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M-79 GRENADE LAUNCHER COST ANALYSIS REPORT

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Technical Report 68-7

M79 GRENADE LAUNCHER COST ANALYSIS REPORT

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The views of the authors do not purport
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Systems & Cost Analysis Division
Comptroller and Director of Programs
U.S. Army Materiel Command
Washington, D. C. 20315

TABLE OF CONTENTS

	<u>Page</u>
Abstract	ii
List of Figures and Tables	iii
I Introduction	1
II System Description	3
III System History	5
IV Development Costs and Analysis	7
V Investment Costs and Analysis	9
VI Operating Costs and Analysis	13
VII Financial Summary	15

Abstract

This report summarizes (1) the operating characteristics, (2) the system history, and (3) the development, investment and operating costs of the M79 Grenade Launcher. Developed by Springfield Armory in the mid-1950's, the M79 Grenade Launcher was designed to bridge the gap between the hand grenade and 60mm mortar. By the end of Fiscal Year 1968 a total of 147,297 launchers had been procured from contractors, not including the 6,855 weapons produced in-house by Springfield Armory. The annual operating cost for maintenance (repair parts, direct and general support maintenance) was \$64.94 per weapon plus \$131.54 per launcher for peacetime ammunition consumption.

LIST OF FIGURES AND TABLES

Figure 1. The M79 Grenade Launcher

Table 1. M79 Grenade Launcher--Principal Characteristics

2. M79 Grenade Launcher--Research & Development Cost Estimate
3. M79 Grenade Launcher--Procurement Schedule
4. M79 Grenade Launcher--Unit Hardware Prices
5. M79 Grenade Launcher--Basic Issue List Items and Costs
6. M79 Grenade Launcher--Operating Costs and Factors
7. M79 Grenade Launcher--Financial Summary

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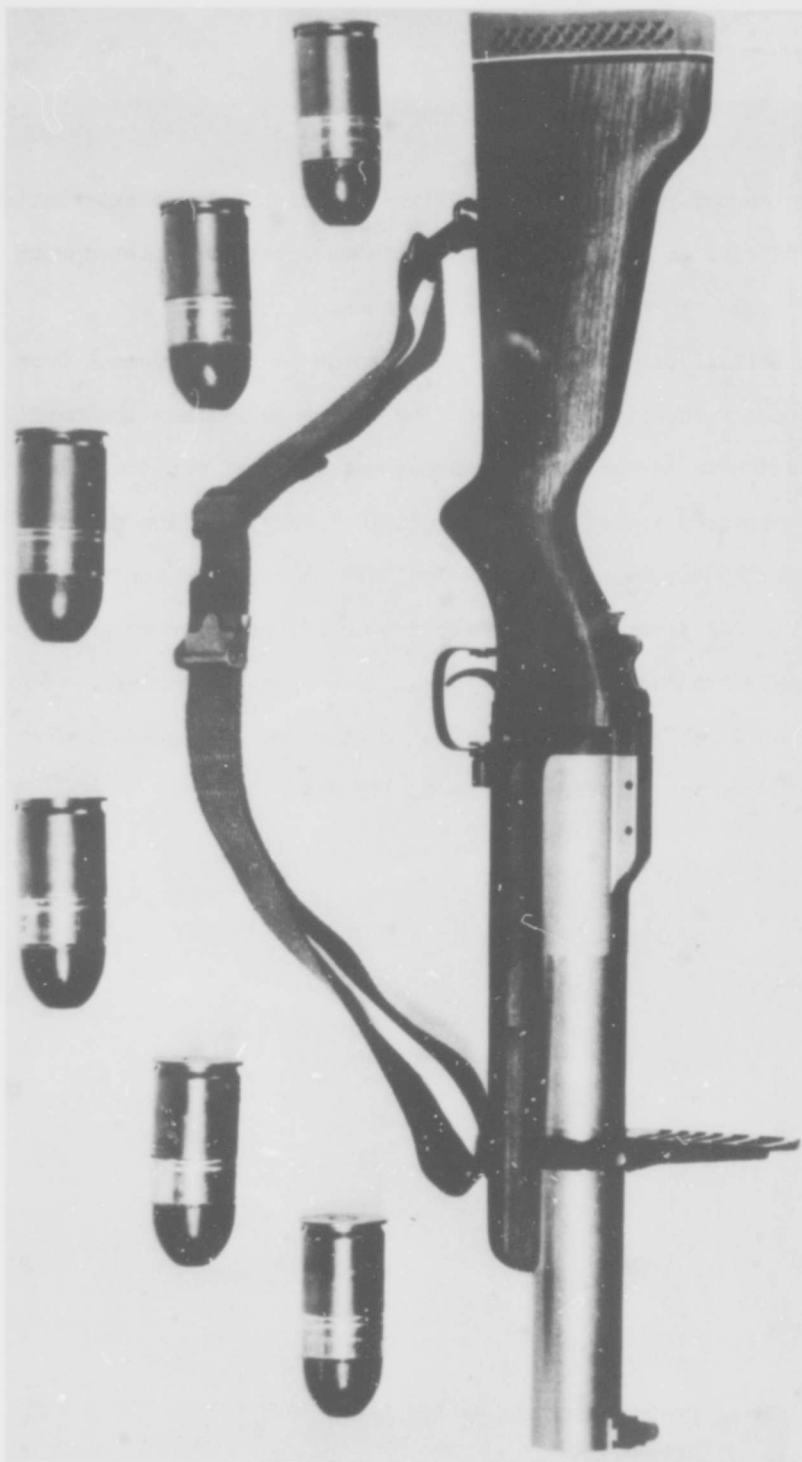
I. INTRODUCTION

This report presents a description of principal characteristics, system history, and the actual and estimated costs associated with the life cycle of the M79 Grenade Launcher.

The initial concept for the M79 Grenade Launcher stemmed from the need for a superior supplement for the range between the hand grenade and 60mm mortar. The launcher was designed and the pilot line was produced in-house by Springfield Armory. Action Manufacturing Co., Kanaar Corp., and TRW Inc. are the private contractors responsible for a large part of the production of these weapons.

The M79 Grenade Launcher, a shoulder weapon, resembles a short, fat single-barrel shot gun. It fires a eight ounce high-explosive shell to a maximum effective range of 375 meters.

Figure 1
THE M79 GRENADE LAUNCHER



USAMCOM Photo

II. SYSTEM DESCRIPTION

The M79 Grenade Launcher (Figure 1) is a single-shot, break-open shoulder-fire weapon. It is breech loaded and chambered for a 40mm metallic cartridge case with internal primer.

Open type sights are provided for sighting the weapon. The front sight is a conventional military type, while the rear sight is a large folding leaf. The barrel is a high strength aluminum alloy and rifled to impart spin to the fused projectile.

The launcher is fired from the usual firing stances. Its recoil is significantly greater than that of the service rifle. A rubber recoil pad is located at the rear end of its stock. A sling is provided to facilitate carrying.

Table 1 illustrates the principal characteristics of the M79 Grenade Launcher.

Table 1

M79 GRENADE LAUNCHER
PRINCIPAL CHARACTERISTICS

Length of Launcher (overall)	28.78 in.
Length of Barrel	14.00 in.
<u>Weight:</u>	
Loaded	6.45 lbs.
Unloaded	5.95 lbs.
<u>Rifling:</u>	
Length	11.83 in.
No. of Lands	6
Depth of Grooves	0.02 in.
Twist	one turn in 48 in.
Maximum Range	410 meters
Maximum Effective Range	375 meters
Muzzle Velocity	250 fps
<u>Ammunition Used:</u>	
Practice	M407
HE	M406
Caliber	40mm
Type	Fixed
Length	3.9 in.
Weight	8.0 oz.
<u>Operational Characteristics:</u>	
Single Shot	
Trigger Operated	
Breech Loaded	

* Feet per second

III. SYSTEM HISTORY

Studies on a grenade launcher started about 1950. The first tests were conducted on a rifle attachment launcher grenade. Later versions progressed from the analysis of a hand-held pistol type to a separate shoulder-weapon. The ammunition phase of these tests was handled separately at Picatinny Arsenal and Aberdeen Proving Grounds, Ballistic Research Laboratories.

About 1954, the T148, a three-round shoulder fired launcher, was developed and tested in response to a request for a multi-round weapon. While this weapon fired the first three rounds rapidly, the parallel single shot version bearing the development identification S-5, could fire 9 rounds as fast as the T148 and also proved more reliable.

Development of the grenade launcher was assigned to the Springfield Armory in line with their traditional small arms mission. The tight security classification surrounding this program dictated that the development, as well as the planned model and pilot production, be assigned to a facility, such as Springfield, which has people cleared for classified secured work and where secure working space could be isolated.

Also it was necessary that engineers at Springfield, experienced in small arms weapons, could be immediately assigned to work closely with Picatinny and Aberdeen. Springfield Armory did not require any subcontractor assistance during development or model and pilot production stage.

After proceeding through the experimental and model stages, the weapon was type classified as Standard "A" and called the M79 by OCTM* 37626, dated 15 December 1960. Although there have been many engineering change orders, there have been no changes in military characteristics since the initial type classification as Standard "A".

The first production order was placed on Springfield Armory on 2 July 1959. Due to the potential value of the launcher in limited or brush warfare situations, Springfield started production on temporary tooling concurrently with production engineering and permanent tool fabrication.

The first out-of-house order was placed with Kanaar Corporation on 22 June 1961. Other prime contractors participating in the program have been Action Manufacturing Co., Exotic Metal Products Co., and TRW Inc. However, Exotic Metal Products Co. was defaulted by the government because of inability to deliver and their claim was eventually settled for \$860 thousand. Total procurements through the end of Fiscal Year 1968 have amounted to 147,297 launchers.

Negotiations are presently being conducted for an additional 22,588 launchers with deliveries tentatively scheduled to commence in August 1969 and be completed by May 1970. Although there are no positive plans for procurement after this buy, it would appear that the possibility of any future procurement will decrease as attachment-type launchers are developed.

* Ordinance Technical Committee Minutes

IV. DEVELOPMENT COSTS AND ANALYSIS

Many factors and circumstances have made the collection of firm, reliable development costs extremely difficult. Because the major portion of this program took place during the mid- and late-1950's, program documents, correspondence and technical reports have since been destroyed. Also, the tight security classification surrounding this program has precluded the availability of any previous studies or summarizations which might have provided some insight. And the closing of Springfield Armory, with the resulting loss of engineers and others cognizant of the program, has further hampered cost acquisition.

Sources participating in the development program at Springfield Armory and then transferred to Rock Island Arsenal with the remainder of the M79 mission have provided some information on research and development costs. Table 2 presents this estimate of research and development costs. It is recommended that any subsequent use of this RDTE estimate for future studies should be tempered by the consideration of its uncertain validity.

TABLE 2
M79 GRENADE LAUNCHER
Research and Development Cost Estimate

Total M79 Program--Springfield Armory	\$2,195,810
(Minus) Applicable to Production	<u>1,405,275</u>
Total Research & Development	\$ 790,535

NOTE: The production figure is based on a \$205 price. Although no cost breakdown for this estimate was available, it probably contains some costs which properly are development or advance production engineering costs.

V. INVESTMENT COSTS AND ANALYSIS

Investment Costs--Non-Recurring

As in the case of development costs, there are no initial investment costs available that would be attributable to Springfield Armory. In fact, the only Non-Recurring costs available, are the out-of-house costs paid to Action Manufacturing Company, Kanaar Corp. and TRW Inc., as listed in Table 7.

Of these out-of-house costs, generally, the production base support (PBS) costs consists of those expenses incurred by moving Government Furnished Equipment (GFE) into the contractors' plants and subsequently clearing the plant after production was completed. Specifically, the \$80,000 in FY 61 was the estimated cost of moving Industrial Production Equipment (IPE) into Kanaar and Action, while the \$44,000 in FY 65 covered the cost of moving IPE into TRW. Future estimates of PBS in FY 69 of \$35,000 cover the movement of seventeen pieces of IPE into Kanaar in order to expand their production capability, whereas the FY 70 estimate of \$100,000 is the cost of layaway at Kanaar.

There are no advance production engineering costs attributable to any of the contractors because the weapon was entirely developed at Springfield Armory. The tooling and test equipment costs in Fiscal Years 1961 and 1962 were for equipment purchased as line items in the first two production contracts. Any additional tooling and test equipment in later years was included in the unit price. Lastly, there is no special support equipment required for the launcher.

Investment Costs--Recurring

From Fiscal Year 1961 through the end of Fiscal Year 1968, seven contracts have been negotiated with the three contractors--Kanaar, Action, and TRW for the production of a total of 147,297 launchers at a total cost of \$23.1 million. Although basic contract prices on these seven contracts amounted to only \$10.6 million, expenditures above these basic prices amounted to approximately \$12.5 million.

The differences between basic contract prices and final contract prices were quantity increases of \$10.5 million, \$0.6 million of engineering change orders and adjustments by the Army Contract Adjustment Board (ACAB). These quantity increases stemmed from favorable acceptance and urgency of need. The engineering change orders were due primarily to production before a solid technical data package had been developed. Lastly, the ACAB adjustments were made as the result of decisions that the contractors were entitled to additional compensation.

Table 3 presents the schedule of procurements of launchers from each of these manufacturers including the quantities procured and final contract prices. Unit prices ranged from \$89.50. per weapon in FY 62 to \$172.81 per weapon (estimated) in FY 68. This price spread of bids stems from the fact that there were many unknowns to be considered in the production of the M79. Significant differences also occurred in costs for inspection equipment and special tooling.

TABLE 3

M79 GRENADE LAUNCHER
PROCUREMENT SCHEDULE

<u>Fiscal Year</u>	<u>Contractor</u>	<u>Quantity (Fixed)</u>	<u>Final Contract Price</u>
1961	Kanaar	7,839	\$1,531,604*
1962	Action	17,259	3,371,481*
1964	Kannaar	15,218	2,133,238
1965	TRW	24,006	2,992,082
1966	Kanaar	8,503	1,147,901
	TRW	11,617	1,473,638
1967	Kanaar	<u>62,855</u>	<u>10,420,966**</u>
TOTAL		147,297	\$23,070,910

* These contract prices include \$0.5 million for Kanaar and \$1.7 million for Action for the cost of repair parts, acceptance inspection equipment, special tooling, and related data.

** This price includes \$48.8 thousand for the cost of primer indent test and repair of GFE stocks.

An analysis of these unit prices for each producer, as shown in Table 4, indicate a 100 percent (or higher) learning curve, thereby offering no value in projecting future unit prices.

The cost of Basic Issue Items (BILI) as well as the basis of issue is presented in Table 5. Total costs are presented in Table 7.

TABLE 4

M79 GRENADE LAUNCHER
Unit Hardware Prices

<u>Fiscal Year</u>	<u>Contractor & Contract No.</u>	<u>Quantity of Launchers</u>	<u>Unit Price Launcher</u>
1961	Kanaar 658	7,320	134.35
		519	130.00
1962	Action 736(w)	1,700	89.50
		9,563	89.80
		5,996	115.00
1964	Kanaar 258(w)	5,600	138.50
		1,900	127.00
		7,718	133.13
1965	TRW 644(w)	18,046	126.48
		5,960	106.67
1966	Kanaar 646(w)	8,503	134.97
	TRW 706(w)	11,617	126.75
1967	Kanaar 715(w)	19,072	151.69
		19,305	168.31
		12,239	172.81*
		11,387	172.81*
		852	172.81*
*Estimated			

TABLE 5

M79 GRENADE LAUNCHER
Basic Issue List Items and Costs

	<u>Basis of Issue</u>	<u>Unit Cost</u>	<u>Total Cost/Rifle</u>
Case, Lubricant	1	.09	.09
Sling	1	.60	.60
Case, Small Arms Accessories	1	1.07	1.07
Screw Driver & Wrench Combination	1	2.12	2.12
			3.88

VI. OPERATING COST AND ANALYSIS

Table 6 lists operating costs and factors for the M79 Grenade Launcher under peacetime conditions. Costs of annual service practice, training costs (service schools, training centers, etc.), operating forces, medical services, Army-wide activities and family housing activities were not available. On the other hand, POL consumption central supply activities (when spread over in-use density), and recurring publication costs are considered to be negligible and are therefore not reported.

Due to the uniqueness of its construction, there is no need for the launcher to be overhauled. No useful life estimates has been established for this weapon, primarily due to the ease with which components may be replaced. The cost of these repair parts is significantly higher than the cost of repair parts for the M16A1 Rifle (\$12.58). This difference is attributable to the following reasons. First, the high replacement factor and cost of the barrel of the M79 (16 per 100 per year at \$32 ea.) and the sight frame (8 per 100 per year at \$21 ea.). Second, the relatively high density of the M16A1 allows for more economic buys.

Table 6

M79 GRENADE LAUNCHER
OPERATING COSTS & FACTORS

<u>Operating Costs</u>	<u>Estimated Annual Unit Cost</u>	<u>Reference</u>
Repair Parts	\$ 16.70	Weapons Cmd.
Ammunition Consumption		
Training	131.54	Munitions Cmd.
Vietnam	501.22	Munitions Cmd.
Crew (incl organ. maint.)	4,509.00	Weapons Cmd.
DS Maintenance	33.64	Weapons Cmd.
GS Maintenance	14.60	Weapons Cmd.
Training <u>/1</u>	2,200.00	Weapons Cmd.
Depot Maintenance <u>/2</u>		
Labor	16.00	Weapons Cmd.
Material	29.76	Weapons Cmd.
<u>Operating Factors</u>		
Average rounds fired/year/weapon		
Peacetime	47 rds.	Weapons Cmd.
Vietnam	182 rds.	Weapons Cmd.
Meantime to Repair <u>/3</u>	2.5 hrs.	Weapons Cmd.
<u>/1</u> Cost of new equipment training. <u>/2</u> Cost of Inspection & Repair (I&R) performed at depot. <u>/3</u> The estimated time for I&R.		

VII. FINANCIAL SUMMARY

As stated earlier, there are no actual reported costs for research and development except for the reported estimate of \$790,535. Table 7 reports actual investment expenditures to date to be \$22.7 million. However, this figure does not include \$1.4 million given to Springfield Armory for the 6,855 launchers and associated BILLI produced during the period July 1960 through February 1963, as well as two payments made by the Army Contract Adjustment Board of \$1.3 million. Of the \$4.2 million investment expected to be completed by Fiscal Year 1971, \$4.1 million is for the purchases of an additional 22,588 Grenade Launchers with the remainder for the layaway of productive facilities in Fiscal Year 1971.

Operating and maintenance costs from Fiscal Year 1960 through the end of Fiscal Year 1968, as shown in Table 7, have amounted to \$84.9 million. Eighty-seven percent of this sum, or \$74.1 million, has been expended since the beginning of Fiscal Year 1966, which is largely attributable to the Vietnam conflict.

Table 7

**M79 GRENADE LAUNCHER
FINANCIAL SUMMARY
(thousands of dollars)**

DESCRIPTION OF WORK	FY 60	FY 61	FY 62	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68	FY 69	FY 70	FY 71
<u>Investment Non-recurring</u>												
Production Base Support		8.0				47.1	13.5		44.0	35.0		100.0
Advance Production Eng'g		124.4	264.8									
Tooling & Test Equipment		204.4	264.8			47.1	13.5		44.0	35.0		100.0
TOTAL												
<u>Investment Recurring</u>												
Launcher, Grenade M79		437.0	1,272.6	404.8	1,750.8	1,181.8	5,531.3	6,146.0	4,230.0	3,903.4		
BILL		22.7	72.7	2.0	29.1	29.9	171.2	148.9	95.0	87.6		
Publications (Initial)		9.3			10.0	10.0	10.0	10.0	7.0	27.0	7.0	
Gov't Quality Assurance		54.3	125.7		2.1							
Selected Repair Parts		1.4	4.4	3.4	3.0	10.7	8.3	12.1	24.4	9.3	18.8	
First Destination Trans.							89.1	.2	104.7			
Other			59.6									
TOTAL		524.7	1,535.0	410.2	1,795.0	1,232.4	5,809.9	6,317.2	4,461.1	4,027.3	25.8	
<u>Operating and Maintenance</u>												
Repair Parts		25.5	57.8	159.7	221.0	400.1	484.5	654.8	893.3			
Ammunition Consumption			681.9	1,763.7	1,830.3	3,047.7	10,440.6	21,784.3	33,846.8			
DS Maintenance		51.3	116.3	321.5	445.3	806.0	976.0	1,318.9	1,799.4			
OS Maintenance		22.2	50.5	139.5	193.2	349.8	423.6	572.4	781.0			
Initial Training	2.2											
Central Supply Activity		2.3	9.0	21.4	27.3	25.0	25.4	25.1	21.8			
Depot Maintenance - Labor							5.6	6.5	5.2			
Depot Maint. - Material					2.0		15.8	17.7	9.4			
Other								3.0	2.5			
TOTAL	2.2	101.3	915.5	2,405.8	2,719.1	4,628.6	12,371.5	24,382.7	37,359.4			

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