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TECHNICAL REPORT

By

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February 1969

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FOREWORD

This work was performed under DA Project No. 1C024401A109 and AMS Code 5025.11.803 under the project title, "Corrosion Preventives and Specialty Compounds." The subtask title was "Weapons Lubricant Evaluation."

ABSTRACT

An Engineer Design Test of small arms lubricants was conducted at the U. S. Army Arctic Test Center utilizing MIL-L-14107(LAW), MIL-L-46000(LSA), MIL-L-46010(S/F) and Experimental Lubricants A and B. The weapons utilized were M14 and XM16E1 rifles and M60 and M73 machine guns. The purpose of the test was to determine the suitability of the lubricants under winter (-10 to -59°F) and spring "break up" (32° to 44°F) conditions as compared to the currently authorized lubricant LAW. Data were obtained concerning the number of malfunctions and evidence of rust, carbon and wear for each lubricant, and the ease of lubricant application. It was concluded that Experimental Lubricants A and B were best suited for use on all the small arms weapons. Indications were made as to the lubricants best suited for each specific weapon. Lubricants A and B proved to be superior overall to the currently authorized lubricant LAW. Lack of lubrication on certain parts of the weapons and incomplete cleaning between tests prevented this from being a true lubricant test. It was recommended that Lubricants A and B be returned to the Arctic for an Engineer Design Test to determine their suitability as compared to LSA. It was further recommended that work initiated to develop an aerosol container for Arctic use be continued. Finally, it was recommended that S/F be considered unsuitable for use on small arms under both Arctic winter and spring "break up" conditions.

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PROBLEM

To evaluate comparatively various small arms weapons lubricants for Arctic use on a variety of small arms weapons to determine:

(a) lubricant best suited for a specific weapon

(b) lubricant best suited for all the weapons tested

(c) whether any of the lubricants tested were superior to the currently authorized lubricants for small arms, MIL-L-14107(LAW).

BACKGROUND

The adequacy of MIL-L-14107(LAW) as the authorized lubricant was challenged as the result of memoranda which indicated that this product was contributing to malfunctions. The U. S. Army Weapons Command Science & Technology Laboratory acquired a sample of the product used and found it to be one previously disqualified so that the criticism was not valid. The questionable report proved that evaluation of lubricants should be performed by qualified personnel knowledgeable as to the physical and chemical properties of lubricants and how these are related to weapon performance.

A program was prepared to compare suitable Arctic lubricants with the authorized MIL-L-14107 on four small arms weapons under Arctic conditions. The observers were to acquire malfunctions data plus other information pertinent to preservative weapons lubricants (e.g., wear, seizure, corrosion, carbon, ease of application, residue buildup or other deleterious effects).

Basically the program was designed:

(a) To determine which lubricants were best suited for a specific weapon in case a particular weapon had design characteristics which could not tolerate a lubricant suitable on the other weapons.

(b) To determine the lubricant which could be satisfactorily used on all the weapons since this could provide a logistical advantage.

(c) To determine whether MIL-L-14107 was truly inadequate so as to need a replacement and justify the expense of a logistical change.

APPROACH

A. Materials Used

Table I lists comparison tests for the lubricants employed. The lubricants are briefly described as follows:

Lubricant MIL-L-14107B(LAW) is a fluid and is the authorized Arctic preservative lubricant for small arms weapons under cold weather conditions (0° to -65°F). The lubricating oil shall consist of tetra-alkyl silicates into which additive materials have been incorporated to inhibit rust and oxidation.

Lubricant MIL-L-46000A(LSA) is a semifluid compound and is the authorized preservative lubricant on automatic weapons such as the M16 rifle in Southeast Asia. This is a synthetic diester lubricant which provides resistance to corrosion and oxidation.

Lubricant MIL-L-46010(S/F) is a dry film preservative lubricant consisting of a resin-bonded heat-cured formulation, which was designed to provide a smooth dry surface. This surface would minimize carbon, residue or dirt buildup. It is a factory applied lubricant.

Experimental Lubricant A is a fluid synthetic diester lubricating oil for small arms developed by Frankford Arsenal. It is similar to MIL-L-46000A except that the base fluid was changed for one having a lower viscosity at low temperature and the thickener was omitted.

Experimental Lubricant B is a semifluid synthetic lubricating oil for small arms developed by Frankford Arsenal. The base fluid was the same as that used in Lubricant A. Otherwise, the thickener and additives were the same as used in MIL-L-46000A.

B. Weapons Used

Forty small arms weapons were used in the Arctic test, ten each M14 rifle, XM16E1 rifle, M60 machine gun and M73 machine gun.

The M14 is a 7.62mm, NATO cartridge 20-round magazine fed, air-cooled, gas operated, shoulder type rifle designed for selective semiautomatic - automatic fire. The normal rate of fire for this weapon is 650 to 780 rounds per minute.

TABLE I

COMPARATIVE TESTS OF LUBRICANTS EMPLOYED

Test	MIL-L-14107 (LAW)	Experimental Lubricant A	Experimental Lubricant B	MIL-L-46000 (LSA)	MIL-L-46010 (S/F)
Viscosity @ 100°F, cs	6.33	5.23	---	---	---
Viscosity @ -65°F, cs	839	1,205	---	---	---
Flash Point, °F	355	30[illegible]	---	---	---
Pour Point, °F	Below -90	Below -80	---	---	---
Evaporation Loss, %	0.9	8.5	13.5	2.7	---
Oxidation Stability	OK	OK	OK	OK	---
Hydrolytic Stability	OK	---	---	---	---
Humidity Cabinet Protection	OK at 400 hours	Fail at 264 hours	OK at 400 hours	OK at 400 hours	---
Salt Spray Protection	---	---	---	---	Min 100 hrs
Wear, mm scar 4-Ball - 40 kg, 167°F, 1200 rpm, 1 hr	1.11 mm	0.52 mm	0.44 mm	0.40 mm	Falex - 500 minutes at 1000 lb load
Load Carrying Capacity (lbs)	---	1,250	1,750	OK at 1,500	Min 2,000 lbs
Coefficient of Friction	0.12	---	---	0.06	0.03
Film Thickness, inches	---	---	---	---	0.0004
Consistency	---	---	368	376	---
Corrosiveness	---	---	OK	OK	---
Gun Performance	Satisfactory operation on the M24A1 machine gun at ambient temperature and -65°F	---	---	Satisfactory operation on the M61 machine gun at ambient temperature, -65°F and 260°F	---

The XM16E1 is a 5.56 mm lightweight 20-round magazine fed, gas operated, air cooled, shoulder or hip fired rifle. It is designed for either semi-automatic or full automatic fire through the use of a selector lever. The normal rate of fire is 650 to 850 rounds per minute.

The M60 is a 7.62 mm air cooled, link belt fed, and gas operated machine gun. It can be fired from the shoulder, hip and in sitting or prone positions. In the sitting or prone positions, the bipod or 7.62 mm machine gun tripod mount M122 may be used. The normal rate of fire is 500 to 650 rounds per minute.

The M73 is a 7.62 mm tank machine gun. It is a lightweight air-cooled weapon designed primarily as a coaxial gun for use on tanks. The weapon utilizes disintegrating metallic link belt fed ammunition for either right or left side feed. It has a short receiver, is recoil operated with a gas assist to boost recoil, is fired from the open bolt position, and is designed with a quick change barrel. The normal rate of fire is 500 to 625 rounds per minute.

The solid film lubricant application to ten of each of the four small arms weapons was accomplished at the U. S. Army Weapons Command Science & Technology Laboratory and then shipped to the Arctic Test Center. The weapons were completely disassembled to permit complete coverage of all component parts.

C. Ammunition

The test performed at this time was programmed prior to subsequent tests which proved that the type of ammunition used could contribute to malfunctions. The results as reported here are discussed with reference to this unforeseen variable.

The ammunition was obtained from the Ammunition Procurement and Supply Agency, Joliet, Illinois.

The M14 rifle employed a 7.62 mm cartridge M80 Ball (FSN 1305-A130).

The XM16E1 rifle emplcyed a 5.56 mm cartridge M193 (FSN 1305-A066).

The M60 machine gun employed a 7.62 mm cartridge (FSN 1305-A127)

The M73 machine gun employed a 7.62 mm cartridge (FSN 1305-A131)

Based on information provided by the Army Procurement and Supply Agency, Joliet, Illinois, the 5.56 mm ammunition used in the 1966-1967 Arctic program was IMR propellant.

D. Tests Conducted

Test No. 1

Semi-automatic Fire (M14 and XM16E1 Rifles)

Method

The weapons were disassembled and cleaned of all traces of lubricants and residue with Stoddard Solvent (P-D-680 "Dry Cleaning Solvent"). The parts were then dried by air hose using moisture free compressed air. Each weapon was lubricated with a patch wet with the designated lubricant. Each set of weapons was then fired semi-automatically (80 rounds in 2 minutes) on three separate occasions during the same day.

The above exercise was repeated at three different temperature ranges (-10°F to -25°F, -25°F to -45°F, and below -45°F). The above exercise was conducted twice, once using a light application and once using a heavy application of lubricant.

Test No. 2

Automatic Fire (M14 and XM16E1 Rifles and M60 and M73 Machine guns)

Objective

To determine the adequacy of test lubricants on weapons that are fired automatically in the hostile environment of the Arctic.

Method

The weapons were disassembled and cleaned of all traces of lubricants and residue with dry cleaning solvent.

The parts were air dried. Each weapon was lubricated by a patch with the designated lubricant. Each set of weapons was then fired 100 rounds per weapon in three to five round bursts, followed by 100 rounds fired in a continuous burst. This exercise was repeated two additional

times during the same day. The rate of fire was determined by use of a rate recorder or stop watch.

The above exercise was repeated at three different temperature ranges (-10°F to -25°F, -25°F to -45°F and below -45°F). The above exercise was conducted twice, once using a light application and once using a heavy application of lubricant.

Test No. 3

Several consecutive days firing without recleaning or relubricating.

Objective

To determine the adequacy of test lubricants during Arctic winter and spring "break up" conditions. The weapons were to be fired fully automatically on consecutive days without additional cleaning or lubrication.

Method

Several days of firing under Arctic winter conditions were conducted in accordance with the method described in paragraph (a) and (b) below. The spring "break up" firing was conducted in accordance with paragraph (c) below.

(a) Six consecutive days firing (semi-automatically and automatically)

(1) Each set of weapons for each test lubricant was cleaned and lightly lubricated with the appropriate test lubricant.

(2) Each set of rifles was fired 50 rounds semi-automatically and 50 rounds automatically for a total of 100 rounds per weapon. Each set of machine guns was fired 50 rounds in three to five round bursts and then a 50 round burst for a total of 100 rounds per weapon.

(3) After firing, the bolts were cleaned, the weapons placed on a bipod or tripod and then exposed to the elements for 7 hours.

(4) The above exercise was repeated one time each day for a total of 6 days or 1200 rounds per weapon.

(5) Weapons were not cleaned or relubricated during the 6 day exercises.

Test No. 4

(b) Three consecutive days firing (high rate fire)

(1) Each set of weapons for each test lubricant was cleaned and lubricated lightly with the appropriate test lubricant.

(2) Each set of rifles and machine guns was fired 200 rounds in three to five round bursts and a 200 round burst.

(3) After firing, the bolt was closed and the weapons were placed on a bipod or tripod and then exposed to the elements for 7 hours.

(4) The above exercise was repeated one time each day for a total of 3 days or 2400 rounds per weapon.

(5) The weapons were not cleaned or lubricated during the 3 day exercise.

Test No. 5

(c) Three consecutive days firing (spring "Break Up" automatic)

(1) Each set of weapons for each test lubricant was cleaned and lubricated lightly with the appropriate test lubricant.

(2) The above exercise was repeated each day for 3 consecutive days without cleaning or relubricating the weapon between firing tests. Each weapon was fired for a total of 600 rounds each as specified under (a) (2).

A code sheet identifying the abbreviations used during the test program is included in the Appendix.

RESULTS AND DISCUSSION

The detailed semi-automatic firing results are shown in the Appendix, Tables 1 through 6. The consolidated results for both the M14 and XM16E1 rifles are shown in Table II.

TABLE II

SEMI-AUTOMATIC FIRE MALFUNCTIONS
ATTRIBUTABLE TO LUBRICATION

Type Weapon	MIL-L-14107 (LAW)	MIL-L-46000 (LSA)	MIL-L-46010 (S/F)	Experimental Lubricant A	Experimental Lubricant B
M-14	3	1	12	0	1
XM16E1	9	8	3	5	5
Total	12	9	15	5	6

It is noted in Table II that Experimental Lubricants A and B provided the least number of total malfunctions. Concerning the individual weapons, Experimental Lubricants A and B and LSA had fewer malfunctions on the M14. The MIL-L-46010A(S/F) had the greatest number of malfunctions. For the XM16E1, S/F and Lubricants A and B were superior to the other lubricants tested. An examination of the detailed test data indicated that there was no significant difference in the number of malfunctions whether tests were conducted at the -10° to -25°F temperature range or below -45°F. It was also revealed that the light and heavy lubrication provided comparable results.

The detailed automatic firing results are shown in the Appendix, Tables 7 through 12. The consolidated results for all the weapons are shown in Table III.

TABLE III

AUTOMATIC FIRE MALFUNCTIONS
ATTRIBUTABLE TO LUBRICATION

Type Weapon	MIL-L-14107 (LAW)	MIL-L-46000 (LSA)	MIL-L-46010 (S/F)	Experimental Lubricant A	Experimental Lubricant B
M-14	2	8	35	8	2
XM16E1	22	17	7	10	16
M60	1	33	1	1	1
M73	13	6	16	3	0
Total	38	64	59	22	19

Referring to Table III, it is noted that Experimental Lubricants A and B had the least number of total malfunctions. Further, it is noted that no one lubricant proved to be superior on all four weapons. It is shown that S/F was inferior on the M14 and the M73, LAW was least effective on the XM16E1, and LSA was considerably inferior on the M60. Concerning all weapons, either Lubricant A or B was most suitable.

The detailed test data also indicates that there was no significant difference in performance when all three ranges of test temperature were considered. It was also revealed that the type of lubrication, light or heavy, had no significant effect on the results.

The rate of fire determinations were made during the automatic firing tests and are also shown in the Appendix, Tables 7 through 12. It is noted that all lubricants fired at the proper rate when using the M60 machine gun. Concerning the M14, XM16E1 rifles and M73 machine gun, none of the test lubricants completely met the rate of fire requirement. An examination of the data reveals instances where the rate was below or above the normal firing rate.

The results after six consecutive days of firing, both semi-automatically and automatically, without recleaning or relubrication are shown in the Appendix, Table 13. The consolidated results for all weapons are shown in Table IV.

TABLE IV

MALFUNCTIONS ATTRIBUTABLE TO LUBRICATION
AFTER SIX CONSECUTIVE DAYS OF FIRING

Type Weapon	MIL-L-14107 (LAW)	MIL-L-46000 (LSA)	MIL-L-46010 (S/F)	Experimental Lubricant A	Experimental Lubricant B
M14	22	13	12	5	10
XM16E1	24	21	9	7	8
M60	15	11	18	3	6
M73	21	14	17	7	11
Total	82	59	56	22	35

It is noted in Table IV that Experimental Lubricants A and B again produced the least number of total malfunctions. In this test Lubricants A and B also proved to be superior on each of the individual weapons. The LAW material was least effective, with LSA and S/F being comparable in the number of malfunctions.

The results after three consecutive days of firing at high rate of fire without recleaning or relubrication are shown in Table V.

TABLE V

MALFUNCTIONS ATTRIBUTABLE TO LUBRICATION
AFTER THREE CONSECUTIVE DAYS OF FIRING

Type Weapon	MIL-L-14107 (LAW)	MIL-L-46000 (LSA)	MIL-L-46010 (S/F)	Experimental Lubricant A	Experimental Lubricant B
M14	9	2	219	13	21
XM16E1	124	93	40	55	80
M60	2	57	1	1	1
Total	135	152	260	69	102

The results in Table V again show that Experimental Lubricants A and B produced the least number of total malfunctions. They were not, however, as effective as either LAW or LSA on the M14. The S/F produced an extremely large number of malfunctions on the M14. Concerning the XM16E1, S/F was superior while LAW was least effective. With the M60, LAW, S/F, and Lubricants A and B were comparable, while LSA produced a large number of malfunctions. It should be pointed out that Lubricants A and B were the most suitable lubricants where all weapons are concerned. The M73 weapons were not included in this test since they had shown an excessive number of malfunctions in previous tests and were, therefore, removed from the test program.

The final phase of the program was concerned with three consecutive days of firing under spring "break up" conditions. The temperature during this test ranged from 32° to 40°F and represented the time of the year when corrosion is a problem.

Although the firing test was conducted as scheduled, personnel at the Arctic Test Center did not record the number of malfunctions evident with each lubricant and weapon combination. On this basis, no data can be shown with regard to malfunctions under these conditions.

During the spring "break up" period all weapons developed varying amounts of rust. An examination of the weapons indicated that weapons lubricated with S/F exhibited more rust than any of the other lubricants. The rusting of all weapons most frequently occurred in relatively inaccessible areas and on areas subject to heat.

Since the weapons had not been disassembled to examine for evidence of rust, arrangements were made to have all weapons shipped to Rock Island Arsenal for complete disassembly and then carefully examined for evidence of rust, carbon and wear. These results are shown in the Appendix Tables 15 through 18.

The rust results provide rust ratings which were made in accordance with a rating system described in ASTM Bulletin No. 154 (1948). Very briefly, the first number indicates the amount of rust; 10 for "no rust" down to 0 for "complete rust". When more extensive rusting was prevalent than could be evaluated by the above scale, an estimation was made of the area free from rust. For example, a rating of 0.95 indicates that 95 percent of the surface was free from rust, or a rating of 0.90 indicates that 90 percent of the surface was free from rust. The alphabetical letters denote whether the rust was in the form of dots (D), spots (S), or areas (A). A dot had a maximum linear dimension of 1 mm, a spot 2 mm, and an area 4 mm or greater. The last number indicates the intensity of the rust; 10 for "no rust" and 0 for "extreme." For example, a rating of 5/D/7 indicates the presence of 8 rust dots, with an intensity that produces only a slight etching or pitting of the surface.

An examination of the rust data reveals that S/F provided the least protection as indicated by the number of instances where rust was found. The best protection was provided by LSA, Lubricant B and LAW with Lubricant A permitting a few more instances of rust.

The results on carbon buildup are also shown in Tables 15 through 18. A numerical value was assigned to each category of carbon buildup and this total was used to establish which lubricant was most effective in preventing carbon buildup. As would be expected, S/F was superior in

in preventing carbon buildup. Of the fluid type lubricants, Lubricant B and LAW were superior followed by Lubricant A and LSA. It should be mentioned that the carbon buildup evident on the XM16E1 rifles may be due in part to the use of the 1MR propellant in the 5.56 mm ammunition, as this type of propellant was subsequently shown[1] to produce a greater number of malfunctions than ball propellant.

The results of the wear examination are also indicated in Tables 15 through 18. Here again, a numerical value was assigned to each category of wear and this total was used to establish which lubricant provided the greatest wear resistance. It was revealed that LSA was the most effective in preventing wear. This was followed by Lubricant B, LAW, S/F and Lubricant A.

Concerning the overall program, there are certain facts that need to be emphasized. The first concerns the lubrication of the weapons. Personnel conducting the test indicated that the lubricants could not be applied to certain parts of the weapons and were difficult to apply to other parts. This lack of lubrication was a contributing factor to the number of weapon malfunctions in causing broken parts, galling, runaway guns, failure to feed and other deleterious effects. This did not provide a completely true picture of the suitability of the lubricants under Arctic use.

It was also revealed that for cleaning, the weapons were not completely disassembled, therefore, could not be adequately cleaned in the P-D-680 dry cleaning solvent. After soaking in solvent and brushing, the weapons were to be blown dry by use of compressed air. This was not done since the air compressor was frozen and inoperable. The parts did not dry sufficiently prior to lubrication so that tests were conducted, in a sense, with a diluted lubricant. This certainly does not provide a proper basis for a lubricant test.

(1) Cook, Lt. Jack C., "Service Test of Lubricants For M14 and M16A1 Rifles Under Arctic Winter Conditions," U. S. Army Arctic Test Center, USATECOM Project No. 8-8-0060-03, 8 April 1968.

The Arctic mittens also caused problems. They were too large and bulky to permit access to many parts. Further, they became soaked with the fluid lubricants thus destroying their insulating properties which are so necessary in Arctic use. A suitable aerosol container is highly desirable to prevent the Arctic mittens from being soaked with lubricant. Of all the lubricants evaluated, only S/F was satisfactory with Arctic mittens. The S/F material was also beneficial in that it did not accumulate blowing snow or other residue.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the tests conducted, consideration being given to the number of malfunctions, presence of rust, carbon and wear, the following lubricants appeared to be best suited for the individual weapons:

M14 Rifle - Lubricant A or Lubricant B
XM16E1 Rifle - Lubricant A or Lubricant B
M60 Machine Gun - Lubricant A, LAW or Lubricant B
M73 Machine Gun - Lubricant A, Lubricant B or LSA

Upon considering all of the test data, either lubricant A or B is best suited for all the small arms weapons tested. LSA would also be suitable except for the M60 Machine Gun.

Of the lubricants tested, Lubricants A and B were superior overall to the currently authorized Arctic lubricant LAW.

None of the fluid lubricants were satisfactory for use with the Arctic mittens. Only S/F was satisfactory in this regard. The size and bulk of the Arctic mittens also prevented access to many areas requiring lubrication.

It is recommended that Lubricants A and B be returned to the Arctic for an Engineer Design Test to determine their suitability compared to LSA under winter and spring "break up" conditions. It is further recommended that work initiated to develop an aerosol container for Arctic use be continued. Finally, it is recommended that S/F be considered unsuitable for use on small arms under both Arctic winter and spring "break up" conditions.

APPENDIX

DETAILED TEST RESULTS

CODE SHEET TO IDENTIFY ABBREVIATIONS

Abbreviations	Definitions
FF	Failure to feed
FL	Failure to lock
FC	Failure to chamber
FFR	Failure of chambered round to fire
FX	Failure to extract
FJ	Failure to eject
I	Ice formation on weapon
BL	Blowing snow in weapon
M	Brass shavings
CL	Carbon light
CM	Carbon medium
CH	Carbon heavy
RL	Rust light
RM	Rust medium
RH	Rust heavy
WL	Wear light
WM	Wear medium
WH	Wear heavy

TABLE I SEMIAUTOMATIC FIRE LUBRICATION LIGHT

DATE 29 Nov 66

AMBIENT AIR TEMPERATURE: -12°F to -23°F WIND SPEED: 1 KNOT

Type wpn. & lube XTÉE)		FF	FL	FC	FFR	FX	FJ Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW						0		240			M				
509998	LAW	2					2	2	240			M				
512375	LSA								240			L				
509963	LSA	1					1	1	240			L				
509664	A						0		240			M				
513493	A						0	0	240			M				
514746	B						0		240			L				
514298	B	1					1	1	240			L				
164957	S/F						0		240			M				
166081	S/F			1			1	1	240			M				
M14																
938585	LAW						0		240							
978304	LAW						0	0	240							
963765	LSA						0		240							
12785	LSA						0	0	240							
977738	A						0		240							
1002384	A						0	0	240							
14618	B		1				1		240							
857959	B						0	1	240							
101819	S/F	1					1		240							
362373	S/F			1			1	2	240							

V.L. - Very Light
L - Light
M - Medium
H - Heavy

TABLE II SEMIAUTOMATIC FIRE LUBRICANT HEAVY

DATE

AMBIENT AIR TEMPERATURE: -18°F to -28°F WIND SPEED: 1 KNOT

Type wpn. & lube M16E1		FP	FL	FC	FPR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW							0		240								
509998	LAW	1						1	1	240								
512375	LSA	1						1		240								
509963	LSA							0	1	240								
509664	A							0		240								
513493	A	1						1	1	240								
514746	B							0		240								
514298	B	2						2	2	240								
164957	S/F									0								Weapon not received
166081	S/F									0								Weapon not received
M14																		
938585	LAW									240								
978304	LAW								0	240								
963765	LSA									240								
12785	LSA								0	240								
977738	A									240								
1002384	A								0	240								
14618	B									240								
857959	B								0	240								
101819	S/F									0								Weapon not received
362373	S/F									0								Weapon not received

TABLE III SEMIAUTOMATIC FIRE LUBRICANT LIGHT

DATE 12 Dec 66

AMBIENT AIR TEMPERATURE: -31°F to -36°F WIND SPEED: 4 KNOTS

Type wpn. & lube Mfg&El		FF	FL	FC	FMR	FA	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	SL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW		1		1			2		240	X			H				Excessive carbon on bolt
509998	LAW	1						1	3	170	X							Ruptured cartridge (removed)
512375	LSA							0		240	X							
509963	LSA							0	0	240	X							
509664	A	2						2		161	X							Replaced bolt carrier
513493	A							0	2	240	X							
514746	B							0		240	X							
514298	B	1						1	1	240	X							
164957	S/F							0		240	X							
166081	S/F							0	0	240	X							
M14																		
938585	LAW									240	X							
978304	LAW								0	240	X							
963765	LSA							0		240	X							
12785	LSA		1					1	1	240	X							Replaced bolt
977738	A									240	X							
1002384	A								0	240	X							
14618	B									240	X							
857959	B								0	240	X							
101819	S/F			1				1		240	X							
362373	S/F		1					1	2	240	X							

TABLE IV SEMIAUTOMATIC FIRE LUBRICATION HEAVY

DATE 11 Dec 66

AMBIENT AIR TEMPERATURE: -26°F to -29°F WIND SPEED: 10 KNOTS

Type wpn. & lube M16E1		FF	FL	FC	FFR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW	2					2			240	X							
509998	LAW							2		240	X							
512375	LSA	1					1			240	X							
509963	LSA							1		240	X							
509664	A	1					1			28	X							Projectile lodged in barrel
513493	A							1		240	X							
514746	B									240	X							
514298	B							0		240	X							
164957	S/F									240	X							
166081	S/F							0		240	X							
M14																		
938585	LAW									240	X							
978304	LAW							0		240	X							
963765	LSA									240	X							
12785	LSA							0		240	X							
977738	A									42	X							Broken firing pin (replaced)
1002384	A							0		240	X							
14618	B									240	X							
857959	B							0		240	X							
101819	S/F			1			1	2		240	X							
362373	S/F		1					1	3	240	X							

TABLE V SEMIAUTOMATIC FIRE LUBRICATION LIGHT

DATE 9 Dec 66

AMBIENT AIR TEMPERATURE: -45°F to -48°F WIND SPEED: 3 KNOTS

Type wpn. & lube M16E1		FP	FL	FC	FFR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW	1					1			240								
509998	LAW							1		240								
512375	LSA					1	1			240								
509963	LSA	1					1	2		240								
509664	A									240								
513493	A							0		240								
514746	B	1					1			240								
514298	B							1		240								
164957	S/F	2					2			240								
166081	S/F							2		240								
M14																		
938585	LAW				1		1			240								
978304	LAW							1		240								
963765	LSA									240								
12785	LSA							0		240								
977738	A									240								
1002384	A							0		240								
14618	B									240								
857959	B							0		240								
101819	S/F			1			1			240								
362373	S/F					1	1	2		240								

TABLE VI SEMIAUTOMATIC FIRE LUBRICATION HEAVY

DATE 28 Jan 67

AMBIENT AIR TEMPERATURE: -52°F to -55°F WIND SPEED: Calm KNOT

Type wpn. & lube M16E1	FP	FL	FC	FMR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730 LAW									240			H					
509998 LAW								0	240			H					
512375 LSA					3	3			240			H					
509963 LSA								3	240		X	M					
509664 A									240			H					
513493 A				1		1		1	240			H					Loose bolt carrier key
514746 B									240			L					
514298 B								0	240			H					
164957 S/F									240			H					
166081 S/F								0	240		X	H					
M14																	
938585 LAW		2				2			240								Missing rear sight replaced
978304 LAW								2	3								Broken firing pin & ejector
963765 LSA									240		X	L					
12785 LSA								0	240		X	H					
977738 A									240		X						
1002384 A								0	240		X						
14618 B									240		X	H					
857959 B								0	240		X	H					
101819 S/F		1	1			2			240								(Burred firing pin, excess wear
362373 S/F		1				1		3	240								(on operating rod guide

TABLE VII AUTOMATIC FIRE RIFLE M16E1, M14 LUBRICATION LIGHT

DATE 21 Dec 66

AMBIENT AIR TEMPERATURE: -13°F to -27°F WIND SPEED: 1 KNOT

Type apn. & lube Model		FP	FL	FC	SFH	FX	FJ	Total apns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW	2						2		600							560	Normal rate of fire is
509998	LAW					1		1	3	600							510	650 to 850 rounds per
512375	LSA	1						1		600							510	minute
509963	LSA		1					1	2	600							590	
509664	A									600							570	
513493	A								0	600							800	
514746	B				1			1		600							720	
514298	B					1		1	2	600							N.Rate	
164957	S/F	1						1		600							750	
166081	S/F								1	600							750	
M14																		
938585	LAW		1					1		600							810	Normal rate of fire is 650 to
979304	LAW								1	500							*800	780 rounds per minute
963765	LSA		1					1		600							800	
12785	LSA								1	600							840	
977738	A									600							600	Broken firing pin (replaced)
1002384	A								0	600							800	
14618	B									600							813	
857959	B								0	600							780	
101819	S/F			2	1			3		600							690	
362373	S/F	1		2	1			4	7	600							660	

*Broken sear

TABLE VII AUTOMATIC FIRE MACHINEGUNS M60 AND M73 LUBRICATION LIGHT (Continued)

DATE 20 Dec 66

AMBIENT AIR TEMPERATURE: -20°F to -26°F WIND SPEED: KNOT

Type wpn. & lube		FP	FL	FC	FFH	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
M60 M.G.																		
79405	LAW									600							590	Normal rate of fire is 500
79508	LAW								0	600							590	to 650 rounds per minute
79398	LSA		2				2			600							598	
79299	LSA		1		2		3	5		584							598	Bolt malfunction
78753	A									600							588	
79062	A		1				1	1		600							585	
78751	B									600							600	
79256	B								0	600							598	
79488	S/F									600							585	
79075	S/F								0	600							650	
M73 M.G.																		
4712	LAW		1				1			600							570	Normal rate of fire is 500
6727	LAW								1	600							500	to 625 rounds per minute
5292	LSA		1				1			600							510	
4879	LSA								1	600							510	
5050	A									600							530	
4911	A								0	600							450	
5200	B									600							450	
4878	B								0	600							N.Rate	
7538	S/F									600							420	Sluggish operation
1100	S/F		2				2		2	600							478	

TABLE VIII AUTOMATIC FIRE RIFLE M16E1 and M14 LUBRICATION HEAVY

DATE 14 Nov 66

AMBIENT AIR TEMPERATURE: -19°F to -28°F WIND SPEED: 1 KNOT

Type wpn. & lube M16E1		FP	FL	FC	FPR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW					1	1			600						660		
509998	LAW	2					2	3		600						600		
512375	LSA			1			1			600						800		
509963	LSA	1			1		2	3		600						720		
503664	A			1			1			600						600		
513493	A							1		600						870		
514746	B	1					1			600						780		
514298	B	1		1			2	3		600						600		
164957	S/F																	Wpns not available for test
166081	S/F							0										Wpns not available for test
M14																		
938585	LAW									600						600		Broken sear (replaced)
978304	LAW							0		600						720		
963765	LSA			2			2			600						600		
12785	LSA							2		600						660		
977738	A		1				1			600						600		
1002384	A							1		600						510		
14618	B		1				1			600						660		
857959	B							1		600						660		
101819	S/F																	Wpns not available for test
362373	S/F							0										Wpns not available for test

TABLE VIII AUTOMATIC FIRE MACHINEGUN M60 and M73 LUBRICATION HEAVY (Continued)

DATE 14 Nov 66

AMBIENT AIR TEMPERATURE: -19°F to -28°F WIND SPEED: KNOT

Type wpn. & lube		FP	FL	FC	FFH	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
M60 M.G.																		
79405	LAW									600						500		
79508	LAW								0	600						500		
79398	LSA		2		1		3			600						600		
79299	LSA	1			1	1	3	6		600						600		
78753	A									600						500		
79062	A								0	600						500		
78751	B		1				1			600						500		
79256	B								1	600						600		
79488	S/F									0								Wpn not received for test
79075	S/F									0								Wpn not received for test
M73 M.G.																		
4712	LAW									600						500		
6727	LAW			1		1		2	2	600						500		
5292	LSA			1				1		600						600		
4879	LSA								1	600						400		Sluggish operation
5050	A	1						1		533						400		
4911	A								1	400						400		Broken extractor
5200	B									600						500		
4878	B								0	600						500		Run away 100 rounds
7538	S/F									0								Wpn not received for test
1100	S/F									0								Wpn not received for test

TABLE IX AUTOMATIC FIRE M16E1 and M14 LUBRICATION LIGHT

DATE: 3 Dec 66

AMBIENT AIR TEMPERATURE: -19°F to -42°F WIND SPEED: 2 KNOTS

Type wpn. & lube M16E1		FP	FL	FC	FFR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW	1		1			2			600						800		
509998	LAW			1			1	3		600						800		
512375	LSA	1					1			600						875		
509963	LSA			1			1	2		600						820		
509664	A	1					1			600						770		
513493	A	1					1	2		600						850		
514746	B	1		1			2			600						820		
514298	B			1			1	3		600						910		
164957	S/F			1			1			600						960		
166081	S/F							1		600						960		
M14																		
938585	LAW									570						960		Broken firing pin at 170 rds (replaced)
978304	LAW							0		600						940		
963765	LSA									600						685		Sear hanging (replaced housing)
12785	LSA							0		600						900		
977738	A									600						685		
1002384	A							0		600						685		
14618	B									582						840		Firing pin frozen
857959	B							0		600						810		
101819	S/F	2	1				3			600						800		
362373	S/F	2	1		1		4	7		600						750		Broken ejector after 240 rds.

TABLE IX AUTOMATIC FIRE MACHINEGUNS M60 and M73 LUBRICATION LIGHT
(Continued)

DATE 2 Dec 66

AMBIENT AIR TEMPERATURE: -24°F to -30°F WIND SPEED: 1 KNOT

Type wpn. & lube		FP	FL	FC	FFR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
M60 M.G.																		
79405	LAW								0	600			H				600	
79508	LAW									600			H				594	
79398	LSA		1	2			3			600			H				600	
79299	LSA	1			1		2		5	600			H				600	
78753	A									600			H				600	
79062	A								0	600			H				600	
78751	B									600							600	
79256	B								0	600							600	
79488	S/F									600							590	
79075	S/F								0	600							600	
M73 M.G.																		
4712	LAW	1					1			600							500	
6727	LAW			1			1		2	600			H				440	
5292	LSA									600			H				500	
4879	LSA				2		2		2	600			H				410	
5050	A									600			H				429	
4911	A								0	600							500	
5200	B									600							450	
4878	B								0	600							450	
7538	S/F	1		1	1		3			522			H				380	Sluggish operation
1100	S/F	1			1		2		5	518			H				847	Sluggish operation - runaway 5 times

TABLE X AUTOMATIC FIRE RIFLES M16E1 and M14 LUBRICATION HEAVY

DATE 27 Jan 67

AMBIENT AIR TEMPERATURE: -23°F to -25°F WIND SPEED: 0 KNOT

Type wpn. & lube M16E1		FP	FL	FC	FFR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW	1			1			2		600							660	
509998	LAW	2						2	4	600							900	
512375	LSA									600							840	
509963	LSA	1			1			2	2	600							720	
509664	A									600							600	
513493	A	1				1		2	2	600							870	
514746	B		1		1			2		600							780	
514298	B						1	1	3	600							600	
164957	S/F						1	1		600							750	
166081	S/F				1			1	2	600							720	
M14																		
938585	LAW									600							660	
978304	LAW								0	600							510	
963765	LSA				2			2		600							600	
12785	LSA								2	600							660	
977738	A									600							600	
1002384	A								0	600							600	
14618	B			1				1		600							660	
857959	B								1	600							660	
101819	S/F	1	2		1			4		600							600	
362373	S/F						1	3	7	600							600	

TABLE X AUTOMATIC FIRE MACHINEGUNS M60 and M73 LUBRICATION HEAVY (Continued)

DATE 6 Dec 66

AMBIENT AIR TEMPERATURE: -23°F to -34°F WIND SPEED: 1 KNOT

Type wpn. & lube		FP	FL	FC	FPR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
M60 M.G.																		
79405	LAW									600						680		
79508	LAW			1			1	1		600						600		
79398	LSA		1			1	2			600						660		
79299	LSA		1	2			3	5		600						650		
78753	A									600						545		
79062	A							0		600						650		
78751	B									600						660		
79256	B							0		600						680		
79488	S/F									600						690		
79075	S/F							0		600						600		
M73 M.G.																		
4712	LAW	6					6			600						580		
6727	LAW							6		600						660		
5292	LSA									600						595		Run away (2) Adjusted Sear Gun OK
4879	LSA	2					2	2		700						545		
5050	A									600						500		
4911	A							0		600						680		
5200	B									600						450		
4878	B							0		447						N.R		Run away (3) Broken trigger & back plate
7538	S/F			2			2			600						500		
1100	S/F	1					1	3		540						500		Replaced back plate

TABLE XI AUTOMATIC FIRE RIFLE M16E1 and M14 LUBRICATION LIGHT

DATE 28 Jan 67

AMBIENT AIR TEMPERATURE: -52°F to -54°F WIND SPEED: 0 KNOT

Type wpn. & lube M16E1		FP	PL	FC	FPR	PX	PJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW				1		3	4		600			H				840	
509998	LAW	2						2	6	600			H				780	
512375	LSA	1					3	4		600			H				N.Rate	
509963	LSA				1			1	5	600			M				780	
509664	A				1			1		600		X	H				840	
513493	A	1					1	2	3	582			H				780	
514746	B		1					1		600			M				660	
514298	B	1						1	2	600			M				780	
164957	S/F				1			1		600			H				780	Replace extractor (Double feed after 80 rds)
166081	S/F	1						1	2	600			H				780	
M14																		
938585	LAW									600							780	Bolt frozen to rear on 5th rd.
978304	LAW								0	600							N.Rate	
963765	LSA		1					1		600			H				780	
12785	LSA						1	1	2	600			H				780	
977738	A			1	2			3		600			L				780	
1002384	A			4				4	7	600							840	
14618	B									10							N.Rate	Broken ejector
857959	B								0	600							780	
101819	S/F	1	1	1	1			4		600							780	
362373	S/F	1		1	1			3	7	600							840	

TABLE XI AUTOMATIC FIRE MACHINEGUNS M60 and M73 LUBRICATION LIGHT (Continued)

DATE 9 Dec 67

AMBIENT AIR TEMPERATURE: -45°F to -46°F WIND SPEED: 0 KNOT

Type wpn. & lube		FP	FL	FC	FFR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
79405	LAW									600						No	Rate	
79508	LAW								0	600						No	Rate	
79398	LSA	1		2				3		600						No	Rate	
79299	LSA				2		1	3	6	600						No	Rate	
78753	A									600						No	Rate	
79062	A								0	600						No	Rate	
78751	B									600						No	Rate	
79256	B								0	600						No	Rate	
79488	S/F									600						No	Rate	
79075	S/F								0	600						No	Rate	
M73 M.G.																		
4712	LAW									600						No	Rate	
6727	LAW			1				1	1	600						No	Rate	
5292	LSA									600						No	Rate	
4829	LSA								0	600							580	
5050	A				2			2		600							590	Runaway @270 & 400 Rds *
4911	A								2	600						No	Rate	
5200	B									600						No	Rate	
4878	B								0	0						No	Rate	Missing part driving spring
7538	S/F			2				2		600						No	Rate	
1100	S/F								2	0						No	Rate	Missing part driving spring

*(Broken rate control pawl replaced)

TABLE XII AUTOMATIC FIRE RIFLES M16E1 and M14 LUBRICATION HEAVY

DATE 7 Dec 66

AMBIENT AIR TEMPERATURE: -45°F to -54°F WIND SPEED: 1 KNOT

Type wpn. & lube M16E1		FP	FL	FC	FFR	PX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW	1					1			600							700	
509998	LAW			2			2	3		600							No Rate	
512375	LSA	1		1			2			600							660	Light snow on weapon
509963	LSA			1			1	3		520			H				680	
509664	A			1			1			600							No Rate	Frozen extractor
513493	A					1	1	2		600			M				No Rate	
514746	B	1					1			600							720	
514298	B	1			1		2	3		600							690	
164957	S/F			1			1			600							860	Light snow on weapon
166081	S/F							1		600							780	Light snow on weapon
M14																		
938585	LAW	1					1			600							870	
978304	LAW							1		600							840	
963765	LSA									600							810	Broken firing pin after 287 rds.
12785	LSA		1				1	1		600							840	
977738	A									600							840	
1002384	A							0		600							780	
14618	B									480							No Rate *	
857959	B							0		440							900	Broken firing pin
101819	S/F		2	1	1		4			600							720	
362373	S/F	1		2			3	7		600							780	

*Broken firing pin after 200 rds.
Broken selector 480 rds.

TABLE XII AUTOMATIC MACHINEGUN M60 and M73 LUBRICATION HEAVY
(Continued)

DATE 28 Jan 67

AMBIENT AIR TEMPERATURE: -48°F to -52°F WIND SPEED: 0 KNOT

Type wpn. & lube		FP	FL	FC	FFR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
M60 M.G.																		
79405	LAW									600			M				600	
79508	LAW								0	600			M				600	
79398	LSA	1			2			3		600							No Rate	Double feed
79299	LSA	1		1			1	3	6	600		X		H			600	
78753	A									600			X	H			600	
79062	A								0	600		X	X	H			600	
78751	B									600		X		L			600	
79256	B								0	600							600	
79488	S/F			1				1		600				H			600	
79075	S/F								1	600				H			600	
M73 M.G.																		
4712	LAW				1			1		600							450	Breech block assy marred
6727	LAW								1	600			X	M			No Rate	Marred firing pin
5292	LSA									600			X	M			590	Marred firing pin
4879	LSA								0	600			X				580	Broken Breech Block roller pin*&
5050	A									600		X	X				No Rate	Runaway gun 3 times
4911	A								0	600	X		X	H			520	
5200	B									600							580	
4878	B								0	0							No Rate	Charging chain galled **
7538	S/F				1			1		600							450	
1100	S/F					3		3	4	6							No Rate	Failed to extract 3 times removed from line

*Rate control pawl
** and burred

TABLE XIII SEVERAL DAYS FIRING RIFLE M16E1 and M14 LUBRICATION LIGHT

DATE 9 Dec 66 to 14 Dec 66

AMBIENT AIR TEMPERATURE: -10°F to -20°F **WIND SPEED:** 1 to 11 **KNOTS**

Type wpn. & lube M16E1		FP	FL	FC	FFR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Dust	Wear	Rate of fire	REMARKS
514730	LAW	15	3		1			19		1100	X		H					Bolt frozen on last round
509998	LAW	4	1					5	24	1200	X		H					
512375	LSA	5	3		3		1	12		1100	X		H					
509963	LSA	6	2		1			9	21	1100	X		H					
509664	A	3	1					4		1100	X		M					Bolt would not chamber
513493	A	2			1			3	7	1200	X		M					
514746	B	1	1		2			4		1200	X		M					
514298	B	3				1		4	8	1200	X		M					Replaced Ejector
614957	S/F	1	1		1			3		1200	X		L					
166081	S/F	1	2		3			6	9	1200	X		M					
M14																		
938585	LAW	2	1	9	2			14		1200	X		H					Replaced firing pin after 800 rds.
978304	LAW	1	3	3		1		8	22	1100	X		H					Bolt hanging to rear
963765	LSA	1	3	4	1			9		1200	X		M					
12785	LSA	1	2		1			4	13	1200	X		M					Replaced operating rod spring
977738	A	1	1	1				3		1200	X		L					Replaced operating rod spring
1002384	A	1	1					2	5	1110	X		L					
14618	B	1	1	4				6		1161	X		H					Replaced sear
857959	B	2		1	1			4	10	1104	X		L					
101819	S/F	1	1	4	1			7		1200	X		L					
362373	S/F	2	2	1				5	12	1200	X		L					

TABLE XIII SEVERAL DAYS FIRING MACHINEGUN M60 and M73 LUBRICATION LIGHT (Continued)

DATE: 9 Dec 66 to 14 Dec 66

AMBIENT AIR TEMPERATURE: -1°F to -20°F WIND SPEED: 1 to 11 KNOTS

Type gun. & Lube		FP	FL	FC	FTH	FX	FJ	Total mis. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
M60 M.G.																		
79405	LAW	1	3	4	3			11		1200	X		H					
79508	LAW	2	1	1				4	15	1200	X		H					
79398	LSA	5	1	1				7		1100	X		H					Replaced feed cover spring
79299	LSA		4					4	11	1200	X		H					
78753	A	1	1		1			3		1100	X		H					Replaced bolt 1100 rounds
79062	A							0	3	1200	X		H					
78751	B				1			1		1100	X		L					
79256	B	2	2		1			5	6	1200	X		H					
79488	S/F	4	3	4	1		1	13		1100	X		M					
79075	S/F	1	1	2	1			5	18	1100	X		M					
M73 M.G.																		
4712	LAW	6		4	1			11		1200	X		H					
6727	LAW	1	8		1			10	21	1200	X		H					
5292	LSA	1	4	1		2	2	10		1200	X		M					
4879	LSA	1	1	1	1			4	14	1102	X		M					Replaced breech block roller pin
5050	A	1	1	1	1			4		1200	X		H					
4911	A	1	1		1			3	7	1200	X		H					
5200	B	2		4	2			8		1200	X		H					Replaced sear
4878	B	1	1		1			3	11	1200	X		M					
7538	S/F	4	1	3	1		1	10		963	X		M					Replaced rate control pawl
1100	S/F	2	1	3			1	7	17	1161	X		M					Replaced feed tray cover assembly

TABLE XIV RIFLE M16E1 and M14 HIGH RATE OF FIRE 3 DAYS LUBRICATION LIGHT

DATE

AMBIENT AIR TEMPERATURE: -10°F to -36°F WIND SPEED: 2 to 11 KNOTS

Type wpn. & lube M16E1		FP	FL	FC	FKR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
514730	LAW	57	9		6			72		2400			H					
509998	LAW	47	4				1	52	124	2400			H					
512375	LSA	62	7		1	1	2	73		2400			H					
509963	LSA	18	1			1		20	93	2400			H					
509664	A	23				1	1	25		2400			H					
513493	A	21	1			3	5	30	55	2400			H					Broken extractor spring
514746	B	26						26		2400			H					
514298	B	50	7		2		1	60	86	2400			H					
164957	S/F	15	1		2			18		2400			H					
166081	S/F	17			1	2	2	22	40	2400			H					
M14																		
938585	LAW	1	1	2	1		2	7		2400			L					
978304	LAW	1			1			2	9	2400			L					
963765	LSA		1				1	2		2400			L					
12785	LSA							0	2	2400			L					
977738	A	3		2				5		2400			L					
1002384	A		7				1	8	13	2400			L					Broken firing pin
14618	B			2		2		4		2400			L					
857959	B			1	10		6	17	21	2400			L					
101819	S/F	2	85	2	5	9	5	108		2400			L					
362373	S/F		87	2	3	15	4	111	219	2400			L					

TABLE XIV MACHINEGUN M60 HIGH RATE OF FIRE 3 DAYS LUBRICATION LIGHT
(Continued)

DATE

AMBIENT AIR TEMPERATURE: -10°F to -36°F WIND SPEED: 2 to 4 KNOTS

Type wpn. & lube M60 M.G.		FP	FL	FC	FPR	FX	FJ	Total wpns. malfunction	Total malfunction by lube	Total rds. fired	BL	I	M	Carbon	Rust	Wear	Rate of fire	REMARKS
79405	LAW		1				1			2400			M					
79508	LAW					1	1	2		2400			M					
79398	LSA						0			2400			M					
79299	LSA	9		10	14	24	57	57		2400			M					
78753	A						0			2400			M					
79062	A		1				1	1		2400			M					
78751	B						0			2400			M					
79256	B	1					1	1		2400			M					
79488	S/F	1					1			2400			M					
79075	S/F						0	1		2400			M					
M73 M.G.																		
4712	LAW																	
6727	LAW																	Due to high rate of malfunctions the 10 M73 Guns were removed from test.
5292	LSA																	
4879	LSA																	
5050	A																	
4911	A																	
5200	B																	
4878	B																	
7538	S/F																	
1100	S/F																	

TABLE

EXAMINATION OF

Serial Number Lubricant	Barrel	Gas Cylinder Plug	Gas Cylinder Piston	Bolt Assembly	Connector Assembly	Operating Rod Spring Guide	Operating Rod Spring	Operating Rod	Trigger Pin	Trigger Sear Assembly	Hammer Spring Housing	Spring Helical Compression
938585 (LAW)												
Rust	1/											
	DSA/7	10	10	10	10	10	10	10	10	10	10	10
Carbon	M	M-H	M-H	L	L	L	L	M	L	L	L	L
Wear	M	M	M	M	M-H	M	L	M-H	H	M	L	L
978304 (LAW)												
Rust	7/D/9	10	10	10	10	10	10	10	10	10	10	10
Carbon	M	H	H	M-H	M	M	M	M	L	L	L	L
Wear	M	M	M	M	M	M	M	M-H	L	L	L	L
857959 (Lube B)												
Rust	0.90/											
	DSA/7	10	10	10	10	10	10	10	10	10	10	10
Carbon	M	M-H	M-H	L-M	L	M	M	H	L	L	L	L
Wear	M	M	M	M-H	M-H	M	L	M-H	M	L-M	M	L
14618 (Lube B)												
Rust	0.90/											
	DSA/5	10	10	9/D/9	10	10	10	10	10	10	10	10
Carbon	M-H	H	M-H	M	L	M	L	M-H	L	L	L	L
Wear	M	M	L-M	M-H	M-H	M	L	L-M	M	L-M	L	L
963675 (LSA)												
Rust	8/D/8	10	10	10	10	10	10	10	10	10	10	10
Carbon	M-H	M-H	M-H	L-M	M	L-M	L	M-H	L	L	L	L
Wear	M	M	L-M	M-H	M-H	M	M	L-M	L	L-M	L	L
12785 (LSA)												
Rust	9/D/9	10	10	10	10	10	10	10	10	10	10	10
Carbon	H	M-H	M-H	M	M	L-M	M	M-H	L	L	L	L
Wear	M	M	L-M	M	M-H	M-H	M	M-H	L	M	M	L
977738 (Lube A)												
Rust	0.90/											
	DSA/5	9/D/9	10	10	10	10	10	10	10	10	10	10
Carbon	H	H	H	M-H	L	L	L	L-M	L	L	L	L
Wear	M	M	L-M	M	M-H	M-H	L	M-H	L	L	L	L
1002384 (Lube A)												
Rust	0.90/											
	DSA/6	10	10	10	9/D/9	7/DS/8	9/D/9	7/DS/6	10	7/A/5	9/D/9	9/D/9
Carbon	M	M-H	M-H	M	M	M-H	M	M	L	L	L	L
Wear	M	M	M	M	H	M	M	M	M	M	M	M
362373 (S/F)												
Rust	0.80/			1/DSA/				3/DSA/				
	DSA/3	10	10	5	7/A/5	10	10	5	10	7/A/5	10	10
Carbon	L	M	M	L-M	L	L	L	L	L	L	L	L
Wear	M	M	M	M-H	M	M	M	M	M	M	L	L
101819 (S/F)												
Rust	0.90/							0.95/				
	DSA/3	10	10	10	9/D/9	10	10	DSA/5	10	10	10	10
Carbon	L-M	M	M	L-M	L	L	L	M	L	L	L	L
Wear	M	M	M	M	M	M	L	M	H	M	L	L

V.L. - Very Light L - Light M - Medium H - Heavy 0 - None

TABLE XV

EXAMINATION OF M14 RIFLES

Gas Cylinder Plug	Gas Cylinder Piston	Bolt Assembly	Connector Assembly	Operating Rod Spring Guide	Operating Rod Spring	Operating Rod	Trigger Pin	Trigger Shear Assembly	Hammer Spring Housing	Spring Helical Compression	Hammer Spring Plunger	Pin (Hammer)	Hammer	Safety	Safety Spring	Trigger Guard	Housing Assembly
10 M-H M	10 M-H M	10 L M	10 L M-H	10 L M	10 L L	10 M M-H	10 L H	10 L M	10 L L	10 L L	10 L L	10 L M	10 L-M M	10 L L	10 L L	10 L L	7/D/8 L-M L
10 H M	10 H M	10 M-H M	10 M M	10 M M	10 M M	10 M M-H	10 L L	10 L L	10 L L	10 L L	10 L L	10 L M-H	10 M M-H	10 L-M L	10 L L	10 L-M L	7/DS/8 M L
10 M-H M	10 M-H M	10 L-M M-H	10 L M-H	10 M M	10 M L	10 H M-H	10 L M	10 L L-M	10 L M	10 L L	10 L L	10 L H	10 L M	10 L L	10 L L	10 L L	10 L M-H
10 H M	10 M-H L-M	9/D/9 M M-H	10 L M-H	10 M M	10 L L	10 M-H L-M	10 L M	10 L L-M	10 L L	10 L L	10 L L	10 L H	10 L M	10 L L	10 L L	10 L L	10 L M
10 M-H M	10 M-H L-M	10 L-M M-H	10 M M-H	10 L-M M	10 L M	10 M-H L-M	10 L L	10 L L-M	10 L L	10 L L	10 L L	10 L L-M	10 L M	10 L L-M	10 L L	10 L L	10 L L-M
10 M-H M	10 M-H L-M	10 M M	10 M M-H	10 L-M M-H	10 M M	10 M-H M-H	10 L L	10 L M	10 L M	10 L L	10 L L	10 L M	10 M L	10 M L	10 M L	10 L-M L	10 M L
9/D/9 M M	10 H L-M	10 M-H M	10 L M-H	10 L M-H	10 L L	10 L-M M-H	10 L L	10 L L	10 L L	10 L L	10 L L	10 L M-H	10 M M	10 M M	10 M L	10 L L	10 L-M M
10 M-H M	10 M-H M	10 M M	9/D/9 M H	7/DS/8 M-H M	9/D/9 M M	7/DS/6 M M	10 L M	7/A/5 L M	9/D/9 L M	9/D/9 L M	10 L M	10 L M	10 L-M M-H	10 L M	10 L M	10 L M	0.70/ DSA/6 L-M M
10 M M	10 M M	1/DSA/ 5 L-M M-H	7/A/5 L M	10 L M	10 L M	3/DSA/ 5 L M	10 L M	7/A/5 L M	10 L L	10 L L	10 L L	10 L L	5/DSA/ 8 L M	7/D/7 L M	10 L M	9/D/9 L M	5/ DSA/6 L M
10 M M	10 M M	10 L-M M	9/D/9 L M	10 L M	10 L L	0.95/ DSA/5 M M	10 L H	10 L M	10 L L	10 L L	10 L L	7/D/8 L M	9/D/9 L-M H	10 L L	10 L L	10 L L	9/D/8 L H

ery Light L - Light M - Medium H - Heavy 0 - None

LE XV

OF M14 RIFLES

Hammer Spring Plunger	Pin (Hammer)	Hammer	Safety	Safety Spring	Trigger Guard	Housing Assembly	Front Sight	Rear Sight	Receiver Group	General Comments
10 L L	10 L M	10 L-M M	10 L L	10 L L	10 L L	7/D/8 L-M L	10 0 VL	10 0 VL	10 M M	Broken Ejector Spring
10 L L	10 L M-H	10 M M-H	10 L-M L	10 L L	10 L-M L	7/DS/8 M L	10 0 VL	10 0 VL	0.95/DSA/5 M M	Broken Operating Rod Spring
10 L L	10 L H	10 L M	10 L L	10 L L	10 L L	10 L M-H	10 0 VL	10 0 VL	10 M M	Broken Ejector Spring
10 L L	10 L H	10 L M	10 L L	10 L L	10 L L	10 L M	9/D/9 0 VL	10 0 VL	10 M M	
10 L L	10 L L-M	10 L M	10 L L-M	10 L L	10 L L	10 L L-M	10 0 VL	10 0 VL	10 L-M L-M	Broken Firing Pin Broken Ejector Spring
10 L L	10 L M	10 M L	10 M L	10 M L	10 L-M L	10 M L	10 0 VL	10 0 VL	10 M-H M-H	Broken Ejector Spring Rear Elev. Screw & Knob Missing
10 L L	10 L M-H	10 M M	10 M M	10 M L	10 L L	10 L-M M	10 0 VL	10 0 VL	10 M M-H	Broken Ejector Spring
10 L M	10 L M	10 L-M M-H	10 L M	10 L M	10 L M	0.70/ DSA/6 L-M M	10 0 VL	10 0 VL	10 M M	Elevating Knob Missing
10 L L	10 L L	5/DSA/ 8 L M	7/D/7 L M	10 L M	9/D/9 L M	5/ DSA/6 L M	10 0 VL	10 0 VL	1/ DSA/5 L M	
10 L L	7/D/8 L M	9/D/9 L-M H	10 L L	10 L L	10 L L	9/D/8 L H	10 0 VL	10 0 VL	0.90/ DSA/5 M M	Broken Ejector Spring

TABLE XVI

EXAMINATION OF XM16E1 RIFLES

Serial Number Lubricant	Bolt Carrier	Bolt	Firing Pin	Retaining Pin	Cam Pin	Automatic Sear	Disconnector	Hammer	Selector Lever	Charging Handle	Dust Cover	Upper Receiver	Lower Receiver	Bolt Assist	Barrel
14730 (LAW)															
Rust	10	0.95/ DSA/5	10	0.80/ DSA/3	5/ DS/5	10	10	10	10	10	7/ DS/8	10	10	10	3/ DSA/5
Carbon	M	H	M-H	M	M	M	M	H	M	M-H	L	H	M	L	L
Wear	L	M-H	L	L	H	M	L-M	M	L	M	L-M	H	L	L	L
09998 (LAW)															
Rust	10	9/D/9	7/DS/5	1/ DSA/5	10	10	10	10	10	10	0.90/ DSA/7	0.90/ DSA/7	10	10	0.90/ DSA/7
Carbon	M	H	M-H	M	M	M	L-M	M	L	L	VL	H	M	VL	L
Wear	L	L	VL	L	M	L	L	M	L	M	L	M	M	M	M
14746 (Lube B)															
Rust	10	0.90/ DSA/5	9/D/9	0.70/ DSA/6	8/DS/7	10	10	10	10	10	9/D/9	10	10	10	5 DSA/8
Carbon	VH	H	M-H	M	M-H	M	M	H	M	VH	M	H	M	L	H
Wear	L	M-H	L	L	M	M	L	M	L	M	L	L	L	L	M
14298 (Lube B)															
Rust	10	9/D/9	10	10	10	10	10	10	10	10	5/ DSA/7	10	10	10	0.90/ DSA/8
Carbon	M	M-H	M	M	M-H	L	L	H	L	M-H	M	M-H	L	M	M
Wear	L	L	L	L	M	L	L	L	L	L	L	M	L	L	M
12375 (LSA)															
Rust	10	7/ DS/8	5/ DSA/7	•	10	10	10	10	10	10	1/ DSA/8	10	10	9/D/9	1/ DSA/6
Carbon	M-H	M-H	M-H	M	H	H	M	H	M	H	L	H	M-H	L	H
Wear	L	M	L	•	M	M	M	M	L	M	L	M	L	L	M
09963 (LSA)															
Rust	10	9/D/9	10	7/D/9	10	10	10	10	10	10	10	10	9/D/9	7/ DS/8	5/ DS/8
Carbon	•M-H	H	M-H	H	M-H	M	M	H	M	M-H	M	H	M	L-M	H
Wear	L	L	L	L	M	L	L	L	L	M	M	M-H	L	L	M
13493 (Lube A)															
Rust	• 7/A/5	0.90/ DSA/4	10	0.50/ DSA/3	7/D/9	10	10	10	10	10	1/ DSA/5	10	10	9/D/9	0.90/ DSA/5
Carbon	M-H	H	H	M	M-H	M	M	M-H	M	H	M	M-H	M	L	M-H
Wear	L	M	L	M	M-H	M	M	M	M	M	L	M	L	L	M
09664 (Lube A)															
Rust	9/D/9	1/ DSA/3	10	1/ DSA/7	10	9/D/9	10	10	10	10	1/ DSA/6	10	10	3/ DSA/8	0.90/ DSA/8
Carbon	H	H	H	M	M-H	M-H	M	H	M	H	M	H	M	M	H
Wear	M	M	L	M	M-H	M	M	M	M	M-H	M	M	M	L	M
66081 (S/F)															
Rust	•10	•10	10	10	10	10	10	10	10	10	0.60/ DSA/5	10	10	3/ DSA/7	0.70/ DSA/8
Carbon	M	M-H	M-H	M	M	L	L-M	L-M	L	M	VL	M-H	L	L	M-H
Wear	L	L-M	L	L-M	M	L	L	L-M	L-M	M	L	M	L-M	L	M
64957 (S/F)															
Rust	10	10	10	9/D/9	9/D/9	10	10	10	10	10	0.60/ DSA/5	10	9/D/9	8/ DS/7	0.70/ DSA/6
Carbon	M-H	M-H	M-H	M	M-H	M	L	H	M	M-H	L	H	M	L	H
Wear	L	L	L	L	M-H	L	L-M	L-M	L-M	M-H	L	M	L-M	L	M

V.L. - Very Light L - Light M - Medium H - Heavy VH - Very Heavy 0 - None

TABLE XVI

TION OF XM16E1 RIFLES

Charging Handle	Dust Cover	Upper Receiver	Lower Receiver	Bolt Assist	Barrel	Front Sight	Rear Sight	Trigger	General Comments
10 -H M	7/ DS/8 L L-M	10 H H	10 M L	10 L L	3/ DSA/5 L L	10 0 VL	10 0 VL	10 L L	
10 L M	0.90/ DSA/7 VL L	9.90/ DSA/7 H M	10 M M	10 VL M	0.90/ DSA/7 L M	9/D/9 O L	10 O L	9/D/9 L L	Carrier Key Loose
10 VH M	9/D/9 M L	10 H L	10 M L	10 L L	5/ DSA/8 H M	10 O L	10 O L	10 M L	Bolt Pitted
10 -H L	5/ DSA/7 M L	10 M-H M	10 L L	10 M L	0.90/ DSA/8 M M	9/D/9 O L	10 O L	10 L L	
10 H M	1/ DSA/8 L L	10 H M	10 M-H L	9/D/9 L L	1/ DSA/6 H M	9/D/9 O L	10 O L	10 M-H M	•Broken Substituted Improper Cotter Pin
10 -H M	10 M M	10 H M-H	9/D/9 M L	7/ DS/8 L-M L	5/ DS/8 H M	0.90/ DSA/7 O L	7/ DS/8 O L	10 M L	•Chrome Bolt Carrier
10 H M	1/ DSA/5 M L	10 M-H M	10 M L	9/D/9 L L	0.90/ DSA/5 M-H M	9/D/9 O L	9/D/9 O L	10 M M	•Chrome Bolt Carrier
10 H M-H	1/ DSA/6 M M	10 H M	10 M M	3/ DSA/8 M L	0.90/ DSA/8 H M	9/D/9 O L	0.90/ DSA/6 O L	10 M-H M	
10 M M	0.60/ DSA/5 VL L	10 M-H M	10 L L-M	3/ DSA/7 L L	0.70/ DSA/8 M-H M	0.60/ DSA/5 O L-M	0.70/ DSA/6 O L	5/ DS/7 M L	•Chrome Bolt Carrier & Chrome Bolt
10 M-H M-H	0.60/ DSA/5 L L	10 H M	9/D/9 M L-M	8/ DS/7 L L	0.70/ DSA/6 H M	0.60/ DSA/7 O L-M	0.80/ DSA/6 O L	9/D/9 L L-M	

ery Heavy 0 - None

Serial Number Lubricant	Cover	Shaft	Front Guide	Rear Guide	Cam Assembly	Lever Assembly	Pawl Assembly	Spring	Feed Tray	Plug & Pin Assembly	Actuator	Spring
79508 (LAW)												
Rust	10	10	10	10	10	10	10	10	10	10	10	10
Carbon	L-M	VL	L	L	L	L	L	L	M	L	L-M	L-M
Wear	M	M	M	M	M	M	M	L	M	L	M	L
79405 (LAW)												
Rust	9/D/9	10	7/D/7	3/ DS/5	9/D/9	5/ DS/7	7/D/8	10	10	10	10	10
Carbon	M	L	L	L	L	L	L	VL	M	L	M-H	M
Wear	M	M	M	M-H	M	M	M	L	M	L	M	L
78751 (Lube B)												
Rust	9/D/9	10	3/ DS/7	4/ DS/7	9/D/9	10	5/ DS/5	10	3/ DSA/7	10	10	10
Carbon	M	L	L	L-M	M	M	M	L	M	L	L	M
Wear	M	M	M	M	M	L	M	L	M	L	M	M
79256 (Lube B)												
Rust	10	10	10	10	10	10	10	10	10	10	10	10
Carbon	M	L	L	L	L-M	M	M	L	M	L	M	L
Wear	M	L	M	M	M	M	M	L	M	L	M	L
79398 (LSA)												
Rust	9/D/9	10	0.99/ DSA/7	1/ DSA/8	0.90/ DSA/5	1/ DSA/7	5/ DS/7	0.90/ DSA/5	7/ DS/8	5/ DS/4	10	10
Carbon	M	L	M	M	M	L	M	L	M	L	L	L
Wear	M	M	M	M	M	M	M	M	M	L	M	M
79299 (LSA)												
Rust	10	10	10	10	10	10	10	10	3/ DS/5	•10	10	10
Carbon	M	VL	M	M	M	M	M	L	H	L	M	M
Wear	M	L	M	M	M	M	M	L	H	L	L	M
78753 (Lube A)												
Rust	7/ DS/5	10	10	10	10	8/D/8	3/ DS/5	1/ DSA/3	3/ DSA/4	10	7/ DS/8	10
Carbon	M	L	L	L	L-M	L-M	L	L	M	L	M	M
Wear	M	M	M	M	M	M	M	M	M	L	M	M
79062 (Lube A)												
Rust	7/ DS/6	10	10	5/ DA/6	10	10	10	10	10	5/ DS/6	10	10
Carbon	M	VL	L-M	M	L-M	L-M	L	VL	M	L	L-M	M
Wear	M	M	M	M	L	M	M	M	M	L	M-H	M
79488 (S/F)												
Rust	0.80/ DSA/3	7/D/8	0.70/ DSA/7	0.70/ DSA/7	9/D/9	7/ DS/7	0.90/ DSA/3	9/D/9	0.75/ DSA/3	1/ DSA/5	3/ DSA/7	10
Carbon	L	L	L	L	L	L	L	L	M	L	L	L
Wear	M	M	M	M	M	M	M	L	M	M	M	L
79075 (S/F)												
Rust	1/ DSA/4	9/D/9	9/D/9	7/ DS/7	1/ DSA/5	9/D/9	10	10	1/ DSA/3	10	6/ DS/5	10
Carbon	M	L	L	L	M	M	L	L	M	M	M	M
Wear	M	M	M	M	M	M	L	L	H	M	M	M

V.L. - Very Light L - Light M - Medium H - Heavy VH - Very Heavy

TABLE XVII

EXAMINATION OF M60 MACHINE GUNS

Spring	Feed Tray	Plug & Pin Assembly	Actuator	Spring	Bearing	Firing Pin	Bolt	Operating Rod Assembly	Buffer	Driving Spring Guide	Driving Spring	Barrel	Receiver	Trigger	Leaf Spring	Pin (Retaining) (2)
10 L L	10 M M	10 L L	10 L-M M	10 L-M L	10 L-M M	10 M L	9/D/9 M-H M	10 VH H	10 L M	10 L M	10 L M	0.90/ DSA/5 H H	0.99/ DSA/7 M-H M	10 M M	10 L L	10 L M
10 VL L	10 M M	10 L L	10 M-H M	10 M L	10 L L	10 M L	5/D/8 H M	0.90/ DSA/3 H H	10 H M	10 H L	10 M L	1/ DSA/3 H M	1/ DSA/3 H M	10 L M	10 VL M	10 L M
10 L L	3/ DSA/7 M M	10 L L	10 L M	10 M M	10 L M	10 M L	9/D/9 M-H M	1/ DSA/6 H H	9/D/9 L L	1/ DSA/5 L M	9/D/9 M M	0.50/ DSA/5 M M	0.90/ DSA/3 M-H M-H	10 M-H M	10 L L	9/D/9 L M
10 L L	10 M M	10 L L	10 M M	10 L L	10 L L	10 M-H L	7/D/8 H M	10 VH H	10 L L	10 M L	10 M L	0.90/ DSA/3 H M	0.70/ DSA/3 M M	10 M M	10 VL M	9/D/9 M M
0.90/ DSA/5 L M	7/ DS/8 M M	5/ DS/4 L L	10 L M	10 L M	10 M M	1/ DS/8 M M	9/D/9 H M	10 VH M	7/A/6 M-H L	10 M L	10 M L	1/ DSA/5 M L	10 M-H L	7/A/5 M L	7/A/5 L L	10 L M
10 L L	3/ DS/5 H H	*10 L L	10 M L	10 M M	10 M M	10 M M	7/ DS/7 H H	10 VH H	10 L M	5/A/6 M M	10 M M	1/ DSA/4 H M	0.90/ DSA/3 H M	10 L L	10 L L	10 L L
1/ DSA/3 L M	3/ DSA/4 M M	10 L L	7/ DS/8 M M	10 M M	10 M M	10 M M	9/D/9 M-H M-H	1/ DSA/3 VH H	10 M M	9/D/9 M M	10 M M	0.90/ DSA/3 H M	0.90/ DSA/3 H M	10 M-H M	0.80/ DSA/5 L M	10 L M
10 VL M	10 M M	5/ DS/6 L L	10 L-M M-H	10 M M	10 M M	10 M L	7/ DS/7 M-H M	10 VH H	1/ DSA/5 L M	10 L L	10 L L	0.90/ DSA/3 M-H M	0.90/ DSA/3 M-H M	3/ DS/5 M-H M	10 L M	10 L L
9/D/9 L L	0.75/ DSA/3 M M	1/ DSA/5 L M	3/ DSA/7 L M	10 L L	10 L M	9/D/9 L M	9/D/9 M M	0.95/ DSA/3 H H	0.80/ DSA/4 L M	3/ DSA/5 L M	10 L L	0.90/ DSA/3 H M	0.60/ DSA/2 M M	0.80/ DSA/5 L M	10 L M	5/ DSA/7 L M
10 L L	1/ DSA/3 M H	10 M M	6/ DS/5 M M	10 M M	10 L M	10 M M	8/D/7 H M	0.90/ DSA/3 VH H	1/ DSA/5 L M	7/ DS/5 L M	10 L M	0.90/ DSA/4 H M	0.90/ DSA/3 M M	1/ DSA/5 L L	10 L L	5/ DS/7 L L

- Heavy VH - Very Heavy

Driving Spring	Barrel	Receiver	Trigger	Leaf Spring	Pin (Retaining) (2)	Sear	Plunger	Plunger Spring	Pin Trigger	Gas Piston	Gas Extension	Washers (2)	General Comments
10 L M	0.90/ DSA/5 H H	0.99/ DSA/7 M-H M	10 M M	10 L L	10 L M	10 M-H M	10 M M	10 L-M L	10 L M	0.90/ DSA/3 VH M	0.90/ DSA/3 VH M	1/ DSA/4 M M	
10 M L	1/ DSA/3 H M	1/ DSA/3 H M	10 L M	10 VL M	10 L M	10 L M	10 L M	10 L M	10 L M	0.90/ DSA/4 VH M	0.95/ DSA/5 VH M	5/ DS/7 H M	
9/D/9 M M	0.50/ DSA/5 M M	0.90/ DSA/3 M-H M-H	10 M-H M	10 L L	9/D/9 L M	10 M M	10 L M	10 L L	10 L L	1/ DSA/3 VH M	9/D/9 VH M	9/D/9 VH M	
10 M L	0.90/ DSA/3 H M	0.70/ DSA/3 M M	10 M M	10 VL M	9/D/9 4 M	10 M M	10 M M	10 L L	10 L L	3/ DSA/7 VH M	9/D/9 VH M	9/D/9 VH M	
10 M L	1/ DSA/5 M L	10 M-H L	7/A/5 M L	7/A/5 L L	10 L M	5/ DS/5 M M	10 M L	10 M L	10 L M	0.90/ DSA/3 H M	1/ DSA/3 H M	9/D/9 M M	
10 M M	1/ DSA/4 H M	0.90/ DSA/3 H M	10 L L	10 L L	10 L L	10 M-H L	10 L L	10 L L	10 L L	1/ DSA/3 H H	1/ DSA/3 H M	1/ DSA/4 M H	Missing Pin & Spring
10 M M	0.90/ DSA/3 H M	0.90/ DSA/3 H M	10 M-H M	0.80/ DSA/5 L M	10 L M	10 H M	10 H M	10 L L	10 M M	1/ DSA/3 VH M	3/ DSA/3 VH M	1/ DSA/3 VH M	
10 L L	0.90/ DSA/3 M-H M	0.90/ DSA/3 M-H M	3/ DS/5 M-H M	10 L M	10 L L	10 M-H M	10 M M	10 M M	10 M M	1/ DSA/3 H M	3/ DSA/3 VH M	7/D/8 M M	
10 L L	0.90/ DSA/3 H M	0.60/ DSA/2 M M	0.80/ DSA/5 L M	10 L M	5/ DSA/7 L M	10 L M	10 L L	10 L L	0.90/ DSA/5 L L	1/ DSA/3 VH M	0.95/ DSA/2 VH M	3/ DSA/5 H H	
10 L M	0.90/ DSA/4 H M	0.90/ DSA/3 M M	1/ DSA/5 L L	10 L L	5/ DS/7 L L	10 L M	10 M M	10 L M	10 L L	1/ DSA/5 VH M	9/D/9 VH M	9/D/9 VH M	

TABLE XVIII

EXAMINATION OF M73 MACHINE

Serial Number Lubricant	Cover Assembly	Feed Cam	Feed Support Assembly	Feed Slide Assembly	Feed Tray	Back Plate Assembly	Driving Springs (2)	Guide Rod (2)	Hand Charger Assembly	Barrel Extension Assembly	Breech Block Assembly	Lever Assembly	Carrier Assembly
4712 (LAW)													
Rust	10	10	10	1/ DSA/3	10	10	10	10	10	10	10	1/ DSA/7	3/ DSA/7
Carbon	L	VL	VL	L	L	VL	L	L	VL	L-M	L	L	L
Wear	M	M	M	M	M	M	M	M	M-H	M-H	M-H	M	M
6727 (LAW)													
Rust	10	10	10	10	7/ DS/8	10	10	10	9/D/9	1/ DSA/7	9/D/9	10	3/ DSA/5
Carbon	L	L	L	L	L	L	L	L	VL	L	M	L	M
Wear	M	M	M	M	M	M-H	M	M	M-H	M-H	M-H	M	M-H
4878 (Lube B)													
Rust	3/ DSA/5	10	7/ DS/8	9/D/9	9/D/9	5/ DS/7	10	10	9/D/9	9/D/9	10	10	10
Carbon	L	L	L	L	L	L	L	L	L	L	L	L	L
Wear	M	M	M	M	M	M-H	M	L	M	M-H	M	M	M
5200 (Lube B)													
Rust	9/D/9	10	10	10	10	10	10	10	10	10	10	10	10
Carbon	L	L	L	L	L	VL	VL	VL	L	L	L	L	L
Wear	M	M	L	M	M	L	L	L	M	M	M	M	M
5292 (LSA)													
Rust	10	10	10	10	10	10	10	10	10	10	10	10	10
Carbon	L	L	L	L	L	L	VL	VL	L	L	L	L	L
Wear	M	M	M	M	L	M-H	L	M	M-H	M	M-H	M	M
4879 (LSA)													
Rust	10	10	10	10	10	10	10	10	10	9/D/9	9/D/9	10	10
Carbon	L	L	L	L	L	VL	VL	VL	L	L	L	L	L
Wear	L	L	L	L	L	L	L	L	M	M	M	M	M
5050 (Lube A)													
Rust	10	10	10	10	9/D/9	9/D/9	10	10	9/D/9	10	10	10	10
Carbon	L	L	L	L	L	L	L	L	L	L	L	L	L
Wear	L	L	L	L	M	M	M	M	M	M	M	M	M
4911 (Lube A)													
Rust	10	10	10	10	10	10	10	10	9/D/9	10	10	10	9/D/9
Carbon	L	L	L	L	L	VL	L	L	L	L	L	L	L
Wear	M	M	M	M	M	M-H	M	L	M-H	M	M-H	M	M-H
7538 (S/F)													
Rust	1/ DSA/3	5/ DS/7	9/D/9	5/ DS/7	7/ DS/5	1/ DSA/3	10	10	0.90/ DSA/3	0.60/ DSA/3	1/ DSA/4	0.90/ DSA/3	3/ DSA/5
Carbon	L	L	L	L	L	VL	VL	VL	VL	L	L	L	L
Wear	M	M	M	L	M	M	M	M	M-H	M	M	M	M
1100 (S/F)													
Rust	0.90/ DSA/5	1/ DSA/7	1/ DSA/7	7/ DSA/7	0.70/ DSA/3	1/ DSA/5	9/D/9	9/D/9	0.90/ DSA/3	9/D/9	3/ DSA/5	7/ DS/6	3/ DSA/7
Carbon	L	VL	VL	VL	L	VL	VL	VL	VL	L	L	L	L
Wear	M	M	M	M	M	M	M	M	M-H	M-H	H	M	M

V.L. - Very Light L - Light M - Medium H - Heavy

TABLE XVIII

EXAMINATION OF M73 MACHINE GUNS

Feed Slide Assembly	Feed Tray	Back Plate Assembly	Driving Springs (2)	Guide Rod (2)	Hand Charger Assembly	Barrel Extension Assembly	Breech Block Assembly	Lever Assembly	Carrier Assembly	Hammer	Hammer Spring	Hammer Spring Rod Guide	Rate Control Pawl	Barrel	Rammer Assembly	Rate Control Slide	Buffer Assembly
1/ DSA/3 L M	10 L M	10 VL M	10 L M	10 L M	10 VL M-H	10 L-M M-H	10 L M-H	1/ DSA/7 L M	3/ DSA/7 L M	10 L M-H	10 L M	10 L M	10 L M	1/ DSA/3 M M	9/D/9 M M	10 L M	1 L M
10 L M	7/ DS/8 L M	10 L M-H	10 L M	10 L M	9/D/9 VL M-H	1/ DSA/7 L M-H	9/D/9 M M-H	10 L M	3/ DSA/5 M M-H	0.90/ DSA/7 L M	10 VL L	10 VL M	10 VL M	1/ DSA/3 M M	10 H M	3/ DS/5 L M	1 V L
9/D/9 L M	9/D/9 L M	5/ DS/7 L M-H	10 L M	10 L L	9/D/9 L M	9/D/9 L M-H	10 L M	10 L M	10 L M	10 L M	10 L L	10 L M	10 L L	1/ DS/7 M M	10 L M	10 L M	1 L M
10 L M	10 L M	10 VL L	10 VL L	10 VL L	10 L M	10 L M	10 L M	10 L M	10 L M	10 L M	10 L M	10 L M	10 L M	0.90/ DSA/4 M M	0.95/ DSA/5 M M	10 M M	1 L M
10 L M	10 L L	10 L M-H	10 VL L	10 VL M	10 L M-H	10 L M	10 L M-H	10 L M	10 L M	10 L M	10 L M	10 L M-H	10 L L	3/ DSA/7 M M	10 M M	10 L M	1 L M
10 L L	10 L L	10 VL L	10 VL L	10 VL L	10 L M	9/D/9 L M	9/D/9 L M	10 L M	10 L M	10 L M	10 L L	10 VL M	10 VL L	1/ DSA/7 M M	9/D/9 L M	10 L M	9/1 L
10 L L	9/D/9 L M	9/D/9 L M	10 L M	10 L M	9/D/9 L M	10 L M	10 L M	10 L M	10 L M	10 L M	10 L M	10 L M	10 L M	0.95/ DSA/3 M M	10 M M	10 L M	
10 L M	10 L M	10 VL M-H	10 L M	10 L L	9/D/9 L M-H	10 L M	10 L M-H	10 L M	9/D/9 L M-H	10 L M-H	10 L M	10 L M	10 VL L	7/D/8 M L	10 L L	10 L M	
5/ DS/7 L L	7/ DS/5 L M	1/ DSA/3 VL M	10 VL M	10 VL M	0.90/ DSA/3 VL M-H	0.60/ DSA/3 L M	1/ DSA/4 L M	0.90/ DSA/3 L M	3/ DSA/5 L M	0.90/ DSA/5 L M	10 L L	10 VL L	9/D/9 VL M	0.90/ DSA/5 M M	1/ DSA/7 L M	9/D/9 L M	9/
7/ DSA/7 VL M	0.70/ DSA/3 L M	1/ DSA/5 VL M	9/D/9 VL M	9/D/9 VL M	0.90/ DSA/3 VL M-H	9/D/9 L M-H	3/ DSA/5 L H	7/ DS/6 L M	3/ DSA/7 L M	9/D/9 L H	9/D/9 L M	7/ DS/8 L M	10 VL L	0.95/ DSA/5 M M	3/ DSA/7 L M	1/ DSA/5 L M	3/ D

- Light M - Medium H - Heavy

E GUNS

Hammer	Hammer Spring	Hammer Spring Rod Guide	Rate Control Pawl	Barrel	Rammer Assembly	Rate Control Slide	Buffer Assembly	Breech Block Cam	Receiver Assembly	General Comments
10 L -H	10 L M	10 L M	10 L M	1/ DSA/3 M M	9/D/9 M M	10 L M	10 L M	10 L M-H	9/D/9 M M-H	
.90/ SA/7 L M	10 VL L	10 VL M	10 VL M	1/ DSA/3 M M	10 H M	3/ DS/5 L M	10 VL L	10 L M	9/D/9 M M-H	2-cotter pins & 1 pin missing in receiver assembly
10 L M	10 L L	10 L M	10 L L	1/ DS/7 M M	10 L M	10 L M	10 L M	2/ DSA/5 L M	1/ DSA/6 M M	
10 L M	10 L M	10 L M	10 L M	0.90/ DSA/4 M M	0.95/ DSA/5 M M	10 M M	10 L M	10 L M	10 M M	
10 L M	10 L M	10 L M-H	10 L L	3/ DSA/7 M M	10 M M	10 L M	10 L L	10 L L	9/D/9 L M	
10 L M	10 L L	10 VL M	10 VL L	1/ DSA/7 M M	9/D/9 L M	10 L M	9/D/9 L M	10 M M	7/DS/8 M M	
10 L M	10 L M	10 L M	10 L M	0.95/ DSA/3 M M	10 M M	10 L M	10 L L	10 L M	10 L M	
10 L -H	10 L M	10 L M	10 VL L	7/D/8 M L	10 L L	10 L M	10 L M	10 L M	10 L M	Firing pin extension spring missing
.90/ SA/5 L M	10 L L	10 VL L	9/D/9 VL M	0.90/ DSA/5 M M	1/ DSA/7 L M	9/D/9 L M	9/D/9 L M	5/A/3 L M	0.90/ DSA/5 L M-H	
/D/9 L H	9/D/9 L M	7/ DS/8 L M	10 VL L	0.95/ DSA/5 M M	3/ DSA/7 L M	1/ DSA/5 L M	3/ DSA/6 L M	9/D/9 L M	0.90/ DSA/5 L M-H	

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13 ABSTRACT

An Engineer Design Test of small arms lubricants was conducted at the U. S. Army Arctic Test Center utilizing MIL-L-14107(LAW), MIL-L-46000 (LSA), MIL-L-46010(S/F) and Experimental Lubricants A and B. The weapons utilized were M14 and XM16E1 rifles and M60 and M73 machine guns. The purpose of the test was to determine the suitability of the lubricants under winter (-10 to -59°F) and spring "break up" (32° to 44°F) conditions as compared to the currently authorized lubricant LAW. Data were obtained concerning the number of malfunctions and evidence of rust, carbon and wear for each lubricant, and the ease of lubricant application. It was concluded that Experimental Lubricants A and B were best suited for use on all the small arms weapons. Indications were made as to the lubricants best suited for each specific weapon. Lubricants A and B proved to be superior overall to the currently authorized lubricant LAW. Lack of lubrication on certain parts of the weapons and incomplete cleaning between tests prevented this from being a true lubricant test. It was recommended that Lubricants A and B be returned to the Arctic for an Engineer Design Test to determine their suitability as compared to LSA. It was further recommended that work initiated to develop an aerosol container for Arctic use be continued. Finally, it was recommended that S/F be considered unsuitable for use on small arms under both Arctic winter and spring "break up" conditions. (U) (Author)

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