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TECHNICAL REPORT

M14 RIFLE COST ANALYSIS REPORT

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WASHINGTON, D.C. 20315

37

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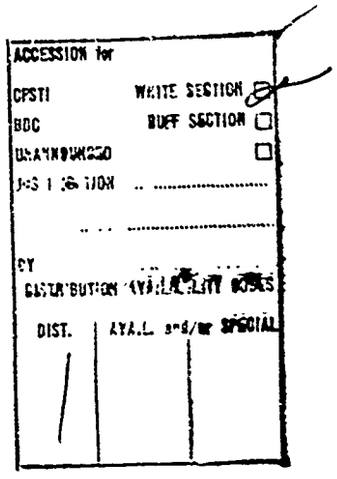

Technical Report 68-4

M14 Rifle Cost Analysis Report

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The views of the authors do not purport to reflect the position of the Department of the Army or the Department of Defense.

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3

TABLE OF CONTENTS

5

Abstract

This report summarizes (1) the system history and (2) the development, investment, and operating costs of the 7.62mm M14 rifle. Development of the rifle occurred from 1945 to 1956 and totaled $10.9 million. Overall, 1.38 million rifles were delivered from 1960 to 1965 by four manufacturers at an average cost of $105.15 each. The production learning (experience) curve had a slope of 92 percent. The annual operating costs per year per rifle for maintenance (includes repair parts, direct and general support facilities, and labor) are about $50.52 per year.

LIST OF FIGURES AND TABLES

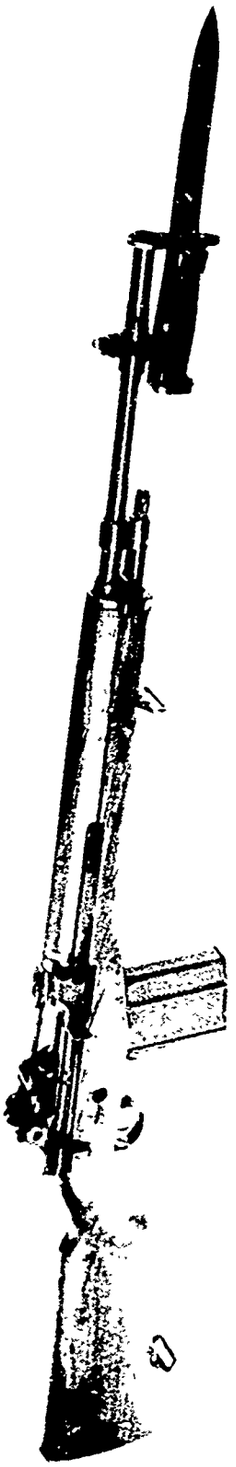
9

I. INTRODUCTION

This report presents the actual and estimated costs associated with the life cycle costs of the M14 rifle. Estimates and actual costs of development are rather limited due to a lack of data, but investment and operating costs are covered in detail.

The M14 rifle (Figure 1) is a lightweight, air-cooled, gas-operated, magazine fed, shoulder weapon designed primarily for semiautomatic or full-automatic fire.

The development of the M-14 rifle occurred because of a review of the program for the development of rifles in the years following World War II which revealed three definite trends. The first reflected a decision to provide the infantryman with a rifle of reduced weight but as accurate and as effective as standard weapons. The second was the development of an acceptable rifle with selective automatic and semiautomatic fire. The last was the simplification of logistical and training problems by developing a rifle to replace the four radically different designs of the M1 rifle, M2 carbine, M3A1 submachine gun, and the Browning Automatic Rifle (BAR). The adoption in June 1957 of the M14 rifle and later modifications of this rifle for the BAR role marked the achievement of all of these goals.



13

II. SYSTEM DESCRIPTION

The 7.62mm rifle M14 is a lightweight, air-cooled, gas-operated, magazine fed, shoulder weapon designed primarily for semi-automatic or full-automatic fire. The rifle is designed to accommodate the rifle bipod M2, the bayonet knife M6, the grenade launcher M76 and grenade launcher sight M15, and the winter trigger kit. Table 1 illustrates the principal characteristics of the M14 rifle.

Table 1

M14 Rifle Principal Characteristics

Model	M14
Weight	
With equipment and empty magazine	9.1 lbs.
Ready to fire-fully loaded with sling	11 lbs
Length with flash suppressor	44.3 in.
Barrel	
Weight	1.75 lbs.
Length	22 in.
Rifling	
Length	19.7 in.
Number of grooves	4
Depth of grocve	0.004 in.
Twist	one turn in 12 in.
Bipod	
Model	M2
Weight	1.75 lbs.
Sling	
Webbing, Model	M1
Weight	0.27 lbs
Leather, Model	M1907
Weight	0.5 lbs.
Method of Actuation	gas-operaced
Method of cooling	air-cooled
Sight radius at 100 yds	26.75 in.
Muzzle velocity	2,800 fps.
Muzzle energy	2,600 ft.-lb.
Chamber pressure (Maximum)	50,000 psi.
Cyclic rate	750 rds/min.
Maximum range	3,500 yards
Maximum effective range	500 yards
Trigger pull	
Maximum	7.5 lbs.
Minimum	6.5 lbs.
Magazine capacity	20 rds.
Flash suppressor	integral with rifle
Sights	
Rear	iron aperture
Front	post
Ammunition used	
7.62MM AP Cartridge	M61
7.62MM Ball Cartridge	M59
7.62MM Tracer Cartridge	M62
7.62MM Blank	M82
7.62 Ball National Match	M118

15

III. SYSTEM HISTORY

Many World War II combat reports received by the Army Ground Forces stressed the need for efficient automatic small arms weapons of light weight. The caliber .30 Browning Automatic Rifle (BAR), a comparatively heavy weapon, had proven itself to be both efficient and effective. The BAR, which was usually carried as a squad or section weapon, was gas-operated, air-cooled, and had a magazine capacity of 20 rounds. Its rate of fire was approximately 300 to 350 rounds per minute at a slow rate; its fast rate was 500 to 600 rounds per minute. It was originally designed as a shoulder-operated weapon; however, many modifications increased its length and weight. In a similar manner, the standard shoulder arm, the caliber .30 M1 rifle, had also proven itself superior to any of the semiautomatic weapons used by either our allies or enemies. The M1 rifle, however, weighed 9 3/4 pounds and was limited in magazine capacity to eight rounds.

In the light of the above considerations, the Army Ground Forces stated in September 1944 that a requirement existed for a weapon that would be comparable in size, weight, and efficiency to the M1 rifle and capable of both automatic and semiautomatic fire. To meet this requirement, the Ordnance Department initiated, in October 1944, a project to modify the M1 rifle. The new rifle was to be equipped with a detachable bipod and, when fired from the

bipod, was to be as effective as the standard BAR. The proposed weapon was also to include a 20 round magazine.

While development work to this end was being carried out at Springfield Armory during 1944 and the first seven months of 1945, a light weight rifle development program was initiated at Office, Chief of Army Ordnance in March 1945. Ordnance Committee Minutes 29132, 20 September 1945, officially launched the study for a rifle weighing less than the caliber .30, M1 rifle. The requirement for a lightweight rifle weighing seven pounds was stated in May 1946. The War Department Equipment Board further recommended that the new rifle replace not only the M1, but also the Carbine and M3A1 submachine gun. With a heavy barrel, the new rifle would also replace the M1918A2 BAR.

Development of a shorter round of ammunition was also initiated by the Ordnance Corps in 1945. All new rifle development was, therefore, based upon this new cartridge, the T65, one-half inch shorter than the caliber .30 1906 and M2 cartridges.

As a result of the 1944 requirement to modify the M1 rifle, the Springfield Armory was instructed to change the original specifications on a weapon under development called the T20 rifle. The rest of this section briefly traces the rifle development program from the T20 rifle until the standardization of the M14 rifle in 1957.

Rifle, Caliber .30, T20 - Early in 1944, Springfield Armory

17 initiated the development of the first model of the T20 rifle, incorporating full and semiautomatic fire. Full automatic fire was accomplished by an independent sear release. The model was capable of automatic fire from an open bolt and semiautomatic fire from a closed bolt position. The open bolt feature did not adequately solve cook-off problems. The basic principle of operation was considered satisfactory. Development of the T20 model terminated in January 1945 with recommendations that minor design changes and strengthening of various components be made. A rifle incorporating these minor design changes was designated T20E1.

Rifle, Caliber .30, T20E2 - In early 1945, the T20E2 rifle was developed from its predecessors, the T20 and T20E1 rifles. This rifle could be fired either on a full or semiautomatic basis. Full automatic fire was achieved by a connector assembly which was actuated by the operating rod handle. This, in turn, actuated a sear release or trip which, with the trigger held to the rear, disengaged the sear from the hammer lugs immediately after the bolt was locked. This model included a recoil check on the muzzle. The bolt was modified to ease feeding and extraction. The receiver was slightly longer than that of the M1 rifle. This allowed the bolt to travel further to the rear and improve feeding. This model also had a gas port located approximately 1 1/2 inches from the muzzle. The T20E2 rifle was designated Limited Procurement Type in May 1945. The project was terminated in March 1948.

Rifle, Caliber .30, T22 - The T22 rifle development was begun in early 1944 by the Remington Arms Company. In this design effort, full automatic fire was accomplished in the open bolt position and semiautomatic fire from a closed bolt position. The open bolt feature did not effectively prevent cook-off. The T22 project to modify the M1 rifle was terminated in March 1948.

Rifle, Caliber .30, T22E2 - The T22E2 rifle was developed from its predecessors, The T22 and T22E1 rifles, by Remington Arms Company. Full automatic fire was accomplished in the open bolt position; semiautomatic fire was accomplished from a closed bolt position. This model incorporated a slight change in the trigger group to simplify manufacture as well as an improved magazine catch. The major advantage of the T22E2 was in its adaptability to re-manufacture of M1 rifles as a peacetime operation. This project was cerminated in March 1948.

Rifle, Caliber .30, T23 - This rifle was a modification of the M1 rifle to provide full and semiautomatic fire. Automatic fire was to be provided by an independent hammer release. The T23 model was advantageous from the standpoint of design, durability, and minimization of functional stresses. Because of mechanism timing, this model fired fully automatic from an open bolt approximately 20 percent of the time. Tests of this weapon indicated the desirability of firing from the closed bolt position. The tests

19

also indicated that a new magazine should be designed rather than attempt to modify the BAR magazine. A device designed to increase gun stability during automatic fire was definitely needed. The project was terminated in March 1948.

Rifle, Caliber .30, T24 - The T24 rifle was also a modification of the M1 rifle to provide full and semiautomatic fire. Automatic fire was provided by an independent sear release. This project was initiated simultaneously with the T23 rifle development in October 1944. This model fired full automatic from a closed bolt position at all times. This project was also ended in March 1948.

Rifle, Caliber .30, Lightweight, T25 - The T25 rifle was the first of the new lightweight rifles to fire the improved T65 type ammunition. This project was initiated in September 1945. This model was designed for selective semiautomatic or full automatic fire. Full automatic fire was performed in the open bolt position. The front sight mount and the bayonet lug were integral with the flash suppressor as a separate unit from the gas system components. The gas cut-off system and front-end design were eventually incorporated into the T44 rifle. The project was suspended in November 1951.

Rifle, Caliber .30, T27 - The T27 rifle project, initiated in April 1946, modified the M1 rifle to fire the new improved .30 caliber ammunition (7.62mm NATO). The rifle was capable of selective full and semiautomatic fire. This project was terminated in March 1948.

Rifle, Caliber .30, Lightweight, T28 - This program initiated in October 1946 was to design a lightweight, selective full and semi-automatic weapon to replace the M1 rifle, M2 carbine, M3A1 sub-machine gun, and the BAR. This rifle, with an in-line stock, was designed to explore the feasibility of low-cost fabrication techniques. Complex stampings and simplified forgings were used extensively in this design. This mechanism had insufficient structural regidity for satisfactory function and durability. The breech mechanism was an adaptation of an experimental Mauser design. The trigger mechanism was also of German origin. Development of this rifle was suspended in late 1950.

Rifle, Caliber .30, Lightweight, T31 - The T31 rifle development program was begun in March 1947. This weapon was a lightweight, selective full and semiautomatic rifle with an in-line stock. It was also intended to replace the M1 rifle, M2 carbine, M3A1 sub-machine gun, and BAR. This model was a novel approach to infantry rifle design and had unusually low stripping forces and energies. The magazine design was later incorporated into the T44 rifle. Attempts were made to reduce recoil and eliminate flash and muzzle blast. These attempts were unsuccessful and the development program was suspended in late 1950.

Rifle, Caliber .30, Lightweight, T33 - This rifle development

program was initiated in March 1949. This rifle was developed on the initiative of a private inventor with guidance from the Office, Chief of Ordnance. The project was suspended in late 1950 because the weapon lacked sufficient ruggedness and durability.

Rifle, Caliber .30, Lightweight, T35 - The T35 rifle development program was initiated in June 1944. This rifle was a modification of the M1 rifle designed to fire the new and improved caliber .30 (7.62mm) NATO ammunition. This semiautomatic weapon incorporated a drop wood stock, iron aperture rear sight, and post front sight. This particular development was suspended in the latter part of 1950.

Rifle, Caliber .30, Lightweight, T36 - A lightweight rifle modified from the T20E2 rifle was officially designated the T36 rifle in November 1949. This weapon was designed to fire the 7.62mm NATO ammunition. The T36 rifle could be used in both full and semiautomatic fire from a closed bolt position. It had a drop wood stock, iron aperture rear sight, and post front sight. A modified T25 rifle magazine design was incorporated into this model. This magazine functioned very satisfactorily. Further modification included a one-piece hand guard and a special butt plate. The T36 rifle development was terminated in the latter part of 1950.

Rifle, Caliber .30, Lightweight, T37 - The T37 rifle was a lightweight rifle modified from the T20E2 and incorporated features from the T36 rifle. This rifle fired NATO ammunition in both the

full and semi-automatic roles. The important modifications included a lightweight 22-inch barrel with the gas port approximately four inches from the muzzle and a lightweight wooden stock. The design included the T20E2 receiver but with filler blocks fore and aft of the magazine. Further revisions incorporated a lightweight stabilizer/flash suppressor and a bolt buffer. Following tests, recommendations were made for further development of a lightweight rifle that would be manufactured with existing production tools.

Rifle, Caliber .30, T44 - The T44 rifle, an eclectic model, evolved from a modified T37 rifle with a gas expansion-cutoff system. This weapon included the front end components of the T25 rifle, the breech system and magazine catch mechanism of the T20E2 rifle, and the magazine of the T31 rifle. This rifle, with a lightweight barrel (1.8 pounds), was developed to replace the M1 rifle, M2 carbine, and the M3A1 submachine gun. It was capable of selective full or semiautomatic fire. It had a prong type flash suppressor together with an automatic pressure relief valve for grenade launching. The bolt action was similar to that of the M1 rifle. Full consideration was given to utilization of tooling used in the manufacture of the M1 rifle.

Rifle, Caliber .30, T44E1 - In October 1951, a heavy barrel (3.5 pounds) version of the T44 rifle was fabricated and designated as the T44E1 rifle. This rifle was designed to replace the BAR. It featured a rate reducer that could provide dual rates of automatic fire. The heavy barrel feature was designed to reduce weapon

jump and to withstand the greater heat and increased erosion that would result from automatic fire. This weapon also had a hinged butt, two position biped, and a new flash suppressor unit.

Rifle, Caliber .30, T44E2 - Modifications to the lightweight barrel version of the T44 rifle led to a weapon which was designated as the T44E2 rifle. It utilized a short receiver and a gas impingement system. Front magazine latching and a centrally activated bolt catch were incorporated. A new operating rod with a modified cross rail section, a new bolt, trigger housing, trigger guard, and a grenade launcher with reduced gas volume were also included in this design.

Rifle, Caliber .30, T47 - In October 1951, a successor to the T25 model was designated T47. This model had a lightweight barrel and fired both full and semiautomatic from the closed bolt position. The bolt of the T47 rifle was locked and unlocked by the tilting action of the breech lock. This was the chief feature that distinguished it from the T44 rifle. The T44 was considered superior and T47 development program was terminated.

Rifle, Caliber, .30, Lightweight, T48 - The Belgian FN rifle was designated the T48 by the Ordnance Corps in October 1951. The rifle was converted to fire the NATO ammunition and was ready for user tests late in 1952. The T48 was a lightweight, gas-operated, air-cooled rifle that could be fired both automatic and semiautomatic. It competed against the T47 and T44 rifles during user tests as a possible successor to the M1 rifle. The outstanding feature of this weapon was its ease and speed of field stripping attributed to a

hinged receiver resembling that of a conventional break-open shotgun. 24
Its weight was substantially the same as the M1 rifle. In April 1953, tests of the T47 rifle were discontinued. Only the T44 series remained in competition with the T48 FN rifle. The T44E4 was selected as the better rifle in June 1957, terminating further evaluation of the T48.

Rifle, Automatic, 7.62mm, M15 (T44E5) - In October 1954, a new heavy barrel rifle was designated T44E5. It was developed to eliminate the modified components used in the T44E1 model. Since this weapon had the identical operating mechanism as the T44E4, it was type classified standard, replacing the BAR, as the M15, 7.62mm automatic rifle in June 1957. The M15 rifle was declared obsolete in December 1959, following successful firing tests of the M14 rifle with the M2 bipod and a slotted plastic upper hand guard.

Rifle, 7.62mm, M14 (T44E4) - In October 1954, a new rifle with a lightweight barrel was designated as the T44E4 rifle. It was developed to eliminate the modified components used in the T44 model. In order to fire the NATO ammunition, the bolt, firing pin, connector, stock, and receiver of the rifle were designed with shortened dimensions. An improved bolt catch and magazine were also designed. The automatic pressure valve used in grenade launching was replaced with a manually operated valve. The rifle could be converted to either automatic or semiautomatic fire by removal of the selector lock and installation of a selector. The rifle was also equipped with a prong

25

type flash suppressor. In June 1957, the T44E4 was classified standard as the M14, 7.62mm rifle, replacing the M1 rifle, M2 carbine, and M3A1 submachinegun.

27

IV. DEVELOPMENT COSTS AND ANALYSIS

Development of the M14 Rifle was accomplished primarily at Springfield Armory. Because of the closing of Springfield Armory and the amount of time expired since the weapon was developed, the available RDT&E costs cannot be further subdivided into the desired categories of engineering, tooling and test equipment, prototype production, systems test and evaluation, and data handling and documentation.

The M14 Rifle RDT&E costs in this report (Table 2) were compiled from Springfield Armory records by the Ordnance Weapons Command in January 1959 and are the latest known available data.

Table 2

M14 Rifle RDTE Funding

Period	Scope of Work	Funding*
FY 1946-1950	Design, development, prototype fabrication and testing of T25, T28, T31, T33, and T47	$ 300.000
	Fabricate 100 T25 for User Test	1,200.000
	Development and Procurement of Ammunition	1.138.200
		$2,638,200

Table 2 continued on Page 15.

28

FY 1951 1956	Design development prototype fabrication and testing of T44. Procurement and testing of T48.	$1 550 000
	Limited Product and Production Engineering on T44 and T48	175 337
	Pilot Production of 500 T44 (Springfield)	1 109.539
	Pilot Production of 500 T48 (H&R)	2.220 589
	Development and Procurement of Ammunition	3.233.858
		$8.289.323
TOTAL		$10.927.523

Summary

Hardware and Engineering:	
T44 et ante having residual value for M14	$ 3,920.465
T48 work having no residual value for M14	2.635 000
Ammunition	4.372 058
	$10 927 523

*All dollars are unadjusted for inflation.

29

V. INVESTMENT COST & ANALYSIS

There were three commercial producers - Olin Mathieson, Harrington and Richardson (H&R), TRW, Inc. and one government facility, Springfield Armory, engaged in the manufacture of the M14 rifle. Production began with the FY 58 procurement at Springfield Armory and concluded with the final scheduled delivery in July 1964.

Tables 3 and 4 show the yearly procurement and delivery schedules.

Table 3

M14 Rifle Yearly Procurement Schedules

FY	Producer	Quantity
58	Springfield Armory	15,600
59	Olin Mathieson	35,000
59	H&R	35,000
60	Springfield Armory	32,000
60	Olin Mathieson	81,500
60	H&R	70,000
61	Springfield Armory	70,500
61	H&R	133,000
61	TRW	100,000
62	Springfield Armory	49,000
62	Olin Mathieson	90,000
62	H&R	224,500
63	Olin Mathieson	150,001
63	H&R	75,000
63	TRW	219,163
	TOTAL PROCUREMENT	1,380,264

Table 4

M14 Rifle Yearly Contract/Work Directive Delivery Schedules

FY	Producer	Quantity
60	Springfield Armory	8,725
60	H&R	600
61	Springfield Armory	43,975
61	H&R	96,500
61	Olin Mathieson	5,890
62	Springfield Armory	59,051
62	H&R	232,300
62	Olin Mathieson	81,390
63	Springfield Armory	45,949
63	H&R	208,100
63	Olin Mathieson	140,220
63	TRW	100,000
64	Springfield Armory	9,400
64	Olin Mathieson	129,001
64	TRW	210,000
65	TRW	9,163
TOTAL		1,380,264

Investment Costs - Non-Recurring

Table 5 gives the actual costs through 1968 with $4,000 required to complete the cost of laying away 21 production machines at TRW. Twenty of the machines will be laid away by the end of FY 70 with the remaining machine February 1973.

31

Table 5

M14 Rifle Investment - Non-recurring Costs

	Cost thru FY 68 (Thousands of Dollars)	Cost to Complete (Estimated)
Production Base Support	$16,728	4
Advance Production Engineering	694	-
Tooling and Test Equipment	12,077	-
Other	22	-

The above figures do not include the following Industrial Production Equipment (IPE) located at each of the commercial contractors. An estimate of the IPE at Springfield Armory is not available.

Contractor	Est. Acq. Cost
Olin Mathieson	$5,911,620
H&R	5,129,674
TRW	299,383

The difference in IPE between TRW and the other contractors can best be explained by the following table:

	Olin	H&R	TRW
IPE	5,911,250	5,129,674	299,383
Acquisition of new machines	1,682,210	1,201,052	6,525,176
TOTAL	7,593,460	6,330,726	6,824,559

The other costs only includes new equipment training. Cost of the initial inventory management effort peculiar to major and minor items of supply, the development and analysis of requirements and supply status data, the preparation of materiel planning studies

and supply control studies, and the determination of the necessity for and the initiation of directive of authorizing action for cataloging, procurement, rebuild, distribution, and disposal are not available at this time. 32

Investment Costs - Recurring

Springfield Armory was the first to produce the M14 rifle in quantity. In Fiscal Year 1958, they produced 15,600 rifles at an average unit cost of about $178. Further procurements from Springfield Armory indicated that learning (experience) was occurring at a 92% rate and the average unit price was decreasing with each new procurement (Table 6).

In Fiscal Year 1959, contracts were let after bids from twelve firms were received. The prices ranged from $68.75 to $157.10 per unit. Two contractors were selected, Olin Mathieson with a bid price of $68.75 per unit and Harrington & Richardson (H&R) with a bid price of $81.03 per unit. Both bids were for 35,000 units.

On the second procurement (70,000 units) of M14 rifles, the average unit price increased for both contractors.

In the case of Olin Mathieson, the price increased $22.25 per unit. An analysis of the increase revealed that $9.19 was due to engineering change orders (ECO's), $2.91 for delivery rate acceleration and the rest, $10.25, due to increase in the burden rate (overhead).

33

Table 6

M14 Rifle Learning Curve Analysis

LEARNING CURVE WORKSHEET

PREPARED BY: AMSWE-CPD

DATE PREPARED: 6 September 1968

CONTRACTOR: Springfield Armory

CONTRACT NO. AND DATE OF CONTRACT (IF MORE THAN ONE CONTRACT, RELATIVITY CONTRACT NUMBERS AND REC. DATES WITH LOT NUMBERS LISTED IN REMARKS): Work Directive Serial Numbers Not Available

WEAPON SYSTEM: M14 Rifle

SEGMENT:

LINE NO	LOT SIZE a	CUMULATIVE UNITS[1] b	UNADJ UNIT COST c	Y, UNIT D.M.H.[2] OR ADJ COST d	APPROX MIDPOINT e	X, CALCULATED MIDPOINT[3] f	LOG X g	LOG Y h
1	FY 58 15,600	15,600	177.69	207.81		5,373	3.73020915	2.31766644
2	FY 60 32,000	47,600	152.24	173.21		26,018	4.47738574	2.23857290
3	FY 62 76,507	116,107	140.22	163.64		79,949	4.90281103	2.21229417
4	FY 62 49,000	167,107	123.21	136.22		141,708	5.15139350	2.13424008
5								
6								
7								
8								
9								
10								

N (number of lots)	4	$B = \frac{N\Sigma(\text{Log X Log Y}) - \Sigma\text{Log X}\ \Sigma\text{Log Y}}{N\Sigma(\text{Log X})^2 - (\Sigma\text{Log X})^2}$	-.11703859
Σ Log X	18.2079942		
Σ Log Y	8.90277445	$A = \text{antilog}\left(\frac{\Sigma\text{Log Y} - B\Sigma\text{Log X}}{N}\right)$ = antilog 2.70002740	575.48
Σ (Log X Log Y)	40.50911000		
Σ (Log X)²	84.53585435	B% = antilog (0.301030B + 2) = antilog 1.99470787	92.2

1 Production breaks and duration should be noted under REMARKS e.g., labor strike 14-23 Nov 66
2 If Y is cost, give dates of follow-on contracts under REMARKS and adjust all costs to same year
3 Specify under REMARKS common curve percent used to calculate lot midpoints.

On the third procurement, the per unit cost increased by $27.82. This increase was due to another increase in burden rate and with the subcontractors increasing their various prices and costs for subcomponents. No dollar figures are available for each increase but the total increase was $27.82. Figure 2 illustrates graphically how each procurement price increased for Olin Mathieson.

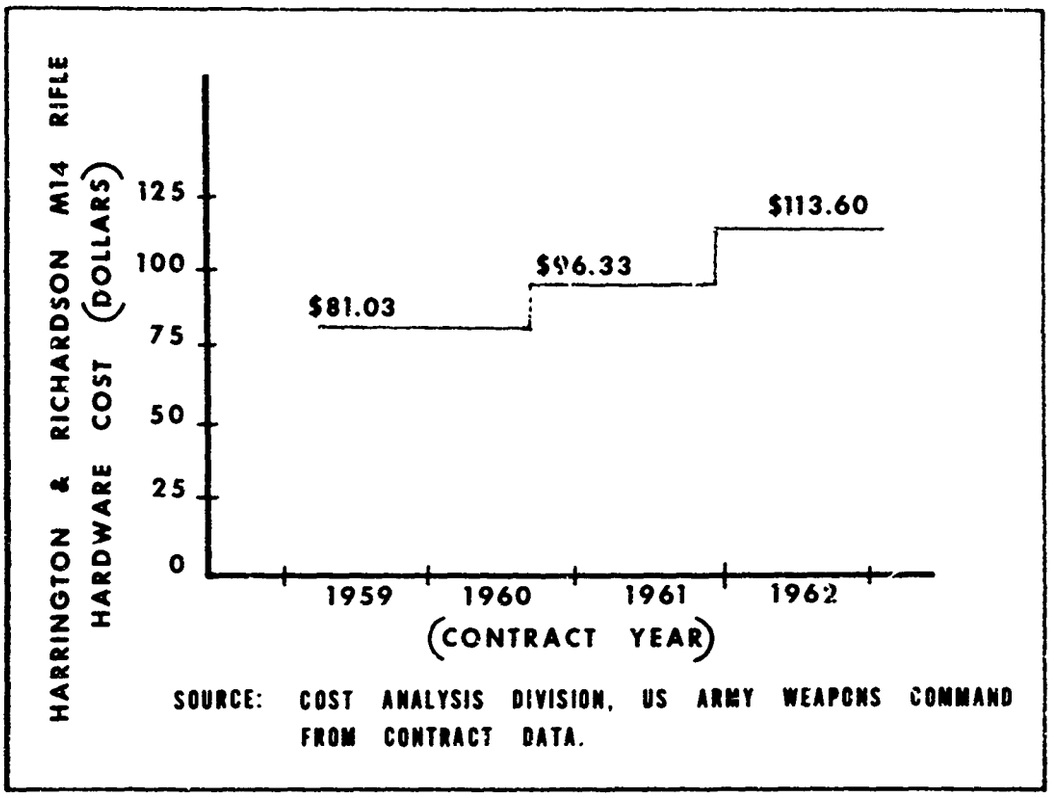


Figure 2

M14 Rifle Harrington & Richardson Hardware Cost by Year

In the case of H&R, on the procurement, the average unit cost increased from $81.02 to $96.33 or $15.30. An analysis of this increase determined that $9.19 was due to ECO's and $6.11 was due to increasing the burden rate from 159% to 200%.

The third procurement also resulted in a price increase from $96.33 to $113.60 or $17.27 per unit. The increase was attributed to the subcontractors increasing their prices by

$9.00 a unit, the burden rate increasing by $6.59 per unit, and the profit rate increasing by $1.70 per unit. Figure 3 illustrates graphically the price increases for H&R.

In FY 62, TRW was a third producer of the M14 rifle and did not experience any price increases when given a second or subsequent procurement.

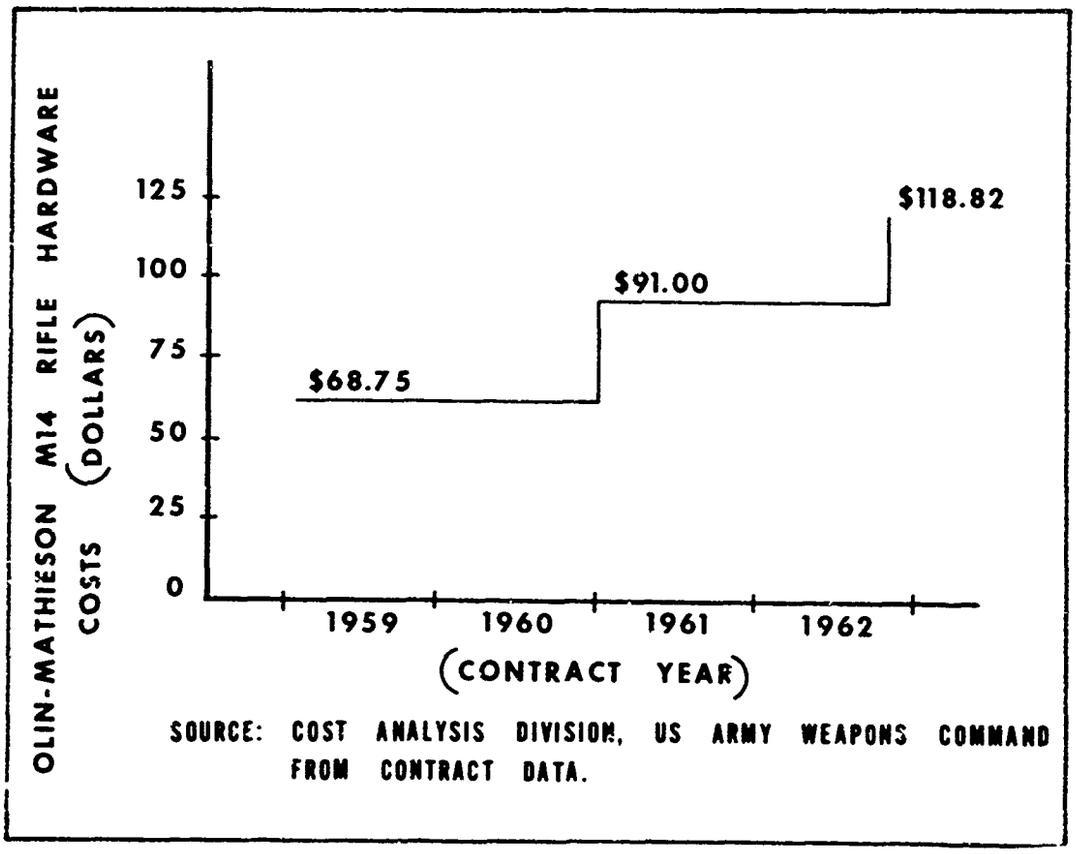


Figure 3

M14 Rifle Olin Mathieson Hardware Cost by Year

The current Basic Issue Line Item (BILI) per weapon is shown below. Total costs for BILI are given in Table 7.

Table 7

M14 Rifle Basic Issue Line Item

Magazine assembly (1 mag w/rifle, 4 mag w/BILI	5
Brush, Bore	1
Brush, Chamber	1
Case, Cleaning Rod	1
Case, Lubricant	1
Combination tool	1
Section, Cleaning rod	4
Swab Holder	1
Sling, Ml	1

Bayonets, scabbards, and bipods comprise the ancillary equipment.

The cost of tools and test equipment replaced or modified after the start of quantity production, the initial reproduction of publications and technical data required to introduce the weapon system into inventory, and the materiels and actions necessary to maintain productive facilities in condition to produce during the production cycle are not available.

An overall analysis of the two contractors, H&R and Olin Mathieson, seems to be that, they bid low on the first contract and then subsequently increased their unit prices to about where the Springfield Armory unit price would have been had the Armory's 92% learning curve been used. All subsequent contracts have declined relative to a unit price according to that projected learning curve of 92%.

37

VI. OPERATING COSTS AND ANALYSIS

The costs of POL consumption, lubricating oil, and bore cleaner, under peacetime conditions, are considered to be negligible. The costs of training, central supply activities, annual service practice, operating forces, medical services, Army-Wide activities, and family housing activities are not available.

Table 8 is a list of operating costs factors and estimated annual unit costs.

Table 8

M14 Rifle Operating Costs and Factors

Operating Costs	Reference	Estimated Annual Unit Cost
A. Repair Parts	Weapon Command	$ 5.95
B. POL consumption		
C. Ammo consumption	Munitions Command	74.36
D. Crew	Weapons Command	4,509.00
E. DS maintenance	Weapons Command	5.32
F. GS maintenance	Weapons Command	3.82
G. Other direct operating cost		
Training		
Central Supply Activities		
Depot Maintenance		
A. Labor	Weapons	$ 15.73
B. Materiel	Command	19.70
Other		

Continued on page 25.

Operating Factors

A.	Estimated useful life of each unit	Unknown	
B.	Average Rounds (or flying hours, etc.) per year	610 Ball 50 Tracer 150 Blank	The Army Small Arms Weapons System (SAWS) Procurement & Cost Data Study (U) Secret November 1965
C.	Meantime to overhaul (MTTO)	1.5 hours	Weapons Command
D.	Time between overhaul (TBO)	5 years	Weapons Command
E.	Meantime between failure (MBTF)	270 days	Weapons Command
F.	Meantime to repair (MTTR)	.6 hour	Weapons Command

Publication and data costs are not sensitive to quantity changes. It is estimated that $4,800 will be expended in FY 69 and $10,200 in FY 70 for M14 publication changes.

37

VII. SUMMARY

The total RDTE Cost was 10.928 million and investment cost of M14 rifle was 177.496 million. Total system cost of RDTE and PEMA (Investment) was 217.945 million.

During the past few years, the Army has been building up its troop strength to meet the nations demands, consequently, in the Operating and Maintenance Cost, ammunition consumption for training has increased during the past three years significantly and will continue to do so in the foreseeable future.

Table 9 shows the total actual costs by fiscal year.

Table 9

M14 Rifle RDTE, Investment, and Operating Cost by Year

DESCRIPTION OF WORK	FY 57 & Prior	FY 58	FY 59	FY 60	FY 61	FY 62	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
RDTE TOTAL	10,928											
INVESTMENT-NON-RECURRING												
Production Base Supply		289	4,959	3,801	6,621	451	68	539				
Advance Production Eng'g		172	55		92	180	25	50	60	60		
Tooling & Test Equip.		2,470	2,308	2,230	3,831	1,238						
Other	10	12										
TOTAL	10	2,943	7,322	6,031	10,544	1,869	93	589	60	60		
INVESTMENT-RECURRING												
Prime Mission Product												
A. M14 Rifle		2,772	6,754	22,283	31,683	39,915	41,195					
B. BILI		417	632	1,348	2,311	2,508	2,816					
C. Ancillary Equip.				1,469	1,658	2,018	347					
D. Engineering		571	60	2,185	2,038	1,303	526					
E. Selected Repair Parts		1,436	1,965	4,968	1,934							
F. First Dest. Trans.				3	41	104	137	97	2			
TOTAL		5,196	9,411	32,256	39,665	45,848	45,021	97	2			
OMA												
Repair Parts					466	1,575	2,940	3,894	4,352	4,666	9,663	7,179
POL Consumption					23	13,861	12,855	36,873	26,132	31,279	45,456	47,233
Ammo Consumption 1/					417	1,408	2,628	3,481	3,890	4,171	472	4,431
DS Maintenance					300	1,013	1,890	2,503	2,798	3,000	3,216	3,186
GS Maintenance										533	390	1,079
Depot Maintenance										723	243	1,069
A. Labor												
B. Materiel												
Other 2/												
TOTAL					1,206	17,857	20,313	46,751	37,172	44,372	63,440	64,179

1/ Includes Ball, Blank, Tracer and some match used in training.
2/ Publication cost only.
3/ Cost to layaway production machinery; $2,000 in FY 69, $1,00 in FY 70, $1,000 in FY 73.

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13. ABSTRACT

This report summarizes (1) the system history and (2) the development, investment, and operating costs of the 7.62mm M14 rifle. Development of the rifle occurred from 1945 to 1956 and totaled $10.9 million. Overall, 1.38 million rifles were delivered from 1960 to 1965 by four manufacturers at an average cost of $105.15 each. The production learning (experience) curve had a slope of 92 percent. The annual operating costs per year per rifle for maintenance (includes repair parts, direct and general support facilities, and labor) are about $50.52 per year.

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14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
M14 Rifle						
Characteristics						
Cost tracks						
Development costs						
Investment costs						
Operating costs						