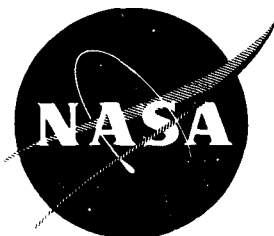


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TWR-5672\*



# STUDY OF SOLID ROCKET MOTOR FOR SPACE SHUTTLE BOOSTER

VOLUME IV COST

by

*Thiokol* / WASATCH DIVISION  
A DIVISION OF THIOKOL CHEMICAL CORPORATION

prepared for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

George C. Marshall Space Flight Center

Contract NAS 8-28430

Data Procurement Document No. 314

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FINAL REPORT

N73- 24802

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FOR SPACE SHUTTLE BOOSTER

VOLUME IV COST

by

THIOKOL/WASATCH DIVISION  
A Division of Thiokol Chemical Corporation  
P.O. Box 524, Brigham City, Utah 84302

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15 March 1972

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Data Procurement Document No. 314  
Data Requirement MA-02

George C. Marshall Space Flight Center  
Marshall Space Flight Center, Alabama

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NATIONAL TECHNICAL  
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SPRINGFIELD, VA. 22161

## PREFACE

This report contains the results of Thiokol Chemical Corporation's Study of Solid Rocket Motors for Space Shuttle Booster. The objective of the study was to provide data to assist National Aeronautics and Space Administration in selection of the booster for the Space Shuttle system. This objective was satisfied through definition of specific Solid Rocket Motor (SRM) stage designs, development program requirements, and production and launch program requirements, as well as the development of credible cost data for each program phase. The study was performed by Thiokol's Wasatch Division, Brigham City, Utah, for the NASA George C. Marshall Space Flight Center under Contract NAS 8-28430. The study was conducted under the direction of Mr. Daniel H. Driscoll/PD-RV-MGR NASA/MSFC. Thiokol study direction was provided by Messrs. E. R. Kearney, Corporate Director, Space Shuttle Program, and J. D. Thirkill, Program Manager, Space Shuttle SRM Booster Study, Wasatch Division.

The final report was prepared in response to Data Procurement Document 314 and Data Requirement MA-02. The report is arranged in four volumes:

- Volume I - Executive Summary
- Volume II - Technical
- Volume III - Program Planning Acquisition
- Volume IV - Cost

Data Requirement MA-02 specified that the Cost report be part of the Program Acquisition and Planning report but because of its importance and size it has been bound as a separate volume in this Final Report.

Volume II, Technical, has been further subdivided into five books as follows for ease of review and handling:

### Book 1

- Section 1.0 - Introduction
- Section 2.0 - Propulsion System Definition
- Section 3.0 - SRM Stage

**Book 2**

- Section 4.0 - SRM Parametric Data**
- Section 5.0 - SRM Stage Recovery**
- Section 6.0 - Environmental Effects**
- Section 7.0 - Reliability and Failure Modes**
- Section 8.0 - System Safety Analysis**
- Section 9.0 - Ground Support Equipment**
- Section 10.0 - Transportation, Assembly, and Checkout**

**Book 3**

- Appendix A - Systems Requirements Analysis**

**Book 4**

- Appendix B - Mass Property Report**
- Appendix C - Stage and SRM CI Specifications**
- Appendix D - Drawings, Bill of Materials, Preliminary ICD's**

**Book 5**

- Appendix E - Recovery System Characteristics for Thiokol Chemical Corporation Solid Propellant Space Shuttle Boosters**
- Appendix F - Quantitative Assessment of Environmental Effects of Rocket Engine Emissions During Space Shuttle Operations at Kennedy Space Center**
- Appendix G - Thiokol Solid Propellant Rocket Engine Noise Prediction**
- Appendix H - SRM Stage Recovery**

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## CONTENTS

	<u>Page</u>
1.0 INTRODUCTION . . . . .	1
2.0 COST ESTIMATING PHILOSOPHY . . . . .	2
3.0 COST CREDIBILITY . . . . .	5
4.0 COST ITEM DEFINITIONS . . . . .	8
5.0 COST SUMMARIES . . . . .	11
5.1 <u>156-Inch Parallel</u> . . . . .	11
5.1.1 Summary . . . . .	13
5.1.2 Expendable . . . . .	15
5.1.2.1 Probable Cost . . . . .	16
5.1.2.1.1 W/O TVC and Thrust Termination . . . . .	17
5.1.2.1.2 With TVC and Thrust Termination . . . . .	26
5.1.2.2 Ceiling Cost . . . . .	35
5.1.2.2.1 W/O TVC and Thrust Termination . . . . .	36
5.1.2.2.2 With TVC and Thrust Termination . . . . .	45
5.1.3 Recoverable . . . . .	54
5.1.3.1 Probable Cost . . . . .	55
5.1.3.1.1 W/O TVC and Thrust Termination . . . . .	56
5.1.3.1.2 With TVC and Thrust Termination . . . . .	62
5.1.3.2 Ceiling Cost . . . . .	68
5.1.3.2.1 W/O TVC and Thrust Termination . . . . .	69
5.1.3.2.2 With TVC and Thrust Termination . . . . .	75
5.2 <u>156-Inch Series</u> . . . . .	81
5.2.1 Summary . . . . .	83
5.2.2 Expendable . . . . .	85
5.2.2.1 Probable Cost . . . . .	86
5.2.2.2 Ceiling Cost . . . . .	95
5.2.2.2.1 With TVC and W/O Thrust Termination . . . . .	96
5.2.2.2.2 With TVC and Thrust Termination . . . . .	105
5.2.3 Recoverable . . . . .	114
5.2.3.1 Probable Cost . . . . .	115
5.2.3.2 Ceiling Cost . . . . .	121
5.2.3.2.1 With TVC and W/O Thrust Termination . . . . .	122
5.2.3.2.2 With TVC and Thrust Termination . . . . .	128

CONTENTS (Cont)

	<u>Page</u>
5.3 <u>260-Inch Series</u> .....	134
5.3.1 Summary .....	136
5.3.2 Expendable .....	138
5.3.3 Recoverable .....	143
5.4 <u>120-Inch Parallel</u> .....	148
5.4.1 Summary .....	150
5.4.2 Expendable .....	152
6.0 FACILITIES .....	157
7.0 MAXIMUM SUCCESS SCHEDULE .....	158
8.0 PARAMETRIC COST DATA .....	159

## 1.0 INTRODUCTION

This volume contains the cost data for solid rocket motors for a Space Shuttle Booster pursuant to the requirements outlined in NASA Contract Number NAS8-28430. The cost data are presented in the format prescribed in the attachment to Data Requirement Number MA-02 for the selected 156 inch parallel and series burn configurations as amended by NASA Letter PM-EP-MGR dated January 31, 1972. In addition, summary cost data are provided for DDT&E, production and production facilities for the 120 inch and 260 inch configurations. Probable costs are provided for all configurations. Both probable costs and ceiling costs are provided for the 156 inch booster stages as explained in Section 2.0, Cost Estimating Philosophy.

A breakdown of facilities included in the probable cost for the 156 inch parallel burn configuration is set forth in Section 6.0. Delta costs for the maximum success schedule requested in the January 31, 1972 NASA letter are set forth in Section 7.0. Section 8.0 consists of graphs depicting parametric cost estimating relationships pursuant to Table 3 of DR MA-02.



## 2.0 COST ESTIMATING PHILOSOPHY

The Solid Rocket Motor costs for this study were prepared utilizing the standard Thiokol/Wasatch estimating procedure. This procedure was augmented by a Space Shuttle Task Force organized and staffed by specialists from the major functional organizations: Program Management, Manufacturing, Quality Test, Engineering, Reliability, Procurement and Pricing.

The Task Force established a baseline configuration for the 156 inch SRM and subsequently prepared the program plan, program schedule and work breakdown structure. These were distributed to the estimating organizations within each of the operating departments: Operations, including Manufacturing, Quality Assurance and Test, Industrial Engineering, Safety, and Transportation; Engineering, including Reliability and Value Engineering, the Development Laboratories, Project Engineering, and Engineering Design; Program Management; Data Processing; Contracts; Publications; Financial Controls; and Procurement. Each of these organizations prepared detailed estimates to the fifth level of the work breakdown structure. These estimates were based upon standards and past experience from similar programs such as Minuteman, Poseidon and the 156 Inch SRM Booster programs. In addition, throughout the estimating period, daily meetings were held by the Space Shuttle Task Force to coordinate configuration and program changes in order to ensure the accuracy of the estimate.

In particular, the direct labor estimates for Manufacturing, Quality Assurance and Test Divisions were prepared by the Industrial Engineering Department utilizing Industrial Engineering Estimate Summaries and Manufacturing Plans prepared especially for the 156-Inch SRM Space Shuttle. The Manufacturing Plans also were used to establish tooling and facility requirements. The Estimate Summaries show the application of Industrial Engineering Time Standards to detailed elements of Manufacturing Plans. The Industrial Engineering Time Standards are based on stop watch time studies of identical operations or the use of standard data (application of time standards extrapolated from time studies). The Estimate Summary sheets include referenced to the Manufacturing Plans, operations numbers, performing cost centers, work descriptions, crew sizes, cycle time, standard manhours and performance and supervisory factors applied to determine total manhour requirements. In production new Estimate Summary sheets were made for nozzle joint fabrication and propellant preparation operations to reflect time standard reductions resulting from machining in larger lot sizes and the use of new or modified facilities or tooling when 100 or more segments are processed per year.

During the period of time which was allotted for estimating this program, Thiokol solicited quotations from reliable subcontractors for major components and material. These items include the case, nozzle, insulation, auxiliary power unit, attach structure and propellant raw materials. After a review by the Task Force, these vendor quotations were utilized in costing the program. These costs include the product cost in addition to tooling and the additional facility requirements required to meet the program schedule. Thiokol has had considerable experience with these subcontractors over the years on Minuteman, Poseidon and the 156-Inch SRM programs and has confidence in their capabilities as to product quality, timely delivery and accurate costs. The vendors have submitted written commitments to support the SRM Space Shuttle Booster Program at all peak annual launch rates.

The labor estimates from the functional organizations and the vendor quotations were consolidated by Pricing which then applied approved labor rates and burdens to arrive at the final costs to the level required by NASA in the work breakdown structure.

The Task Force reviewed the total package comprising DDT&E, Production and Site Operations in order to assure that adequate and credible costs were available in all areas. The review revealed that: (1) adequate consideration had been given to design, engineering analysis, development tests and manufacturing procedures; (2) the projected manufacturing improvement was sound; (3) adequate staffing of all organizations was reasonable to assure the attainment of program objectives; (4) adequate quantities of components and materials were included with allowance for motor losses; and (5) site operations analysis was reviewed to assure that proper manning and equipment considerations had been made.

Upon completion of the review, the costs were adjusted as required based upon previous experience. The resulting costs reflect the inputs of the operating organizations and vendor quotations and are designated "probable costs" inasmuch as Thiokol considers them to be valid. In view of previous statistical estimates which were somewhat higher, the significant cost elements including vendor quotations were reviewed again. As a result certain cost elements and vendor quotations were increased in order to provide complete confidence. The resulting costs are designated "ceiling costs."

Detailed cost data for the various configurations and options are provided in this section including both probable and ceiling costs. The following is a selected exemplary summary for the two SRM 156 inch parallel burn booster stage for the 60 vehicle peak annual launch rate.

	<u>Probable Cost</u> (Dollars in Thousands)		<u>Ceiling Cost</u> (Dollars in Thousands)	
	<u>Without TVC &amp; TT</u>	<u>With TVC &amp; TT</u>	<u>Without TVC &amp; TT</u>	<u>With TVC &amp; TT</u>
ED & D	\$ 39,839	\$ 51,320	\$ 44,990	\$ 57,283
Tooling	7,553	9,702	9,798	12,332
GTH	7,586	8,460	8,166	9,107
FTH	<u>33,548</u>	<u>38,911</u>	<u>38,890</u>	<u>44,693</u>
Total DDT & E	\$ 88,526	\$ 108,393	\$ 101,844	\$ 123,415
Production	\$ 1,777,723	\$ 1,988,310	\$ 2,214,930	\$ 2,489,613
Tooling	23,078	24,008	27,868	29,388
Facilities	<u>99,764</u>	<u>99,764</u>	<u>108,288</u>	<u>108,288</u>
Total Production	\$ 1,900,615	\$ 2,112,082	\$ 2,351,086	\$ 2,627,289
Operations	<u>\$ 15,677</u>	<u>\$ 15,677</u>	<u>\$ 17,016</u>	<u>\$ 17,016</u>
Total Program	\$ 2,004,818	\$ 2,236,152	\$ 2,469,946	\$ 2,767,720

### 3.0 COST CREDIBILITY

#### 3.1 GENERAL

The cost data presented herein for the SRM booster stage are based upon Thiokol and vendor experience. Because of the demonstrated technology and the attendant cost experience, Thiokol firmly believes that the cost data presented herein are entirely credible. The required technology exists and no major developments are required. The case is manufactured from the same type of steel now used in Minuteman Stage I SRM and the Titan IIIC SRM. Nozzle construction and materials are standard for Minuteman and Poseidon and are used in the 120-Inch Titan IIIC SRM. The flex bearing TVC system is employed on both stages of Poseidon and has been demonstrated for motors of the 156-inch size. The propellant currently is in use on the Stage I Minuteman SRM, Thiokol's Wasatch Division having processed over 125 million pounds. Consequently, its characteristics and costs are well established. The ignition and thrust termination systems also are standard.

The cost credibility of solid propellant rocket motor programs is further illustrated by summarizing Thiokol's Wasatch Division major programs since 1960. Major cost-plus and incentive contracts have included the Minuteman, Poseidon, 156-inch and 120-inch Programs. Completed contracts in this category total more than \$556 million of costs and \$39 million, or approximately 7 percent, cost underruns. Fixed price contracts for such programs as Bomarc, Genie and 156-inch have been conducted for more than \$14 million on a profitable basis. Isolating the large motor programs (156-inch and 120-inch) the cost was approximately \$12 million with a 9 percent overrun.

In arriving at the SRM stage cost for the Space Shuttle Program, Thiokol costed the program as outlined in Section 2.0, Cost Estimating Philosophy. Two cost levels are presented for the 156-inch SRM parallel and series burn configurations. The ceiling costs were developed by using a conservative approach to significant cost elements. Vendor quotations on major components such as the case and nozzle were significantly increased. Raw material costs were projected at current usage levels for programs such as Minuteman and Poseidon with no allowance for quantity buy cost reductions. Current labor efficiencies and burden rates also were used in arriving at the ceiling costs. As a result of this extremely conservative cost approach, Thiokol believes the ceiling costs presented herein represent the maximum on the high side.

The probable costs were developed using standard cost estimating procedures. In the area of the case and nozzle for example the quotations from the vendors were used as received without adjustment. The effect of increased volume on lowering the cost of ammonium perchlorate and other raw materials, as well as the influence of labor efficiencies and the effect of including the Space Shuttle SRM in the labor base thereby lowering the overhead rates, were taken into account in developing the probable cost. The probable costs represent Thiokol's best estimate of program costs.

### 3.2 PROBABLE COST

The probable costs presented in the cost summaries of Section IV constitute a cost position in which Thiokol has a high degree of cost confidence for reasons as outlined below:

1. The probable cost for propellant is based upon current experience in raw materials, mixing and casting of Minuteman propellant. Cost reductions as a result of quantity buys of raw material and increased processing efficiencies have been taken into account.
2. The case cost as quoted by Rohr was used. No consideration has been applied for negotiations which should result in further cost improvement.
3. Nozzle costs used in the probable cost base was that of the highest of three vendors and does not include any cost savings anticipated in negotiations.
4. The Thiokol estimate for the attach structure was used even though it was higher than vendor estimates. Thiokol realizes that the attach structure costs are considerably lower than the figures used by the vehicle contractors. However, Thiokol considers the costs used herein to be reasonable and that the structure can be obtained for the costs indicated when procured as the result of competitive procurement procedures.
5. In costing the probable cost, Thiokol increased the inhouse labor by 11 percent for DDT&E and 12 percent for production.

### 3.3 CEILING COST

The following considerations were made in arriving at the ceiling costs:

1. The ceiling cost for propellant is based upon an ultra-conservative approach inasmuch as no provision has been made for reductions as a result of quantity buys of raw materials, continuous mixing and casting and increased processing efficiencies.
2. The 156-inch case cost submitted by Rohr, a reliable subcontractor currently making 120-inch cases, was increased approximately 20 percent in order to reflect a cost equal to the cost per pound of the 120-inch Titan IIC SRM case. No provisions were made for the cost savings resulting from larger production and learning available at the subcontractor from his 120-inch case experience.

3. The nozzle was quoted by three reliable subcontractors, Kaiser, Hitco and Rohr. To increase cost confidence, the cost of the highest vendor was utilized and increased approximately 25 percent in order to reflect an approximate cost per pound of the current 120-inch Titan IIIC nozzle which is a complex LITVC nozzle in comparison to our 156-inch Flex Seal nozzle.
4. The structure cost was estimated by Thiokol utilizing drawings available from the preliminary design. To increase confidence in our estimate Rohr and National Steel and Ship Building were solicited for estimates. Thiokol realizes that the attach structure costs are considerably lower than the figures used by the vehicle contractors. However, Thiokol considers the costs used herein to be reasonable and that the structure can be obtained for the costs indicated when procured as the result of competitive procurement procedures.
5. For the ceiling cost, Thiokol also chose to increase the labor inhouse by approximately 16 percent for DDT&E and 40 percent for production.

#### 3.4 RECOVERY

Recovery costs as presented herein were costed on the basis of a conservative 90 percent recovery and assumed hardware would be discarded after ten uses. Items which have been considered for refurbishment are the case, nozzle metal parts, attach structure, auxiliary power supply and recovery system.

#### 4.0 COST ITEM DEFINITIONS

The definitions set forth below are provided to assist in the analysis of the cost data presented in this volume.

##### 4.1 PROGRAM MANAGEMENT

Comprises all effort associated with over-all program support consisting of the following:

1. Program Management
2. Contracts
3. Publications
4. Financial Control
5. Procurement
6. Safety

##### 4.2 SYSTEM ENGINEERING

Consists of the following engineering support areas:

1. Reliability
2. Project Engineering
3. Configuration Management
4. Maintenance Engineering
5. System Engineering
6. Mass Properties Control

##### 4.3 CASE

Includes: vendor cost; all direct/direct labor to process insulated case up to lining; manufacturing support; in-house and vendor tooling, and engineering design labor. This effort includes component qualification testing in ED&D.

##### 4.4 NOZZLE, FIXED

Includes: vendor cost; all direct/direct labor to process nozzle up to assembly onto the aft closure; manufacturing support; in-house and vendor tooling; and engineering design labor. This effort includes component qualification testing in ED&D.

##### 4.5 NOZZLE, FLEX BEARING

Includes: vendor cost; all direct/direct labor for fabricating the flex seal to process the nozzle up to assembly onto the aft closure; manufacturing support; in-house and vendor tooling; and engineering design labor. Also includes component qualification testing in ED&D. This is an option for parallel burn and is included in the baseline for series burn.

#### 4.6 IGNITER

Includes: vendor cost; all direct/direct labor to process the igniter up to installation on the motor; manufacturing support; in-house and vendor tooling; and engineering design labor. This effort includes component qualification testing in ED&D.

#### 4.7 PROPELLANT (TPH-1011) AND LINER

Includes: all material cost; all direct/direct labor up to X-ray; manufacturing support; in-house tooling; and engineering design labor.

#### 4.8 POWER SUPPLY AND DISTRIBUTION

Includes: all vendor cost for components and materials; direct/direct labor up to final assembly; manufacturing support; in-house and vendor tooling, and engineering design labor. This effort includes component qualification testing in ED&D.

#### 4.9 FINAL ASSEMBLY

Includes: all miscellaneous raw material and components not covered in the major items; all direct/direct labor associated with assembly activity and X-ray conducted at the Wasatch Division up through loading on transporters; manufacturing support; in-house and vendor tooling; and engineering design labor for motor configuration.

#### 4.10 GROUND TEST

Includes: test area assembly; checkout, data reduction, acquisition and reporting; instrumentation for all static tests; and GTH test data reduction.

#### 4.11 AUXILIARY POWER SUPPLY (APU)

Includes: vendor cost; all direct/direct labor to process up to assembly on the motor; manufacturing support; engineering design labor; and component qualification testing in ED&D. This is an option for parallel burn and is included in the baseline for series burn.

#### 4.12 THRUST TERMINATION

Includes: cost from vendor; all direct/direct labor up to installing on the motor; manufacturing support; in-house and vendor tooling; engineering design labor; and component qualification in ED&D.



#### 4.13 INSTALLATION, ASSEMBLY AND CHECK OUT

Includes: the direct effort for assembly and check out at the launch site for GTH, FTH and Production.

#### 4.14 FACILITIES

The effort required to provide new facilities and modification and rearrangement of existing facilities at Thiokol and the major vendors including labor and material. Also includes the facility costs for GTH launch site and operational launch site requirements.

#### 4.15 SUPPORT EQUIPMENT AND SPARES

Includes: ground support equipment required at the launch site; vendor costs; direct/direct labor up to loading on the transporter; manufacturing support; and engineering design. Cost also includes allowance for operational component spares.

#### 4.16 FLIGHT TEST SUPPORT

That effort required to provide instrumentation data reduction and analysis of the flight test motors during DDT&E. Data reduction and analysis will be accomplished in production.

#### 4.17 OPERATIONS SUPPORT

That effort involved with management of assembly and check out effort at the launch site.

#### 4.18 INTERSTAGE STRUCTURES

Attach structure and fairings including: vendor cost; manufacturing support; and engineering design labor. Qualification test cost is included in ED&D.

#### 4.19 RECOVERY SYSTEM

Includes vendor development costs during ED&D, vendor costs during production, recovery operations at the launch site and costs for disassembly of the recovered hardware at the recovery site.

#### 4.20 TRANSPORTATION

Includes all transportation cost for shipping motor segments, spares, ground support equipment, and miscellaneous items from the Wasatch Division to the launch site. Also includes shipping cost from vendors directly to the launch site for items such as fairings and attach structure. All direct labor involved is included.

## **5.0 COST SUMMARIES**

### **5.1 156 Inch Parallel Expendable Cost**

## 156 INCH PARALLEL BURN

Presented in this section are the expendable costs for the parallel configuration, both probable and ceiling, as defined in Section 3.0. These costs are set forth on NASA Cost Tables I and II.

The recoverable costs for the DDT&E and 60 per year launch rate are presented on NASA Table I; however, the alternate launch rates of 40, 20, and 10 are presented in total costs only by DDT&E, Production recurring and Production Facilities. The Table II time phased costs are only presented in total dollars by fiscal year for all launch rates.

For clarification it should be noted that in the 23 February presentation, it was stated that the Recovery System Development Cost was included in the recoverable cost. This was in error and on the Recoverable Cost sheets in this section the Recovery System Development Cost is included as part of the DDT&E Program Cost.

For your convenience a cost summary is included in the front of this section summarizing the cost detail which follows.

### 5.1.1 Summary

SUMMARY 156 INCH SRM PARALLEL BURN

(DOLLARS IN THOUSANDS)

	DDT&E	<u>Production</u> <u>60/Year Rate</u>		Total Program	<u>Production</u> <u>40/Year Rate</u>		Total Program	<u>Production</u> <u>20/Year Rate</u>		Total Program	<u>Production</u> <u>10/Year Rate</u>		Total Program
		<u>Recurring</u>	<u>Facilities</u>		<u>Recurring</u>	<u>Facilities</u>		<u>Recurring</u>	<u>Facilities</u>		<u>Recurring</u>	<u>Facilities</u>	
<u>Parallel Burn-Expendable</u>													
<u>Probable Cost</u>													
Without TVC-TT	88,526	1,816,528	99,764	2,004,818	1,562,911	63,855	1,715,292	972,031	54,638	1,115,195	531,568	40,867	660,961
Recurring Cost/Launch		4,128			4,440			4,959			5,263		
Peak Annual Funding	27,612	248,770			174,986			117,201			76,485		
With TVC-TT	108,393	2,027,995	99,764	2,236,152	1,704,279	63,855	1,876,527	1,050,142	54,638	1,213,173	571,945	40,867	721,205
Recurring Cost/Launch		4,609			4,842			5,358			5,663		
Peak Annual Funding	34,191	276,750			190,835			124,934			80,778		
<u>Ceiling Cost</u>													
Without TVC-TT	101,844	2,259,814	108,288	2,469,946	1,946,925	69,608	2,118,077	1,194,875	59,308	1,356,027	648,848	44,357	795,049
Recurring Cost/Launch		5,136			5,531			6,096			6,424		
Peak Annual Funding	32,129	308,015			217,984			140,509			89,974		
With TVC-TT	123,415	2,536,017	108,288	2,767,720	2,138,379	69,608	2,331,402	1,302,554	59,308	1,485,277	705,571	44,357	873,343
Recurring Cost/Launch		5,764			6,075			6,646			6,986		
Peak Annual Funding	39,294	344,554			239,479			151,092			95,822		
<u>Parallel Burn - Recoverable</u>													
<u>Probable Cost</u>													
Without TVC-TT	174,427	1,133,566	78,359	1,386,352	1,064,958	49,826	1,289,211	702,114	42,686	919,227	406,553	30,979	611,959
Recurring Cost/Launch		2,576			3,025			3,582			4,025		
Peak Annual Funding	19,656	166,105			132,181			100,415			89,040		
With TVC-TT	195,290	1,283,357	78,359	1,557,006	1,148,734	49,826	1,393,850	751,506	42,686	989,482	431,500	30,979	657,769
Recurring Cost/Launch		2,916			3,264			3,834			4,272		
Peak Annual Funding	22,045	193,282			142,682			106,397			73,133		
<u>Ceiling Cost</u>													
Without TVC-TT	192,414	1,371,302	85,053	1,648,769	1,285,981	54,083	1,532,478	848,995	46,333	1,087,742	491,262	34,746	718,422
Recurring Cost/Launch		3,116			3,653			4,332			4,864		
Peak Annual Funding	23,372	204,921			157,096			118,608			82,276		
With TVC-TT	215,120	1,580,551	85,053	1,880,724	1,411,645	54,083	1,680,848	924,847	46,333	1,186,300	530,753	34,746	780,619
Recurring Cost/Launch		3,592			4,010			4,719			5,255		
Peak Annual Funding	26,629	233,473			172,065			127,253			87,927		

### 5.1.2 Expendable

**5.1.2.1 Probable Cost**

5.1.2.1.1 W/O TVC & TT



PROBABLE COST 156 INCH SRM PARALLEL BURN W/O TVC TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					60/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,705	156	42	849	2,752	11,072	1,052		12,124	700	15,576
SYSTEM ENGINEERING	3,529		5	1,079	4,613	5,005			5,005		9,618
SRM'S	27,225	7,038	2,534	25,602	62,399	1,451,442	21,692		1,473,134		1,535,533
CASE	12,378	2,645	70	11,438	26,531	763,806	9,512		773,318		799,849
NOZZLE	4,345	1,254	783	4,778	11,160	225,703	1,454		227,157		238,317
IGNITER	460	252	5	234	951	7,799	390		8,189		9,140
PROPELLANT AND LINER	7,169	1,388	1,069	6,902	16,508	361,977	2,919		364,896		381,404
POWER SUPPLY DISTRIBUTION	210	14	103	639	966	22,749	349		23,098		24,064
FINAL ASSEMBLY	1,106	675	369	1,611	3,761	66,560	7,068		73,628		77,389
GROUND TEST	1,557	810	155		2,522	2,848			2,848		5,370
AUXILIARY POWER UNIT (APU)											
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	207		160	440	807					6,836	7,643
FACILITIES	5,344		1,946		7,290	1,396		99,764	101,160		108,450
SUPPORT EQUIPMENT AND SPARES	196		1,399	571	2,166	5,227			5,227	3,963	11,356
FLIGHT TEST SUPPORT				473	473	7,289			7,289		7,762
OPERATIONS SUPPORT			124	212	336					4,178	4,514
STRUCTURE	1,633	359	1,019	3,199	6,210	222,631	334		222,965		229,175
TRANSPORTATION			357	1,123	1,480	73,711			73,711		75,191
TOTAL PROGRAM	39,839	7,553	7,586	33,548	88,526	1,777,773	23,078	99,764	1,900,615	15,677	2,004,818

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 PROBABLE COST 156 INCH SRM PARALLEL BURN W/O TVC TT 60/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		208	9,266	20,748	27,236	21,582	716				
DDT & E		208	9,266	20,748	27,236	21,582	716				
DEVELOPMENT		208	9,266	17,595	14,576						
DEVELOPMENT		208	9,266	17,595	14,576						
STE											
DELIVERABLE HARDWARE				1,608	12,212	20,509					
DUMMY ENGINES				1,608	1,992						
FLIGHT ENGINES					10,220	20,509					
O & FS AND SPARES				1,545	448	1,073	716				
RECURRING TOTAL							40,053	78,364	97,520	137,572	154,987
INVESTMENT							29,698	77,669	96,656	136,353	153,613
DELIVER NEW ENGINES							39,578	77,434	96,363	135,940	153,148
GROUND SUPPORT EQUIP.							120	235	293	413	465
PARTS											
OPERATIONS							355	695	864	1,219	1,374
FLIGHT SUPPORT							168	328	408	576	649
OPERATIONS							96	188	234	330	372
PARTS							91	179	222	313	353
FACILITIES	499	6,030	1,008				17,222	23,978	13,740	9,186	13,806
TRANSPORTATION					376	510	2,369	3,316	4,120	5,820	6,549
TOTAL PROGRAM		707	15,296	21,756	27,612	22,092	60,360	105,658	115,380	152,578	175,342

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										79,756
DDT & E										79,756
DEVELOPMENT										41,645
DEVELOPMENT										41,645
STE										
DELIVERABLE HARDWARE										34,329
DUMMY ENGINES										3,600
FLIGHT ENGINES										30,729
O & FS AND SPARES										3,782
RECURRING TOTAL		184,591	229,869	228,125	219,418	219,418	148,021	3,483		1,741,421
INVESTMENT		182,955	227,831	226,105	217,475	217,475	146,709	3,452		1,725,991
DELIVER NEW ENGINES		182,401	227,141	225,420	216,816	216,816	146,265	3,442		1,720,764
GROUND SUPPORT EQUIP.		554	690	685	659	659	444	10		5,227
PARTS										
OPERATIONS		1,636	2,038	2,020	1,943	1,943	1,312	31		15,430
FLIGHT SUPPORT		773	962	954	918	918	620	15		7,289
OPERATIONS		443	552	547	526	526	355	9		4,178
PARTS		420	524	519	499	499	337	7		3,963
FACILITIES		13,795	9,186							108,450
TRANSPORTATION		7,805	9,715	9,647	9,279	9,279	6,256	150		75,191
TOTAL PROGRAM		206,191	248,770	237,772	228,697	228,697	154,277	3,633		2,004,818

PROBABLE COST 156 INCH SRM PARALLEL BURN W/O TVC TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	D T & E					40/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	D T & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,705	156	42	849	2,752	11,072	1,052		12,124	700	15,576
SYSTEM ENGINEERING	3,529		5	1,079	4,613	5,005			5,005		9,618
SRM'S	27,225	7,038	2,534	25,602	62,399	1,264,419	19,064		1,283,483		1,345,882
CASE	12,378	2,645	70	11,438	26,531	693,193	8,277		701,470		728,001
NOZZLE	4,345	1,254	783	4,778	11,160	192,573	1,358		193,931		205,091
IGNITER	460	252	5	234	951	7,174	376		7,550		8,501
PROPELLANT AND LINER	7,169	1,388	1,049	6,902	16,508	292,132	2,475		294,607		311,115
POWER SUPPLY DISTRIBUTION	210	14	103	639	966	19,587	349		19,936		20,902
FINAL ASSEMBLY	1,106	675	369	1,611	3,761	57,328	6,229		63,557		67,318
GROUND TEST	1,557	810	155		2,522	2,432			2,432		4,954
AUXILIARY POWER UNIT (APU)											
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	207		160	440	807					5,674	6,481
FACILITIES	5,344		1,946		7,290	437		63,855	64,292		71,582
SUPPORT EQUIPMENT AND SPARES	196		1,399	571	2,166	4,396			4,396	3,293	9,855
FLIGHT TEST SUPPORT				473	473	5,933			5,933		6,406
OPERATIONS SUPPORT			124	212	336					3,675	4,011
STRUCTURE	1,633	359	1,019	3,199	6,210	178,722	334		179,056		185,266
TRANSPORTATION			357	1,123	1,480	59,135			59,135		60,615
TOTAL PROGRAM	39,839	7,553	7,586	33,548	88,526	1,529,119	20,450	63,855	1,613,424	13,342	1,715,292

**SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS**  
**PROBABLE COST SRM PARALLEL W/O TVC TT 40/YEAR PRODUCTION**

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
<b>NONRECURRING TOTAL</b>		208	9,266	20,748	27,236	21,582	716				
<b>DDT &amp; E</b>		208	9,266	20,748	27,236	21,582	716				
<b>DEVELOPMENT</b>		208	9,266	17,595	14,576						
DEVELOPMENT		208	9,266	17,595	14,576						
STE											
<b>DELIVERABLE HARDWARE</b>				1,608	12,212	20,509					
DUMMY ENGINES				1,608	1,992						
FLIGHT ENGINES					10,220	20,509					
O & FS AND SPARES				1,545	448	1,073	716				
<b>RECURRING TOTAL</b>							42,094	84,186	105,233	150,335	168,373
<b>INVESTMENT</b>							41,733	83,464	104,331	149,044	166,929
DELIVER NEW ENGINES							41,609	83,218	104,023	148,604	166,437
GROUND SUPPORT EQUIP.							124	246	308	440	492
PARTS											
OPERATIONS							361	722	902	1,291	1,444
FLIGHT SUPPORT							166	333	415	593	664
OPERATIONS							103	205	257	368	412
PARTS							92	184	230	330	368
FACILITIES		499	6,030	1,008			17,187	23,951	13,722	9,185	
TRANSPORTATION					376	510	2,327	3,310	4,134	5,904	6,613
<b>TOTAL PROGRAM</b>		707	15,296	21,756	27,612	22,092	62,324	111,447	123,089	165,424	174,986

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
<b>NONRECURRING TOTAL</b>										79,756
<b>DDT &amp; E</b>										79,756
<b>DEVELOPMENT</b>										41,645
DEVELOPMENT										41,645
STE										
<b>DELIVERABLE HARDWARE</b>										34,329
DUMMY ENGINES										3,600
FLIGHT ENGINES										30,729
O & FS AND SPARES										3,782
<b>RECURRING TOTAL</b>		165,368	162,361	160,857	159,354	157,850	142,818	4,510		1,503,339
<b>INVESTMENT</b>		163,949	160,967	159,476	157,986	146,496	141,592	4,471		1,490,438
DELIVER NEW ENGINES		163,465	160,493	159,006	157,520	156,034	141,174	4,459		1,486,042
GROUND SUPPORT EQUIP.		484	474	470	466	462	418	12		4,396
PARTS										
OPERATIONS		1,419	1,394	1,381	1,368	1,354	1,226	39		12,901
FLIGHT SUPPORT		652	641	635	629	623	564	18		5,933
OPERATIONS		405	397	393	390	386	349	10		3,675
PARTS		362	356	353	349	345	313	11		3,293
FACILITIES										71,582
TRANSPORTATION		6,498	6,377	6,316	6,262	6,201	5,613	174		60,615
<b>TOTAL PROGRAM</b>		171,866	168,738	167,173	165,616	164,051	148,431	4,684		1,715,292

PROBABLE COST 156 INCH SRM PARALLEL BURN W/O TVC TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					20/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,705	156	42	849	2,752	9,411	894		10,305	700	13,757
SYSTEM ENGINEERING	3,529		5	1,079	4,613	4,254			4,254		8,867
SRM'S	27,225	7,038	2,534	25,602	62,399	762,594	17,467		780,061		842,460
CASE	12,378	2,645	70	11,438	26,531	415,025	7,583		422,608		449,139
NOZZLE	4,345	1,254	783	4,778	11,160	121,850	1,244		123,094		134,254
IGNITER	460	252	5	234	951	4,885	344		5,229		6,180
PROPELLANT AND LINER	7,169	1,388	1,049	6,902	16,508	167,440	2,268		169,708		186,216
POWER SUPPLY DISTRIBUTION	210	14	103	639	966	13,307	320		13,627		14,593
FINAL ASSEMBLY	1,106	675	369	1,611	3,761	38,051	5,708		43,759		47,520
GROUND TEST	1,557	810	155		2,522	2,036			2,036		4,558
AUXILIARY POWER UNIT (APU)											
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	207		160	440	807					4,710	5,517
FACILITIES	5,344		1,946		7,290	441		54,638	55,079		62,369
SUPPORT EQUIPMENT AND SPARES	196		1,399	571	2,166	3,678			3,678	2,755	8,599
FLIGHT TEST SUPPORT				473	473	4,829			4,829		5,302
OPERATIONS SUPPORT			124	212	336					3,234	3,570
STRUCTURE	1,633	359	1,019	3,199	6,210	117,547	334		117,881		124,091
TRANSPORTATION			357	1,123	1,480	39,183			39,183		40,663
TOTAL PROGRAM	39,839	7,553	7,586	33,548	88,526	941,937	18,695	54,638	1,015,270	11,399	1,115,195

**SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS**  
**PROBABLE COST SRM PARALLEL W/O TVC TT 20/YEAR PRODUCTION**

COST ELEMENT	FY	(DOLLARS IN THOUSANDS)									
		1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		208	9,266	20,748	27,236	21,582	716				
DDT & E		208	9,266	20,748	27,236	21,582	716				
DEVELOPMENT		208	9,266	17,595	14,576						
DEVELOPMENT		208	9,266	17,595	14,576						
STE											
DELIVERABLE HARDWARE				1,608	12,212	20,509					
DUMMY ENGINES				1,608	1,992						
FLIGHT ENGINES					10,220	20,509					
O & FS AND SPARES				1,545	448	1,073	716				
RECURRING TOTAL							44,757	89,512	96,970	96,970	96,039
INVESTMENT							44,237	88,473	95,845	95,845	94,924
DELIVER NEW ENGINES							44,060	88,119	95,463	95,463	94,545
GROUND SUPPORT EQUIP.							177	354	382	382	379
PARTS											
OPERATIONS							520	1,039	1,125	1,125	1,115
FLIGHT SUPPORT							232	464	502	502	497
OPERATIONS							155	311	336	336	334
PARTS							133	264	287	287	284
FACILITIES		499	6,030	1,008			16,389	23,936	13,709		
TRANSPORTATION					376	510	2,546	3,753	4,070	4,070	4,030
TOTAL PROGRAM		707	15,296	21,756	27,612	22,092	64,408	117,201	114,749	101,040	100,069

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										79,756
DDT & E										79,756
DEVELOPMENT										41,645
DEVELOPMENT										41,645
STE										
DELIVERABLE HARDWARE										34,329
DUMMY ENGINES										3,600
FLIGHT ENGINES										30,729
O & FS AND SPARES										3,782
RECURRING TOTAL		94,172	92,308	91,376	89,510	88,577	47,553	4,663		932,407
INVESTMENT		93,080	91,237	90,315	88,472	87,551	47,001	4,609		921,589
DELIVER NEW ENGINES		92,709	90,873	89,955	88,119	87,202	46,813	4,590		917,911
GROUND SUPPORT EQUIP.		371	364	360	353	349	188	19		3,678
PARTS										
OPERATIONS		1,092	1,071	1,061	1,038	1,026	552	54		10,818
FLIGHT SUPPORT		487	478	474	464	459	246	24		4,829
OPERATIONS		327	320	317	310	307	165	16		3,234
PARTS		278	273	270	264	260	141	14		2,755
FACILITIES		395	403							62,369
TRANSPORTATION		3,247	3,886	3,819	3,752	3,717	1,992	195		40,663
TOTAL PROGRAM		98,514	96,597	95,195	93,262	92,294	49,545	4,858		1,115,195

PROBABLE COST 156 INCH SRM PARALLEL BURN W/O TVC TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					10/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,705	156	42	849	2,752	9,411	894		10,305	700	13,757
SYSTEM ENGINEERING	3,529		5	1,079	4,613	4,254			4,254		8,867
SRM'S	27,225	7,038	2,534	25,602	62,399	404,448	9,499		413,947		476,346
CASE	12,378	2,645	70	11,438	26,531	219,320	4,124		223,444		249,975
NOZZLE	4,345	1,254	783	4,778	11,160	65,367	676		66,043		77,203
IGNITER			5			2,505	187		2,692		3,643
PROPELLANT AND LINER	460	252	1,049	234	951	91,214	1,233		92,447		108,955
POWER SUPPLY DISTRIBUTION	7,169	1,388	103	6,902	16,508	6,670	174		6,844		7,810
FINAL ASSEMBLY	210	14		639	966	18,354	3,105		21,459		25,220
GROUND TEST			369			1,018			1,018		3,540
AUXILIARY POWER UNIT (APU)	1,106	675	155	1,611	3,761						
THRUST TERMINATION	1,557	810			2,522						
INSTALLATION ASSEMBLY AND CHECKOUT	207		160	440	807					3,909	4,716
FACILITIES	5,344		1,946		7,290	438		40,867	41,305		48,595
SUPPORT EQUIPMENT AND SPARES	196		1,399	571	2,166	3,105			3,105	2,271	7,542
FLIGHT TEST SUPPORT				473	473	3,912			3,912		4,385
OPERATIONS SUPPORT			124	212	336					2,846	3,182
STRUCTURE	1,633	359	1,019	3,199	6,210	64,160	334		64,494		70,704
TRANSPORTATION			357	1,123	1,480	21,387			21,387		22,867
TOTAL PROGRAM	39,839	7,553	7,586	33,548	88,526	511,115	10,727	40,867	562,709	9,726	660,961

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 PROBABLE COST SRM PARALLEL W/O TVC TT 10/YEAR PRODUCTION

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		208	9,266	20,748	27,236	21,582	716				
DDT & E		208	9,266	20,748	27,236	21,582	716				
DEVELOPMENT		208	9,266	17,595	14,576						
DEVELOPMENT		208	9,266	17,595	14,576						
STE											
DELIVERABLE HARDWARE				1,608	12,212	20,509					
DUMMY ENGINES				1,608	1,992						
FLIGHT ENGINES					10,220	20,509					
O & FS AND SPARES				1,545	448	1,073	716				
RECURRING TOTAL							45,368	50,465	50,465	49,955	49,444
INVESTMENT							44,664	49,571	49,571	49,070	48,569
DELIVER NEW ENGINES							44,287	49,263	49,263	48,766	48,268
GROUND SUPPORT EQUIP.							277	308	308	304	301
PARTS											
OPERATIONS							804	894	894	885	875
FLIGHT SUPPORT							349	387	387	383	379
OPERATIONS							253	282	282	279	276
PARTS							202	225	225	223	220
FACILITIES		499	6,030	1,008			17,149	23,909			
TRANSPORTATION					376	510	2,567	2,111	2,111	2,088	2,067
TOTAL PROGRAM		707	15,296	21,756	27,612	22,092	65,800	76,485	52,576	52,043	51,511

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										79,756
DDT & E										79,756
DEVELOPMENT										41,645
DEVELOPMENT										41,645
STE										
DELIVERABLE HARDWARE										34,329
DUMMY ENGINES										3,600
FLIGHT ENGINES										30,729
O & FS AND SPARES										1,782
RECURRING TOTAL		48,936	47,405	46,897	46,386	45,366	26,506	2,550		509,743
INVESTMENT		48,068	46,566	46,066	45,565	44,563	26,037	2,504		500,714
DELIVER NEW ENGINES		47,770	46,278	45,780	45,282	44,287	25,876	2,489		497,609
GROUND SUPPORT EQUIP.		298	288	286	283	276	161	15		3,105
PARTS										
OPERATIONS		868	839	831	821	803	469	46		9,029
FLIGHT SUPPORT		376	364	360	356	348	203	20		3,912
OPERATIONS		274	264	262	259	253	148	14		2,846
PARTS		218	211	209	206	202	118	12		2,271
FACILITIES										48,595
TRANSPORTATION		2,044	1,983	1,960	1,939	1,896	1,104	106		22,867
TOTAL PROGRAM		50,980	49,388	48,857	48,325	47,262	27,615	2,656		660,961



5.1.2.1.2 With TVC and TT

PROBABLE COST 156 INCH SRM PARALLEL BURN WITH TVC/TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					60/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,772	156	42	858	2,828	11,072	1,052		12,124	700	15,652
SYSTEM ENGINEERING	4,630		5	1,274	5,909	5,005			5,005		10,914
SRM'S	36,901	9,187	2,993	30,553	79,634	1,661,979	22,622		1,684,601		1,764,235
CASE	12,378	2,645	70	11,438	26,531	763,806	9,512		773,318		799,849
NOZZLE	6,039	1,953	894	5,583	14,469	295,728	1,516		297,244		311,713
IGNITER	460	252	5	234	951	7,799	390		8,189		9,140
PROPELLANT AND LNER	7,169	1,388	1,049	6,902	16,508	361,977	2,919		364,896		381,404
POWER SUPPLY DISTRIBUTION	226	19	134	738	1,117	22,749	349		23,098		24,215
FINAL ASSEMBLY	1,368	1,625	449	1,932	5,374	72,455	7,659		80,114		85,488
GROUND TEST	1,606	1,011	187		2,804	2,848			2,848		5,652
AUXILIARY POWER UNIT (APU)	7,073	259	147	3,495	10,974	123,339			123,339		134,313
THRUST TERMINATION	582	35	58	231	906	11,278	277		11,555		12,461
INSTALLATION ASSEMBLY AND CHECKOUT	227		174	476	877					6,836	7,713
FACILITIES	5,919		1,946		7,865	1,396		99,764	101,160		109,025
SUPPORT EQUIPMENT AND SPARES	238		1,765	577	2,580	5,227			5,227	3,963	11,770
FLIGHT TEST SUPPORT				527	527	7,289			7,289		7,816
OPERATIONS SUPPORT			124	212	336					4,178	4,514
STRUCTURE	1,633	359	1,019	3,199	6,210	222,631	334		222,965		229,175
TRANSPORTATION			392	1,235	1,627	73,711			73,711		75,338
TOTAL PROGRAM	51,320	9,702	8,460	38,911	108,393	1,988,310	24,008	99,764	2,112,082	15,677	2,236,152

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 PROBABLE COST 156 INCH SRM PARALLEL BURN WITH TVC/TT 60/YEAR PROJECTION RATE

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		273	12,157	26,664	33,814	25,175	818				
DDT & E		273	12,157	26,664	33,814	25,175	818				
DEVELOPMENT		273	12,157	23,085	19,123						
DEVELOPMENT		273	12,157	23,085	19,123						
STE											
DELIVERABLE HARDWARE				1,814	14,180	23,949					
DUMMY ENGINES				1,814	2,245						
FLIGHT ENGINES					11,935	23,949					
O & FS AND SPARES				1,765	511	1,226	818				
RECURRING TOTAL							44,916	87,880	109,362	154,278	173,807
INVESTMENT							44,562	87,185	108,498	153,059	172,434
DELIVER NEW ENGINES							44,441	86,950	108,205	152,646	171,969
GROUND SUPPORT EQUIP.							121	235	293	413	465
PARTS											
OPERATIONS							355	695	864	1,219	1,374
FLIGHT SUPPORT							168	328	408	576	649
OPERATIONS							96	188	234	330	372
PARTS							91	179	222	313	353
FACILITIES		502	6,062	1,014			17,313	24,105	13,813	9,234	13,879
TRANSPORTATION					377	512	2,373	3,322	4,129	5,831	6,562
TOTAL PROGRAM		775	18,219	27,678	34,191	25,687	65,420	115,307	127,304	169,343	194,248

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										98,901
DDT & E										98,901
DEVELOPMENT										54,638
DEVELOPMENT										54,638
STE										
DELIVERABLE HARDWARE										39,943
DUMMY ENGINES										4,059
FLIGHT ENGINES										35,884
O & FS AND SPARES										4,320
RECURRING TOTAL		207,006	257,781	255,828	246,064	246,064	165,996	3,906		1,952,888
INVESTMENT		205,370	255,744	253,807	244,120	244,120	164,683	3,876		1,937,458
DELIVER NEW ENGINES		204,816	255,054	253,122	243,461	243,461	164,240	3,866		1,932,231
GROUND SUPPORT EQUIP.		554	690	685	659	659	443	10		5,227
PARTS										
OPERATIONS		1,636	2,038	2,020	1,943	1,943	1,313	30		15,430
FLIGHT SUPPORT		773	962	954	918	918	620	15		7,289
OPERATIONS		443	552	547	526	526	356	8		4,178
PARTS		420	524	519	499	499	337	7		3,963
FACILITIES		13,868	9,235							109,025
TRANSPORTATION		7,820	9,734	9,666	9,297	9,297	6,268	150		75,338
TOTAL PROGRAM		228,694	276,750	265,494	255,361	255,361	172,264	4,056		2,236,152

PROBABLE COST 156 INCH SRM PARALLEL BURN WITH TVC/TT

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					40/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,772	156	42	858	2,828	11,072	1,052		12,124	700	15,652
SYSTEM ENGINEERING	4,630		5	1,274	5,909	5,005			5,005		10,914
SRM'S	36,901	9,187	2,993	30,553	79,634	1,405,094	19,757		1,424,851		1,504,485
CASE	12,378	2,645	70	11,438	26,531	693,193	8,277		701,470		728,001
NOZZLE	6,039	1,953	894	5,583	14,469	202,168	1,364		203,532		218,001
IGNITER	460	252	5	234	951	7,174	376		7,550		8,501
PROPELLANT AND LINER	7,169	1,388	1,049	6,902	16,508	292,132	2,475		294,607		311,115
POWER SUPPLY DISTRIBUTION	226	19	134	738	1,117	19,587	349		19,936		21,053
FINAL ASSEMBLY	1,368	1,625	449	1,932	5,374	61,347	6,673		68,020		73,394
GROUND TEST	1,606	1,011	187		2,804	2,432			2,432		5,236
AUXILIARY POWER UNIT (APU)	7,073	259	147	3,495	10,974	117,875			117,875		128,849
THRUST TERMINATION	582	35	58	231	906	9,186	243		9,429		10,335
INSTALLATION ASSEMBLY AND CHECKOUT	227		174	476	877					5,674	6,551
FACILITIES	5,919		1,946		7,865	437		63,855	64,292		72,157
SUPPORT EQUIPMENT AND SPARES	238		1,765	577	2,580	4,396			4,396	3,293	10,269
FLIGHT TEST SUPPORT				527	527	5,933			5,933		6,460
OPERATIONS SUPPORT			124	212	336					3,675	4,011
STRUCTURE	1,633	359	1,019	3,199	6,210	178,722	334		179,056		185,266
TRANSPORTATION			392	1,235	1,627	59,135			59,135		60,762
TOTAL PROGRAM	51,320	9,702	8,460	38,911	108,393	1,669,794	21,143	63,855	1,754,792	13,342	1,876,527

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 PROBABLE COST 156 INCH SRM PARALLEL BURN WITH TVC/TT 40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		273	12,157	26,664	33,814	25,175	818				
DDT & E		273	12,157	26,664	33,814	25,175	818				
DEVELOPMENT		273	12,157	23,085	19,123						
DEVELOPMENT		273	12,157	23,085	19,123						
STE											
DELIVERABLE HARDWARE				1,814	14,180	23,949					
DUMMY ENGINES				1,814	2,245						
FLIGHT ENGINES					11,935	23,949					
O & FS AND SPARES				1,765	511	1,226	818				
RECURRING TOTAL							46,052	92,103	115,129	164,472	184,206
INVESTMENT							45,691	91,381	114,227	163,181	182,762
DELIVER NEW ENGINES							45,567	91,135	113,919	162,741	182,270
GROUND SUPPORT EQUIP.							124	246	308	440	492
PARTS											
OPERATIONS							361	722	902	1,291	1,444
FLIGHT SUPPORT							166	333	415	593	664
OPERATIONS							103	205	257	368	412
PARTS							92	184	230	330	368
FACILITIES		502	6,062	1,014			17,344	24,144	13,832	9,259	
TRANSPORTATION					377	512	2,331	3,318	4,144	5,918	6,629
TOTAL PROGRAM		775	18,219	27,678	34,191	25,687	66,545	119,565	133,105	179,649	190,835

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										98,901
DDT & E										98,901
DEVELOPMENT										54,638
DEVELOPMENT										54,638
STE										
DELIVERABLE HARDWARE										39,943
DUMMY ENGINES										4,059
FLIGHT ENGINES										35,884
O & FS AND SPARES										4,320
RECURRING TOTAL		180,918	177,628	175,984	174,339	172,694	156,247	4,935		1,644,707
INVESTMENT		179,499	176,234	174,603	172,971	171,340	155,021	4,896		1,631,806
DELIVER NEW ENGINES		179,015	175,760	174,133	172,505	170,878	154,604	4,883		1,627,410
GROUND SUPPORT EQUIP.		484	474	470	466	462	417	13		4,396
PARTS										
OPERATIONS		1,419	1,394	1,381	1,368	1,354	1,226	39		12,901
FLIGHT SUPPORT		652	641	635	629	623	564	18		5,933
OPERATIONS		405	397	393	390	386	349	10		3,675
PARTS		362	356	353	349	345	313	11		3,293
FACILITIES										72,157
TRANSPORTATION		6,514	6,392	6,331	6,277	6,216	5,627	176		60,762
TOTAL PROGRAM		187,432	184,020	182,315	180,616	178,910	161,874	5,111		1,876,527

PROBABLE COST 156 INCH SRM PARALLEL BURN WITH TVC/TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					20/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,772	156	42	858	2,828	9,411	894		10,305	700	13,833
SYSTEM ENGINEERING	4,630		5	1,274	5,909	4,254			4,254		10,163
SRM'S	36,901	9,187	2,993	30,553	79,634	839,948	18,224		858,172		937,806
CASE	12,378	2,645	70	11,438	26,531	414,973	7,635		422,608		449,139
NOZZLE	6,039	1,953	894	5,583	14,469	127,509	1,258		128,767		143,236
IGNITER	460	252	5	234	951	4,882	347		5,229		6,180
PROPELLANT AND LINER	7,169	1,388	1,049	6,902	16,508	167,425	2,283		169,708		186,216
POWER SUPPLY DISTRIBUTION	226	19	134	738	1,117	13,305	322		13,627		14,744
FINAL ASSEMBLY	1,368	1,625	449	1,932	5,374	40,564	6,116		46,680		52,054
GROUND TEST	1,606	1,011	187		2,804	2,036			2,036		4,840
AUXILIARY POWER UNIT (APU)	7,073	259	147	3,495	10,974	63,810			63,810		74,784
THRUST TERMINATION	582	35	58	231	906	5,444	263		5,707		6,613
INSTALLATION ASSEMBLY AND CHECKOUT	227		174	476	877					4,710	5,587
FACILITIES	5,919		1,946		7,865	441		54,638	55,079		62,944
SUPPORT EQUIPMENT AND SPARES	238		1,765		2,580	3,678			3,678	2,755	9,013
FLIGHT TEST SUPPORT				527	527	4,829			4,829		5,356
OPERATIONS SUPPORT			124	212	336					3,234	3,570
STRUCTURE	1,633	359	1,019	3,199	6,210	117,547	334		117,881		124,091
TRANSPORTATION			392	1,235	1,627	39,183			39,183		40,810
TOTAL PROGRAM	51,320	9,702	8,460	38,911	108,393	1,019,291	19,452	54,638	1,093,381	11,399	1,213,173

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 PROBABLE COST 156 INCH SRM PARALLEL BURN WITH TVC/TT 20/YEARS PRODUCTION RATE

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		273	12, 157	26, 664	33, 814	25, 175	818				
DDT & E		273	12, 157	26, 664	33, 814	25, 175	818				
DEVELOPMENT		273	12, 157	23, 085	19, 123						
DEVELOPMENT		273	12, 157	23, 085	19, 123						
STE											
DELIVERABLE HARDWARE				1, 814	14, 180	23, 949					
DUMMY ENGINES				1, 814	2, 245						
FLIGHT ENGINES					11, 935	23, 949					
O & FS AND SPARES				1, 765	511	1, 226	818				
RECURRING TOTAL							48, 506	97, 009	105, 093	105, 093	104, 083
INVESTMENT							47, 986	95, 971	103, 968	103, 968	102, 969
DELIVER NEW ENGINES							47, 809	95, 618	103, 586	103, 586	102, 590
GROUND SUPPORT EQUIP.							177	353	382	382	379
PARTS											
OPERATIONS							520	1, 038	1, 125	1, 125	1, 114
FLIGHT SUPPORT							232	464	502	502	497
OPERATIONS							155	310	336	336	333
PARTS							133	264	287	287	284
FACILITIES		502	6, 062	1, 014			17, 374	24, 158	13, 834		
TRANSPORTATION					377	512	2, 555	3, 767	4, 085	4, 085	4, 044
TOTAL PROGRAM		775	18, 219	27, 678	34, 191	25, 687	69, 253	124, 934	123, 012	109, 178	108, 127

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										98, 901
DDT & E										98, 901
DEVELOPMENT										54, 638
DEVELOPMENT										54, 638
STE										
DELIVERABLE HARDWARE										39, 943
DUMMY ENGINES										4, 059
FLIGHT ENGINES										35, 884
O & FS AND SPARES										4, 320
RECURRING TOTAL		102, 061	100, 041	99, 032	97, 009	95, 999	51, 537	5, 055		1, 010, 518
INVESTMENT		100, 969	98, 970	97, 971	95, 971	94, 972	50, 985	5, 000		999, 700
DELIVER NEW ENGINES		100, 598	98, 606	97, 610	95, 618	94, 622	50, 797	4, 981		996, 021
GROUND SUPPORT EQUIP.		371	364	361	353	350	188	19		3, 679
PARTS										
OPERATIONS		1, 092	1, 071	1, 061	1, 038	1, 027	552	55		10, 818
FLIGHT SUPPORT		487	478	474	464	459	246	24		4, 829
OPERATIONS		327	320	317	310	307	166	17		3, 234
PARTS		278	273	270	264	261	140	14		2, 755
FACILITIES										62, 944
TRANSPORTATION		3, 963	3, 885	3, 844	3, 767	3, 730	2, 000	196		40, 810
TOTAL PROGRAM		106, 024	103, 926	102, 876	100, 776	99, 729	53, 537	5, 251		1, 213, 173

PROBABLE COST 156 INCH SRM PARALLEL BURN WITH TVC/TT

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

SRM	DDT & E					10/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,772	156	42	858	2,828	9,411	894		10,305	700	13,833
SYSTEM ENGINEERING	4,630		5	1,274	5,909	4,254			4,254		10,163
SRM'S	36,901	9,187	2,993	30,553	79,634	444,403	9,921		454,324		533,958
CASE	12,378	2,645	70	11,438	26,531	219,288	4,156		223,444		249,975
NOZZLE	6,039	1,953	894	5,583	14,469	68,422	685		69,107		83,576
IGNITER	460	252	5	234	951	2,503	189		2,692		3,643
PROPELLANT AND LINER	7,169	1,388	1,049	6,902	16,508	91,204	1,243		92,447		108,955
POWER SUPPLY DISTRIBUTION	226	19	134	738	1,117	6,669	175		6,844		7,961
FINAL ASSEMBLY	1,368	1,625	449	1,932	5,374	19,263	3,330		22,593		27,967
GROUND TEST	1,606	1,011	187		2,804	1,018			1,018		3,822
AUXILIARY POWER UNIT (APU)	7,073	259	147	3,495	10,974	33,110			33,110		44,084
THRUST TERMINATION	582	35	58	231	906	2,926	143		3,069		3,975
INSTALLATION ASSEMBLY AND CHECKOUT	227		174	476	877					3,909	4,786
FACILITIES	5,919		1,946		7,865	438		40,867	41,305		49,170
SUPPORT EQUIPMENT AND SPARES	238		1,765	577	2,580	3,105			3,105	2,271	7,956
FLIGHT TEST SUPPORT				527	527	3,912			3,912		4,439
OPERATIONS SUPPORT			124	121	336					2,846	3,182
STRUCTURE	1,633	359	1,019	3,199	6,210	64,160	334		64,494		70,704
TRANSPORTATION			392	1,235	1,627	21,387			21,387		23,014
TOTAL PROGRAM	51,320	9,702	8,460	38,911	108,393	551,070	11,149	40,867	603,086	9,726	721,205



SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 PROBABLE COST 156 INCH SRM PARALLEL BURN WITH TVC/TT 10/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		273	12,157	26,664	33,814	25,175	818				
DDT & E		273	12,157	26,664	33,814	25,175	818				
DEVELOPMENT		273	12,157	23,085	19,123						
DEVELOPMENT		273	12,157	23,085	19,123						
STE											
DELIVERABLE HARDWARE				1,814	14,180	23,949					
DUMMY ENGINES				1,814	2,245						
FLIGHT ENGINES					11,935	23,949					
O & FS AND SPARES				1,765	511	1,226	818				
RECURRING TOTAL							48,962	54,463	54,463	53,912	53,361
INVESTMENT							48,158	53,569	53,569	53,027	52,486
DELIVER NEW ENGINES							47,881	53,261	53,261	52,723	52,185
GROUND SUPPORT EQUIP.							277	308	308	304	301
PARTS											
OPERATIONS							804	894	894	885	875
FLIGHT SUPPORT							349	387	387	383	379
OPERATIONS							253	282	282	279	276
PARTS							202	225	225	223	220
FACILITIES		502	6,062	1,014			17,401	24,191			
TRANSPORTATION					377	512	2,586	2,124	2,124	2,101	2,080
TOTAL PROGRAM		775	18,219	27,678	34,191	25,687	69,767	80,778	56,587	56,013	55,441

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										98,901
DDT & E										98,901
DEVELOPMENT										54,638
DEVELOPMENT										54,638
STE										
DELIVERABLE HARDWARE										39,943
DUMMY ENGINES										4,059
FLIGHT ENGINES										35,884
O & FS AND SPARES										4,320
RECURRING TOTAL		52,813	51,160	50,612	50,061	48,960	28,605	2,748		550,120
INVESTMENT		51,945	50,321	49,781	49,240	48,157	28,136	2,702		541,091
DELIVER NEW ENGINES		51,647	50,033	49,495	48,957	47,881	27,975	2,687		537,986
GROUND SUPPORT EQUIP.		298	288	286	283	276	161	15		3,105
PARTS										
OPERATIONS		868	839	831	821	803	469	46		9,029
FLIGHT SUPPORT		376	364	360	356	348	203	20		3,912
OPERATIONS		274	264	262	259	253	143	14		2,846
PARTS		218	211	209	206	202	118	12		2,271
FACILITIES										49,170
TRANSPORTATION		2,057	1,995	1,972	1,952	1,908	1,117	109		23,014
TOTAL PROGRAM		54,870	53,155	52,584	52,013	50,868	29,722	2,857		721,205

#### 5.1.2.2 Ceiling Cost

5.1.2.2.1 W/O TVC and TT

CEILING COST 156 INCH SRM PARALLEL BURN W/O TVC TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					60/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,778	163	44	885	4,870	12,017	1,142		13,159	760	16,789
SYSTEM ENGINEERING	3,680		5	1,125	4,810	5,432			5,432		10,242
SRM'S	31,837	9,261	2,899	30,605	74,602	1,860,723	26,366		1,887,089		1,961,691
CASE	14,956	3,692	73	14,226	32,947	1,012,557	12,298		1,024,855		1,057,802
NOZZLE	5,251	1,501	1,008	6,009	13,769	244,975	1,586		246,561		260,330
IGNITER	480	274	5	244	1,003	8,465	423		8,888		9,891
PROPELLANT AND LINER	7,985	1,929	1,144	7,597	18,655	494,696	4,009		498,705		517,360
POWER SUPPLY DISTRIBUTION	219	20	107	666	1,012	24,693	378		25,071		26,083
FINAL ASSEMBLY	1,323	810	400	1,863	4,396	72,246	7,672		79,918		84,314
GROUND TEST	1,623	1,035	162		2,820	3,091			3,091		5,911
AUXILIARY POWER UNIT (APU)											
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	216		167	459	842					7,420	8,262
FACILITIES	5,572		2,029		7,601	1,513	108,288		109,801		117,402
SUPPORT EQUIPMENT AND SPARES	204		1,459	595	2,258	5,674			5,674	4,301	12,233
FLIGHT TEST SUPPORT				493	493	7,912			7,912		8,405
OPERATIONS SUPPORT			129	221	350					4,535	4,885
STRUCTURE	1,703	374	1,062	3,336	6,475	241,651	360		242,011		248,486
TRANSPORTATION			372	1,171	1,543	80,008			80,008		81,551
TOTAL PROGRAM	44,990	9,798	8,166	38,890	101,844	2,214,930	27,868	108,288	2,351,086	17,016	2,469,946

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM PARALLEL BURN W/O TVC & TT 60/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		244	10,857	24,019	31,721	25,113	746				
DDT & E		244	10,857	24,019	31,721	25,113	746				
DEVELOPMENT		244	10,857	20,616	17,079						
DEVELOPMENT		244	10,857	20,616	17,079						
STE											
DELIVERABLE HARDWARE				1,792	14,175	23,994					
DUMMY ENGINES				1,792	2,218						
FLIGHT ENGINES					11,957	23,994					
O & FS AND SPARES				1,611	467	1,119	746				
RECURRING TOTAL							50,101	98,023	121,984	172,085	193,869
INVESTMENT							49,716	97,269	121,047	170,762	192,378
DELIVER NEW ENGINES							49,585	97,014	120,729	170,314	191,873
GROUND SUPPORT EQUIP.							131	255	318	448	505
PARTS											
OPERATIONS							385	754	938	1,323	1,491
FLIGHT SUPPORT							182	356	443	625	704
OPERATIONS							104	204	254	358	404
PARTS							99	194	241	340	383
FACILITIES		540	6,528	1,092			18,643	25,958	14,875	9,944	14,945
TRANSPORTATION					408	555	2,569	3,596	4,469	6,312	7,103
TOTAL PROGRAM		784	17,385	25,111	32,129	25,668	72,059	127,577	141,329	188,341	215,917

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										92,700
DDT & E										92,700
DEVELOPMENT										48,796
DEVELOPMENT										48,796
STE										
DELIVERABLE HARDWARE										39,961
DUMMY ENGINES										4,010
FLIGHT ENGINES										35,951
O & FS AND SPARES										3,943
RECURRING TOTAL		230,899	287,535	285,355	274,465	274,465	185,155	4,357		2,178,293
INVESTMENT		229,123	285,324	283,162	272,355	272,355	183,731	4,323		2,161,545
DELIVER NEW ENGINES		228,522	284,575	282,419	271,640	271,640	183,249	4,311		2,155,871
GROUND SUPPORT EQUIP.		601	749	743	715	715	482	12		5,674
PARTS										
OPERATIONS		1,776	2,211	2,193	2,110	2,110	1,424	33		16,748
FLIGHT SUPPORT		839	1,044	1,036	997	997	673	16		7,912
OPERATIONS		481	599	594	571	571	385	10		4,535
PARTS		456	568	563	542	542	366	7		4,301
FACILITIES		14,934	9,943							117,402
TRANSPORTATION		8,465	10,537	10,463	10,063	10,063	6,785	163		81,551
TOTAL PROGRAM		254,298	308,015	295,818	284,528	284,528	191,940	4,519		2,469,946

CEILING COST 156 INCH SRM PARALLEL BURN W/O TVC TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E				40/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM	
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING				FACILITIES
SRM											
PROGRAM MANAGEMENT	1,778	163	44	885	2,870	12,017	1,142		13,159	760	16,789
SYSTEM ENGINEERING	3,680		5	1,125	4,810	5,432			5,432		10,242
SRM'S	31,837	9,261	2,899	30,605	74,602	1,620,134	23,492		1,643,626		1,718,228
CASE	14,956	3,692	73	14,226	32,947	901,178	10,945		912,123		945,070
NOZZLE	5,251	1,501	1,008	6,009	13,769	209,024	1,473		210,497		224,266
IGNITER	480	274	5	244	1,004	7,787	408		8,195		9,198
PROPELLANT AND LINER	7,985	1,929	1,144	7,597	18,655	416,019	3,527		419,546		438,201
POWER SUPPLY DISTRIBUTION	219	20	107	666	1,012	21,261	378		21,639		22,651
FINAL ASSEMBLY	1,323	810	400	1,863	4,396	62,225	6,761		68,986		73,382
GROUND TEST	1,623	1,035	162		2,820	2,640			2,640		5,460
AUXILIARY POWER UNIT (APU)											
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	216		167	459	842					6,159	7,001
FACILITIES	5,572		2,029		7,601	476		69,308	69,784		77,385
SUPPORT EQUIPMENT AND SPARES	204		1,459	595	2,258	4,771			4,771	3,575	10,604
FLIGHT TEST SUPPORT				493	493	6,440			6,440		6,933
OPERATIONS SUPPORT			129	221	350					3,989	4,339
STRUCTURE	1,703	374	1,062	3,336	6,475	193,992	360		194,352		200,827
TRANSPORTATION			372	1,171	1,543	64,186			64,186		65,729
TOTAL PROGRAM	44,990	9,798	8,166	38,890	101,844	1,907,448	24,994	69,308	2,001,750	14,483	2,118,077

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM PARALLEL BURN W/O TVC & TT 40 /YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		244	10,857	24,019	31,721	25,113	746				
DDT & E		244	10,857	24,019	31,721	25,113	746				
DEVELOPMENT		244	10,857	20,616	17,079						
DEVELOPMENT		244	10,857	20,616	17,079						
STE											
DELIVERABLE HARDWARE				1,792	14,175	23,994					
DUMMY ENGINES				1,792	2,218						
FLIGHT ENGINES					11,957	23,994					
O & FS AND SPARES				1,611	467	1,119	746				
RECURRING TOTAL							52,704	105,406	131,758	188,227	210,813
INVESTMENT							52,312	104,622	130,778	186,826	209,245
DELIVER NEW ENGINES							52,178	104,355	130,444	186,349	208,711
GROUND SUPPORT EQUIP.							134	267	334	477	534
PARTS											
OPERATIONS							392	784	980	1,401	1,568
FLIGHT SUPPORT							180	361	451	644	721
OPERATIONS							112	223	279	399	447
PARTS							100	200	250	358	400
FACILITIES		540	6,528	1,092			18,569	25,893	14,835	9,928	
TRANSPORTATION					408	555	2,521	3,589	4,483	6,402	7,171
TOTAL PROGRAM		784	17,385	25,111	32,129	25,668	74,540	134,888	151,076	204,557	217,984

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										92,700
DDT & E										92,700
DEVELOPMENT										48,796
DEVELOPMENT										48,796
STE										
DELIVERABLE HARDWARE										39,961
DUMMY ENGINES										4,010
FLIGHT ENGINES										35,951
O & FS AND SPARES										3,943
RECURRING TOTAL		207,049	203,285	201,402	199,521	197,637	178,815	5,646		1,882,263
INVESTMENT		205,509	201,772	199,903	198,036	196,167	177,484	5,605		1,868,259
DELIVER NEW ENGINES		204,984	201,257	199,393	197,530	195,666	177,031	5,590		1,863,488
GROUND SUPPORT EQUIP.		525	515	510	506	501	453	15		4,771
PARTS										
OPERATIONS		1,540	1,513	1,499	1,485	1,470	1,331	41		14,004
FLIGHT SUPPORT		708	696	689	683	676	612	19		6,440
OPERATIONS		439	431	427	423	419	379	11		3,989
PARTS		393	386	383	379	375	340	11		3,575
FACILITIES										77,385
TRANSPORTATION		7,046	6,915	6,849	6,790	6,724	6,086	190		65,729
TOTAL PROGRAM		214,095	210,200	208,251	206,311	204,361	184,901	5,836		2,118,077

CEILING COST 156 INCH SRM PARALLEL BURN W/O TVC TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					20/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,778	163	44	885	2,870	10,214	971		11,185	760	14,815
SYSTEM ENGINEERING	3,680		5	1,125	4,810	4,617			4,617		9,427
SRM'S	31,837	9,261	2,899	30,605	74,602	964,991	21,519		986,510		1,061,112
CASE	14,956	3,692	73	14,226	32,947	536,353	10,118		546,471		579,418
NOZZLE	5,251	1,501	1,008	6,009	13,769	132,249	1,360		133,609		147,378
IGNITER	480	274	5	244	1,003	5,298	378		5,676		6,679
PROPELLANT AND LINER	7,985	1,929	1,144	7,597	18,655	233,185	3,071		236,256		254,911
POWER SUPPLY DISTRIBUTION	219	20	107	666	1,012	14,434	357		14,791		15,803
FINAL ASSEMBLY	1,323	810	400	1,863	4,396	41,262	6,235		47,497		51,893
GROUND TEST	1,623	1,035	162		2,820	2,210			2,210		5,030
AUXILIARY POWER UNIT (APU)											
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	216		167	459	842					5,112	5,954
FACILITIES	5,572		2,029		7,601	476		59,308	59,784		67,385
SUPPORT EQUIPMENT AND SPARES	204		1,459	595	2,258	4,012			4,012	2,970	9,240
FLIGHT TEST SUPPORT				493	493	5,242			5,242		5,735
OPERATIONS SUPPORT			129	221	350					3,510	3,860
STRUCTURE	1,703	374	1,062	3,336	6,475	127,591	360		127,951		134,426
TRANSPORTATION			372	1,171	1,543	42,530			42,530		44,073
TOTAL PROGRAM	44,990	9,798	8,166	38,890	101,844	1,159,673	22,850	59,308	1,241,831	12,352	1,356,027



SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM PARALLEL BURN W/O TVC & TT 20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		244	10,857	24,019	31,721	25,113	746				
DDT & E		244	10,857	24,019	31,721	25,113	746				
DEVELOPMENT		244	10,857	20,616	17,079						
DEVELOPMENT		244	10,857	20,616	17,079						
STE											
DELIVERABLE HARDWARE				1,792	14,175	23,994					
DUMMY ENGINES				1,792	2,218						
FLIGHT ENGINES					11,957	23,994					
O & FS AND SPARES				1,611	467	1,119	746				
RECURRING TOTAL							55,290	110,579	119,794	119,794	118,643
INVESTMENT							54,727	109,454	118,575	118,575	117,435
DELIVER NEW ENGINES							54,534	109,069	118,158	118,158	117,022
GROUND SUPPORT EQUIP.							193	385	417	417	413
PARTS											
OPERATIONS							563	1,125	1,219	1,219	1,208
FLIGHT SUPPORT							252	503	545	545	540
OPERATIONS							168	337	365	365	362
PARTS							143	285	309	309	306
FACILITIES		540	6,528	1,092			18,552	25,862	14,811		
TRANSPORTATION					408	555	2,756	4,068	4,412	4,412	4,368
TOTAL PROGRAM		784	17,385	25,111	32,129	25,668	77,344	140,509	139,017	124,206	123,011

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										92,700
DDT & E										92,700
DEVELOPMENT										48,796
DEVELOPMENT										48,796
STE										
DELIVERABLE HARDWARE										39,961
DUMMY ENGINES										4,010
FLIGHT ENGINES										35,951
O & FS AND SPARES										3,943
RECURRING TOTAL		116,339	114,034	112,883	110,579	109,427	58,745	5,762		1,151,869
INVESTMENT		115,155	112,874	111,734	109,454	108,314	58,148	5,702		1,140,147
DELIVER NEW ENGINES		114,750	112,477	111,341	109,069	107,933	57,943	5,681		1,136,135
GROUND SUPPORT EQUIP.		405	397	393	385	381	205	21		4,012
PARTS										
OPERATIONS		1,184	1,160	1,149	1,125	1,113	597	60		11,722
FLIGHT SUPPORT		529	519	514	503	498	267	27		5,242
OPERATIONS		355	347	344	337	333	179	18		3,510
PARTS		300	294	291	285	282	151	15		2,970
FACILITIES										67,385
TRANSPORTATION		4,279	4,196	4,152	4,068	4,028	2,160	211		44,073
TOTAL PROGRAM		120,618	118,230	117,035	114,647	113,455	60,905	5,973		1,356,027

CEILING COST 156 INCH SRM PARALLEL BURN W/O TVC TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E				10/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM	
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING				FACILITIES
SRM											
PROGRAM MANAGEMENT	1,778	163	44	885	2,870	10,214	971		11,185	760	14,815
SYSTEM ENGINEERING	3,680		5	1,125	4,810	4,617			4,617		9,427
SRM'S	31,837	9,261	2,899	30,605	74,602	509,399	11,781		521,180		595,782
CASE	14,956	3,692	73	14,226	32,947	285,049	5,519		290,568		323,515
NOZZLE	5,251	1,501	1,008	6,009	13,769	70,934	751		71,685		85,454
IGNITER	480	274	5	244	1,003	2,742	180		2,922		3,925
PROPELLANT AND LINER	7,985	1,929	1,144	7,597	18,655	122,509	1,670		124,179		142,834
POWER SUPPLY DISTRIBUTION	219	20	107	666	1,012	7,227	202		7,429		8,441
FINAL ASSEMBLY	1,323	810	400	1,863	4,396	19,833	3,459		23,292		27,688
GROUND TEST	1,623	1,035	162		2,820	1,105			1,105		3,925
AUXILIARY POWER UNIT (APU)											
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	216		167	459	842					4,243	5,085
FACILITIES	5,572		2,029		7,601	476		44,357	44,833		52,434
SUPPORT EQUIPMENT AND SPARES	204		1,459	595	2,258	3,370			3,370	2,465	8,093
FLIGHT TEST SUPPORT				493	493	4,246			4,246		4,739
OPERATIONS SUPPORT			129	221	350					3,089	3,439
STRUCTURE	1,703	374	1,062	3,336	6,475	69,643	360		70,003		76,478
TRANSPORTATION			372	1,171	1,543	23,214			23,214		24,757
TOTAL PROGRAM	44,990	9,798	8,166	38,890	101,844	625,179	13,112	44,357	682,648	10,557	795,049

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM PARALLEL BURN W/O TVC & TT 10/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		244	10,857	24,019	31,721	25,113	746				
DDT & E		244	10,857	24,019	31,721	25,113	746				
DEVELOPMENT		244	10,857	20,616	17,079						
DEVELOPMENT		244	10,857	20,616	17,079						
STE											
DELIVERABLE HARDWARE				1,792	14,175	23,994					
DUMMY ENGINES				1,792	2,218						
FLIGHT ENGINES					11,957	23,994					
O & FS AND SPARES				1,611	467	1,119	746				
RECURRING TOTAL							55,639	61,891	61,891	61,266	60,641
INVESTMENT							54,767	60,921	60,921	60,305	59,690
DELIVER NEW ENGINES							54,467	60,587	60,587	59,975	59,363
GROUND SUPPORT EQUIP.							300	334	334	330	327
PARTS											
OPERATIONS							872	970	970	961	951
FLIGHT SUPPORT							378	420	420	416	412
OPERATIONS							275	306	306	303	300
PARTS							219	244	244	242	239
FACILITIES		540	6,528	1,092			18,476	25,798			
TRANSPORTATION					408	555	2,776	2,285	2,285	2,260	2,238
TOTAL PROGRAM		784	17,385	25,111	32,129	25,668	77,637	89,974	64,176	63,526	62,879

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										92,700
DDT & E										92,700
DEVELOPMENT										48,796
DEVELOPMENT										48,796
STE										
DELIVERABLE HARDWARE										39,961
DUMMY ENGINES										4,010
FLIGHT ENGINES										35,951
O & FS AND SPARES										3,943
RECURRING TOTAL		60,017	58,139	57,515	56,889	55,639	32,508	3,123		625,158
INVESTMENT		59,075	57,228	56,613	55,998	54,767	31,998	3,075		615,358
DELIVER NEW ENGINES		58,751	56,915	56,303	55,691	54,467	31,823	3,059		611,988
GROUND SUPPORT EQUIP.		324	313	310	307	300	175	16		3,370
PARTS										
OPERATIONS		942	911	902	891	872	510	48		9,800
FLIGHT SUPPORT		408	395	391	386	378	221	21		4,246
OPERATIONS		297	287	284	281	275	161	14		3,089
PARTS		237	229	227	224	219	128	13		2,465
FACILITIES										52,434
TRANSPORTATION		2,213	2,146	2,122	2,099	2,052	1,201	117		24,757
TOTAL PROGRAM		62,230	60,285	59,637	58,988	57,691	33,709	3,240		795,049

5.1.2.2.2 With TVC and TT

CEILING COST 156 INCH SRM PARALLEL BURN WITH TVC/TT

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					60/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	895	2,950	12,017	1,142		13,159	760	16,869
SYSTEM ENGINEERING	4,828		5	1,328	6,161	5,432			5,432		11,593
SRM'S	42,247	11,795	3,408	35,978	93,428	2,135,406	27,886		2,163,292		2,256,720
CASE	14,956	3,692	73	14,226	32,947	1,012,279	12,576		1,024,855		1,057,802
NOZZLE	7,297	2,336	1,152	7,021	17,806	367,425	1,882		369,307		387,113
IGNITER	480	274	5	244	1,003	8,465	423		8,888		9,891
PROPELLANT AND LINER	7,985	1,929	1,144	7,597	18,655	494,696	4,009		498,705		517,360
POWER SUPPLY DISTRIBUTION	236	26	140	770	1,172	24,693	378		25,071		26,243
FINAL ASSEMBLY	1,636	1,940	486	2,235	6,297	78,641	8,317		86,958		93,255
GROUND TEST	1,675	1,291	195		3,161	3,091			3,091		6,252
AUXILIARY POWER UNIT (APU)	7,375	270	153	3,644	11,442	133,875			133,875		145,317
THRUST TERMINATION	607	37	60	241	945	12,241	301		12,542		13,487
INSTALLATION ASSEMBLY AND CHECKOUT	237		181	496	914					7,420	8,334
FACILITIES	6,172		2,029		8,201	1,513		108,288	109,801		118,002
SUPPORT EQUIPMENT AND SPARES	248		1,840	602	2,690	5,674			5,674	4,301	12,665
FLIGHT TEST SUPPORT				549	549	7,912			7,912		8,461
OPERATIONS SUPPORT			129	221	350					4,535	4,885
STRUCTURE	1,703	374	1,062	3,336	6,475	241,651	360		242,011		248,486
TRANSPORTATION			409	1,288	1,697	80,008			80,008		81,705
TOTAL PROGRAM	57,283	12,332	9,107	44,693	123,415	2,489,613	29,388	108,288	2,627,289	17,016	2,767,720

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM PARALLEL BURN WITH TVC & TT 60/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		314	14,009	30,459	38,885	28,998	852				
DDT & E		314	14,009	30,459	38,885	28,998	852				
DEVELOPMENT		314	14,009	26,600	22,035						
DEVELOPMENT		314	14,009	26,600	22,035						
STE											
DELIVERABLE HARDWARE				2,019	16,317	27,720					
DUMMY ENGINES				2,019	2,500						
FLIGHT ENGINES					13,817	27,720					
O & FS AND SPARES				1,840	533	1,278	852				
RECURRING TOTAL							56,454	110,452	137,452	193,905	218,451
INVESTMENT							56,069	109,698	136,514	192,582	216,960
DELIVER NEW ENGINES							55,938	109,443	136,196	192,134	216,455
GROUND SUPPORT EQUIP.							131	255	318	448	505
PARTS											
OPERATIONS							385	754	938	1,323	1,491
FLIGHT SUPPORT							182	356	443	625	704
OPERATIONS							104	204	254	358	404
PARTS							99	194	241	340	383
FACILITIES		541	6,561	1,099			18,741	26,092	14,951	10,000	15,017
TRANSPORTATION					409	553	2,575	3,601	4,480	6,321	7,120
TOTAL PROGRAM		855	20,570	31,558	39,294	29,551	78,622	140,145	156,883	210,226	240,588

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										113,517
DDT & E										113,517
DEVELOPMENT										62,958
DEVELOPMENT										62,958
STE										
DELIVERABLE HARDWARE										46,056
DUMMY ENGINES										4,519
FLIGHT ENGINES										41,537
O & FS AND SPARES										4,503
RECURRING TOTAL		260,177	323,994	321,538	309,266	309,266	208,632	4,909		2,454,496
INVESTMENT		258,401	321,783	319,345	307,156	307,156	207,208	4,876		2,437,748
DELIVER NEW ENGINES		257,800	321,034	318,602	306,441	306,441	206,726	4,864		2,432,074
GROUND SUPPORT EQUIP.		601	749	743	715	715	482	12		5,674
PARTS										
OPERATIONS		1,776	2,211	2,193	2,110	2,110	1,424	33		16,748
FLIGHT SUPPORT		839	1,044	1,036	997	997	673	16		7,912
OPERATIONS		481	599	594	571	571	385	10		4,535
PARTS		456	568	563	542	542	366	7		4,301
FACILITIES		15,000	10,000							118,002
TRANSPORTATION		8,480	10,560	10,482	10,081	10,086	6,801	161		81,705
TOTAL PROGRAM		283,657	344,554	332,020	319,347	319,347	215,433	5,070		2,767,720

CEILING COST 156 INCH SRM PARALLEL BURN WITH TVC/TT

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					40/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	895	2,950	12,017	1,142		13,159	760	16,869
SYSTEM ENGINEERING	4,828		5	1,328	6,161	5,432			5,432		11,593
SRM'S	42,247	11,795	3,408	35,978	93,428	1,811,018	24,362		1,835,380		1,928,808
CASE	14,956	3,692	73	14,226	32,947	901,331	10,792		912,123		945,070
NOZZLE	7,297	2,336	1,152	7,021	17,806	257,481	1,748		259,229		277,035
IGNITER	480	274	5	244	1,003	7,787	408		8,195		9,198
PROPELLANT AND LINER	7,985	1,929	1,144	7,597	18,655	416,019	3,527		419,546		438,201
POWER SUPPLY DISTRIBUTION	236	26	140	770	1,172	21,261	378		21,639		22,811
FINAL ASSEMBLY	1,636	1,940	486	2,235	6,297	66,585	7,245		73,830		80,127
GROUND TEST	1,675	1,291	195		3,161	2,640			2,640		5,801
AUXILIARY POWER UNIT (APU)	7,375	270	153	3,644	11,442	127,944			127,944		139,386
THRUST TERMINATION	607	37	60	241	945	9,970	264		10,234		11,179
INSTALLATION ASSEMBLY AND CHECKOUT	237		181	496	914					6,159	7,073
FACILITIES	6,172		2,029		8,201	476		69,308	69,784		77,985
SUPPORT EQUIPMENT AND SPARES	248		1,840	602	2,690	4,771			4,771	3,575	11,036
FLIGHT TEST SUPPORT				549	549	6,440			6,440		6,989
OPERATIONS SUPPORT			129	221	350					3,989	4,339
STRUCTURE	1,703	374	1,062	3,336	6,475	193,992	360		194,352		200,827
TRANSPORTATION			409	1,288	1,697	64,186			64,186		65,883
TOTAL PROGRAM	57,283	12,332	9,107	44,693	123,415	2,098,332	25,864	69,308	2,193,504	14,483	2,331,402

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM PARALLEL BURN WITH TVC & TT 40/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		314	14,009	30,459	38,885	28,998	852				
DDT & E		314	14,009	30,459	38,885	28,998	852				
DEVELOPMENT		314	14,009	26,600	22,035						
DEVELOPMENT		314	14,009	26,600	22,035						
STE											
DELIVERABLE HARDWARE				2,019	16,317	27,720					
DUMMY ENGINES				2,019	2,500						
FLIGHT ENGINES					13,817	27,720					
O & FS AND SPARES				1,840	533	1,278	852				
RECURRING TOTAL							58,073	116,145	145,181	207,402	232,289
INVESTMENT							57,681	115,361	144,201	206,001	230,721
DELIVER NEW ENGINES							57,547	115,094	143,867	205,524	230,187
GROUND SUPPORT EQUIP.							134	267	334	477	534
PARTS											
OPERATIONS							392	784	980	1,401	1,568
FLIGHT SUPPORT							180	361	451	644	721
OPERATIONS							112	223	279	399	447
PARTS							100	200	250	358	400
FACILITIES		541	6,561	1,099			18,741	26,092	14,951	10,000	
TRANSPORTATION					409	553	2,532	3,594	4,493	6,419	7,190
TOTAL PROGRAM		855	20,570	31,558	39,294	29,551	80,198	145,831	164,625	223,821	239,479

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										113,517
DDT & E										113,517
DEVELOPMENT										62,958
DEVELOPMENT										62,958
STE										
DELIVERABLE HARDWARE										46,056
DUMMY ENGINES										4,519
FLIGHT ENGINES										41,537
O & FS AND SPARES										4,503
RECURRING TOTAL		228,142	223,994	221,920	219,847	217,771	197,032	6,221		2,074,017
INVESTMENT		226,602	222,481	220,421	218,362	216,301	195,701	6,180		2,060,013
DELIVER NEW ENGINES		226,077	221,966	219,911	217,856	215,800	195,248	6,165		2,055,242
GROUND SUPPORT EQUIP.		525	515	510	506	501	453	15		4,771
PARTS										
OPERATIONS		1,540	1,513	1,499	1,485	1,470	1,331	41		14,004
FLIGHT SUPPORT		708	696	689	683	676	612	19		6,440
OPERATIONS		439	431	427	423	419	379	11		3,989
PARTS		393	386	383	379	375	340	11		3,575
FACILITIES										77,985
TRANSPORTATION		7,061	6,932	6,868	6,803	6,741	6,098	190		65,883
TOTAL PROGRAM		235,203	230,926	228,788	226,650	224,512	203,130	6,411		2,331,402



CEILING COST 156 INCH SRM PARALLEL BURN WITH TVC/TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					20/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	895	2,950	10,214	971		11,185	760	14,895
SYSTEM ENGINEERING	4,828		5	1,328	6,161	4,617			4,617		10,778
SRM'S	42,247	11,795	3,408	35,978	93,428	1,071,725	22,464		1,094,189		1,187,617
CASE	14,956	3,692	73	14,226	32,947	536,353	10,118		546,471		579,418
NOZZLE	7,297	2,336	1,152	7,021	17,806	161,048	1,614		162,662		180,468
IGNITER	480	274	5	244	1,003	5,298	378		5,676		6,679
PROPELLANT AND LINER	7,985	1,929	1,144	7,597	18,655	233,185	3,071		236,256		254,911
POWER SUPPLY DISTRIBUTION	236	26	140	770	1,172	14,434	357		14,791		15,963
FINAL ASSEMBLY	1,636	1,940	486	2,235	6,297	43,986	6,681		50,667		56,964
GROUND TEST	1,675	1,291	195		3,161	2,210			2,210		5,371
AUXILIARY POWER UNIT (APU)	7,375	270	153	3,644	11,442	69,261			69,261		80,703
THRUST TERMINATION	607	37	60	241	945	5,950	245		6,195		7,140
INSTALLATION ASSEMBLY AND CHECKOUT	237		181	496	914					5,112	6,026
FACILITIES	6,172		2,029		8,201	476		59,308	59,784		67,985
SUPPORT EQUIPMENT AND SPARES	248		1,840	602	2,690	4,012			4,012	2,970	9,672
FLIGHT TEST SUPPORT				549	549	5,242			5,242		5,791
OPERATIONS SUPPORT			129	221	350					3,510	3,860
STRUCTURE	1,703	374	1,062	3,336	6,475	127,591	360		127,951		134,426
TRANSPORTATION			409	1,288	1,697	42,530			42,530		44,227
TOTAL PROGRAM	57,283	12,332	9,107	44,693	123,415	1,266,407	23,795	59,308	1,349,510	12,352	1,485,277

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM PARALLEL BURN WITH TVC & TT 20/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		314	14,009	30,459	38,885	28,998	852				
DDT & E		314	14,009	30,459	38,885	28,998	852				
DEVELOPMENT		314	14,009	26,600	22,035						
DEVELOPMENT		314	14,009	26,600	22,035						
STE											
DELIVERABLE HARDWARE				2,019	16,317	27,720					
DUMMY ENGINES				2,019	2,500						
FLIGHT ENGINES					13,817	27,720					
O & FS AND SPARES				1,840	533	1,278	852				
RECURRING TOTAL							60,459	120,918	130,993	130,993	129,732
INVESTMENT							59,896	119,791	129,774	129,774	128,526
DELIVER NEW ENGINES							59,703	119,406	129,357	129,357	128,113
GROUND SUPPORT EQUIP.							193	385	417	417	413
PARTS											
OPERATIONS							563	1,125	1,219	1,219	1,208
FLIGHT SUPPORT							252	503	545	545	540
OPERATIONS							168	337	365	365	362
PARTS							143	285	309	309	306
FACILITIES		541	6,561	1,099			18,741	26,092	14,951		
TRANSPORTATION					409	553	2,775	4,084	4,423	4,423	4,380
TOTAL PROGRAM		855	20,570	31,558	39,294	29,551	82,827	151,092	150,367	135,416	134,114

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										113,517
DDT & E										113,517
DEVELOPMENT										62,958
DEVELOPMENT										62,958
STE										
DELIVERABLE HARDWARE										46,056
DUMMY ENGINES										4,519
FLIGHT ENGINES										41,537
O & FS AND SPARES										4,503
RECURRING TOTAL		127,214	124,695	123,436	120,916	119,656	64,237	6,299		1,259,548
INVESTMENT		126,030	123,535	122,287	119,791	118,543	63,640	6,239		1,247,826
DELIVER NEW ENGINES		125,625	123,138	121,894	119,406	118,162	63,435	6,218		1,243,814
GROUND SUPPORT EQUIP.		405	397	393	385	381	205	21		4,012
PARTS										
OPERATIONS		1,184	1,160	1,149	1,125	1,113	597	60		11,722
FLIGHT SUPPORT		529	519	514	503	498	267	27		5,242
OPERATIONS		355	347	344	337	333	179	18		3,510
PARTS		300	294	291	285	282	151	15		2,970
FACILITIES										67,985
TRANSPORTATION		4,296	4,210	4,167	4,084	4,042	2,169	212		44,227
TOTAL PROGRAM		131,510	128,905	127,603	125,000	123,698	66,406	6,511		1,485,277

CEILING COST 156 INCH SRM PARALLEL BURN WITH TVC/TT  
(DOLLARS IN THOUSANDS)

DATE 15<sup>th</sup> March 1972

	DDT & E					10/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	895	2,950	10,214	971		11,185	760	14,895
SYSTEM ENGINEERING	4,828		5	1,328	6,161	4,617			4,617		10,778
SRM'S	42,247	11,795	3,408	35,978	93,428	565,600	12,303		577,903		671,331
CASE	14,956	3,692	73	14,226	32,947	285,049	5,519		290,568		323,515
NOZZLE	7,297	2,336	1,152	7,021	17,806	87,017	891		87,908		105,714
IGNITER	480	274	5	244	1,003	2,742	180		2,922		3,925
PROPELLANT AND LINER	7,985	1,929	1,144	7,597	18,655	122,509	1,670		124,179		142,834
POWER SUPPLY DISTRIBUTION	236	26	140	770	1,172	7,227	202		7,429		8,601
FINAL ASSEMBLY	1,636	1,940	486	2,235	6,297	20,816	3,707		24,523		30,820
GROUND TEST	1,675	1,291	195		3,161	1,105			1,105		4,266
AUXILIARY POWER UNIT (APU)	7,375	270	153	3,644	11,442	35,938			35,938		47,380
THRUST TERMINATION	607	37	60	241	945	3,197	134		3,331		4,276
INSTALLATION ASSEMBLY AND CHECKOUT	237		181	496	914					4,243	5,157
FACILITIES	6,172		2,029		8,201	476		44,357	44,833		53,034
SUPPORT EQUIPMENT AND SPARES	248		1,840	602	2,690	3,370			3,370	2,465	8,525
FLIGHT TEST SUPPORT				549	549	4,246			4,246		4,795
OPERATIONS SUPPORT			129	221	350					3,089	3,439
STRUCTURE	1,703	374	1,062	3,336	6,475	69,643	360		70,003		76,478
TRANSPORTATION			409	1,288	1,697	23,214			23,214		24,911
TOTAL PROGRAM	57,283	12,332	9,107	44,693	123,415	681,380	13,634	44,357	739,371	10,557	873,343

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM PARALLEL BURN WITH TVC & TT 10/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		314	14,009	30,459	38,885	28,998	852				
DDT & E		314	14,009	30,459	38,885	28,998	852				
DEVELOPMENT		314	14,009	26,600	22,035						
DEVELOPMENT		314	14,009	26,600	22,035						
STE											
DELIVERABLE HARDWARE				2,019	16,317	27,720					
DUMMY ENGINES				2,019	2,500						
FLIGHT ENGINES					13,817	27,720					
O & FS AND SPARES				1,840	533	1,278	852				
RECURRING TOTAL							60,620	67,431	67,431	66,750	66,069
INVESTMENT							59,748	66,461	66,461	65,789	65,118
DELIVER NEW ENGINES							59,448	66,127	66,127	65,459	64,791
GROUND SUPPORT EQUIP.							300	334	334	330	327
PARTS											
OPERATIONS							872	970	970	961	951
FLIGHT SUPPORT							378	420	420	416	412
OPERATIONS							275	306	306	303	300
PARTS							219	244	244	242	239
FACILITIES		541	6,561	1,099			18,741	26,092			
TRANSPORTATION					409	553	2,801	2,299	2,299	2,274	2,251
TOTAL PROGRAM		855	20,570	31,558	39,294	29,551	83,014	95,822	69,730	69,024	68,320

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										113,517
DDT & E										113,517
DEVELOPMENT										62,958
DEVELOPMENT										62,958
STE										
DELIVERABLE HARDWARE										46,056
DUMMY ENGINES										4,519
FLIGHT ENGINES										41,537
O & FS AND SPARES										4,503
RECURRING TOTAL		65,389	63,343	62,663	61,982	60,620	35,418	3,405		681,121
INVESTMENT		64,447	62,432	61,761	61,091	59,748	34,908	3,357		671,321
DELIVER NEW ENGINES		64,123	62,119	61,451	60,784	59,448	34,733	3,341		667,951
GROUND SUPPORT EQUIP.		324	313	310	307	300	175	16		3,370
PARTS										
OPERATIONS		942	911	902	891	872	510	48		9,800
FLIGHT SUPPORT		408	395	391	386	378	221	21		4,246
OPERATIONS		297	287	284	281	275	161	14		3,089
PARTS		237	229	227	224	219	128	13		2,465
FACILITIES										53,034
TRANSPORTATION		2,227	2,161	2,135	2,112	2,066	1,208	116		24,911
TOTAL PROGRAM		67,616	65,504	64,798	64,094	62,686	36,626	3,521		872,583

### **5.1.3 156 Inch Parallel Recoverable Cost**

#### 5.1.3.1 Probable Cost

5.1.3.1.1 W/O TVC and TT

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY PARALLEL BURN W/O TVC & TT

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E TOTAL	DDT & E REFURBISH AND RECOVERY DELTA	DDT & E WITH REFURBISH AND RECOVERY TOTAL (1)	PRODUCTION PROGRAM TOTAL	60/YR RATE REFURBISH AND RECOVERY			PROD PROGRAM WITH REFURBISH AND RECOVERY TOTAL (2)	OPERATIONS TOTAL	REFURBISH AND RECOVERY OPERATIONS DELTA	OPERATIONS WITH REFURBISH AND RECOVERY TOTAL (3)	TOTAL PROGRAM
					PRODUCTION DELTA	TOOLING DELTA	FACILITIES DELTA					
SRM												
PROGRAM MANAGEMENT	2,752		2,752	12,124				12,124	700		700	15,576
SYSTEM ENGINEERING	4,613	230	4,843	5,005				5,005				9,848
SRM'S	62,399	(3,670)	58,729	1,473,134	(583,988)	(2,453)		886,693				945,422
CASE	26,531	(4,390)	22,141	773,318	(554,067)	(2,355)		216,896				239,037
NOZZLE	11,160	593	11,753	227,157	(27,207)	(88)		199,852				211,605
IGNITER	951		951	8,189				8,189				9,140
PROPELLANT AND LINER	16,508		16,508	364,896				364,896				381,404
POWER SUPPLY DISTRIBUTION	966	(29)	937	23,098	(2,714)			20,384				21,321
FINAL ASSEMBLY	3,761		3,761	73,628				73,628				77,389
GROUND TEST	2,522	156	2,678	2,848				2,848				5,526
AUXILIARY POWER UNIT (APU)												
THRUST TERMINATION												
INSTALLATION ASSEMBLY AND CHECKOUT	807		807						6,836		6,836	7,643
FACILITIES	7,290		7,290	101,160			(41,796)	59,364		18,995	18,995	85,649
SUPPORT EQUIPMENT AND SPARES	2,166		2,166	5,227				5,227	3,963		3,963	11,356
FLIGHT TEST SUPPORT	473	95	568	7,289				7,289				7,857
OPERATIONS SUPPORT	336		336						4,178		4,178	4,514
STRUCTURE	6,210	(1,640)	4,570	222,965	(187,993)			34,972				39,542
RECOVERY SYSTEM		90,844	90,844							86,361	86,361	177,205
TRANSPORTATION	1,480	42	1,522	73,711	6,507			80,218				81,740
TOTAL PROGRAMS	88,526	85,901	174,427	1,900,615	(765,474)	(2,453)	(41,796)	1,090,892	15,677	105,356	121,033	1,386,352

NOTE: TOTAL PROGRAM IS SUM OF  
COLUMN 1, 2, AND 3



PROBABLE COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN W/O TVC & TT

60/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$415	\$11,088	\$17,082	\$19,656	\$14,811	\$39,311	\$70,041	\$78,484	\$105,200	\$120,287	\$141,881	\$172,334	\$166,105	\$159,737	\$159,737	\$107,691	\$2,492	\$1,386,352

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN W/O TVC & TT

40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$174,427	\$1,064,958	\$49,826	\$1,289,211

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$415	\$11,088	\$17,082	\$19,656	\$14,811	\$44,275	\$86,978	\$90,867	\$123,558	\$132,181	\$129,865	\$127,548	\$126,261	\$125,103	\$123,944	\$112,103	\$3,476	\$1,289,211

1

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN W/O TVC & TT

20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$174,427	\$702,114	\$42,686	\$919,227

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$415	\$11,088	\$17,082	\$19,656	\$14,811	\$51,173	\$100,415	\$99,956	\$83,638	\$82,812	\$81,162	\$79,603	\$78,777	\$77,218	\$76,393	\$40,993	\$4,035	\$919,227

PARALLEL COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN W/O TVC & TT

10/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$174,427	\$406,553	\$30,979	\$611,959

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$415	\$11,088	\$17,082	\$19,656	\$14,811	\$57,993	\$69,040	\$60,867	\$58,236	\$47,748	\$47,260	\$45,797	\$45,309	\$44,821	\$43,785	\$25,612	\$2,439	\$611,959

**5.1.3.1.2 With TVC and TT**

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY PARALLEL BURN WITH TVC & TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E TOTAL	DDT & E REFURBISH AND RECOVERY DELTA	DDT & E WITH REFURBISH AND RECOVERY TOTAL (1)	PRODUCTION PROGRAM TOTAL	60/YR RATE REFURBISH AND RECOVERY			PROD PROGRAM WITH REFURBISH AND RECOVERY TOTAL (2)	OPERATIONS TOTAL	REFURBISH AND RECOVERY OPERATIONS DELTA	OPERATIONS WITH REFURBISH AND RECOVERY TOTAL (3)	TOTAL PROGRAM
					PRODUCTION DELTA	TOOLING DELTA	FACILITIES DELTA					
SRM												
PROGRAM MANAGEMENT	2,828		2,828	12,124				12,124	700		700	15,652
SYSTEM ENGINEERING	5,909	291	6,200	5,005				5,005				11,205
SRM'S	79,634	(2,735)	76,899	1,684,601	(645,635)	(2,482)		1,036,484				1,113,383
CASE	26,531	(4,390)	22,141	773,318	(554,067)	(2,355)		216,896				239,037
NOZZLE	14,469	767	15,236	287,244	(30,813)	(127)		266,304				281,540
IGNITER	951		951	8,189				8,189				9,140
PROPELLANT AND LINER	16,508		16,508	364,896				364,896				381,404
POWER SUPPLY DISTRIBUTION	1,117	(29)	1,088	23,098	(2,714)			20,384				21,472
FINAL ASSEMBLY	5,374		5,374	80,114				80,114				85,488
GROUND TEST	2,804	156	2,960	2,848				2,848				5,808
AUXILIARY POWER UNIT (APU)	10,974	761	11,735	123,339	(58,041)			65,298				77,033
THRUST TERMINATION	906		906	11,555				11,555				12,461
INSTALLATION ASSEMBLY AND CHECKOUT	877		877						6,836		6,836	7,713
FACILITIES	7,865		7,865	101,160			(41,796)	59,364		18,995	18,995	86,224
SUPPORT EQUIPMENT AND SPARES	2,580		2,580	5,227				5,227	3,963		3,963	11,770
FLIGHT TEST SUPPORT	527	95	622	7,289				7,289				7,911
OPERATIONS SUPPORT	336		336						4,178		4,178	4,514
STRUCTURE	6,210	(1,640)	4,570	222,965	(187,993)			34,972				39,542
RECOVERY SYSTEM		90,844	90,844							86,361	86,361	177,205
TRANSPORTATION	1,627	42	1,669	73,711	6,507			80,218				81,887
TOTAL PROGRAMS	108,393	86,897	195,290	2,112,082	(827,121)	(2,482)	(41,796)	1,240,683	15,677	105,356	121,033	1,557,006

NOTE: TOTAL PROGRAM IS SUM OF  
COLUMN 1, 2, AND 3

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN WITH TVC & TT

60/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$466	\$13,278	\$20,450	\$22,045	\$16,611	\$44,090	\$78,555	\$88,025	\$117,987	\$134,909	\$159,128	\$193,282	\$186,296	\$179,154	\$179,154	\$120,782	\$2,794	\$1,557,006

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN WITH TVC & TT

40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION</u>	<u>TOTAL</u>
	<u>RECURRING</u>	<u>FACILITIES</u>	<u>PROGRAM</u>
\$195,290	\$1,148,734	\$49,826	\$1,393,850

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$466	\$13,278	\$20,450	\$22,045	\$16,611	\$47,792	\$91,324	\$98,085	\$133,374	\$142,682	\$140,181	\$137,680	\$136,291	\$135,041	\$133,790	\$121,009	\$3,751	\$1,393,850



PROBABLE COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN WITH TVC & TT

20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

DDT&E	PRODUCTION	PRODUCTION	TOTAL
_____	<u>RECURRING</u>	<u>FACILITIES</u>	<u>PROGRAM</u>
\$195,290	\$751,506	\$42,686	\$989,482

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$466	\$13,278	\$20,450	\$22,045	\$16,611	\$54,960	\$106,397	\$105,904	\$89,827	\$88,940	\$87,167	\$85,493	\$84,606	\$82,932	\$82,046	\$44,027	\$4,333	\$989,482

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN WITH TVC & TT

10/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$195,290	\$431,500	\$30,979	\$657,769

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$466	\$13,278	\$20,450	\$22,045	\$16,611	\$62,122	\$73,133	\$63,666	\$61,670	\$51,148	\$50,625	\$49,057	\$48,535	\$48,012	\$46,902	\$27,436	\$2,613	\$657,769

### 5.1.3.2 Ceiling Cost

**5.1.3.2.1 W/O TVC and TT**

CEILING COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY PARALLEL BURN W/O TVC & TT

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E TOTAL	DDT & E REFURBISH AND RECOVERY DELTA	DDT & E WITH REFURBISH AND RECOVERY TOTAL (1)	PRODUCTION PROGRAM TOTAL	60/YR RATE REFURBISH AND RECOVERY			PROD PROGRAM WITH REFURBISH AND RECOVERY TOTAL (2)	OPERATIONS TOTAL	REFURBISH AND RECOVERY OPERATIONS DELTA	OPERATIONS WITH REFURBISH AND RECOVERY TOTAL (3)	TOTAL PROGRAM
					PRODUCTION DELTA	TOOLING DELTA	FACILITIES DELTA					
SRM												
PROGRAM MANAGEMENT	2,870		2,870	13,159				13,159	760		760	16,789
SYSTEM ENGINEERING	4,810	241	5,051	5,432				5,432				10,483
SRM'S	74,602	(4,232)	70,370	1,887,089	(780,009)	(3,739)		1,103,341				1,173,711
CASE	32,947	(5,031)	27,916	1,024,855	(741,425)	(3,544)		279,886				307,802
NOZZLE	13,769	665	14,434	246,561	(35,638)	(195)		210,728				225,162
IGNITER	1,003		1,003	8,888				8,888				9,891
PROPELLANT AND LINER	18,655		18,655	498,705				498,705				517,360
POWER SUPPLY DISTRIBUTION	1,012	(31)	981	25,071	(2,946)			22,125				23,106
FINAL ASSEMBLY	4,396		4,396	79,918				79,918				84,314
GROUND TEST	2,820	165	2,985	3,091				3,091				6,076
AUXILIARY POWER UNIT (APU)												
THRUST TERMINATION												
INSTALLATION ASSEMBLY AND CHECKOUT	842		842						7,420		7,420	8,262
FACILITIES	7,601		7,601	109,801			(45,366)	64,435		20,618	20,618	92,654
SUPPORT EQUIPMENT AND SPARES	2,258		2,258	5,674				5,674	4,301		4,301	12,233
FLIGHT TEST SUPPORT	493	100	593	7,912				7,912				8,505
OPERATIONS SUPPORT	350		350						4,535		4,535	4,885
STRUCTURE	6,475	(1,714)	4,761	242,011	(204,052)			37,959				42,720
RECOVERY SYSTEM		96,131	96,131							93,737	93,737	189,868
TRANSPORTATION	1,543	44	1,587	80,008	7,064			87,072				88,659
TOTAL PROGRAMS	101,844	90,570	192,414	2,351,086	(976,997)	(3,739)	(45,366)	1,324,984	17,016	114,355	131,371	1,648,769

NOTE: TOTAL PROGRAM IS SUM OF  
COLUMN 1, 2, AND 3

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN W/O TVC & TT

60/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$494	\$13,290	\$20,473	\$23,372	\$17,612	\$46,745	\$83,285	\$93,325	\$125,092	\$143,033	\$168,710	\$204,921	\$197,514	\$189,943	\$189,943	\$128,055	\$2,962	\$1,648,769

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN W/O TVC & TT

40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$192,414	\$1,285,981	\$54,083	\$1,532,478

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$494	\$13,290	\$20,473	\$23,372	\$17,612	\$52,620	\$103,336	\$107,994	\$146,847	\$157,096	\$154,343	\$151,589	\$150,060	\$148,683	\$147,306	\$133,233	\$4,130	\$1,532,478

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN W/O TVC & TT

20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$192,414	\$848,995	\$46,333	\$1,087,742

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$494	\$13,290	\$20,473	\$23,372	\$17,612	\$60,539	\$118,608	\$118,064	\$98,945	\$97,969	\$96,016	\$94,171	\$93,195	\$91,351	\$90,374	\$48,496	\$4,773	\$1,087,742



CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN W/O TVC & TT

10/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$192,414	\$491,262	\$34,746	\$718,422

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$494	\$13,290	\$20,473	\$23,372	\$17,612	\$68,054	\$82,276	\$70,951	\$66,604	\$56,032	\$55,459	\$53,742	\$53,169	\$52,597	\$51,380	\$30,055	\$2,862	\$718,422

**5.1.3.2.2 With TVC and TT**



CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN WITH TVC & TT

60/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$563	\$16,017	\$24,675	\$26,629	\$20,066	\$53,258	\$94,890	\$106,329	\$142,522	\$162,962	\$192,217	\$233,473	\$225,034	\$216,408	\$216,408	\$145,897	\$3,376	\$1,880,724

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN WITH TVC & TT

40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$215,120	\$1,411,645	\$54,083	\$1,680,848

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$563	\$16,017	\$24,675	\$26,629	\$20,066	\$57,634	\$109,992	\$118,284	\$160,839	\$172,065	\$169,049	\$166,033	\$164,358	\$162,850	\$161,342	\$145,928	\$4,524	\$1,680,848

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN WITH TVC & TT

20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$215,120	\$924,847	\$46,333	\$1,186,300

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$563	\$16,017	\$24,675	\$26,629	\$20,066	\$65,892	\$127,253	\$126,662	\$107,695	\$106,632	\$104,506	\$102,499	\$101,436	\$99,429	\$98,366	\$52,785	\$5,195	\$1,186,300

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY PARALLEL BURN WITH TVC & TT

10/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>aDDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$215,120	\$530,753	\$34,746	\$780,619

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$563	\$16,017	\$24,675	\$26,629	\$20,066	\$73,720	\$87,927	\$74,827	\$71,317	\$60,697	\$60,077	\$58,216	\$57,596	\$56,976	\$55,658	\$32,558	\$3,100	\$780,619

## 5.2 156 Inch Series Expendable Cost



## 156 INCH SERIES BURN

Presented in this section are the expendable costs for the Series Configuration, both probable and ceiling, as defined in Section 3.0. These costs are set forth on NASA Cost Tables I and II.

The recoverable costs for the DDT&E and 60 per year launch rate are presented on NASA Cost Table I; however, the alternate launch rates of 40, 20 and 10 are presented in total costs only by DDT&E, Production recurring and Production facilities. The Table II time phased cost are only presented in total dollars by fiscal year for all launch rates.

In the 23 February presentation it was stated that the Recovery System Development Cost was included in the recurring cost per launch for the recoverable cost. This was correct but for consistency with the 156-inch parallel configuration we have included the Recovery System Development Cost in the DDT&E and excluded it from the recurring production cost.

For your convenience a cost summary is included in the front of this section summarizing the cost detail which follows.

### 5.2.1 Summary

SUMMARY 156 INCH SRM SERIES BURN

(DOLLARS IN THOUSANDS)

	DDT&E	Production 60/Year Rate			Production 40/Year Rate			Production 20/Year Rate			Production 10/Year Rate		
		Recurring	Facilities	Total Program	Recurring	Facilities	Total Program	Recurring	Facilities	Total Program	Recurring	Facilities	Total Program
<u>Series Burn-Expendable</u>													
<u>Probable Cost</u>													
With TVC/W/O TT	151,902	3,428,120	134,639	3,714,661	2,893,476	118,612	3,163,990	1,809,511	72,532	2,033,945	978,138	58,983	1,189,023
Recurring Cost/Launch		7,791			8,220			9,232			9,685		
Peak Annual Funding	48,906	464,484			323,845			206,087			130,459		
<u>Ceiling Cost</u>													
With TVC/W/O TT	171,486	4,400,293	146,092	4,717,871	3,733,535	128,702	4,033,723	2,306,164	78,702	2,556,352	1,246,399	64,000	1,481,885
Recurring Cost/Launch		10,001			10,607			11,766			12,341		
Peak Annual Funding	55,583	593,784			417,797			259,176			159,693		
With TVC-TT	172,550	4,419,049	146,092	4,737,691	3,749,652	128,702	4,050,904	2,316,021	78,702	2,567,273	1,251,748	64,000	1,488,298
Recurring Cost/Launch		10,043			10,652			11,816			12,394		
Peak Annual Funding	55,968	596,259			419,705			260,201			160,224		
<u>Series Burn - Recoverable</u>													
<u>Probable Cost</u>													
With TVC W/O TT	256,902	2,074,705	119,190	2,450,797	1,825,696	105,024	2,187,622	1,182,435	64,713	1,504,050	692,620	52,861	1,002,383
Recurring Cost/Launch		4,715			5,187			6,033			6,858		
Peak Annual Funding	34,714	304,358			224,036			159,972			125,095		
<u>Ceiling Cost</u>													
With TVC W/O TT	280,574	2,599,688	129,330	3,009,592	2,287,386	113,958	2,681,918	1,480,926	70,218	1,831,718	869,823	57,357	1,207,754
Recurring Cost/Launch		5,908			6,498			7,556			8,612		
Peak Annual Funding	42,635	373,811			274,704			194,319			149,524		
With TVC-TT	281,638	2,618,444	129,330	3,029,412	2,304,282	113,958	2,699,878	1,491,706	70,218	1,843,562	876,287	57,357	1,215,282
Recurring Cost/Launch		5,951			6,546			7,611			8,676		
Peak Annual Funding	42,917	376,278			276,549			195,572			150,438		

### 5.2.2 Expendable

#### 5.2.2.1 Probable Cost With TVC and W/O TT

PROBABLE COST 156 INCH SRM SERIES BURN WITH TVC W/O TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					60/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,772	156	42	880	2,850	12,149	1,052		13,201	700	16,751
SYSTEM ENGINEERING	4,630		5	1,416	6,051	6,625			6,625		12,676
SRM'S	40,543	10,359	3,842	55,916	110,660	2,759,498	30,867		2,790,365		2,901,025
CASE	15,188	3,434	147	23,969	42,738	1,313,407	12,249		1,325,656		1,368,394
NOZZLE	6,145	1,953	1,007	8,426	17,531	397,480	1,464		398,944		416,475
IGNITER	563	266	11	450	1,290	10,431	430		10,861		12,151
PROPELLANT AND LINER	8,276	1,698	1,656	13,843	25,473	659,760	4,497		664,257		689,730
POWER SUPPLY DISTRIBUTION	226	19	151	1,223	1,619	56,516	392		56,908		58,527
FINAL ASSEMBLY	1,466	1,719	499	3,014	6,698	132,834	11,835		144,669		151,367
GROUND TEST	1,606	1,011	208		2,825	4,273			4,273		7,098
AUXILIARY POWER UNIT (APU)	7,073	259	163	4,991	12,486	184,797			184,797		197,283
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	239		193	528	960					8,232	9,192
FACILITIES	6,294		1,946		8,240	1,610		134,639	136,249		144,489
SUPPORT EQUIPMENT AND SPARES	238		2,752	592	3,582	5,915			5,915	5,242	14,739
FLIGHT TEST SUPPORT				617	617	9,459			9,459		10,076
OPERATIONS SUPPORT			124	212	336					4,179	4,515
STRUCTURE	5,481	1,562	2,180	6,732	15,955	440,301	282		440,583		456,538
TRANSPORTATION			639	2,012	2,651	142,009			142,009		144,660
TOTAL PROGRAM	59,197	12,077	11,723	68,905	151,902	3,377,566	32,201	134,639	3,544,406	18,353	3,714,661

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 PROBABLE COST 156 INCH SRM SERIES BURN WITH TVC W/O TT 60/YEAR PRODUCTION

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		323	14,352	32,210	48,183	44,903	1,040				
DDT & E		323	14,352	32,210	48,183	44,903	1,040				
DEVELOPMENT		323	14,352	27,253	22,575						
DEVELOPMENT		323	14,352	27,253	22,575						
STE											
DELIVERABLE HARDWARE				2,712	24,957	43,344					
DUMMY ENGINES				2,712	3,357						
FLIGHT ENGINES					21,600	43,344					
O & FS AND SPARES				2,245	651	1,559	1,040				
RECURRING TOTAL							75,545	147,803	183,933	259,476	292,321
INVESTMENT							75,110	146,953	182,875	257,984	290,640
DELIVER NEW ENGINES							74,973	146,687	182,544	257,517	290,114
GROUND SUPPORT EQUIP.							137	266	331	467	526
PARTS											
OPERATIONS							435	850	1,058	1,492	1,681
FLIGHT SUPPORT							218	426	530	747	842
OPERATIONS							96	188	234	330	372
PARTS							121	236	294	415	467
FACILITIES		665	8,034	1,344			22,945	31,947	18,307	12,238	18,393
TRANSPORTATION					723	984	4,557	6,380	7,927	11,197	12,600
TOTAL PROGRAM		988	22,386	33,554	48,906	45,887	104,087	186,130	210,167	282,911	323,314

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										141,011
DDT & E										141,011
DEVELOPMENT										64,503
DEVELOPMENT										64,503
STE										
DELIVERABLE HARDWARE										71,013
DUMMY ENGINES										6,069
FLIGHT ENGINES										64,944
O & FS AND SPARES										5,495
RECURRING TOTAL		348,158	433,555	430,267	413,846	413,846	279,183	6,568		3,284,501
INVESTMENT		346,156	431,062	427,796	411,468	411,468	277,577	6,532		3,265,621
DELIVER NEW ENGINES		345,529	430,281	427,021	410,723	410,723	277,075	6,519		3,259,706
GROUND SUPPORT EQUIP.		627	781	775	745	745	502	13		5,915
PARTS										
OPERATIONS		2,002	2,493	2,471	2,378	2,378	1,606	36		18,880
FLIGHT SUPPORT		1,003	1,249	1,238	1,192	1,192	805	17		9,459
OPERATIONS		443	552	547	526	526	355	10		4,179
PARTS		556	692	686	660	660	446	9		5,242
FACILITIES		18,379	12,237							144,489
TRANSPORTATION		15,016	18,692	18,560	17,851	17,851	12,036	286		144,660
TOTAL PROGRAM		381,553	464,484	448,827	431,697	431,697	291,219	6,854		3,714,661

PROBABLE COST 156 INCH SRM SERIES BURN WITH TVC W/O TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					40/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,772	156	42	880	4,850	12,149	1,053		13,202	699	16,751
SYSTEM ENGINEERING	4,630		5	1,416	6,051	6,625			6,625		12,676
SRM'S	40,543	10,359	3,842	55,916	110,660	2,341,772	26,583		2,368,355		2,479,015
CASE	15,188	3,434	147	23,969	42,738	1,135,031	10,840		1,145,871		1,188,609
NOZZLE	6,145	1,953	1,007	8,426	17,531	340,978	1,428		342,406		359,937
IGNITER	563	266	11	450	1,290	9,157	395		9,552		10,842
PROPELLANT AND LINER	8,276	1,698	1,656	13,843	25,473	532,510	3,630		536,140		561,613
POWER SUPPLY DISTRIBUTION	226	19	151	1,223	1,619	49,065	372		49,437		51,056
FINAL ASSEMBLY	1,466	1,719	499	3,014	6,698	113,400	9,918		123,318		130,016
GROUND TEST	1,606	1,011	208		2,825	2,886			2,886		5,711
AUXILIARY POWER UNIT (APU)	7,073	259	163	4,991	12,486	158,745			158,745		171,231
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	239		193	528	960					7,590	8,550
FACILITIES	6,294		1,946		8,240	1,443		118,612	120,055		128,295
SUPPORT EQUIPMENT AND SPARES	238		2,752	592	3,582	4,907			4,907	4,654	13,143
FLIGHT TEST SUPPORT				617	617	8,077			8,077		8,694
OPERATIONS SUPPORT			124	212	336					4,179	4,515
STRUCTURE	5,481	1,562	2,180	6,732	15,955	352,240	282		352,522		368,477
TRANSPORTATION			639	2,012	2,651	121,223			121,223		123,874
TOTAL PROGRAM	59,197	12,077	11,723	68,905	151,902	2,848,436	27,918	118,612	2,994,966	17,122	3,163,990



SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
PROBABLE COST SERIES WITH TVC W/O TT 40/YEAR PRODUCTION

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		323	14,352	32,210	48,183	44,903	1,040				
DDT & E		323	14,352	32,210	48,183	44,903	1,040				
DEVELOPMENT		323	14,352	27,253	22,575						
DEVELOPMENT		323	14,352	27,253	22,575						
STE											
DELIVERABLE HARDWARE				2,712	24,957	43,344					
DUMMY ENGINES				2,712	3,357						
FLIGHT ENGINES					21,600	43,344					
O & FS AND SPARES				2,245	651	1,559	1,040				
RECURRING TOTAL							77,583	155,166	193,955	277,082	310,330
INVESTMENT							77,110	154,219	192,773	275,390	308,436
DELIVER NEW ENGINES							76,972	153,944	192,430	274,899	307,887
GROUND SUPPORT EQUIP.							138	275	343	491	549
PARTS											
OPERATIONS							473	947	1,182	1,692	1,894
FLIGHT SUPPORT							226	453	565	808	905
OPERATIONS							117	234	292	418	468
PARTS							130	260	325	466	521
FACILITIES		665	8,034	1,344			34,270	42,928	24,594	16,460	
TRANSPORTATION					723	984	4,859	6,764	8,448	12,065	13,515
TOTAL PROGRAM		988	22,386	33,554	48,906	45,887	117,752	204,858	226,997	305,607	323,845

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										141,011
DDT & E										141,011
DEVELOPMENT										64,503
DEVELOPMENT										64,503
STE										
DELIVERABLE HARDWARE										71,013
DUMMY ENGINES										6,069
FLIGHT ENGINES										64,944
O & FS AND SPARES										5,495
RECURRING TOTAL		304,787	299,247	296,476	293,707	290,934	263,227	8,316		2,770,810
INVESTMENT		302,929	297,420	294,667	291,914	289,159	261,620	8,263		2,753,900
DELIVER NEW ENGINES		302,389	296,891	294,142	291,393	288,644	261,154	8,248		2,748,993
GROUND SUPPORT EQUIP.		540	529	525	521	515	466	15		4,907
PARTS										
OPERATIONS		1,858	1,827	1,809	1,771	1,777	1,607	53		16,910
FLIGHT SUPPORT		886	873	864	857	848	67	25		8,077
OPERATIONS		461	451	447	443	439	497	12		4,179
PARTS		511	503	498	493	488	443	16		4,654
FACILITIES										128,295
TRANSPORTATION		13,279	13,032	12,908	12,796	12,672	11,471	358		123,874
TOTAL PROGRAM		318,066	312,279	309,384	306,503	303,606	274,698	8,674		3,163,990

PROBABLE COST 156 INCH SRM SERIES BURN WITH TVC W/O TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					20/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,772	156	42	880	2,850	10,327	895		11,222	699	14,771
SYSTEM ENGINEERING	4,630		5	1,416	6,051	5,632			5,632		11,683
SRM'S	40,543	10,359	3,842	55,916	110,660	1,440,625	24,507		1,465,132		1,575,792
CASE	15,188	3,434	147	23,969	42,738	696,819	10,287		707,106		749,844
NOZZLE	6,145	1,953	1,007	8,426	17,531	207,192	1,324		208,516		226,047
IGNITER	563	266	11	450	1,290	5,118	349		5,467		6,757
PROPELLANT AND LINER	8,276	1,698	1,656	13,843	25,473	305,352	3,250		308,602		334,075
POWER SUPPLY DISTRIBUTION	226	19	151	1,223	1,619	33,989	340		34,329		35,948
FINAL ASSEMBLY	1,466	1,719	499	3,014	6,698	80,473	8,957		89,430		96,128
GROUND TEST	1,606	1,011	208		2,825	1,994			1,994		4,819
AUXILIARY POWER UNIT (APU)	7,073	259	163	4,991	12,486	109,688			109,688		122,174
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT			193	528	960					6,300	7,260
FACILITIES	6,294		1,946		8,240	1,443		72,532	73,975		82,215
SUPPORT EQUIPMENT AND SPARES	238		2,752	592	3,582	4,121			4,121	3,870	11,573
FLIGHT TEST SUPPORT				617	617	6,542			6,542		7,159
OPERATIONS SUPPORT			124	212	336					3,678	4,014
STRUCTURE	5,481	1,562	2,180	6,732	15,955	227,191	280		227,471		243,426
TRANSPORTATION			639	2,012	2,651	73,401			73,401		76,052
TOTAL PROGRAM	59,197	12,077	11,723	68,905	151,902	1,769,282	25,682	72,532	1,867,496	14,547	2,033,945

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 PROBABLE COSTS SERIES WITH TVC W/O TT 20/YEAR PRODUCTION  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		323	14,352	32,210	48,183	44,903	1,040				
DDT & E		323	14,352	32,210	48,183	44,903	1,040				
DEVELOPMENT		323	14,352	27,253	22,575						
DEVELOPMENT		323	14,352	27,253	22,575						
STE											
DELIVERABLE HARDWARE				2,712	24,957	43,344					
DUMMY ENGINES				2,712	3,357						
FLIGHT ENGINES					21,600	43,344					
O & FS AND SPARES				2,245	651	1,559	1,040				
RECURRING TOTAL							83,265	166,529	180,404	180,404	178,671
INVESTMENT							82,588	165,176	178,939	178,939	177,219
DELIVER NEW ENGINES							82,390	164,780	178,511	178,511	176,795
GROUND SUPPORT EQUIP.							198	396	428	428	424
PARTS											
OPERATIONS							677	1,353	1,465	1,465	1,452
FLIGHT SUPPORT							315	628	680	680	674
OPERATIONS							176	353	383	383	379
PARTS							186	372	402	402	399
FACILITIES		665	8,034	1,344			22,548	31,554	18,070		
TRANSPORTATION					723	984	4,712	7,020	7,613	7,613	7,537
TOTAL PROGRAM		988	22,386	33,554	48,906	45,887	111,565	205,103	206,087	188,017	186,208

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										141,011
DDT & E										141,011
DEVELOPMENT										64,503
DEVELOPMENT										64,503
STE										
DELIVERABLE HARDWARE										71,013
DUMMY ENGINES										6,069
FLIGHT ENGINES										64,944
O & FS AND SPARES										5,495
RECURRING TOTAL		175,201	171,732	169,998	166,529	164,792	88,468	8,674		1,734,667
INVESTMENT		173,778	170,337	168,617	165,176	163,454	87,750	8,604		1,720,577
DELIVER NEW ENGINES		173,362	169,929	168,213	164,780	163,063	87,539	8,583		1,716,456
GROUND SUPPORT EQUIP.		416	408	404	396	391	211	21		4,121
PARTS										
OPERATIONS		1,423	1,395	1,381	1,353	1,338	718	70		14,090
FLIGHT SUPPORT		660	648	642	628	621	333	33		6,542
OPERATIONS		372	364	360	353	349	188	18		3,678
PARTS		391	383	379	372	368	197	19		3,870
FACILITIES										82,215
TRANSPORTATION		7,385	7,240	7,164	7,020	6,951	3,727	363		76,052
TOTAL PROGRAM		182,586	178,972	177,162	173,549	171,743	92,195	9,037		2,033,945

PROBABLE COST 156 INCH SRM SERIES BURN WITH TVC W/O TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					10/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,772	156	42	880	2,850	10,327	895		11,222	699	14,771
SYSTEM ENGINEERING	4,630		5	1,416	6,051	5,632			5,632		11,683
SRM'S	40,543	10,359	3,842	55,916	110,660	764,221	13,544		777,765		888,425
CASE	15,188	3,434	147	23,969	42,738	375,169	5,436		380,605		423,343
NOZZLE	6,145	1,953	1,007	8,426	17,531	110,332	759		111,091		128,622
IGNITER	563	266	11	450	1,290	3,108	197		3,305		4,595
PROPELLANT AND LINER	8,276	1,698	1,656	13,843	25,473	165,910	1,867		167,777		193,250
POWER SUPPLY DISTRIBUTION	226	19	151	1,223	1,619	16,054	197		16,251		17,870
FINAL ASSEMBLY	1,466	1,719	499	3,014	6,698	41,339	5,088		46,427		53,125
GROUND TEST	1,606	1,011	208		2,825	935			935		3,760
AUXILIARY POWER UNIT (APU)	7,073	259	163	4,991	12,486	51,374			51,374		63,860
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	239		193	528	960					5,229	6,189
FACILITIES	6,294		1,946		8,240	1,443		58,983	60,426		68,666
SUPPORT EQUIPMENT AND SPARES	238		2,752	592	3,582	3,461			3,461	3,212	10,255
FLIGHT TEST SUPPORT				617	617	5,299			5,299		5,916
OPERATIONS SUPPORT			124	212	336					3,237	3,573
STRUCTURE	5,481	1,562	2,180	6,732	15,955	121,428	280		121,708		137,663
TRANSPORTATION			639	2,012	2,651	39,231			39,231		41,882
TOTAL PROGRAM	59,197	12,077	11,723	68,905	151,902	951,042	14,719	58,983	1,024,744	12,377	1,189,023

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 PROBABLE COSTS SERIES WITH TVC W/O TT 10/YEAR PRODUCTION  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		323	14,352	32,210	48,183	44,903	1,040				
DDT & E		323	14,352	32,210	48,183	44,903	1,040				
DEVELOPMENT		323	14,352	27,253	22,575						
DEVELOPMENT		323	14,352	27,253	22,575						
STE											
DELIVERABLE HARDWARE				2,712	24,957	43,344					
DUMMY ENGINES				2,712	3,357						
FLIGHT ENGINES					21,600	43,344					
O & FS AND SPARES				2,245	651	1,559	1,040				
RECURRING TOTAL							83,436	92,809	92,809	91,871	90,935
INVESTMENT							82,390	91,646	91,646	90,720	89,795
DELIVER NEW ENGINES							82,081	91,303	91,303	90,382	89,459
GROUND SUPPORT EQUIP.							309	343	343	338	336
PARTS											
OPERATIONS							1,046	1,163	1,163	1,151	1,140
FLIGHT SUPPORT							473	524	524	519	514
OPERATIONS							288	321	321	317	314
PARTS							285	318	318	315	312
FACILITIES		665	8,034	1,344			24,839	33,784			
TRANSPORTATION					723	984	4,618	3,866	3,866	3,823	3,786
TOTAL PROGRAM		988	22,386	33,554	48,906	45,887	113,933	130,459	96,675	95,694	94,721

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										141,011
DDT & E										141,011
DEVELOPMENT										64,503
DEVELOPMENT										64,503
STE										
DELIVERABLE HARDWARE										71,013
DUMMY ENGINES										6,069
FLIGHT ENGINES										64,944
O & FS AND SPARES										5,495
RECURRING TOTAL		89,998	87,183	86,246	85,309	83,434	48,749	4,685		937,464
INVESTMENT		88,869	86,092	85,165	84,240	82,389	48,137	4,627		925,716
DELIVER NEW ENGINES		88,536	85,770	84,847	83,925	82,081	47,957	4,611		922,255
GROUND SUPPORT EQUIP.		333	322	318	315	308	180	16		3,461
PARTS										
OPERATIONS		1,129	1,091	1,081	1,069	1,045	612	58		11,748
FLIGHT SUPPORT		509	492	488	482	472	276	26		5,299
OPERATIONS		311	301	297	295	288	169	15		3,237
PARTS		309	298	296	292	285	167	17		3,212
FACILITIES										68,666
TRANSPORTATION		3,744	3,631	3,589	3,552	3,472	2,031	197		41,882
TOTAL PROGRAM		93,742	90,814	89,835	88,861	86,906	50,780	4,882		1,189,023

#### 5.2.2.2 Ceiling Cost

#### 5.2.2.2.1 Ceiling Cost with TVC and W/O TT

CEILING COST 156 INCH SRM SERIES BURN WITH TVC/WO TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

SRM	DDT & E					60/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	918	2,973	13,183	1,142		14,325	759	18,057
SYSTEM ENGINEERING	4,828		5	1,476	6,309	7,189			7,189		13,498
SRM'S	46,605	13,305	4,375	64,198	128,483	3,669,372	38,910		3,708,282		3,836,765
CASE	18,237	4,731	153	28,997	52,118	1,866,426	17,398		1,883,824		1,935,942
NOZZLE	7,457	2,336	1,280	10,596	21,669	518,560	1,905		520,465		542,134
IGNITER	587	289	11	469	1,356	11,318	467		11,785		13,141
PROPELLANT AND LINER	9,279	2,320	1,847	14,174	27,620	862,455	5,873		868,328		895,948
POWER SUPPLY DISTRIBUTION	236	26	157	1,275	1,694	61,324	425		61,749		63,443
FINAL ASSEMBLY	1,759	2,042	540	3,483	7,824	144,134	12,842		156,976		164,800
GROUND TEST	1,675	1,291	217		3,183	4,637			4,637		7,820
AUXILIARY POWER UNIT (APU)	7,375	270	170	5,204	13,019	200,518			200,518		213,537
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	249		201	551	1,001					8,932	9,933
FACILITIES	6,564		2,029		8,593	1,748		146,092	147,840		156,433
SUPPORT EQUIPMENT AND SPARES	248		2,869	617	3,734	6,418			6,418	5,688	15,840
FLIGHT TEST SUPPORT				643	643	10,264			10,264		10,907
OPERATIONS SUPPORT			129	221	350					4,535	4,885
STRUCTURE	5,715	1,629	2,273	7,019	16,636	477,760	303		478,063		494,699
TRANSPORTATION			666	2,098	2,764	154,090			154,090		156,854
TOTAL PROGRAM	66,057	15,097	12,591	77,741	171,486	4,340,024	40,355	146,092	4,526,471	19,914	4,717,871



SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM SERIES BURN WITH TVC W/O TT 60/YEAR PRODUCTION RATE  
 ( DOLLARS IN THOUSANDS )

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		370	16,486	36,636	54,799	50,754	1,084				
DDT & E		370	16,486	36,636	54,799	50,754	1,084				
DEVELOPMENT		370	16,486	31,304	25,933						
DEVELOPMENT		370	16,486	31,304	25,933						
STE											
DELIVERABLE HARDWARE				2,992	28,188	49,128					
DUMMY ENGINES				2,992	3,705						
FLIGHT ENGINES					24,483	49,128					
O & FS AND SPARES				2,340	678	1,626	1,084				
RECURRING TOTAL							97,623	191,001	237,690	335,312	377,756
INVESTMENT							97,152	190,078	236,542	333,693	375,933
DELIVER NEW ENGINES							97,004	189,790	236,183	333,186	375,362
GROUND SUPPORT EQUIP.							148	288	359	507	571
PARTS											
OPERATIONS							471	923	1,148	1,619	1,823
FLIGHT SUPPORT							236	462	575	811	913
OPERATIONS							104	204	254	358	404
PARTS							131	257	319	450	506
FACILITIES		720	8,698	1,455			24,842	34,587	19,820	13,250	19,914
TRANSPORTATION					784	1,067	4,941	6,917	8,596	12,140	13,662
TOTAL PROGRAM		1,090	25,184	38,091	55,583	51,821	128,490	232,505	266,106	360,702	411,332

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										160,129
DDT & E										160,129
DEVELOPMENT										74,093
DEVELOPMENT										74,093
STE										
DELIVERABLE HARDWARE										80,308
DUMMY ENGINES										6,697
FLIGHT ENGINES										73,611
O & FS AND SPARES										5,728
RECURRING TOTAL		449,912	560,268	556,022	534,801	534,801	360,779	8,490		4,244,455
INVESTMENT		447,740	557,564	553,340	532,220	532,220	359,037	8,449		4,223,968
DELIVER NEW ENGINES		447,060	556,717	552,499	531,411	531,411	358,492	8,435		4,217,550
GROUND SUPPORT EQUIP.		680	847	841	809	809	545	14		6,418
PARTS										
OPERATIONS		2,172	2,704	2,682	2,581	2,581	1,742	41		20,487
FLIGHT SUPPORT		1,088	1,355	1,344	1,293	1,293	873	21		10,264
OPERATIONS		481	599	594	571	571	385	10		4,535
PARTS		603	750	744	717	717	484	10		5,688
FACILITIES		19,897	13,250							156,433
TRANSPORTATION		16,281	20,266	20,124	19,356	19,356	13,050	314		156,854
TOTAL PROGRAM		486,090	593,784	576,146	554,157	554,157	373,829	8,804		4,717,871

CEILING COST 156 INCH SRM SERIES BURN WITH TVC/WO TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					40/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	918	2,973	13,183	1,142		14,325	759	18,057
SYSTEM ENGINEERING	4,828		5	1,476	6,309	7,189			7,189		13,498
SRM'S	46,605	13,305	4,375	64,198	128,483	3,130,105	33,636		3,163,741		3,292,224
CASE	18,237	4,731	153	28,997	52,118	1,590,948	15,180		1,606,128		1,658,246
NOZZLE	7,457	2,336	1,280	10,596	21,669	441,582	1,848		443,430		465,099
IGNITER	587	289	11	469	1,356	9,936	429		10,365		11,721
PROPELLANT AND LINER	9,279	2,320	1,847	14,174	27,620	735,970	5,015		740,985		768,605
POWER SUPPLY DISTRIBUTION	236	26	157	1,275	1,694	53,240	403	1,275	53,643		55,337
FINAL ASSEMBLY	1,759	2,042	540	3,483	7,824	123,048	10,761		133,809		141,633
GROUND TEST	1,675	1,291	217		3,183	3,132			3,132		6,315
AUXILIARY POWER UNIT (APU)	7,375	270	170	5,204	13,019	172,249			172,249		185,268
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	249		201	551	1,001					8,236	9,237
FACILITIES	6,564		2,029		8,593	1,566		128,702	130,268		138,861
SUPPORT EQUIPMENT AND SPARES	248		2,869	617	3,734	5,324			5,324	5,050	14,108
FLIGHT TEST SUPPORT				643	643	8,764			8,764		9,407
OPERATIONS SUPPORT			129	221	350					4,535	4,885
STRUCTURE	5,715	1,629	2,273	7,019	16,636	382,208	303		382,511		399,147
TRANSPORTATION			666	2,098	2,764	131,535			131,535		134,299
TOTAL PROGRAM	66,057	15,097	12,591	77,741	171,486	3,679,874	35,081	128,702	3,843,657	18,580	4,033,723

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM SERIES BURN WITH TVC W/O TT 40/YEAR PRODUCTION RATE  
 ( DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		370	16,486	36,636	54,799	50,754	1,084				
DDT & E		370	16,486	36,636	54,799	50,754	1,084				
DEVELOPMENT		370	16,486	31,304	25,933						
DEVELOPMENT		370	16,486	31,304	25,933						
STE											
DELIVERABLE HARDWARE				2,992	28,188	49,128					
DUMMY ENGINES				2,992	3,705						
FLIGHT ENGINES					24,483	49,128					
O & FS AND SPARES				2,340	678	1,626	1,084				
RECURRING TOTAL							100,789	201,575	251,966	359,948	403,145
INVESTMENT							100,299	200,597	250,746	358,208	401,193
DELIVER NEW ENGINES							100,149	200,299	250,373	357,676	400,597
GROUND SUPPORT EQUIP.							150	298	373	532	596
PARTS											
OPERATIONS							490	978	1,220	1,740	1,952
FLIGHT SUPPORT							245	492	613	876	983
OPERATIONS							104	204	254	358	404
PARTS							141	282	353	506	565
FACILITIES		720	8,698	1,455			37,089	46,463	26,620	17,816	
TRANSPORTATION					784	1,067	5,267	7,333	9,159	13,081	14,652
TOTAL PROGRAM		1,090	25,184	38,091	55,583	51,821	144,229	255,371	287,745	390,845	417,797

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										160,129
DDT & E										160,129
DEVELOPMENT										74,093
DEVELOPMENT										74,093
STE										
DELIVERABLE HARDWARE										80,308
DUMMY ENGINES										6,697
FLIGHT ENGINES										73,611
O & FS AND SPARES										5,728
RECURRING TOTAL		396,027	388,956	385,355	381,738	378,140	341,996	10,799		3,600,434
INVESTMENT		394,030	386,864	383,282	379,702	376,119	340,298	10,747		3,582,085
DELIVER NEW ENGINES		393,444	386,290	382,713	379,137	375,560	339,792	10,731		3,576,761
GROUND SUPPORT EQUIP.		586	574	569	565	559	506	16		5,324
PARTS										
OPERATIONS		1,997	2,092	2,073	2,036	2,021	1,698	52		18,349
FLIGHT SUPPORT		961	947	938	930	920	833	26		8,764
OPERATIONS		481	599	594	571	571	385	10		4,535
PARTS		555	546	541	535	530	480	16		5,050
FACILITIES										138,861
TRANSPORTATION		14,397	14,128	13,994	13,873	13,739	12,436	389		134,299
TOTAL PROGRAM		410,424	403,084	399,349	395,611	391,879	354,432	11,188		4,033,723

CEILING COST 156 INCH SRM SERIES BURN WITH TVC/WO TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					20/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	918	2,973	11,205	971		12,176	759	15,908
SYSTEM ENGINEERING	4,828		5	1,476	6,309	6,111			6,111		12,420
SRM'S	46,605	13,305	4,375	64,198	128,483	1,901,490	30,998		1,932,488		2,060,971
CASE	18,237	4,731	153	28,997	52,118	964,510	13,990		978,500		1,030,618
NOZZLE	7,457	2,336	1,280	10,596	21,669	267,523	1,703		269,226		290,895
IGNITER	587	289	11	469	1,356	5,537	395		5,932		7,288
PROPELLANT AND LINER	9,279	2,320	1,847	14,174	27,620	418,738	4,622		423,360		450,980
POWER SUPPLY DISTRIBUTION	236	26	157	1,275	1,694	36,878	371		37,249		38,943
FINAL ASSEMBLY	1,759	2,042	540	3,483	7,824	87,121	9,917		97,038		104,862
GROUND TEST	1,675	1,291	217		3,183	2,164			2,164		5,347
AUXILIARY POWER UNIT (APU)	7,375	270	170	5,204	13,019	119,019			119,019		132,038
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	249		201	551	1,001					6,836	7,837
FACILITIES	6,564		2,029		8,593	1,566		78,702	80,268		88,861
SUPPORT EQUIPMENT AND SPARES	248		2,869	617	3,734	4,472			4,472	4,199	12,405
FLIGHT TEST SUPPORT				643	643	7,099			7,099		7,742
OPERATIONS SUPPORT			129	221	350					3,991	4,341
STRUCTURE	5,715	1,629	2,273	7,019	16,636	246,519	303		246,822		263,458
TRANSPORTATION			666	2,098	2,764	79,645			79,645		82,409
TOTAL PROGRAM	66,057	15,097	12,591	77,741	171,486	2,258,107	32,272	78,702	2,369,081	15,785	2,556,352

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM SERIES BURN WITH TVC W/O TT 20/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		370	16,486	36,636	54,799	50,754	1,084				
DDT & E		370	16,486	36,636	54,799	50,754	1,084				
DEVELOPMENT		370	16,486	31,304	25,933						
DEVELOPMENT		370	16,486	31,304	25,933						
STE											
DELIVERABLE HARDWARE				2,992	28,188	49,128					
DUMMY ENGINES				2,992	3,705						
FLIGHT ENGINES					24,483	49,128					
O & FS AND SPARES				2,340	678	1,626	1,084				
RECURRING TOTAL							106,798	213,595	231,395	231,395	229,171
INVESTMENT							106,064	212,127	229,805	229,805	227,595
DELIVER NEW ENGINES							105,849	211,698	229,340	229,340	227,135
GROUND SUPPORT EQUIP.							215	429	465	465	460
PARTS											
OPERATIONS							734	1,468	1,590	1,590	1,576
FLIGHT SUPPORT							341	682	738	738	732
OPERATIONS							191	383	415	415	412
PARTS							202	403	437	437	432
FACILITIES		720	8,698	1,455			24,352	34,104	19,532		
TRANSPORTATION					784	1,067	5,104	7,606	8,249	8,249	8,168
TOTAL PROGRAM		1,090	25,184	38,091	55,583	51,821	137,338	255,305	259,176	239,644	237,339

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										160,129
DDT & E										160,129
DEVELOPMENT										74,093
DEVELOPMENT										74,093
STE										
DELIVERABLE HARDWARE										80,308
DUMMY ENGINES										6,697
FLIGHT ENGINES										73,611
O & FS AND SPARES										5,728
RECURRING TOTAL		224,719	220,270	218,046	213,595	211,369	113,473	11,127		2,224,953
INVESTMENT		223,175	218,756	216,547	212,127	209,918	112,695	11,050		2,209,664
DELIVER NEW ENGINES		222,724	218,314	216,109	211,698	209,493	112,465	11,027		2,205,192
GROUND SUPPORT EQUIP.		451	442	438	429	425	230	23		4,472
PARTS										
OPERATIONS		1,544	1,514	1,499	1,468	1,451	778	77		15,289
FLIGHT SUPPORT		717	703	696	682	674	361	35		7,099
OPERATIONS		403	395	391	383	379	204	20		3,991
PARTS		424	416	412	403	398	213	22		4,199
FACILITIES										88,861
TRANSPORTATION		8,003	7,845	7,762	7,606	7,532	4,038	396		82,409
TOTAL PROGRAM		232,722	228,115	225,808	221,201	218,901	117,511	11,523		2,556,352

CEILING COST 156 INCH SRM SERIES BURN WITH TVC/WO TT

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					10/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	918	2,973	11,205	971		12,176	759	15,908
SYSTEM ENGINEERING	4,828		5	1,476	6,309	6,111			6,111		12,420
SRM'S	46,605	13,305	4,375	64,198	128,483	1,011,758	17,222		1,028,980		1,157,463
CASE	18,237	4,731	153	28,997	52,118	520,848	7,773		528,621		580,739
NOZZLE	7,457	2,336	1,280	10,596	21,669	143,810	946		144,756		166,425
IGNITER	587	289	11	469	1,356	3,367	219		3,586		4,942
PROPELLANT AND LINER	9,279	2,320	1,847	14,174	27,620	224,682	2,568		227,250		254,870
POWER SUPPLY DISTRIBUTION	236	26	157	1,275	1,694	17,427	206		17,633		19,327
FINAL ASSEMBLY	1,759	2,042	540	3,483	7,824	44,866	5,510		50,376		58,200
GROUND TEST	1,675	1,291	217	3,183	3,183	1,014			1,014		4,197
AUXILIARY POWER UNIT (APU)	7,375	270	170	5,204	13,019	55,744			55,744		68,763
THRUST TERMINATION											
INSTALLATION ASSEMBLY AND CHECKOUT	249		201	551	1,001					5,674	6,675
FACILITIES	6,564		2,029		8,593	1,566		64,000	65,566		74,159
SUPPORT EQUIPMENT AND SPARES	248		2,869	617	3,734	3,756			3,756	3,485	10,975
FLIGHT TEST SUPPORT				643	643	5,750			5,750		6,393
OPERATIONS SUPPORT			129	221	350					3,512	3,862
STRUCTURE	5,715	1,629	2,273	7,019	16,636	131,759	303		132,062		148,698
TRANSPORTATION			666	2,098	2,764	42,568			42,568		45,332
TOTAL PROGRAM	66,057	15,097	12,591	77,741	171,486	1,214,473	18,496	64,000	1,296,969	13,430	1,481,885

SRM PROGRAM TIME PHASED FUNDING REQUIREMENTS  
 CEILING COST 156 INCH SRM SERIES BURN WITH TVC W/O TT 10/YEAR PRODUCTION RATE  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		370	16,486	36,636	54,799	50,754	1,084				
DDT & E		370	16,486	36,636	54,799	50,754	1,084				
DEVELOPMENT		370	16,486	31,304	25,933						
DEVELOPMENT		370	16,486	31,304	25,933						
STE											
DELIVERABLE HARDWARE				2,992	28,188	49,128					
DUMMY ENGINES				2,992	3,705						
FLIGHT ENGINES					24,483	49,128					
O & FS AND SPARES				2,340	678	1,626	1,084				
RECURRING TOTAL							107,003	119,022	119,022	117,824	116,620
INVESTMENT							105,868	117,762	117,762	116,573	115,383
DELIVER NEW ENGINES							105,533	117,390	117,390	116,205	115,019
GROUND SUPPORT EQUIP.							335	372	372	368	364
PARTS											
OPERATIONS							1,135	1,260	1,260	1,251	1,237
FLIGHT SUPPORT							513	568	568	563	558
OPERATIONS							313	347	347	345	341
PARTS							309	345	345	343	338
FACILITIES		720	8,698	1,455			26,799	36,487			
TRANSPORTATION					784	1,067	4,993	4,184	4,184	4,140	4,098
TOTAL PROGRAM		1,090	25,184	38,091	55,583	51,821	139,879	159,693	123,206	121,964	120,718

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										160,129
DDT & E										160,129
DEVELOPMENT										74,093
DEVELOPMENT										74,093
STE										
DELIVERABLE HARDWARE										80,308
DUMMY ENGINES										6,697
FLIGHT ENGINES										73,611
O & FS AND SPARES										5,728
RECURRING TOTAL		115,420	111,810	110,610	109,406	107,001	62,518	6,009		1,202,265
INVESTMENT		114,194	110,625	109,436	108,246	105,867	61,855	5,947		1,189,518
DELIVER NEW ENGINES		113,833	110,276	109,090	107,904	105,533	61,660	5,929		1,185,762
GROUND SUPPORT EQUIP.		361	349	346	342	334	195	18		3,756
PARTS										
OPERATIONS		1,226	1,185	1,174	1,160	1,134	663	62		12,747
FLIGHT SUPPORT		553	535	530	523	512	299	28		5,750
OPERATIONS		338	326	323	320	313	183	16		3,512
PARTS		335	324	321	317	309	181	18		3,485
FACILITIES										74,159
TRANSPORTATION		4,053	3,930	3,885	3,844	3,758	2,199	213		45,332
TOTAL PROGRAM		119,473	115,740	114,495	113,250	110,759	64,717	6,222		1,481,885

**5.2.2.2.2 With TVC and TT**



CEILING COST 156 INCH SRM SERIES BURN WITH TVC & TT

(DOLLARS IN THOUSANDS)

DATE 15, March 1972

	DDT & E					60/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	918	2,973	13,183	1,142		14,325	759	18,057
SYSTEM ENGINEERING	4,828		5	1,476	6,309	7,189			7,189		13,498
SRM'S	47,212	13,342	4,465	64,528	129,547	3,687,712	39,326		3,727,038		3,856,585
CASE	18,237	4,731	153	28,997	52,118	1,866,426	17,398		1,883,824		1,935,942
NOZZLE	7,457	2,336	1,280	10,596	21,669	518,560	1,905		520,465		542,134
IGNITER	587	289	11	469	1,356	11,318	467		11,785		13,141
PROPELLANT AND LINER	9,279	2,320	1,847	14,174	27,620	862,455	5,873		868,328		895,948
POWER SUPPLY DISTRIBUTION	236	26	157	1,275	1,694	61,324	425		61,749		63,443
FINAL ASSEMBLY	1,759	2,042	590	3,483	7,824	144,134	12,842		156,976		164,800
GROUND TEST	1,675	1,291	217		3,183	4,637			4,637		7,820
AUXILIARY POWER UNIT (APU)	7,375	270	170	5,204	13,019	200,518			200,518		213,537
THRUST TERMINATION	607	37	90	330	1,064	18,340	416		18,756		19,820
INSTALLATION ASSEMBLY AND CHECKOUT	249		201	551	1,001					8,932	9,933
FACILITIES	6,564		2,029		8,593	1,748		146,092	147,840		156,433
SUPPORT EQUIPMENT AND SPARES	248		2,869	617	3,734	6,418			6,418	5,688	15,840
FLIGHT TEST SUPPORT				643	643	10,264			10,264		10,907
OPERATIONS SUPPORT			129	221	350					4,535	4,885
STRUCTURE	5,715	1,629	2,273	7,019	16,636	477,760	303		478,063		494,699
TRANSPORTATION			666	2,098	2,764	154,090			154,090		156,854
TOTAL PROGRAM	66,664	15,134	12,681	78,071	172,550	4,358,364	40,771	146,092	4,545,227	19,914	4,737,691

SR 100 A 11 E BASED FUNDING QU...  
 CEILING COST 156 INCH SRM SERIES BURN WITH TVC & TT 60/YEAR PRODUCTION  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		374	16,629	36,948	55,184	50,974	1,084				
DDT & E		374	16,629	36,948	55,184	50,974	1,084				
DEVELOPMENT		374	16,629	31,576	26,158						
DEVELOPMENT		374	16,629	31,576	26,158						
STE											
DELIVERABLE HARDWARE				3,032	28,348	49,348					
DUMMY ENGINES				3,032	3,755						
FLIGHT ENGINES					24,593	49,348					
O & FS AND SPARES				2,340	678	1,626	1,084				
RECURRING TOTAL							98,053	191,845	238,740	336,794	379,425
INVESTMENT							97,583	190,922	237,592	335,175	377,602
DELIVER NEW ENGINES							97,435	190,634	237,233	334,668	377,031
GROUND SUPPORT EQUIP.							148	288	359	507	571
PARTS											
OPERATIONS							470	923	1,148	1,619	1,823
FLIGHT SUPPORT							236	462	575	811	913
OPERATIONS							104	204	254	358	404
PARTS							130	257	319	450	506
FACILITIES		720	8,698	1,455			24,842	34,587	19,820	13,250	19,913
TRANSPORTATION					784	1,067	4,941	6,917	8,596	12,140	13,662
TOTAL PROGRAM		1,094	25,327	38,403	55,968	52,041	128,920	233,349	267,156	362,184	413,000

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										161,193
DDT & E										161,193
DEVELOPMENT										74,737
DEVELOPMENT										74,737
STE										
DELIVERABLE HARDWARE										80,728
DUMMY ENGINES										6,787
FLIGHT ENGINES										73,941
O & FS AND SPARES										5,728
RECURRING TOTAL		451,900	562,743	558,481	537,165	537,165	362,373	8,527		4,263,211
INVESTMENT		449,728	560,039	555,798	534,584	534,584	360,631	8,486		4,242,724
DELIVER NEW ENGINES		449,048	559,192	554,956	533,775	533,775	360,086	8,473		4,236,306
GROUND SUPPORT EQUIP.		680	847	842	809	809	545	13		6,418
PARTS										
OPERATIONS		2,172	2,704	2,683	2,581	2,581	1,742	41		20,487
FLIGHT SUPPORT		1,088	1,355	1,344	1,293	1,293	873	21		10,264
OPERATIONS		481	599	594	571	571	385	10		4,535
PARTS		603	750	745	717	717	484	10		5,688
FACILITIES		19,898	13,250							156,433
TRANSPORTATION		16,281	20,266	20,124	19,356	19,356	13,050	314		156,854
TOTAL PROGRAM		488,079	596,259	578,605	556,521	556,521	375,423	8,841		4,737,691

CEILING COST 156 INCH SRM SERIES BURN WITH TVC & TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					40/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	918	2,973	13,183	1,142		14,325	759	18,057
SYSTEM ENGINEERING	4,828		5	1,476	6,309	7,189			7,189		13,498
SRM'S	47,212	13,342	4,465	64,528	129,547	3,145,859	33,999		3,179,858		3,309,405
CASE	18,237	4,731	153	28,997	52,118	1,590,948	15,180		1,606,128		1,658,246
NOZZLE	7,457	2,336	1,280	10,596	21,669	441,582	1,848		443,430		465,099
IGNITER	587	289	11	469	1,356	9,936	429		10,365		11,721
PROPELLANT AND LINER	9,279	2,320	1,847	14,174	27,620	735,970	5,015		740,985		768,605
POWER SUPPLY DISTRIBUTION	236	26	157	1,275	1,694	53,240	403		53,643		55,337
FINAL ASSEMBLY	1,759	2,042	540	3,483	7,824	123,048	10,761		133,809		141,633
GROUND TEST	1,675	1,291	217		3,183	3,132			3,132		6,315
AUXILIARY POWER UNIT (APU)	7,375	270	170	5,204	13,019	172,249			172,249		185,268
THRUST TERMINATION	607	37	90	330	1,064	15,754	363		16,117		17,181
INSTALLATION ASSEMBLY AND CHECKOUT	249		201	551	1,001					8,236	9,237
FACILITIES	6,564		2,029		8,593	1,566	128,702		130,268		138,861
SUPPORT EQUIPMENT AND SPARES	248		2,869	617	3,734	5,324			5,324	5,050	14,108
FLIGHT TEST SUPPORT				643	643	8,764			8,764		9,407
OPERATIONS SUPPORT			129	221	350					4,535	4,885
STRUCTURE	5,715	1,629	2,273	7,019	16,636	382,208	303		382,511		399,147
TRANSPORTATION			666	2,098	2,764	131,535			131,535		134,299
TOTAL PROGRAM	66,664	15,134	12,681	78,071	172,550	3,695,628	35,444	128,702	3,859,774	18,580	4,050,904

MILITARY PROGRAM TIME PHASE D.F.O. D.I.G. REQUIREMENTS  
 CEILING COST SERIES WITH TVC & TT40/YEAR PRODUCTION  
 (DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		374	16,629	36,948	55,184	50,974	1,084				
DDT & E		374	16,629	36,948	55,184	50,974	1,084				
DEVELOPMENT		374	16,629	31,576	26,158						
DEVELOPMENT		374	16,629	31,576	26,158						
STE											
DELIVERABLE HARDWARE				3,032	28,348	49,348					
DUMMY ENGINES				3,032	3,755						
FLIGHT ENGINES					24,593	49,348					
O & FS AND SPARES				2,340	678	1,626	1,084				
RECURRING TOTAL							101,264	202,527	253,157	361,656	405,053
INVESTMENT							100,751	201,499	251,874	359,820	402,998
DELIVER NEW ENGINES							100,601	201,201	251,501	359,288	402,402
GROUND SUPPORT EQUIP.							150	298	373	532	596
PARTS											
OPERATIONS							513	1,028	1,283	1,836	2,055
FLIGHT SUPPORT							245	492	613	876	982
OPERATIONS							127	254	317	454	508
PARTS							141	282	353	506	565
FACILITIES		720	8,698	1,455			37,089	46,477	26,620	17,802	
TRANSPORTATION					784	1,067	5,267	7,333	9,159	13,081	14,652
TOTAL PROGRAM		1,094	25,327	38,403	55,968	52,041	144,704	256,337	288,936	392,539	419,705

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										161,193
DDT & E										161,193
DEVELOPMENT										74,737
DEVELOPMENT										74,737
STE										
DELIVERABLE HARDWARE										80,728
DUMMY ENGINES										6,787
FLIGHT ENGINES										73,941
O & FS AND SPARES										5,728
RECURRING TOTAL		397,819	390,588	386,971	383,356	379,737	343,572	10,851		3,616,551
INVESTMENT		395,803	388,605	385,006	381,410	377,811	341,829	10,796		3,598,202
DELIVER NEW ENGINES		395,217	388,031	384,438	380,845	377,252	341,323	10,779		3,592,878
GROUND SUPPORT EQUIP.		586	574	568	565	559	506	17		5,324
PARTS										
OPERATIONS		2,016	1,983	1,965	1,946	1,926	1,743	55		18,349
FLIGHT SUPPORT		961	947	939	930	920	833	26		8,764
OPERATIONS		500	490	485	481	476	430	13		4,535
PARTS		555	546	541	535	530	480	16		5,050
FACILITIES										138,861
TRANSPORTATION		14,397	14,128	13,994	13,873	13,739	12,436	389		134,299
TOTAL PROGRAM		412,216	404,716	400,965	397,229	393,476	356,008	11,240		4,050,904

CEILING COST 156 INCH SRM SERIES BURN WITH TVC & TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					20/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	918	2,973	11,205	971		12,176	759	15,908
SYSTEM ENGINEERING	4,828		5	1,476	6,309	6,111			6,111		12,420
SRM'S	47,212	13,342	4,465	64,528	129,547	1,911,011	31,334		1,942,345		2,071,892
CASE	18,237	4,731	153	28,997	52,118	964,510	13,990		978,500		1,030,618
NOZZLE	7,457	2,336	1,280	10,596	21,669	267,523	1,703		269,226		290,895
IGNITER	587	289	11	469	1,356	5,537	395		5,932		7,288
PROPELLANT AND LINER	9,279	2,320	1,847	14,174	27,620	418,738	4,622		423,360		450,980
POWER SUPPLY DISTRIBUTION	236	26	157	1,275	1,694	36,878	371		37,249		38,943
FINAL ASSEMBLY	1,759	2,042	540	3,483	7,824	87,121	9,917		97,038		104,862
GROUND TEST	1,675	1,291	217		3,183	2,164			2,164		5,347
AUXILIARY POWER UNIT (APU)	7,375	270	170	5,204	13,019	119,019			119,019		132,038
THRUST TERMINATION	607	37	90	330	1,064	9,521	336		9,857		10,921
INSTALLATION ASSEMBLY AND CHECKOUT	249		201	551	1,001					6,836	7,837
FACILITIES	6,564		2,029		8,593	1,566		78,702	80,268		88,861
SUPPORT EQUIPMENT AND SPARES	248		2,869	617	3,734	4,472			4,472	4,199	12,405
FLIGHT TEST SUPPORT				643	643	7,099			7,099		7,742
OPERATIONS SUPPORT			129	221	350					3,991	4,341
STRUCTURE	5,715	1,629	2,273	7,019	16,636	246,519	303		246,822		263,458
TRANSPORTATION			666	2,098	2,764	79,645			79,645		82,409
TOTAL PROGRAM	66,664	15,134	12,681	78,071	172,550	2,267,628	32,608	78,702	2,378,938	15,785	2,567,273

CEILING COST SERIES WITH TVC & TT 20/YEAR PRODUCTION  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		374	16,629	36,948	55,184	50,974	1,084				
DDT & E		374	16,629	36,948	55,184	50,974	1,084				
DEVELOPMENT		374	16,629	31,576	26,158						
DEVELOPMENT		374	16,629	31,576	26,158						
STE											
DELIVERABLE HARDWARE				3,032	28,348	49,348					
DUMMY ENGINES				3,032	3,755						
FLIGHT ENGINES					24,593	49,348					
O & FS AND SPARES				2,340	678	1,626	1,084				
RECURRING TOTAL							107,272	214,542	232,420	232,420	230,185
INVESTMENT							106,537	213,074	230,830	230,830	228,610
DELIVER NEW ENGINES							106,322	212,645	230,365	230,365	228,150
GROUND SUPPORT EQUIP.							215	429	465	465	460
PARTS											
OPERATIONS							735	1,468	1,590	1,590	1,575
FLIGHT SUPPORT							341	682	738	738	732
OPERATIONS							192	383	415	415	411
PARTS							202	403	437	437	432
FACILITIES		720	8,698	1,455			24,352	34,104	19,532		
TRANSPORTATION					784	1,067	5,104	7,606	8,249	8,249	8,168
TOTAL PROGRAM		1,094	25,327	38,403	55,968	52,041	137,812	256,252	260,201	240,669	238,353

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										161,193
DDT & E										161,193
DEVELOPMENT										74,737
DEVELOPMENT										74,737
STE										
DELIVERABLE HARDWARE										80,728
DUMMY ENGINES										6,787
FLIGHT ENGINES										73,941
O & FS AND SPARES										5,728
RECURRING TOTAL		225,714	221,247	219,012	214,542	212,306	113,975	11,175		2,234,810
INVESTMENT		224,171	219,733	217,513	213,074	210,855	113,196	11,098		2,219,521
DELIVER NEW ENGINES		223,720	219,290	217,075	212,645	210,430	112,967	11,075		2,215,049
GROUND SUPPORT EQUIP.		451	443	438	429	425	229	23		4,472
PARTS										
OPERATIONS		1,543	1,514	1,499	1,468	1,451	779	77		15,289
FLIGHT SUPPORT		716	703	696	682	674	362	35		7,099
OPERATIONS		403	395	391	383	379	204	20		3,991
PARTS		424	416	412	403	398	213	22		4,199
FACILITIES										88,861
TRANSPORTATION		8,002	7,845	7,763	7,606	7,532	4,038	396		82,409
TOTAL PROGRAM		233,716	229,092	226,775	222,148	219,838	118,013	11,571		2,567,273

CEILING COST 156 INCH SRM SERIES BURN WITH TVE & TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E					10/YEAR RATE PRODUCTION PROGRAM			PRODUCTION PROGRAM TOTAL	OPERATIONS	TOTAL PROGRAM
	ENGINEERING DESIGN AND DEVELOPMENT (ED & D)	TOOLING	GROUND TEST HARDWARE (GTH)	FLIGHT TEST HARDWARE (FTH)	DDT & E TOTAL	PRODUCTION	TOOLING	FACILITIES			
SRM											
PROGRAM MANAGEMENT	1,848	163	44	918	2,973	11,205	971		12,176	759	15,908
SYSTEM ENGINEERING	4,828		5	1,476	6,309	6,111			6,111		12,420
SRM'S	47,212	13,342	4,465	64,528	129,547	1,016,919	17,410		1,034,329		1,163,876
CASE	18,237	4,731	153	28,997	52,118	520,848	7,773		528,621		580,739
NOZZLE	7,457	2,336	1,280	10,596	21,669	143,810	946		144,756		166,425
IGNITER	587	289	11	469	1,356	3,367	219		3,586		4,942
PROPELLANT AND LINER	9,279	2,320	1,847	14,174	27,620	224,682	2,568		227,250		254,870
POWER SUPPLY DISTRIBUTION	236	26	157	1,275	1,694	17,427	206		17,633		19,327
FINAL ASSEMBLY	1,759	2,042	540	3,483	7,824	44,866	5,510		50,376		58,200
GROUND TEST	1,675	1,291	217		3,183	1,014			1,014		4,197
AUXILIARY POWER UNIT (APU)	7,375	270	170	5,204	13,019	55,744			55,744		68,763
THRUST TERMINATION	607	37	90	330	1,064	5,161	188		5,349		6,413
INSTALLATION ASSEMBLY AND CHECKOUT	249		201	551	1,001					5,674	6,675
FACILITIES	6,564		2,029		8,593	1,566		64,000	65,566		74,159
SUPPORT EQUIPMENT AND SPARES	248		2,869	617	3,734	3,756			3,756	3,485	10,975
FLIGHT TEST SUPPORT				643	643	5,750			5,750		6,393
OPERATIONS SUPPORT			129	221	350					3,512	3,862
STRUCTURE	5,715	1,629	2,273	7,019	16,636	131,759	303		132,062		148,698
TRANSPORTATION			666	2,098	2,764	42,568			42,568		45,332
TOTAL PROGRAM	66,664	15,134	12,681	78,071	172,550	1,219,634	18,684	64,000	1,302,318	13,430	1,488,298

CEILING COST SERIES WITH TVC & TT 10/YEAR PRODUCTION  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

COST ELEMENT	FY	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
NONRECURRING TOTAL		374	16,629	36,948	55,184	50,974	1,084				
DDT & E		374	16,629	36,948	55,184	50,974	1,084				
DEVELOPMENT		374	16,629	31,576	26,158						
DEVELOPMENT		374	16,629	31,576							
STE											
DELIVERABLE HARDWARE				3,032	28,348	49,348					
DUMMY ENGINES				3,032	3,755						
FLIGHT ENGINES					24,593	49,348					
O & FS AND SPARES				2,340	678	1,626	1,084				
RECURRING TOTAL							107,479	119,553	119,553	118,346	117,138
INVESTMENT							106,344	118,292	118,292	117,096	115,902
DELIVER NEW ENGINES							106,009	117,920	117,920	116,728	115,538
GROUND SUPPORT EQUIP.							335	372	372	368	364
PARTS											
OPERATIONS							1,135	1,261	1,261	1,250	1,236
FLIGHT SUPPORT							513	568	568	564	558
OPERATIONS							313	348	348	344	340
PARTS							309	345	345	342	338
FACILITIES		720	8,698	1,455			26,799	36,487			
TRANSPORTATION					784	1,067	4,993	4,184	4,184	4,139	4,098
TOTAL PROGRAM		1,094	25,327	38,403	55,968	52,041	140,355	160,224	123,737	122,485	121,236

COST ELEMENT	FY	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
NONRECURRING TOTAL										161,193
DDT & E										161,193
DEVELOPMENT										74,737
DEVELOPMENT										74,737
STE										
DELIVERABLE HARDWARE										80,728
DUMMY ENGINES										6,787
FLIGHT ENGINES										73,941
O & FS AND SPARES										5,728
RECURRING TOTAL		115,934	112,307	111,102	109,893	107,477	62,796	6,036		1,207,614
INVESTMENT		114,708	111,122	109,928	108,733	106,343	62,133	5,974		1,194,867
DELIVER NEW ENGINES		114,347	110,773	109,582	108,391	106,009	61,938	5,956		1,191,111
GROUND SUPPORT EQUIP.		361	349	346	342	334	195	18		3,756
PARTS										
OPERATIONS		1,226	1,185	1,174	1,160	1,134	663	62		12,747
FLIGHT SUPPORT		553	535	530	523	512	298	28		7,750
OPERATIONS		338	326	323	320	313	183	16		5,512
PARTS		335	324	321	317	309	182	18		3,485
FACILITIES										74,159
TRANSPORTATION		4,053	3,930	3,885	3,844	3,758	2,200	213		45,332
TOTAL PROGRAM		119,987	116,237	114,987	113,737	111,235	64,996	6,249		1,488,298



### 5.2.3 156 Inch Series Recoverable Cost

#### 5.2.3.1 Probable Cost With TVC and W/O TT

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY SERIES BURN WITH TVC W/O TT

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E TOTAL	DDT & E REFURBISH AND RECOVERY DELTA	DDT & E WITH REFURBISH AND RECOVERY TOTAL (1)	PRODUCTION PROGRAM TOTAL	60/YR RATE REFURBISH AND RECOVERY			PROD PROGRAM WITH REFURBISH AND RECOVERY TOTAL (2)	OPERATIONS TOTAL	REFURBISH AND RECOVERY OPERATIONS DELTA	OPERATIONS WITH REFURBISH AND RECOVERY TOTAL (3)	TOTAL PROGRAM
					PRODUCTION DELTA	TOOLING DELTA	FACILITIES DELTA					
SRM												
PROGRAM MANAGEMENT	2,850		2,850	13,201				13,201	700		700	16,751
SYSTEM ENGINEERING	6,051	302	6,353	6,625				6,625				12,978
SRM'S	110,660	(8,655)	102,005	2,790,365	(1,102,741)	(956)		1,686,668				1,788,673
CASE	42,738	(9,519)	33,223	1,325,656	(979,577)	(1,049)		345,030				378,253
NOZZLE	17,531	630	18,161	398,944	(43,084)	93		355,953				374,114
IGNITER	1,290		1,290	10,861				10,861				12,151
PROPELLANT AND LINER	25,473		25,473	664,257				664,257				689,730
POWER SUPPLY DISTRIBUTION	1,619	(43)	1,576	56,908	(4,098)			52,810				54,386
FINAL ASSEMBLY	6,698		6,698	144,669				144,669				151,367
GROUND TEST	2,825	156	2,981	4,273				4,273				7,254
AUXILIARY POWER UNIT (APU)	12,486	117	12,603	184,797	(75,982)			108,815				121,418
THRUST TERMINATION												
INSTALLATION ASSEMBLY AND CHECKOUT	960		960						8,232		8,232	9,192
FACILITIES	8,240		8,240	136,249			(41,809)	94,440		24,750	24,750	127,430
SUPPORT EQUIPMENT AND SPARES	3,582		3,582	5,915				5,915	5,242		5,242	14,739
FLIGHT TEST SUPPORT	617	118	735	9,459				9,459				10,194
OPERATIONS SUPPORT	336		336						4,179		4,179	4,515
STRUCTURE	15,955	(1,561)	14,394	440,683	(371,480)			69,093				83,487
RECOVERY SYSTEM		114,718	114,718							112,362	112,362	227,080
TRANSPORTATION	2,651	78	2,729	142,009	11,020			153,029				155,758
TOTAL PROGRAMS	151,902	105,000	256,902	3,544,406	(1,463,211)	(956)	(41,809)	2,038,430	18,353	137,112	155,465	2,450,797

NOTE: TOTAL PROGRAM IS SUM OF  
COLUMN 1, 2, AND 3

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY SERIES BURN WITH TVC & W/O TT

60/YR PRODUCTION RATE  
(DOLLARS IN THOUSANDS)

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$733	\$20,514	\$31,594	\$34,714	\$26,158	\$69,428	\$123,699	\$138,611	\$185,793	\$212,439	\$250,575	\$304,358	\$293,357	\$282,111	\$282,111	\$190,193	\$4,409	\$2,450,797

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY SERIES BURN WITH TVC & W/O TT

40/YR PRODUCTION RATE  
(DOLLARS IN THOUSANDS)

<u>DDT &amp; E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$256,902	\$1,825,696	\$105,024	\$2,187,622

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$733	\$20,514	\$31,594	\$34,714	\$26,158	\$75,042	\$143,097	\$154,011	\$209,421	\$224,036	\$220,110	\$216,183	\$214,002	\$212,038	\$210,075	\$190,006	\$5,888	\$2,187,622

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY SERIES BURN WITH TVC & W/O TT

20/YR PRODUCTION RATE  
(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$256,902	\$1,182,435	\$64,713	\$1,504,050

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$733	\$20,514	\$31,594	\$34,714	\$26,158	\$83,582	\$159,972	\$159,223	\$136,608	\$135,260	\$132,563	\$130,017	\$128,669	\$126,123	\$124,774	\$66,956	\$6,590	\$1,504,050

PROBABLE COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY SERIES BURN WITH TVC & W/O TT

10/YR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>			<u>PRODUCTION RECURRING</u>					<u>PRODUCTION FACILITIES</u>					<u>TOTAL PROGRAM</u>				
\$256,902			\$692,620					\$52,861					\$1,002,383				
<u>FUNDING REQUIREMENTS</u>																	
<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$733	\$20,514	\$31,594	\$34,714	\$26,158	\$94,741	\$125,095	\$95,406	\$78,801	\$78,004	\$77,207	\$74,816	\$74,020	\$73,223	\$71,529	\$41,841	\$3,987	\$1,002,383

#### 5.2.3.2 Ceiling Cost



5.2.3.2.1 With TVC and W/O TT

CEILING COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY SERIES BURN WITH TVC W/O TT

(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E TOTAL	DDT & E REFURBISH AND RECOVERY DELTA	DDT & E WITH REFURBISH AND RECOVERY TOTAL (1)	PRODUCTION PROGRAM TOTAL	60/YR RATE REFURBISH AND RECOVERY			PROD PROGRAM WITH REFURBISH AND RECOVERY TOTAL (2)	OPERATIONS TOTAL	REFURBISH AND RECOVERY OPERATIONS DELTA	OPERATIONS WITH REFURBISH AND RECOVERY TOTAL (3)	TOTAL PROGRAM
					PRODUCTION DELTA	TOOLING DELTA	FACILITIES DELTA					
SRM												
PROGRAM MANAGEMENT	2,973		2,973	14,325				14,325	759		759	18,057
SYSTEM ENGINEERING	6,309	315	6,624	7,189				7,189				13,813
SRM'S	128,483	(11,179)	117,304	3,708,282	(1,528,074)	(1,571)		2,178,637				2,295,941
CASE	52,118	(12,190)	39,928	1,883,824	(1,385,032)	(1,654)		497,138				537,066
NOZZLE	21,669	768	22,437	520,465	(56,149)	83		464,399				486,836
IGNITER	1,356		1,356	11,785				11,785				13,141
PROPELLANT AND LINER	27,620		27,620	868,328				868,328				895,948
POWER SUPPLY DISTRIBUTION	1,694	(46)	1,648	61,749	(4,447)			57,302				58,950
FINAL ASSEMBLY	7,824		7,824	156,976				156,976				164,800
GROUND TEST	3,183	165	3,348	4,637				4,637				7,985
AUXILIARY POWER UNIT (APU)	13,019	124	13,143	209,518	(82,446)			118,072				131,215
THRUST TERMINATION												
INSTALLATION ASSEMBLY AND CHECKOUT	1,001		1,001						8,932		8,932	9,933
FACILITIES	8,593		8,593	147,840			(45,366)	102,474		26,856	26,856	137,923
SUPPORT EQUIPMENT AND SPARES	3,734		3,734	6,418				6,418	5,688		5,688	15,840
FLIGHT TEST SUPPORT	643	125	768	10,264				10,264				11,032
OPERATIONS SUPPORT	350		350						4,535		4,535	4,885
STRUCTURE	16,636	(1,651)	14,985	478,063	(403,989)			74,974				89,959
RECOVERY SYSTEM		121,395	121,395							121,920	121,920	243,315
TRANSPORTATION	2,764	83	2,847	154,090	11,957			166,047				168,894
TOTAL PROGRAMS	171,486	109,088	280,574	4,526,471	(1,919,206)	(1,571)	(45,366)	2,560,328	19,914	148,776	168,690	3,009,592

NOTE: TOTAL PROGRAM IS SUM OF  
COLUMN 1, 2, AND 3

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC & W/O TT

60/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$901	\$25,011	\$38,532	\$42,635	\$32,127	\$85,271	\$151,926	\$170,241	\$228,190	\$270,917	\$307,756	\$373,811	\$360,299	\$346,488	\$346,488	\$233,594	\$5,405	\$3,009,592

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC & W/O TT

40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$280,574	\$2,287,386	\$113,958	\$2,681,918

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$901	\$25,011	\$38,532	\$42,635	\$32,127	\$92,014	\$175,227	\$188,842	\$256,783	\$274,704	\$269,889	\$265,075	\$262,400	\$259,993	\$257,585	\$232,977	\$7,223	\$2,681,918

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC & W/O TT

20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$280,574	\$1,480,926	\$70,218	\$1,831,718

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$901	\$25,011	\$38,532	\$42,635	\$32,127	\$101,814	\$194,319	\$193,407	\$166,405	\$164,763	\$161,479	\$158,377	\$156,735	\$153,633	\$151,991	\$81,561	\$8,028	\$1,831,718

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC & W/O TT

10/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$280,574	\$869,823	\$57,357	\$1,207,754

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$901	\$25,011	\$38,532	\$42,635	\$32,127	\$114,182	\$149,524	\$113,744	\$94,972	\$94,011	\$93,051	\$90,169	\$89,209	\$88,248	\$86,207	\$50,428	\$4,803	\$1,207,754

**5.2.3.2.2 With TVC and TT**

CEILING COST 156 INCH SRM WITH REFURBISHMENT AND RECOVERY SERIES BURN WITH TVC & TT  
(DOLLARS IN THOUSANDS)

DATE 15 March 1972

	DDT & E TOTAL	DDT & E REFURBISH AND RECOVERY DELTA	DDT & E WITH REFURBISH AND RECOVERY TOTAL (1)	PRODUCTION PROGRAM TOTAL	60/YR RATE REFURBISH AND RECOVERY			PROD PROGRAM WITH REFURBISH AND RECOVERY TOTAL (2)	OPERATIONS TOTAL	REFURBISH AND RECOVERY OPERATIONS DELTA	OPERATIONS WITH REFURBISH AND RECOVERY TOTAL (3)	TOTAL PROGRAM
					PRODUCTION DELTA	TOOLING DELTA	FACILITIES DELTA					
SRM												
PROGRAM MANAGEMENT	2,973		2,973	14,325				14,325	759		759	18,057
SYSTEM ENGINEERING	6,309	315	6,624	7,189				7,189				13,813
SRM'S	129,547	(11,179)	118,368	3,727,038	(1,528,074)	(1,571)		2,197,393				2,315,761
CASE	52,118	(12,190)	39,928	1,883,824	(1,385,032)	(1,654)		497,138				537,066
NOZZLE	21,669	768	22,437	520,465	(56,149)	83		464,399				486,836
IGNITER	1,356		1,356	11,785				11,785				13,141
PROPELLANT AND LINER	27,620		27,620	868,328				868,328				895,948
POWER SUPPLY DISTRIBUTION	1,694	(46)	1,648	61,749	(4,447)			57,302				58,950
FINAL ASSEMBLY	7,824		7,824	156,976				156,976				164,800
GROUND TEST	3,183	165	3,348	4,637				4,637				7,985
AUXILIARY POWER UNIT (APU)	13,019	124	13,143	200,518	(82,446)			118,072				131,215
THRUST TERMINATION	1,064		1,064	18,756				18,756				19,820
INSTALLATION ASSEMBLY AND CHECKOUT	1,001		1,001						8,932		8,932	9,933
FACILITIES	8,593		8,593	147,840			(45,366)	102,474		26,856	26,856	137,923
SUPPORT EQUIPMENT AND SPARES	3,734		3,734	6,418				6,418	5,688		5,688	15,840
FLIGHT TEST SUPPORT	643	125	768	10,264				10,264				11,032
OPERATIONS SUPPORT	350		350						4,535		4,535	4,885
STRUCTURE	16,636	(1,651)	14,985	478,063	(403,069)			74,974				89,959
RECOVERY SYSTEM		121,395	121,395							121,920	121,920	243,315
TRANSPORTATION	2,764	83	2,847	154,090	11,957			166,047				168,894
TOTAL PROGRAMS	172,550	109,088	281,638	4,545,227	(1,919,206)	(1,571)	(45,366)	2,579,084	19,914	148,776	168,690	3,029,412

NOTE: TOTAL PROGRAM IS SUM OF  
COLUMN 1, 2, AND 3



CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC & TT  
60/YEAR PRODUCTION RATE

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$ 907	\$ 25,158	\$ 38,758	\$ 42,917	\$ 32,339	\$ 85,834	\$152,929	\$171,365	\$229,696	\$262,639	\$309,787	\$376,278	\$362,678	\$348,775	\$348,775	\$235,136	\$ 5,441	\$3,029,412

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC & TT

40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$281,638	\$2,304,282	\$113,958	\$2,699,878

FUNING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$907	\$25,158	\$28,758	\$42,917	\$32,339	\$92,632	\$176,418	\$190,110	\$258,507	\$276,549	\$271,702	\$266,855	\$264,162	\$261,738	\$259,315	\$234,541	\$7,270	\$2,699,878

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC & TT

20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION</u>	<u>TOTAL</u>
_____	<u>RECURRING</u>	<u>FACILITIES</u>	<u>PROGRAM</u>
\$281,638	\$1,491,706	\$70,218	\$1,843,562

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$907	\$25,158	\$38,758	\$42,917	\$32,339	\$102,475	\$195,572	\$194,654	\$167,486	\$165,833	\$162,527	\$159,405	\$157,752	\$154,630	\$152,978	\$82,090	\$8,081	\$1,843,562

CEILING COST 156 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC & TT

10/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION</u>	<u>TOTAL</u>
<u>          </u>	<u>RECURRING</u>	<u>FACILITIES</u>	<u>PROGRAM</u>
\$281,638	\$876,287	\$57,357	\$1,215,282

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$907	\$25,158	\$38,758	\$42,917	\$32,339	\$114,898	\$150,438	\$114,434	\$95,567	\$94,601	\$93,634	\$90,735	\$89,768	\$88,802	\$86,748	\$50,744	\$4,834	\$1,215,282

### 5.3 260 Inch Series Expendable Cost

## 260 INCH SERIES BURN

Presented in this section are the probable costs for the expendable and recoverable 260-inch Series Configuration. Since these costs were extrapolated from statistical data, they are presented in total cost only for DDT&E, Production recurring and Production Facilities for the 60, 40, 20 and 10 launch rates.

For your convenience a cost summary is included in the front of this section summarizing the cost detail which follows.

### 5.3.1 Summary

SUMMARY 260 INCH SRM SERIES BURN

(DOLLARS IN THOUSANDS)

	<u>DDT&amp;E</u>	<u>Production</u>			<u>Production</u>			<u>Production</u>			<u>Production</u>		
		<u>60/Year Rate</u>	<u>Facilities</u>	<u>Total</u>	<u>40/Year Rate</u>	<u>Facilities</u>	<u>Total</u>	<u>20/Year Rate</u>	<u>Facilities</u>	<u>Total</u>	<u>10/Year Rate</u>	<u>Facilities</u>	<u>Total</u>
		<u>Recurring</u>	<u>Program</u>	<u>Program</u>	<u>Recurring</u>	<u>Program</u>	<u>Program</u>	<u>Recurring</u>	<u>Facilities</u>	<u>Program</u>	<u>Recurring</u>	<u>Facilities</u>	<u>Program</u>
<u>Series Burn-Expendable</u>													
<u>Probable Cost</u>													
With TVC	230,473	3,181,766	148,000	3,560,239	2,709,818	130,000	3,070,291	1,698,066	80,000	2,008,539	940,996	66,000	1,237,469
Recurring Cost/Launch		7,231			7,698			8,663			9,317		
Peak Annual Funding	50,555	443,250			315,319			212,317			135,750		
<u>Series Burn-Recoverable</u>													
<u>Probable Cost</u>													
With TVC	376,178	1,908,720	129,000	2,413,898	1,725,504	114,000	2,215,682	1,124,060	70,000	1,570,238	671,953	58,000	1,106,131
Recurring Cost/Launch		4,338			4,902			5,735			6,653		
Peak Annual Funding	35,920	299,882			227,001			170,282			124,504		



### 5.3.2 260 Inch Series Expendable Probable Cost

PROBABLE COST 260 INCH SRM SERIES BURN WITH TVC

60/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$230,473	\$3,181,766	\$148,000	\$3,560,239

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$1,068	\$26,346	\$40,587	\$50,555	\$38,095	\$101,111	\$180,148	\$201,866	\$270,578	\$309,385	\$364,924	\$443,250	\$427,229	\$410,852	\$410,852	\$276,987	\$6,406	\$3,560,239

PROBABLE COST 260 INCH SRM SERIES BURN WITH TVC

40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$230,473	\$2,709,818	\$130,000	\$3,070,291

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$1,068	\$26,346	\$40,587	\$50,555	\$38,095	\$105,618	\$196,126	\$216,763	\$294,748	\$315,319	\$309,792	\$304,266	\$301,196	\$298,432	\$295,669	\$267,421	\$8,290	\$3,070,291

PROBABLE COST 260 INCH SRM SERIES BURN WITH TVC

20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>aDDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$230,473	\$1,698,066	\$80,000	\$2,008,539

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$1,068	\$26,346	\$40,587	\$50,555	\$38,095	\$112,076	\$212,317	\$203,264	\$183,179	\$181,371	\$177,756	\$174,341	\$172,534	\$169,119	\$167,311	\$89,782	\$8,838	\$2,008,539

PROBABLE COST 260 INCH SRM SERIES BURN WITH TVC

10/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$230,473	\$940,996	\$66,000	\$1,237,469

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$1,068	\$26,346	\$40,587	\$50,555	\$38,095	\$117,683	\$135,750	\$106,985	\$105,995	\$96,894	\$95,904	\$92,934	\$91,944	\$90,954	\$88,850	\$51,974	\$4,951	\$1,237,469

### 5.3.3 260 Inch Series Recoverable Probable Cost

PROBABLE COST 260 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC

60/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$376,178	\$1,908,720	\$129,000	\$2,529,608

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$759	\$18,719	\$28,838	\$35,920	\$27,067	\$68,407	\$121,880	\$136,573	\$183,060	\$209,315	\$246,891	\$299,882	\$289,043	\$277,963	\$277,963	\$187,397	\$4,221	\$2,413,898

PROBABLE COST 260 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC

40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$376,178	\$1,725,504	\$114,000	\$2,215,682

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$759	\$18,719	\$28,838	\$35,920	\$27,067	\$76,035	\$147,951	\$156,049	\$212,192	\$227,001	\$223,022	\$219,044	\$216,834	\$214,844	\$212,855	\$192,520	\$6,032	\$2,215,682



PROBABLE COST 260 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC

20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$376,178	\$1,124,060	\$70,000	\$1,570,238

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$759	\$18,719	\$28,838	\$35,920	\$27,067	\$87,329	\$170,282	\$169,498	\$142,731	\$141,322	\$138,505	\$135,845	\$134,436	\$131,775	\$130,368	\$69,957	\$6,887	\$1,570,238

PROBABLE COST 260 INCH SRM WITH REFURBISHMENT & RECOVERY SERIES BURN WITH TVC

10/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$376,178	\$671,953	\$58,000	\$1,106,131

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$759	\$18,719	\$28,838	\$35,920	\$27,067	\$104,734	\$124,504	\$121,685	\$97,112	\$86,231	\$85,350	\$82,707	\$81,826	\$80,945	\$79,073	\$46,254	\$4,407	\$1,106,131

#### 5.4 120 Inch Parallel Expendable Probable Cost

## 120 INCH PARALLEL BURN

Presented in this section are the expendable probable costs only for the 120-inch parallel configuration. Since these costs were extrapolated from statistical data, they are presented in total cost only for the DDT&E, Production recurring and Production Facilities for the 60, 40, 20 and 10 launch rates.

For your convenience a cost summary is included in the front of this section summarizing the cost detail which follows.

#### 5.4.1 Summary

SUMMARY 120 INCH SRM PARALLEL BURN

(DOLLARS IN THOUSANDS)

	<u>DDT&amp;E</u>	<u>Production</u> <u>60/Year Rate</u>		<u>Total</u> <u>Program</u>	<u>Production</u> <u>40/Year Rate</u>		<u>Total</u> <u>Program</u>	<u>Production</u> <u>20/Year Rate</u>		<u>Total</u> <u>Program</u>	<u>Production</u> <u>10/Year Rate</u>		<u>Total</u> <u>Program</u>
		<u>Recurring</u>	<u>Facility</u>		<u>Recurring</u>	<u>Facilities</u>		<u>Recurring</u>	<u>Facilities</u>		<u>Recurring</u>	<u>Facilities</u>	
<u>Parallel Burn - Expendable</u>													
<u>Probable Cost</u>													
Without TVC 7 TT	97,395	2,312,279	200,398	2,610,072	1,995,999	143,295	2,236,689	1,207,468	107,768	1,412,631	655,355	95,884	848,634
Recurring Cost/Launch		5,255			5,670			6,161			6,489		
Peak Annual Funding	37,063	324,954			229,708			143,665			93,095		

#### 5.4.2 120 Inch Parallel Expendable Probable Cost

PROBABLE COST 120 INCH SRM PARALLEL BURN WITHOUT TVC/TT

60/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$97,395	\$2,312,279	\$200,398	\$2,610,072

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$783	\$19,315	\$29,755	\$37,063	\$27,928	\$74,126	\$132,070	\$147,991	\$198,365	\$226,815	\$267,532	\$324,954	\$313,209	\$301,202	\$301,202	\$203,064	\$4,698	\$2,610,072



PROBABLE COST 120 INCH SRM PARALLEL BURN WITHOUT TVC/TT

40/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$97,395	\$1,995,999	\$143,295	\$2,236,689

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$783	\$19,315	\$29,755	\$37,063	\$27,928	\$76,942	\$142,152	\$157,910	\$214,722	\$229,708	\$225,682	\$221,656	\$219,419	\$217,406	\$215,393	\$194,816	\$6,039	\$2,236,689

PROBABLE COST 120 INCH SRM PARALLEL BURN WITHOUT TVC/TT

20/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION</u>	<u>PRODUCTION</u>	<u>TOTAL</u>
<u>\$97,395</u>	<u>RECURRING</u>	<u>FACILITIES</u>	<u>PROGRAM</u>
	\$1,207,468	\$107,768	\$1,412,631

FUND

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$783	\$19,315	\$29,755	\$37,063	\$27,928	\$78,825	\$144,657	\$142,958	\$128,832	\$127,561	\$125,018	\$122,616	\$121,345	\$118,944	\$117,672	\$63,145	\$6,214	\$1,412,631

PROBABLE COST 120 INCH SRM PARALLEL BURN WITHOUT TVC/TT

10/YEAR PRODUCTION RATE

(DOLLARS IN THOUSANDS)

<u>DDT&amp;E</u>	<u>PRODUCTION RECURRING</u>	<u>PRODUCTION FACILITIES</u>	<u>TOTAL PROGRAM</u>
\$97,395	\$655,355	\$95,884	\$848,634

FUNDING REQUIREMENTS

<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>Total</u>
\$783	\$19,315	\$29,755	\$37,063	\$27,928	\$80,705	\$93,095	\$71,518	\$67,127	\$66,448	\$65,769	\$63,732	\$63,054	\$62,375	\$60,932	\$35,643	\$3,392	\$848,634

6.0 FACILITIES - PARALLEL BURN

Identified below are the Thiokol and vendor facilities required for use on the 156 inch SRM Booster DDT&E and 60 peak annual production rate programs. It has been determined that of the total facility cost identified by the case subcontractor thirty thousand dollars of tooling was inadvertently included. This was discovered too late to change the cost in order to reflect the proper dollar allocation between tooling and facilities.

<u>Facility Use</u>	<u>Facility *Cost</u>	<u>Tooling *Cost</u>	<u>Total *Cost</u>
Thiokol	\$13,931	\$ -	\$ 13,931
Case	30,024	32,910	62,934
Nozzle	10,045	-	10,045
Insulation	6,658	-	6,658
Ammonium Perchlorate	13,164	-	13,164
Operation Site	<u>1,718</u>	<u>-</u>	<u>1,718</u>
Total	\$75,540	\$32,910	\$108,450

\* (Dollars in Thousands)

7.0 MAXIMUM SUCCESS SCHEDULE

7.1 COST IMPACT TO DDT&E PROGRAM

If the maximum success schedule is considered it will have a cost savings effect to the program which was costed to the baseline schedule. This savings results from reduction in time-related costs since the maximum schedule reduces the DDT&E program by six months. The cost reductions are made in level-of-effort type cost in Program Management, System Engineering, Manufacturing Support, Installation Assembly and Checkout, and Operations Site Support.

These savings, stated in thousands of dollars, are as follows:

Parallel Configuration - DDT&E

Probable Cost	(\$1, 273)
Ceiling Cost	(\$1, 333)

Series Configuration - DDT&E

Probable Cost	(\$1, 371)
Ceiling Cost	(\$1, 436)

## 8.0 PARAMETRIC COST DATA

The CER's requested by NASA are included in this section and the costs shown do not include facility cost. CER's are presented as follows:

SCHEDULE I - DDT & E Cost = Function of Static Test or  
FTH Motor Quantity

Schedule IA - Probable Cost 156 Inch SRM  
Parallel Burn without TVC/TT

Schedule IB - Probable Cost 156 Inch SRM  
Parallel Burn with TVC/TT

Schedule IC - Ceiling Cost 156 Inch SRM  
Parallel Burn without TVC/TT

SCHEDULE II - DDT & E Cost = Function of Gross Weight

Schedule IIA - Probable Cost 156 Inch SRM  
Parallel Burn without TVC/TT

Schedule IIB - Probable Cost 156 Inch SRM  
Parallel Burn with TVC/TT

Schedule IIC - Ceiling Cost 156 Inch SRM  
Parallel Burn without TVC/TT

SCHEDULE III - Production Cost = Function of Motor Quantity  
and/or Weight Variance

Schedule III A - Probable Cost 156 Inch SRM  
Parallel Burn without TVC/TT

Schedule III B - Probable Cost 156 Inch SRM  
Parallel Burn with TVC/TT

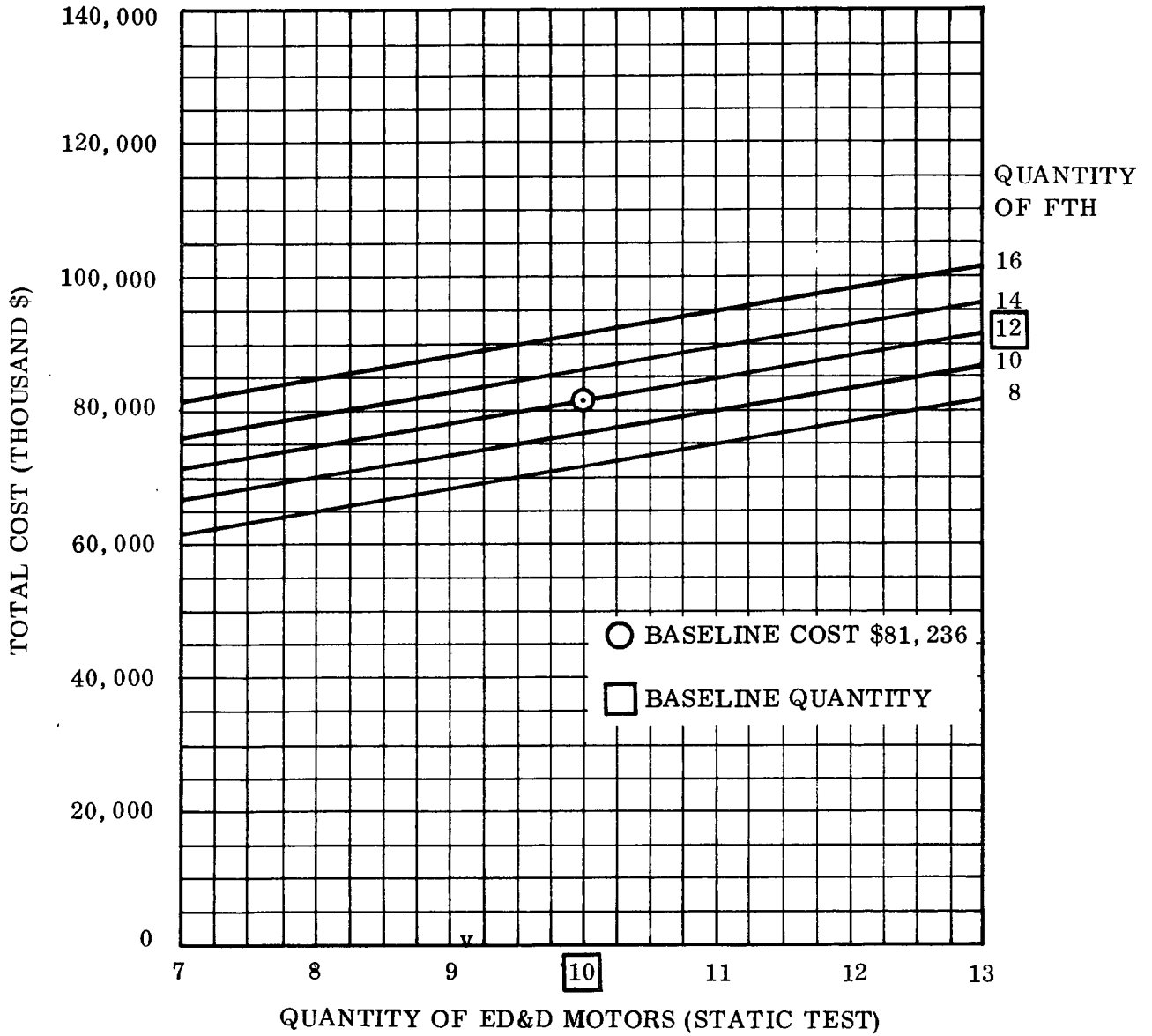
Schedule III C - Probable Cost 156 Inch SRM  
Parallel Burn without TVC/TT

Schedule I shows the cost variance to the DDT & E Program by changing ED & D motors (static test motors) or FTH motors within the quantity restraints as shown. Due to Fix Cost a total of four motors change is the limit of variance which can be permitted within this CER. To interpolate from this graph, if you choose to select a cost impact by changing from ten to twelve ED & D motors, read the grid across the bottom to twelve, then move up the grid until you intersect with the baseline quantity of twelve FTH motors; move across the grid to the left for the total program cost.

Schedule II can be interpolated by determining the gross weight required, then moving up the grid to the intersecting line, then moving to the left grid for total DDT & E cost.

Schedule III can be interpolated for production cost for the baseline weight by selecting the quantity from the bottom grid and moving up until you intersect the solid line, then moving to the left grid for total cost. If you choose to change the gross weight the two lines on each side of the baseline (solid line) represent cost effect of ten and twenty percent weight variances. These weight variances can be interpolated the same as the baseline above.

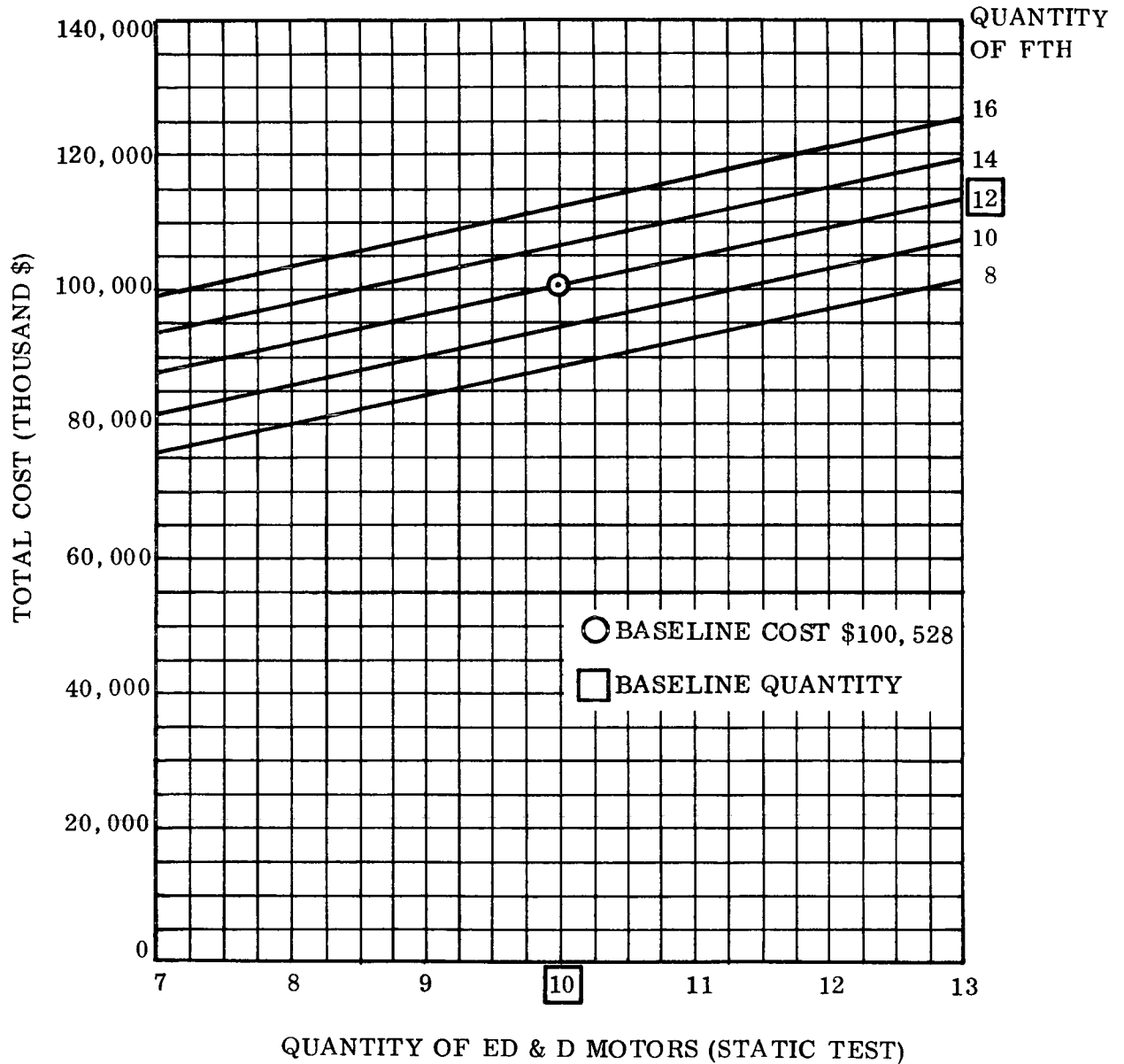
DDT & E COST = FUNCTION OF FTH OR STATIC TEST MOTOR QUANTITY



PROBABLE COST 156 IN. SRM PARALLEL BURN WITHOUT TVC/TT (SCHEDULE IA)

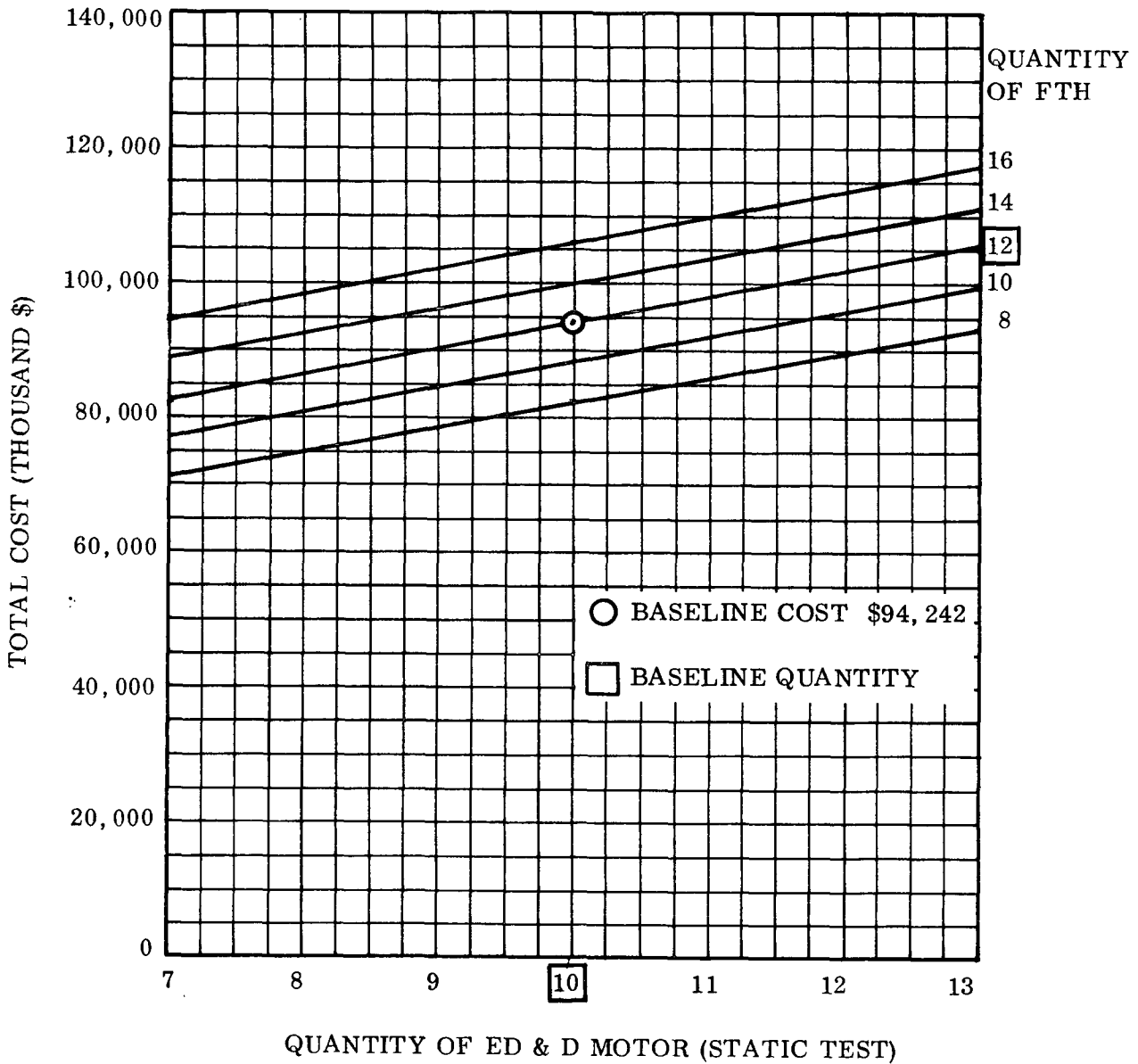


DDT & E COST = FUNCTION OF FTH OR STATIC TEST MOTOR QUANTITY



PROBABLE COST 156 IN. SRM PARALLEL BURN WITH  
TVC/TT (SCHEDULE I B)

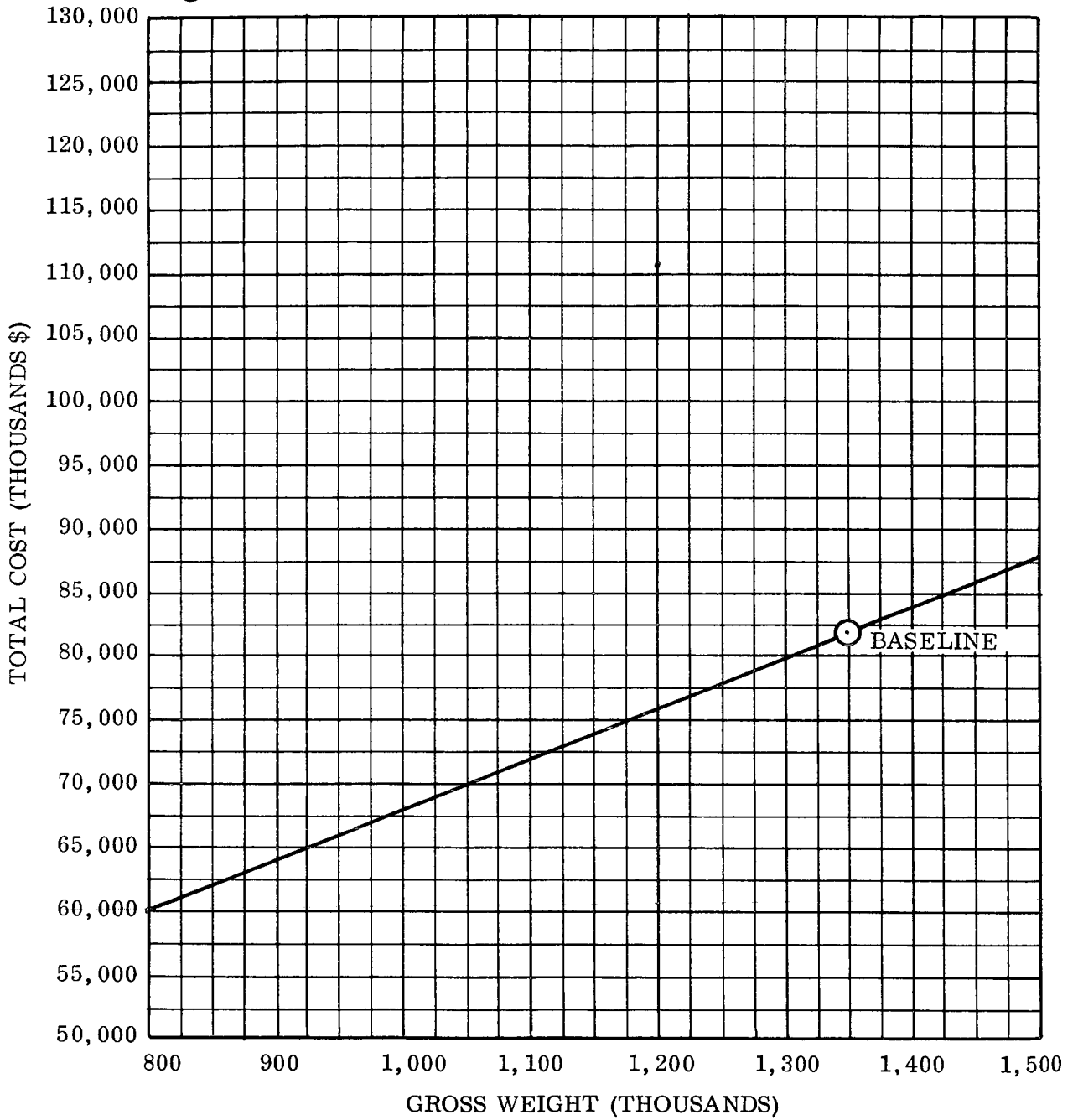
DDT & E COST = FUNCTION OF FTH OR STATIC TEST MOTOR QUANTITY



CEILING COST 156 IN. SRM PARALLEL BURN WITHOUT TVC/TT (SCHEDULE I C)

DDT & E COST = FUNCTION OF GROSS WEIGHT

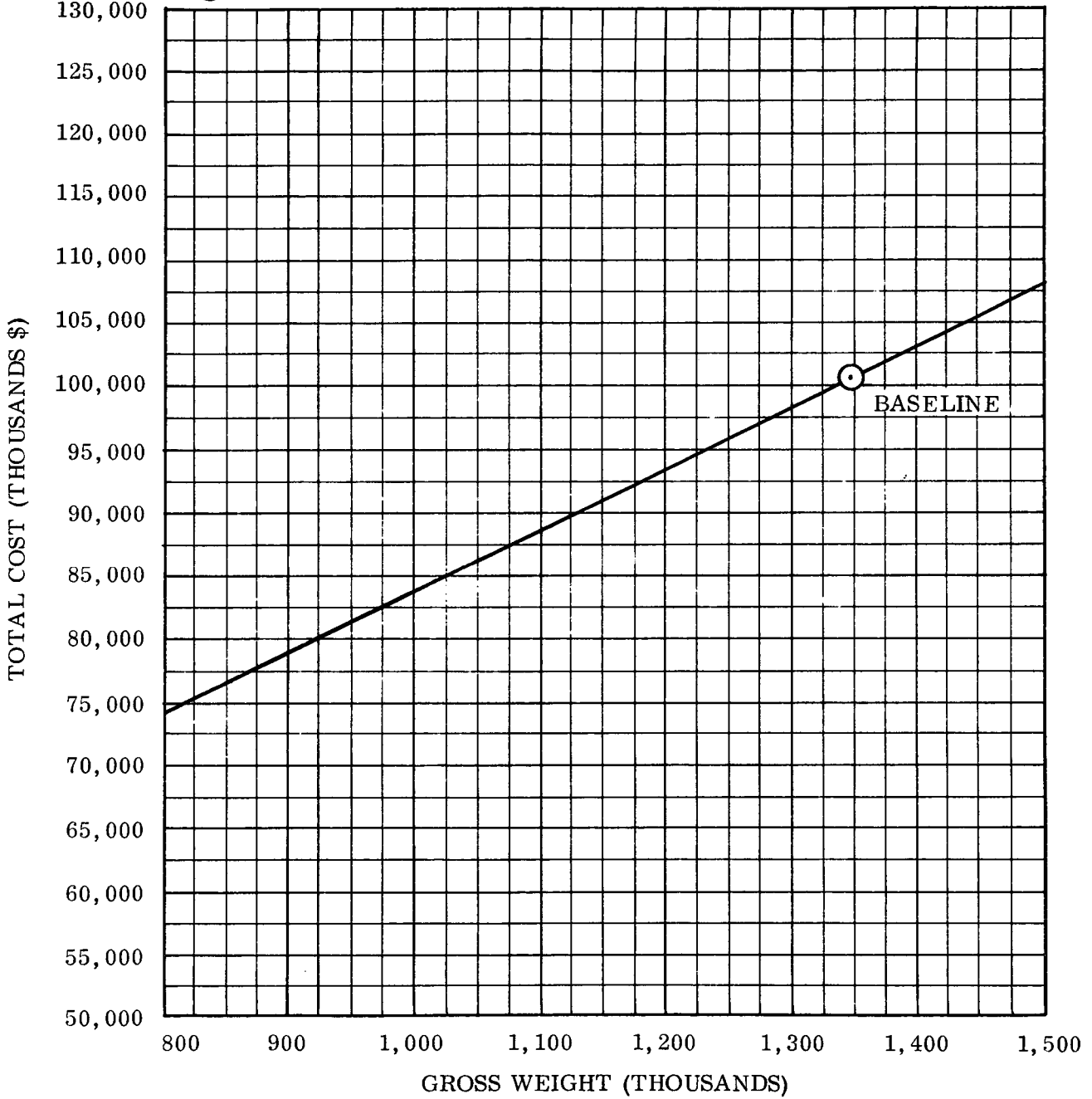
⊙ BASELINE COST \$81,236 (THOUSANDS)



Probable Cost 156 Inch SRM Parallel Burn Without TVC/TT  
(Schedule II A)

DDT & E COST = FUNCTION OF GROSS WEIGHT

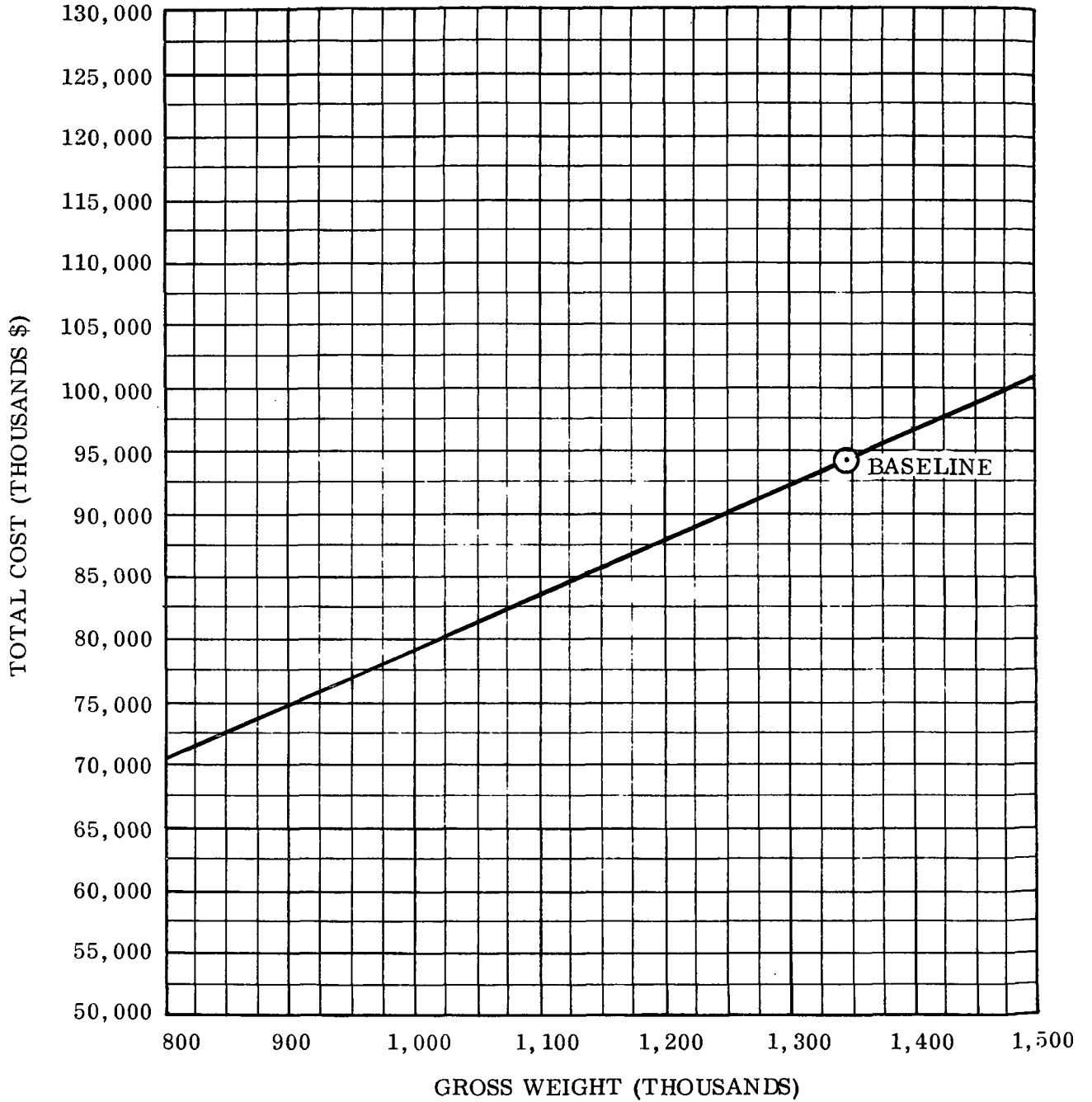
⊙ BASELINE COST \$100,528 (THOUSANDS)



Probable Cost 156 Inch SRM Parallel Burn With TVC/TT  
(Schedule II B)

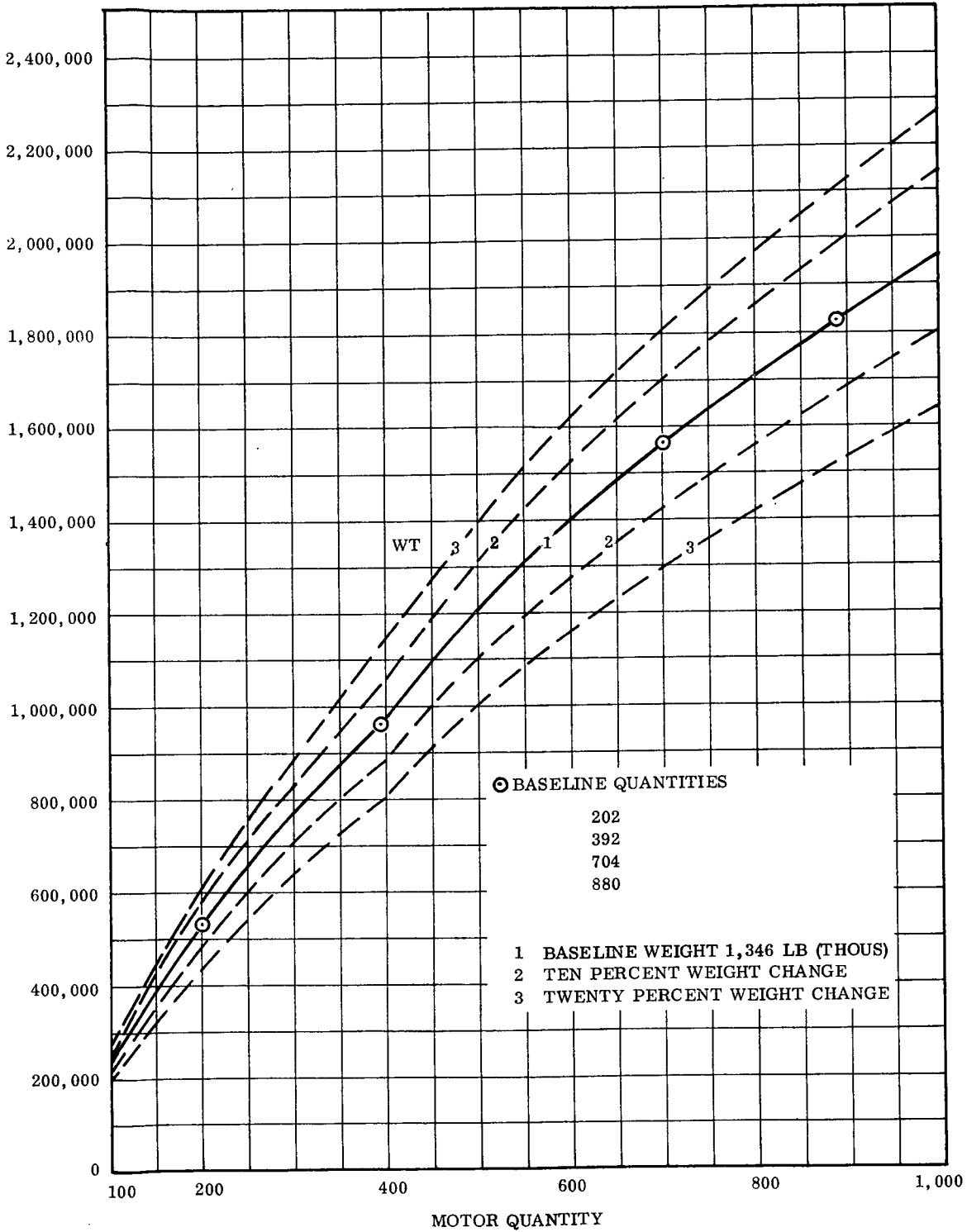
DDT & E COST = FUNCTION OF GROSS WEIGHT

⊙ BASELINE COST \$94,243 (THOUSANDS)



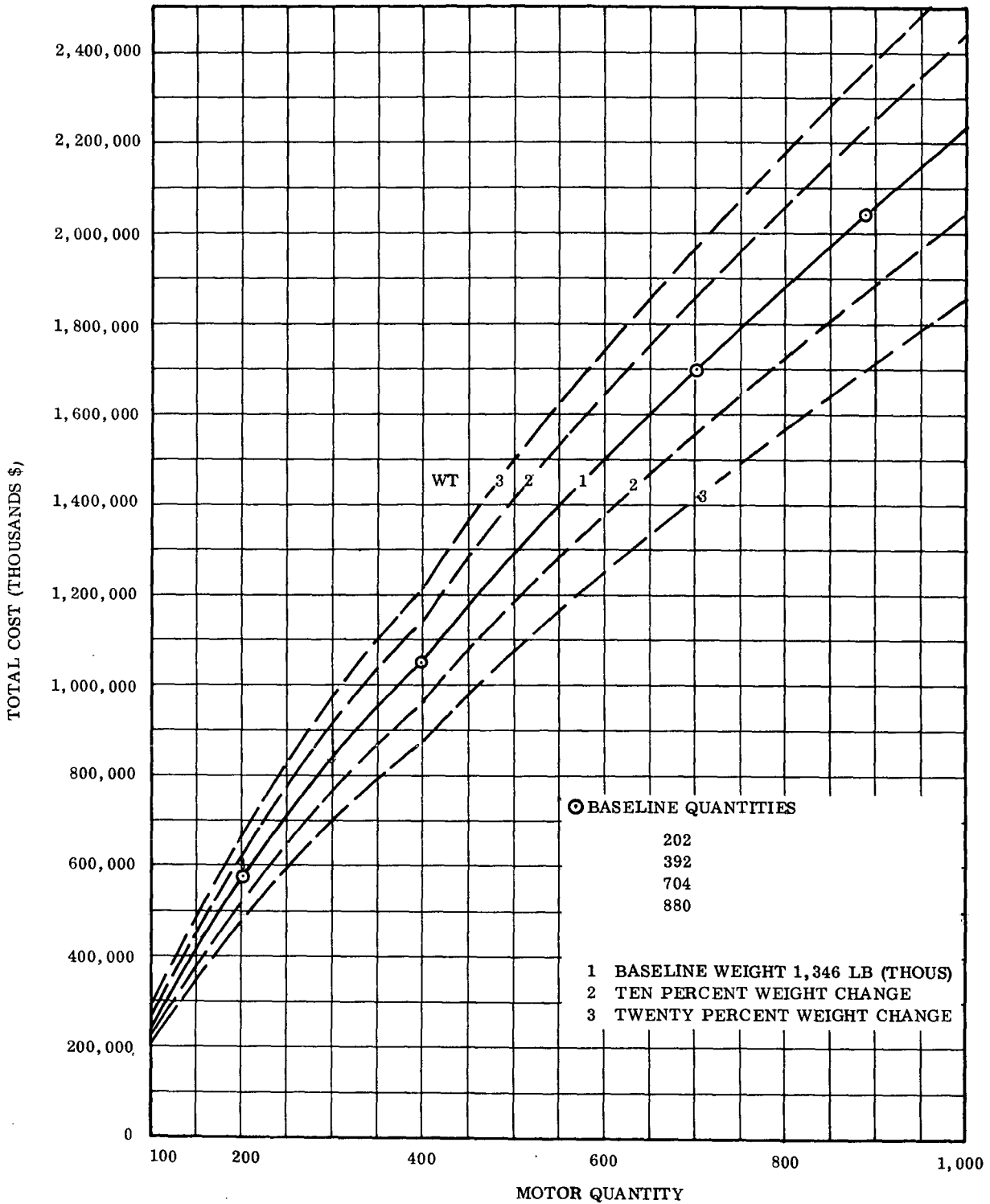
Ceiling Cost 156 Inch SRM Parallel Burn Without TVC/TT  
(Schedule II C)

PRODUCTION COST = FUNCTION OF MOTOR QUANTITY AND/OR WEIGHT VARIANCE



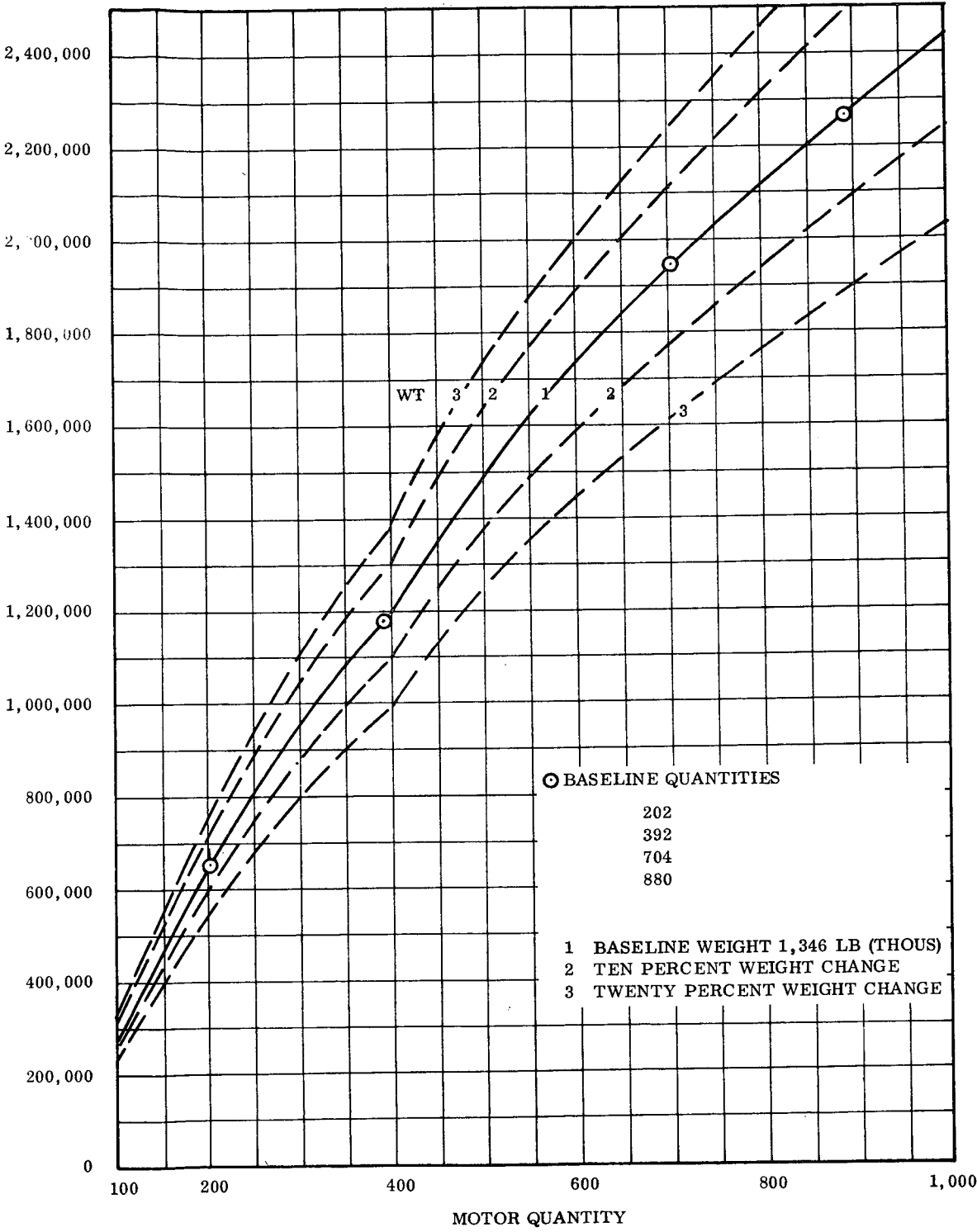
Probable Cost 156 Inch SRM Parallel Burn Without TVC/TT  
(Schedule III A)

PRODUCTION COST = FUNCTION OF MOTOR QUANTITY AND/OR WEIGHT VARIANCE



Probable Cost 156 Inch SRM Parallel Burn With TVC/TT  
(Schedule III B)

PRODUCTION COST = FUNCTION OF MOTOR QUANTITY AND/OR WEIGHT VARIANCE



Ceiling Cost 156 Inch SRM Parallel Burn Without TVC/TT  
(Schedule III C)