G AND A)			1612,126	897,588	2509,714		
J - GENERAL AND ADMINISTRATIVE							
K - TOTAL COST							
L - PROFIT OR FEE							
M - TOTAL PRICE			1879,739	1046,588	2926,327		

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 1011-R 30 JUN 70 REPLACES AMC FORM 1011-R, 28 MAR 68, WHICH IS OBSOLETE

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED: In-House Monitoring of XM235 Limited Production Contract

3. QUANTITY: 1000

4. PRODUCTION RATE: 100/mo.

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT: Squad Automatic Weapon System

6. WORK BREAKDOWN STRUCTURE LEVEL: 4

7. ESTIMATE PREPARED AS OF: 30 November 1974

PRODUCTION				ESTIMATED COSTS				REFERENCE
8		9	10	11	12	13	14	15
COST CATEGORIES		HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDULE
A	- ENGINEERING							
	1 DIRECT LABOR			149,440		149,440		
	2 MATERIAL			-0-		-0-		
	3 OVERHEAD			146,152		146,152		
	4 OTHER			-0-		-0-		
B	- TOOLING							
	1 DIRECT LABOR							
	2 MATERIAL							
	3 OVERHEAD							
	4 OTHER							
C	- QUALITY CONTROL							
	1 DIRECT LABOR							
	2 MATERIAL							
	3 OVERHEAD							
	4 OTHER							
D	- MANUFACTURING							
	1 DIRECT LABOR							
	2 MATERIAL							
	3 OVERHEAD							
	4 OTHER							
E	- PURCHASED EQUIPMENT							
F	- SUBCONTRACT							
G	- MATERIAL OVERHEAD							
H	- OTHER							
I	- TOTAL COST LESS (G AND A)			295,592		295,592		
J	- GENERAL AND ADMINISTRATIVE							
K	- TOTAL COST							
L	- PROFIT OR FEE							
M	- TOTAL PRICE							

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 Nov 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 1011-R 30 JUN 70 REPLACES AMC FORM 1011-R, 20 MAR 68, WHICH IS OBSOLETE

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22)

1. PREPARING INSTALLATION			
SARRI-LS-C			
2. SUPPLIES OR SERVICES TO BE PROCURED		**3. QUANTITY**	**4. PRODUCTION RATE**
Limited Production Contract F-N or BC		1000	100/Mo
5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	**6. WORK BREAKDOWN STRUCTURE LEVEL**	**7. ESTIMATE PREPARED AS OF**	
Squad Automatic Weapon System	4	30 Nov 74	

PRODUCTION			ESTIMATED COSTS				REFERENCE
8	9	10	11	12	13	14	15
COST CATEGORIES	HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDULE
A - ENGINEERING							
1 DIRECT LABOR			310,205	125,453	435,658		
2 MATERIAL			4,000	2,000	6,000		
3 OVERHEAD			392,999	152,478	545,477		
4 OTHER			8,737	8,737	17,474		
B - TOOLING							
1 DIRECT LABOR			24,135	135,988	160,123		
2 MATERIAL			11,866	366,468	378,334		
3 OVERHEAD			26,547	149,586	176,133		
4 OTHER			-0-	-0-	-0-		
C - QUALITY CONTROL							
1 DIRECT LABOR			53,306		53,306		
2 MATERIAL			-0-		-0-		
3 OVERHEAD			58,640		58,640		
4 OTHER			-0-		-0-		
D - MANUFACTURING							
1 DIRECT LABOR			401,393		401,393		
2 MATERIAL			85,007		85,007		
3 OVERHEAD			441,532		441,532		
4 OTHER			-0-				
E - PURCHASED EQUIPMENT							
F - SUBCONTRACT							
G - MATERIAL OVERHEAD							
H - OTHER							
I - TOTAL COST LESS *(G AND A)*			1,818,367	940,710	2,759,077		
J - GENERAL AND ADMINISTRATIVE							
K - TOTAL COST							
L - PROFIT OR FEE							
M - TOTAL PRICE			2,120,216	1,096,868	3,217,084		

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 November 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011-R

REPLACES AMC FORM 1011-R, 28 MAR 68, WHICH IS OBSOLETE

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22)

1. PREPARING INSTALLATION: SARRI-LS-C

2. SUPPLIES OR SERVICES TO BE PROCURED	3. QUANTITY	4. PRODUCTION RATE
In-House Monitoring of F-N or BC Limited Production Contract	1000	100/Mo

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	6. WORK BREAKDOWN STRUCTURE LEVEL	7. ESTIMATE PREPARED AS OF
Squad Automatic Weapon System	4	30 Nov 74

PRODUCTION			ESTIMATED COSTS				REFERENCE
8	9	10	11	12	13	14	15
COST CATEGORIES	HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDULE
A . ENGINEERING							
1 DIRECT LABOR			149,440		149,440		
2 MATERIAL			-0-		-0-		
3 OVERHEAD			146,152		146,152		
4 OTHER			-0-		-0-		
B . TOOLING							
1 DIRECT LABOR							
2 MATERIAL							
3 OVERHEAD							
4 OTHER							
C . QUALITY CONTROL							
1 DIRECT LABOR							
2 MATERIAL							
3 OVERHEAD							
4 OTHER							
D . MANUFACTURING							
1 DIRECT LABOR							
2 MATERIAL							
3 OVERHEAD							
4 OTHER							
E . PURCHASED EQUIPMENT							
F . SUBCONTRACT							
G . MATERIAL OVERHEAD							
H . OTHER							
I . TOTAL COST LESS (G AND A)			295,592		295,592		
J . GENERAL AND ADMINISTRATIVE							
K . TOTAL COST							
L . PROFIT OR FEE							
M . TOTAL PRICE							

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	30 November 74
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 1011-R, 30 JUN 70 — REPLACES AMC FORM 1011-R, 28 MAR 66, WHICH IS OBSOLETE

	XM233	XM234	XM235	BC/FN A+B+C 3
2.0 Investment Nonrecurring				
2.1 Contract				
2.11 Initial Prod Facilities				
Engineering				
Direct Labor	131,870	132,515	111,976	
Material	2,000	2,000	2,000	
Overhead	160,427	161,315	135,691	
Other Direct Chgs.	9,039	9,083	8,089	
2.12 Initial Prod Fac.				
Tooling				
Direct Labor	128,706	155,532	123,726	
Material	367,891	351,503	380,009	
Overhead	141,577	171,085	136,097	
Other Direct Chgs.	-0-	-0-	-0-	
2.13 Other	-0-	-0-	-0-	
2.14 Total Cost	941,510	983,033	897,588	940,710
2.15 G&A 6%				
2.16 Profit 10%				
2.17 Total Price	1,097,801	1,146,216	1,046,588	1,096,868
3.0 Investment Recurring				
3.1 Contract				
3.11 Production				
3.111 Engineering				
Direct Labor	326,676	327,960	275,978	
Material	4,000	4,000	4,000	
Overhead	414,671	415,888	348,439	
Other Direct Chgs.	9,039	9,083	8,089	
3.112 Tooling(maintenance of)				
Direct Labor	25,627	25,609	21,169	
Material	12,600	12,600	10,400	
Overhead	28,189	28,168	23,285	
Other Direct Chgs.				
3.113 Manufacturing				
Direct Labor	426,318	426,148	351,712	
Material	103,820	67,200	84,000	
Overhead	468,950	468,763	386,883	
Other Direct Chgs.				
3.114 Quality Control				
Direct Labor	56,602	56,567	46,748	
Material	-	-	-	
Overhead	62,262	62,234	51,423	
Other Direct Chgs.	-0-	-0-	-0-	
3.115 Other	-0-	-0-	-0-	
3.116 Total Cost	1,938,754	1,904,220	1,612,126	1,818,367

	XM233	XM234	XM235	BC/FN A+B+C / 3
3.117 G&A 6%				
3.118 Profit 10%				
3.119 Total Price	2,260,587	2,220,321	1,879,739	2,120,216
3.12 Engineering Changes (Included in 3.111)				
3.13 FDT	-	-	-	-
3.14 MWO's	-	-	-	-
3.2 In-House				
3.21 Production				
3.211 Engineering (Supervision and monitoring of contractors)				
Direct Labor	149,440	149,440	149,440	
Material				
Overhead	146,152	146,152	146,152	
Other Direct Chgs.				
3.3 Quantity (Units Produced)	1,000	1,000	1,000	
3.4 Total In-House	295,592	295,592	295,592	295,592

NUMBER IV-A

BASIC COST ESTIMATE PACKAGE
FULL SCALE PRODUCTION
XM233 IN 6.00MM

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22) (On R&D Drawings)

1. PREPARING INSTALLATION: AMSAR-PPX-PD — ARMCOM 75-a

2. SUPPLIES OR SERVICES TO BE PROCURED: SAWS, Maremont

3. QUANTITY: 80,000

4. PRODUCTION RATE: 2,000/mo.

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT

6. WORK BREAKDOWN STRUCTURE LEVEL: 4

7. ESTIMATE PREPARED AS OF: 9 Oct 74

		8 COST CATEGORIES	9 PRODUCTION HOURS	10 PRODUCTION RATE	11 ESTIMATED COSTS RECURRING	12 ESTIMATED COSTS NONRECURRING	13 ESTIMATED COSTS TOTAL COST	14 ESTIMATED COSTS UNIT COST	15 REFERENCE SCHEDI
A	.	ENGINEERING					290,906	3,636	
	1	DIRECT LABOR	20,779	7.00	145,453		145,453		
	2	MATERIAL							
	3	OVERHEAD		100%	145,453		145,453		
	4	OTHER							
B	.	TOOLING					1,653,774	20,672	
	1	DIRECT LABOR	37,119	5.86	217,517		217,517		
	2	MATERIAL			1,218,740		1,218,740		
	3	OVERHEAD		100%	217,517		217,517		
	4	OTHER							
C	.	QUALITY CONTROL					351,564	4,395	
	1	DIRECT LABOR	41,556	4.23	175,782		175,782		
	2	MATERIAL							
	3	OVERHEAD		100%	175,782		175,782		
	4	OTHER							
D	.	MANUFACTURING					48,438,281	605,479	
	1	DIRECT LABOR	1,620,300	5.17	8,376,951		8,376,951		
	2	MATERIAL			18,197,488		18,197,488		
	3	OVERHEAD		261%	21,863,842		21,863,842		
	4	OTHER							
E	.	PURCHASED EQUIPMENT							
F	.	SUBCONTRACT							
G	.	MATERIAL OVERHEAD							
H	.	OTHER							
I	.	TOTAL COST LESS (G AND A)					50,734,525	634,182	
J	.	GENERAL AND ADMINISTRATIVE		6%			3,044,072	38,051	
K	.	TOTAL COST					53,778,597	672,233	
L	.	PROFIT OR FEE		10%			5,377,860	67,223	
M	.	TOTAL PRICE					59,156,457	739,456	

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL MICHAEL H. TANAKA Industrial Engineer	Michael H. Tanaka	4207	9 Oct 74
b. REVIEWING OFFICIAL DENNIS W. MEREDITH Ch, Price Dev & Tech An Br	Dennis W. Meredith	4207	9 Oct 74
c. APPROVING OFFICIAL W. H. COFFENBERRY Chief, Contract Pricing Div	W. H. Coffenberry	4831-218	9 Oct 74

AMC FORM 30 JUN 70 1011-R REPLACES AMC FORM 1011-R, 28 MAR 68, WHICH IS OBSOLETE

Official Use Only

NUMBER IV-B

BASIC COST ESTIMATE PACKAGE
FULL SCALE PRODUCTION
XM234 IN 6.00MM

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22) (On R&D Drawings)

1. PREPARING INSTALLATION: AMSAR-PPX-PD — ARMCOM 75-b

2. SUPPLIES OR SERVICES TO BE PROCURED: SAWS, Philco-Ford

3. QUANTITY: 80,000

4. PRODUCTION RATE: 2,000/mo.

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT:

6. WORK BREAKDOWN STRUCTURE LEVEL: 4

7. ESTIMATE PREPARED AS OF: 9 Oct 74

		PRODUCTION			ESTIMATED COSTS				REFERENCE
		8	9	10	11	12	13	14	15
		COST CATEGORIES	HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHED
A	.	ENGINEERING					290,906	3.636	
	1	DIRECT LABOR	20,779	7.00	145,453		145,453		
	2	MATERIAL							
	3	OVERHEAD		100%	145,453		145,453		
	4	OTHER							
B	.	TOOLING					1,749,494	21,869	
	1	DIRECT LABOR	44,852	5.86	262,833		262,833		
	2	MATERIAL			1,223,828		1,223,828		
	3	OVERHEAD		100%	262,833		262,833		
	4	OTHER							
C	.	QUALITY CONTROL					351,564	4.395	
	1	DIRECT LABOR	41,550	4.23	175,782		175,782		
	2	MATERIAL							
	3	OVERHEAD		100%	175,782		175,782		
	4	OTHER							
D	.	MANUFACTURING					42,102,738	526,284	
	1	DIRECT LABOR	1,619,534	5.17	8,372,991		8,372,991		
	2	MATERIAL			11,876,240		11,876,240		
	3	OVERHEAD		261%	21,853,507		21,853,507		
	4	OTHER							
E	.	PURCHASED EQUIPMENT							
F	.	SUBCONTRACT							
G	.	MATERIAL OVERHEAD							
H	.	OTHER							
I	.	TOTAL COST LESS (G AND A)					44,494,702	556.184	
J	.	GENERAL AND ADMINISTRATIVE		6%			2,669,682	33.371	
K	.	TOTAL COST					47,164,384	589.555	
L	.	PROFIT OR FEE		10%			4,716,438	58.955	
M	.	TOTAL PRICE					51,880,822	648.510	

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL MICHAEL H. TANAKA Industrial Engineer	Michael H. Tanaka	4207	9 Oct 74
b. REVIEWING OFFICIAL DENNIS W. MEREDITH Ch, Price Dev & Tech An Br	Dennis W. Meredith	4207	9 Oct 74
c. APPROVING OFFICIAL W. H. COFFENBERRY Chief, Contract Pricing Div	W. H. Coffenberry	4831-218	9 Oct 74

AMC FORM 30 JUN 70 1011-R — REPLACES AMC FORM 1011-R, 28 MAR 68, WHICH IS OBSOLETE.

NUMBER IV-C

BASIC COST ESTIMATE PACKAGE
FULL SCALE PRODUCTION
XM235 IN 6.00MM

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22) (On R & D Drawings)

1. PREPARING INSTALLATION: AMSAR-PPX-PD — 7.96 — ARMCOM 75-c

2. SUPPLIES OR SERVICES TO BE PROCURED: SAWS, Rodman

3. QUANTITY: 80,000

4. PRODUCTION RATE: ? other estimates were 2,000/mo. — 8,000/mo.

5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT:

6. WORK BREAKDOWN STRUCTURE LEVEL: 4

7. ESTIMATE PREPARED AS OF: 9 Oct 74

PRODUCTION				ESTIMATED COSTS				REFERENCE
8	9	10	11	12	13	14	15
COST CATEGORIES	HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDI
A . ENGINEERING					290,906	3.636	
1 DIRECT LABOR	20,779	7.00	145,453		145,453		
2 MATERIAL							
3 OVERHEAD		100%	145,453		145,453		
4 OTHER							
B . TOOLING					1,401,280	17.516	
1 DIRECT LABOR	36,239	5.86	212,361		212,361		
2 MATERIAL			976,558		976,558		
3 OVERHEAD		100%	212,361		212,361		
4 OTHER							
C . QUALITY CONTROL					351,564	4.395	
1 DIRECT LABOR	41,556	4.23	175,782		175,782		
2 MATERIAL							
3 OVERHEAD		100%	175,782		175,782		
4 OTHER							
D . MANUFACTURING					33,931,324	424.142	
1 DIRECT LABOR	1,338,170	5.17	6,918,339		6,918,339		
2 MATERIAL			8,956,120		8,956,120		
3 OVERHEAD		261%	18,056,865		18,056,865		
4 OTHER							
E . PURCHASED EQUIPMENT							
F . SUBCONTRACT							
G . MATERIAL OVERHEAD							
H . OTHER							
I . TOTAL COST LESS (G AND A)					35,975,074	449.689	
J . GENERAL AND ADMINISTRATIVE 6%					2,158,504	26.981	
K . TOTAL COST					38,133,578	476,670	
L . PROFIT OR FEE 10%					3,813,358	47,667	
M . TOTAL PRICE					41,946,936	524.337	

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL MICHAEL H. TANAKA Industrial Engineer	Michael H. Tanaka	4207	9 Oct 74
b. REVIEWING OFFICIAL DENNIS W. MEREDITH Ch, Price Dev & Tech An Br	Dennis W. Meredith	4207	9 Oct 74
c. APPROVING OFFICIAL W. H. COFFENBERRY Chief, Contract Pricing Div	W. H. Coffenberry	4831-218	9 Oct 74

AMC FORM 30 JUN 70 1011-R Encl 3 REPLACES AMC FORM 1011-R, 28 MAR 68, WHICH IS OBSOLETE

NUMBER IV - D

BASIC COST ESTIMATE PACKAGE
FULL SCALE PRODUCTION
FABRIQUE NATIONALE OR
BEST CONCEPTUAL WEAPON

INDEPENDENT GOVERNMENT COST ESTIMATE--PRODUCTION

(AMCR 715-22) NUMBER IV-D

1. PREPARING INSTALLATION			
SARRI-LS-C			
2. SUPPLIES OR SERVICES TO BE PROCURED		3. QUANTITY	4. PRODUCTION RATE
SAWS Fabrique Nationale or Best Conceptual Weapon		80,000	2000/Mo.
5. SYSTEM(S) SUPPORTED BY THIS PROCUREMENT	6. WORK BREAKDOWN STRUCTURE LEVEL	7. ESTIMATE PREPARED AS OF	
Squad Auotmatic Weapon System	4	9 Oct 74	

PRODUCTION				ESTIMATED COSTS				REFERENCE
8	9	10	11	12	13	14	15
COST CATEGORIES	HOURS	RATE	RECURRING	NONRECURRING	TOTAL COST	UNIT COST	SCHEDULE
A . ENGINEERING					290,906	3.636	
1 DIRECT LABOR	20,779	7.00	145,453		145,453		
2 MATERIAL							
3 OVERHEAD		100%	145,453		145,453		
4 OTHER							
B . TOOLING					1,601,513	20.019	
1 DIRECT LABOR	39,403	5.86	230,902		230,902		
2 MATERIAL			1,139,709		1,139,709		
3 OVERHEAD		100%	230,902		230,902		
4 OTHER							
C . QUALITY CONTROL					351,564	4.395	
1 DIRECT LABOR	41,556	4.23	175,782		175,782		
2 MATERIAL							
3 OVERHEAD		100%	175,782		175,782		
4 OTHER							
D . MANUFACTURING					41,490,773	518.635	
1 DIRECT LABOR	1,526,00	5.17	7,889,425		7,889 425		
2 MATERIAL			13,009,949		13,009,949		
3 OVERHEAD		261%	20,591,399		20,591,399		
4 OTHER							
E . PURCHASED EQUIPMENT							
F . SUBCONTRACT							
G . MATERIAL OVERHEAD							
H . OTHER							
I . TOTAL COST LESS (G AND A)					43,734,756	546.685	
J . GENERAL AND ADMINISTRATIVE 6%					2,624,085	32.801	
K . TOTAL COST					46,358,841	579.486	
L . PROFIT OR FEE 10%					4,635,884	57.949	
M . TOTAL PRICE					50,994,726	637.434	

16. TYPED NAME AND TITLE	SIGNATURE	EXTENSION	DATE
a. PREPARING OFFICIAL ROY F. SCHWEGLER Mechanical Engineer		4255	6 May 75
b. REVIEWING OFFICIAL			
c. APPROVING OFFICIAL			

AMC FORM 30 JUN 70 1011-R REPLACES AMC FORM 1011-R, 28 MAR 68, WHICH IS OBSOLETE

DISTRIBUTION

Commander US Army Armament Command ATTN: AMSAR-RDG	3
AMSAR-PPX	1
AMSAR-PPM	1
AMSAR-CP	1
AMSAR-CPE	1
Commander US Army Material Command 5001 Eisenhower Avenue Alexandria, VA 22333 ATTN: AMCAM-L	1
AMCRD	1
HQ, DA ATTN: DAMA-PPM-I	3
Commander Defense Documentation Center for Scientific and Technical Information Cameron Station Alexandria, VA 22314 ATTN: Document Service Center	2
Commander Rock Island Arsenal Rock Island, IL 61201 ATTN: SARRI-LS	8
Commander Frankford Arsenal Bridge & Tacony Streets Philadelphia, PA 19137 ATTN: SARFA-MDS	2