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ORDBG-1327--26 Oct 51

Aberdeen Proving Ground

MARYLAND

A TEST OF U.S. RIFLE, CALIBER .30, M1

D. A. Project No. 502-08-006
DEVELOPMENT AND PROOF SERVICES
28th Report OCO Project No. TS2-2015

ARMY---OO---ABERDEEN PROVING GROUND, MD.--415

A TEST OF U. S. RIFLE, CALIBER .30, M1

TWENTY-EIGHTH REPORT ON PROJECT NO. TS2-2015

HEADQUARTERS
9301 TSU (ORD) CLIMATIC TEST DETACHMENT
Yuma Test Station
Yuma, Arizona

CGRobinson/jab/
22 October 1953

Authority: ORDTS
DA Priority: 1C

A TEST OF U. S. RIFLE, CALIBER .30, M1

TWENTY-EIGHTH REPORT ON PROJECT NO. TS2-2015

DATES OF TEST: 17 August to 7 September 1953

OBJECT

To evaluate functioning performance of weapons, after exposure to desert heat and blowing sand, when prepared with standard and experimental lubricants.

SUMMARY

Two U. S. Rifles, Caliber .30, M1, were tested with lubricants which were manufactured under MIL-L-644A and NRL E-51 specifications. The Lubricant developed under the NRL E-51 specification was definitely unsatisfactory for the M1 rifle under desert conditions.

CONCLUSIONS

It is concluded that the lubricant which meets the NRL E-51 specification should not be used on the M1 rifle when desert conditions exist.

RECOMMENDATIONS

It is recommended that the lubricant meeting specification MIL-L-644A be used on the U. S. Rifle, caliber .30, M1 for desert operation.

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I. INTRODUCTION

A. DISCUSSION

The original test was to have been a comparative test of the T44, FN, and M1 rifles. Since the T44 and FN rifles were not available at the time scheduled for the test, the test was continued with the M1 rifle only, and the test was primarily for the purpose of comparing lubricants. The M1 rifle used for the test was the standard U. S. Rifle, Caliber .30, M1.

B. REFERENCES

1. Authority for test (copy attached as Appendix A).

a. Letter file OO 400.112/1205 APG, APG 400.112/9-288 dated 2 April 1953, Subject: Approval of the Ordnance Climatic Test Program for Yuma, Arizona for the Summer 1953.

b. Letter file OO 400.112/875 Aberdeen, dated 16 March 1953, Subject: Approval of Ordnance Climatic Test Program, Yuma, Arizona, Summer, 1953.

c. APG Memorandum from Acting Chief, Arms and Ammunition Division to Chief, Climatic Test Division dated 30 July 1953, Subject: Summer Tests at Yuma, Arizona, 1953.

2. Technical References

a. Development and Proof Services Sixteenth Report on Project No. TS2-2023; Title: A Test of Weapon Mount, M74, Modified.

b. Development and Proof Services Fifteenth Report on Project No. TS2-2023; Title: A Test of Machine Gun, Caliber .30, T153.

c. Development and Proof Services Firing Record No. 1479.

d. Test Plan.

II. DESCRIPTION OF MATERIEL

A. The standard U. S. Rifle, Caliber .30, M1, is described in War Department Technical Manual Number TM9-1275.

III. DETAILS OF TEST

A. PROCEDURES

1. One of the rifles was thoroughly cleaned and degreased before being oiled lightly with oil, MIL-L-644A. The other rifle was prepared in the same manner except that experimental oil, NRL E-51 was used.

2. The two weapons were stored in such a manner that full exposure to outdoor weather conditions resulted. Each weapon was fired twenty rounds on the first day and twenty rounds daily thereafter for a period of ten days. Both weapons were fired from the shoulder.

3. The weapons were cleaned and re-oiled and the test repeated. In the repeated phase of the test the weapons were lubricated in such a manner that the one having oil MIL-L-644A for the first phase then had oil NRL E-51 for the repeated phase, to insure that the difference in individual weapon performance was equally distributed for the two types of lubricant.

4. Observations included the performance of weapon and ammunition; comfort and convenience in operating weapon under conditions of excessive heat; ease of adjusting sights; vulnerability of various components and assemblies to blowing sand; and evaporation of lubricant. Components were observed which could burn the gunner because of contact with face or hands after gun exposure to direct sunlight.

B. RESULTS

1. Total number of malfunctions:

	Lubricant		
Serial No. of weapon	MIL-L-644A	NRL E-51	Total
3470273	12	68	80
1225565	1	11	12
Total:	13	79	92

2. Overall operation of those weapons lubricated with the NRL E-51 oil was very unsatisfactory.

C. OBSERVATIONS

1. It was observed that the M1 rifle is very sensitive to the lubricant under desert conditions as is shown by the summary above.

2. When the rifles were disassembled after completing the first cycle it was observed that the one lubricated with the NRL E-51 oil was

completely dry but contained less sand than the one lubricated with MIL-L-644A oil. An attempt was made to show this in photograph number A91949.

3. It was also observed that the lubricant NRL E-51 allowed more wear on the working parts.

D. OBSERVERS

None

IV. CONCLUSIONS

A. The lubricant which meets specification NRL E-51 is completely unsatisfactory for use on the U. S. Rifle, Caliber .30, M1 under conditions of exposure to desert summer weather.

B. Weapon and ammunition performance was satisfactory, although the weapon performance is slightly reduced because of dust entering the trigger mechanism, when proper lubricant was employed.

C. No difficulty was encountered with sight adjustments.

D. Ease and convenience of operation under desert heat was satisfactory.

E. The lubricant NRL E-51 had a very high rate of evaporation as compared to the MIL-L-644A lubricant.

V. RECOMMENDATIONS

A. It is recommended that further test on the U. S. Rifle, Caliber .30, M1, lubricated with the oil NRL E-51 be discontinued in favor of the oil MIL-L-644A, for use under summer desert conditions.

B. That a method be developed which will raise the boiling point of the NRL-E-51 oil without increasing the viscosity. A suggested way of accomplishing this would be by means of chemical additives. If the boiling point could be raised sufficiently without affecting the viscosity, the NRL E-51 lubricant may prove superior to the MIL-L-644A lubricant.

REVIEWED BY:

C. M. STRATTON
Lt. Col., Ord Corps

PREPARED BY:

CARROLL G. ROBINSON
Project Engineer
Southwest Research Institute

APPROVED BY:

for T. F. COLLERAN
Director, D&PS

SUBMITTED BY:

BENJAMIN S. GOODWIN
Chief, A&A Division

RECORD OF EQUIPMENT PERFORMANCE

Item of Equipment: U. S. Rifle, Caliber .30, M1

Rated by: C. G. Robinson   Date: 23 October 1953

[illegible]	RATING	SOURCE	REMARKS
Durability			
ENVIRONMENTAL FACTOR			
Hard Surface Road			
Gravel Surface Road			
Unsurfaced Trail			
Rough Hard Ground			
Stony or Rocky Ground			
Sand (dry)			
Loose Sand (shallow water)			
Clay (wet)			
Muskeg (frozen)			
Muskeg (unfrozen)			
Frozen Ground			
Hilly or Mountainous			
Swamp			
Smooth Ice			
Rough Ice			
Pack Ice			
Hard Packed Snow			
Dry Snow, Powdery to 18"			
Dry Snow, Powdery over 18"			
Dry Snow, Compacted to 18"			
Dry Snow, Compacted over 18"			
Wet Snow			
Water less than 2' depth			
Water to 5' depth			
Water over 5' depth			
Temp. below -65°F. (storage)			
Temp. from -65°F. to -25°F.			
Temp. from -25°F. to +32°F.			
Temp. from +32°F. to +90°F.			
Temp. from +90°F. to +125°F.			Requires lubricant MIL-L-644A Max. +125°F
Temp. over +125°F.			
Radiation to 360 BTU/Ft.Sq./Hr.			3[illegible]2 BTU/Ft. Sq./Hr. Max.
Dust, Airborne			
Blowing Sand			
Blowing Snow			
Rain			
Snowfall, Heavy			
Ice Fog			
Sleet (Freezing)			
Wind (over 25 mph)			
Altitude to 5,000'			
Altitude over 5,000'			
Tropical Humidity			
Forest (open)			
Brush (dense)			
Tundra (unfrozen)			
Windchill (700 to 1400)			
Windchill (1400 to 1900)			
Windchill (over 1900)			

RECORD OF EQUIPMENT PERFORMANCE

Item of Equipment: Lubricant, NRL E-51

Rated by: C. G. Robinson Date: 23 October 1953

	RATING	SOURCE	REMARKS
Durability			
ENVIRONMENTAL FACTOR			
Hard Surface Road			
Gravel Surface Road			
Unsurfaced Trail			
Rough Hard Ground			
Stony or Rocky Ground			
Sand (dry)			
Loose Sand (shallow water)			
Clay (wet)			
Muskeg (frozen)			
Muskeg (unfrozen)			
Frozen Ground			
Hilly or Mountainous			
Swamp			
Smooth Ice			
Rough Ice			
Pack Ice			
Hard Packed Snow			
Dry Snow, Powdery to 18"			
Dry Snow, Powdery over 18"			
Dry Snow, Compacted to 18"			
Dry Snow, Compacted over 18"			
Wet Snow			
Water less than 2" depth			
Water to 5" depth			
Water over 5" depth			
Temp. Below -65°F. (storage)			
Temp. from -65°F. to -25°F.			
Temp. from -25°F. to +32°F.			
Temp. from +32°F. to +90°F.			
Temp. from +90°F. to +125°F.			
Temp. over +125°F.			
Radiation up to 360 BTU/Ft.Sq./Hr.			
Dust, Airborne			
Blowing Sand			
Blowing Snow			
Rain			
Snowfall, Heavy			
Dense Fog			
Sleet (freezing)			
Wind (over 25 mph)			
Altitude to 5,000'			
Altitude over 5,000'			
Tropical Humidity			
Forest (open)			
Brush (dense)			
Tundra (unfrozen)			
Windchill (700 to 1100)			
Windchill (1100 to 1900)			
Windchill (over 1900)			

RECORD OF EQUIPMENT PERFORMANCE

Item of Equipment: [illegible]

Rated by: C. G. Robinson Date: [illegible] October 194[illegible]

	RATING & SOURCE		REMARKS
Durability			
ENVIRONMENTAL FACTOR			
Hard Surface Road			
Gravel Surface Road			
Unsurfaced [illegible]			
Rough Hard Ground			
Stony or Rocky Ground			
Sand (dry)			Sand will [illegible]
Loose Sand (shallow water)			
Clay (wet)			
Muskeg (frozen)			
Muskeg (unfrozen)			
Frozen Ground			
Hilly or Mountainous			
Swamp			
Smooth Ice			
Rough Ice			
Pack Ice			
Hard Packed Snow			
Dry Snow, Powdery to 18"			
Dry Snow, Powdery over 18"			
Dry Snow, Compacted to 18"			
Dry Snow, Compacted over 18"			
Wet Snow			
Water less than 2' depth			
Water to [illegible] depth			
Water over [illegible] depth			
Temp. below [illegible] F. (average)			
Temp. from -65° F. to -25° F.			
Temp. from -25° F. to +32° F.			
Temp. from +32° F. to +90° F.			
Temp. from +90° F. to +125° F.			[illegible]
Temp. over +125° F.			
Radiation to 400 BTU/Hr.Sq.Ft.			[illegible]
Dust, Airborne			
Blowing Sand			
Blowing Snow			
Rain			
Snowfall, Heavy			
Ice Fog			
Sleet (Freezing)			
Wind (over 25 mph)			
Altitude [illegible]			
Altitude [illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible]			
[illegible] to 1000)			
[illegible]			

APPENDICES

A. Correspondence

B. Firing Record

C. Photographs

APPENDIX A

Correspondence

1. Letter file OO. 400.112/1205 APG, APG 400.112/9-283 dated 2 April 1953, Subject: Approval of the Ordnance Climatic Test Program for Yuma, Arizona for the Summer of 1953.

2. Letter file OO 400.112/875 Aberdeen, dated 16 March 1953, Subject: Approval of Ordnance Climatic Test Program, Yuma, Arizona, Summer, 1953.

3. Test Plan.

4. Memorandum from Acting Chief, Arms and Ammunition Division to Chief, Climatic Test Division, Subject: Summer Test at Yuma, Arizona, 1953.

COPY

WAR DEPARTMENT SAZweibel/sz/55827

0.0 400.112/1205 APG
ORDTB

OFFICE OF THE CHIEF OF ORDNANCE

WASHINGTON, D. C.

APG 400.112/9-285

2 April 1953

SUBJECT: Approval of the Ordnance Climatic Test Program for Yuma, Arizona for the Summer 1953

TO: Commanding General
Aberdeen Proving Ground
Maryland

ATTN: Development and Proof Services
Climatic Test Division

1. Reference is made to letter from this office, file No. 00 400.112/875 Aberdeen, dated 16 March 1953, subject as above, giving verbal approval of the program.

2. Formal approval of the desert test program for the summer of 1953 has been received from the Assistant Chief of Staff, G-4.

3. Authorization has been given for direct correspondence with the Commanding Officer, Yuma Test Station on administrative and logistic support and the Chief Signal Officer on meteorological support.

BY COMMAND OF MAJOR GENERAL FORD:

/s/ N. L. Klein
N. L. KLEIN
Assistant

10

COPY

WAR DEPARTMENT
OFFICE OF THE CHIEF OF ORDNANCE
WASHINGTON, D.C.

SZweibel/sz/55827

To insure prompt attention
replying refer to:
O.O. 400.112/875 Aberdeen

16 March 1953

Attention of
ORDTB

SUBJECT: Approval of Ordnance Climatic Test Program, Yuma, Arizona, Summer, 1953

TO: Commanding General
Aberdeen Proving Ground
Maryland

ATTN: Climatic Test Division
Development and Proof Services

1. Forwarded herewith is the Program for the Ordnance Climatic Tests for Yuma, Arizona, for the Summer of 1953, for which verbal approval has been received from Lt Col L. M. Hoover, ACofA, G-4. Formal approval will be forwarded to your office as soon as it has been received.

2. The fleet of 15 vehicles marked by astericks (*) will be requisitioned by this office. It is requested that the necessary requisitioning for the remainder of the equipment be accomplished at the earliest possible date by your office.

BY COMMAND OF MAJOR GENERAL FORD:

/s/ N. L. KLEIN
Assistant

1 Incl:
Subj Prog (In Dup)

PROJECT:

PROJECT NO.: TS2-2015

PROJECT ENGINEER: Robinson

AUTHORITY: ORDTS

O.C.M. ITEM:

PRIORITY: 1C

QUANTITY: 2 - Rifle,Light Weight,Cal. .30, T44
2 - Rifle, Light Weigt,CAL. .30, FN
2 - Rifle, U.S.,Cal..30,M1

OBJECT OF TEST: To evaluate functioning performance of weapons, after exposure to desert heat and blowing sand, when prepared with standard and experimental lubricants.

SYNOPSIS OF PRESENT SITUATION: Army Field Forces have narrowed the choice of light rifles which might be picked for standardization to the T44 and the FN. Both weapons have given fairly good performances in engineering tests at APG and in field trials at Fort Benning. Early standardization of one of these rifles appears likely.

DESCRIPTION: The T44 and FN rifles were designed to meet Army Field Forces requirements for a light-weight weapon to replace the M1. Both of these rifles are chambered for the light-rifle cartridge and have 20-round magazines. Firing can be either semi or full-automatic. The T44 is a further modification of the M1 rifle, hence many of the machine tools available for M1 rifle production could be used to produce it. The distinguishing features of the FN rifle are its ease of field maintenance and its mechanical simplicity.

FACILITIES REQUIRED: The same facilities required to test the light machine guns can be used.

INSTRUMENTATION REQUIRED: None.

DETAILED TEST PROCEDURE: The same procedure specified for the light machine guns will be employed except that one 20-round magazine will be fired each day, half of the firing to be in full-automatic bursts. The M1 rifle will be the control weapon.

COPY

Mr. ACWood/pk/2284
DATE: 30 July 1953

TO : Chief, Climatic Test Division

FROM : Acting Chief, Arms and Ammunition Division

SUBJECT: Summer Tests at Yuma Arizona, 1953

It is requested that the following items be deleted from the tests recommended by the Arms and Ammunition Division for summer operations at Yuma this year:

1. Light machine gun, Cal. .30 T52
2. Light Rifle, Cal. .30 T44
3. Light Rifle Cal .30 FN

The above items are being dropped from the program because of their non-availability.

4. Rifle, Recoilless, 57mm, T66E2A1

Removed because of design failure in the weapon discovered at Aberdeen in recent tests.

BENJAMIN S. GOODWIN

/s/ ARTHUR C. WOOD

ORDBG-DPS-CTD 1st Ind Mr Christopher/lbs/5233
Chief, Climatic Test Division

TO: CO, OCTD, Yuma Test Station, Yuma, Arizona, 3 August 1953

For your information and necessary action.

ROBERT G. BLAYLOCK
Lt Col Ord Corps

/s/W.C. Christopher
W. C. CHRISTOPHER
Assistant Chief
Climatic Test Division

APPENDIX B

Development and Proof Services Firing Record No. 1479

HEADQUARTERS
9301 TSU (ORD) CLIMATIC TEST DETACHMENT
Yuma Test Station
Yuma, Arizona

OBJECT OF TEST: To Evaluate Functioning Performance of Weapons, After Exposure to Desert Heat and Blowing Sand, When Prepared with Standard and Experimental Lubricants.

DATE OF TEST: 17 Aug thru 7 Sep 1953
FIRING RECORD NO: 1479
SHEET 1 OF 7
AUTHORITY: OCO letter dated 2 Apr 1953 O.O.400.112/1205 APG
WORK ORDER: 14-01

DEVELOPMENT: ORDTS
PROJECT NO.: TS2-2015
RELATED FIRING RECORDS: 1453 - 1481

MATERIEL

U. S. Rifle, Cal. .30, M1, Winchester No. 1225565
U. S. Rifle, Cal. .30, M1, Springfield Armory No. 3470273

Oil Lubricating Preservative, Sp(PL-SP)
Specification MIL-L-644A w/Amend. 1
Stk No. 14-O-2833-994
Cont. DA-28-024-ORD-1990(52)
American Oil & Supply Company
Newark, New Jersey

Oil Lubricating
Preservative for 20MM M-3 Aircraft Machine Gun
NRL E-51
BuORD Stock No. 1941-O-50
Contract No. NORD 12123
Lehigh Chemical Products Company
Chestertown, Maryland

AMMUNITION

Cartridge, ball, caliber .30, M2, Lot No. F.A. 4046
Cartridge, ball, caliber .30, M2, Lot No. TWL 40818

FACILITIES

No special facilities were required.

ROUND-BY-ROUND DATA

DATE	TIME	ROUNDS	REMARKS
U. S. Rifle, Cal. .30, M1, Springfield Armory No. 3470273 Lubricated with MIL-L-644A Ammunition Lot No. FA-4046			
Aug. 17	1430	20	Rapid fire - Satisfactory
18	1330	20	Rapid fire - Satisfactory
19	1000	20	Rapid fire - Satisfactory

FIRING RECORD NO. 1479
SHEET 2 OF 7

DATE	TIME	ROUNDS	REMARKS
Aug. 20	1050	20	Rapid fire - Satisfactory
21	0958	20	Rapid fire - Satisfactory
22	1030	20	Rapid fire - Satisfactory
23	1052	20	Rapid fire - Satisfactory
24	1035	1-13	14th rd. failed to feed. Bolt did not return far enough to rear.
		14-20	Rapid fire - Satisfactory
25	1012	1-4	Large amount of sand had accumulated on weapon overnight. 5th rd. failed to feed. Bolt does not return all the way to rear.
		5-12	Failed to eject clip after 12th round.
		13	14th rd. failed to feed because of short bolt action.
		14-15	16th rd. failed to feed because of short bolt action.
		16	17th rd. failed to feed because of short bolt action.
		17	18th rd. failed to feed because of short bolt action.
		18-20	Failed to eject clip after firing 20th rd. Gas cylinder lock screw was slightly loose and was tightened.
26	1425	1-9	10th rd. failed to feed because bolt did not return far enough to the rear.
		10-11	12th rd. failed to feed because bolt did not return far enough to the rear.
		12-13	13th rd. failed to eject. Operating rod was off bolt.
		14-20	Rapid fire - Satisfactory. Weapon has less binding and is easier to operate than other Ml. Has also collected more sand than other Ml.
27	1055	1-13	14th rd. failed to feed.
		14-20	Rapid fire - Satisfactory Weapon operates much easier than other Ml.

U. S. Rifle, Cal. .30, Ml, Springfield Armory No. 3470273 Lubricated with MIL. L-51
Ammunition - Lot No. FA-4046

Aug. 28	1545	9	2nd, 4th, 7th, and 9th rounds failed to fire. Returned rifle for reassembly and replaced firing pin with a new one.
	1615	20	Rapid fire - Satisfactory

FIRING RECORD NO. 1479
SHEET 3 OF 7

DATE	TIME	ROUNDS	REMARKS
Aug. 29	1510	20	Rapid fire - Satisfactory
30	1440	20	Rapid fire - Satisfactory Out side housing of weapon is beginning to get dry.
31	1330	20	Rapid fire - Satisfactory
Sep. 1	1500	1-4	Weapon is drying faster than other Mfl. Bolt is harder to operate and hangs up similiar to the other weapon with this oil.
		Lot No TWL-40818	
		5-20	Rapid fire - Satisfactory
2	1548	1-10	Outside of weapon is dry but the working parts still have oil. Bolt is also hard to operate when trigger has been pulled. 11th round failed to feed. Round did not come up high enough to enter chamber.
		11-16	Rapid fire - Satisfactory Clip failed to eject because the bolt did not return far enough to the rear.
		17-20	Satisfactory
3	1437	1	Bolt is still hard to open. 2nd round did not feed because of bolt not returning far enough to rear. Did eject round that fired.
		2-17	18th round failed for the same reason.
		18	19th round failed for the same reason.
		19	20th round failed for the same reason. Cannot open bolt by hand.
		20	Satisfactory.
4	1535	1	Bolt was hard to open before firing. 2nd round failed to feed because bolt did not return far enough.
		2-4	5th round failed to feed for same reason.
		5-6	7th round failed to feed for same reason.
		7	8th round failed to feed for same reason.
		8-9	10th round failed to feed for same reason.
		10	11th round failed to feed for same reason.
		11	12th round failed to feed for same reason.
		12-17	18th round failed to feed for same reason.
		18	19th round failed to feed for same reason.
		19-20	Satisfactory
Sep. 5	1453	1	Could not get bolt open without using force before firing in order to remove round left in chamber. 2nd round failed to feed because bolt did not return to rear far enough.

DATE	TIME	ROUNDS	REMARKS
Sep. 5	1453	2	3rd failed to feed for same reason.
		3-8	Fired Satisfactory but failed to eject clip.
		9	10th round failed to feed for same reason as No. 2.
		10	11th round failed to feed for same reason as No. 2.
		11	12th round failed to feed for same reason as No. 2.
		12	13th round failed to feed for same reason as No. 2.
		13	14th round failed to feed for same reason as No. 2.
		14	15th round failed to feed for same reason as No. 2.
		15	16th round failed to feed for same reason as No. 2.
		16	Clip failed to eject.
		17	18th round failed to feed as bolt stuck 1 1/4" from chamber.
		18	19th round failed to feed. Reason in No. 2
		19	20th round failed to feed. Reason in No. 2
		20	Could not open bolt by hand.
Sep. 6	1500	1	2nd round failed to feed because bolt did not return far enough to rear.
		2	3rd round failed to feed. Same reason as No. 2.
		3	4th round failed to feed. Same reason as No. 2.
		4	5th round failed to feed. Same reason as No. 2.
		5	6th round failed to feed. Same reason as No. 2.
		6	7th round failed to feed. Same reason as No. 2.
		7	8th round failed to feed. Same reason as No. 2.
		8	9th round failed to feed. Same reason as No. 2.
		9	10th round failed to feed. Same reason as No. 2.
		10	11th round failed to feed. Same reason as No. 2.
		11	12th round failed to feed. Same reason as No. 2.
		12	Failed to eject clip.
		13	14th round failed to feed. Same reason as No. 2.
		14	15th round failed to feed. Same reason as No. 2.
		15	16th round failed to feed. Same reason as No. 2.
		16	17th round failed to feed. Same reason as No. 2.
		17	18th round failed to feed. Same reason as No. 2.
		18	19th round failed to feed. Same reason as No. 2.
		19	20th round failed to feed. Same reason as No. 2.
		20	Failed to eject clip.

FIRING RECORD NO. 1479
SHEET 5 OF 7

DATE	TIME	ROUNDS	REMARKS
Sep. 7	1507	1	Had to force bolt open in order to remove round in chamber. Bolt does not go all the way into battery position. 2nd round failed to feed because the bolt does not return all the distance to rear position when fired.
		2	3rd round failed to feed. Same reason as No. 2.
		3	4th round failed to feed. Same reason as No. 2.
		4-5	5th round failed to eject. Bolt stopped at mid-point position.
		6	7th round failed to feed. Same reason as No. 2.
		7	8th round failed to feed. Same reason as No. 2.
		8	Bolt stayed back and clip failed to eject.
		9	9th round failed to eject.
		10	11th round failed to feed. Same reason as No. 2.
		11	11th round failed to eject.
		12	12th round failed to eject.
		13	13th round failed to eject.
		14	14th round failed to eject.
		15	15th round failed to eject.
		16	16th round failed to eject. Bolt does not leave chamber. Clip did not eject.
		17	17th round failed to eject.
		18	18th round failed to eject.
		19	19th round failed to eject.
		20	20th round failed to eject.

U. S. Rifle, Cal. .30, M1, Winchester No. 1229565 Lubricated with MIL E-51
Ammunition - Lot No. FA-4046

Aug. 17	1610	20	Rapid fire - Satisfactory
18	1335	20	Rapid fire - Satisfactory. Oil evaporates faster than M1 with MIL-L-644A oil.
19	1005	20	Rapid fire - Satisfactory
20	1055	20	Rapid fire - Satisfactory. Oil is collecting dust around chamber
21	0956	20	Rapid fire - Satisfactory
22	1035	20	Rapid fire - Satisfactory. Bolt squeaks and is dry.
23	1050	20	Rapid fire - Satisfactory. Almost impossible to open bolt by hand in order to remove round in chamber before firing.
24	1033	1	Fired round in chamber to open bolt. Could not open it with hands.

DATE	TIME	ROUND	REMARKS
Aug. 24	1033	2	Bolt still fails to open with use of hands.
		3	Bolt still fails to open with use of hands.
		4	Bolt still fails to open with use of hands.
		5-20	Rapid fire - Satisfactory
25	1010	20	Rapid fire - Satisfactory
26	1420	1-12	Rapid fire - Satisfactory. Fired chambered round to open bolt first. Clip was not ejected.
		13	14th round failed to feed as bolt did not return all the way to rear.
		14-17	18th round failed to feed as bolt did not return all the way to rear.
		18-20	Rapid fire - Satisfactory.
27	1045	1	Bolt failed to return to rear after firing first round.
		2-8	Rapid fire - Satisfactory. 9th round failed to feed. Bolt did not leave forward position, and is unusually hard to open.
		9-12	13th round failed to feed. Same reason a (9).
		13-16	Rapid fire - Satisfactory. Clip failed to eject.
		17	18th round failed to feed.
		18-20	Rapid fire - Satisfactory.

U. S. Rifle, Cal. .30, M1, Winchester No. 1225565 Lubricated with MIL -L-644A

Aug. 28	1545	20	Rapid fire - Satisfactory
29	1510	20	Rapid fire - Satisfactory
30	1440	20	Rapid fire - Satisfactory. Weapon is still damp with oil.
31	1130	20	Rapid fire - Satisfactory
Sep. 1	1500	20	Rapid fire - Satisfactory
	(Lot No, TWL-40818)		
2	1552	20	Rapid fire - Satisfactory
3	1442	20	Rapid fire - Satisfactory
4	1515	20	Rapid fire - Satisfactory
5	1503	20	Rapid fire - Satisfactory
6	1508	20	Rapid fire - Satisfactory
7	1515	1-12	Rapid fire - Satisfactory. Clip failed to eject.
		13-20	Rapid fire - Satisfactory.

FIRING RECORD NO. 1479
SHEET 7 OF 7

SUMMARY

WEAPON NO.	LUBRICANT	NO. STOPPAGES*
3470273	MIL-L-644A	10
3470273	NRL E-51	62
1225565	NRL E-51	6
1225565	MIL-L-644A	0

*Does not include failures to eject clip or those encountered on the first day of firing a cycle.

LUBRICANT	NO. STOPPAGES
MIL-L-644A	10
NRL E-51	68

OBSERVATIONS

It was observed that the Rifle, M1, is very sensitive to the lubricant under desert conditions as is shown by the summary above.

When the Rifles were disassembled after completing the first cycle it was observed that the one with the NRL E-51 lubricant was completely dry but contained less sand than the one with the MIL-L-644A lubricant. An attempt was made to show this in photograph number A91949.

It was also observed that the NRL E-51 lubricant allowed more wear on the working parts.

It was also observed that the overall working quality of the weapon lubricated with the MIL-L-644A oil was far superior to that lubricated with the NRL E-51 oil.

OBSERVERS

None

Carroll G. Robinson

C. K. STRATTON
Lt. Col., Ord Corps
Commanding

CARROLL G. ROBINSON
Project Engineer
Southwest Research Institute

Inclosure: Photograph No. A91949

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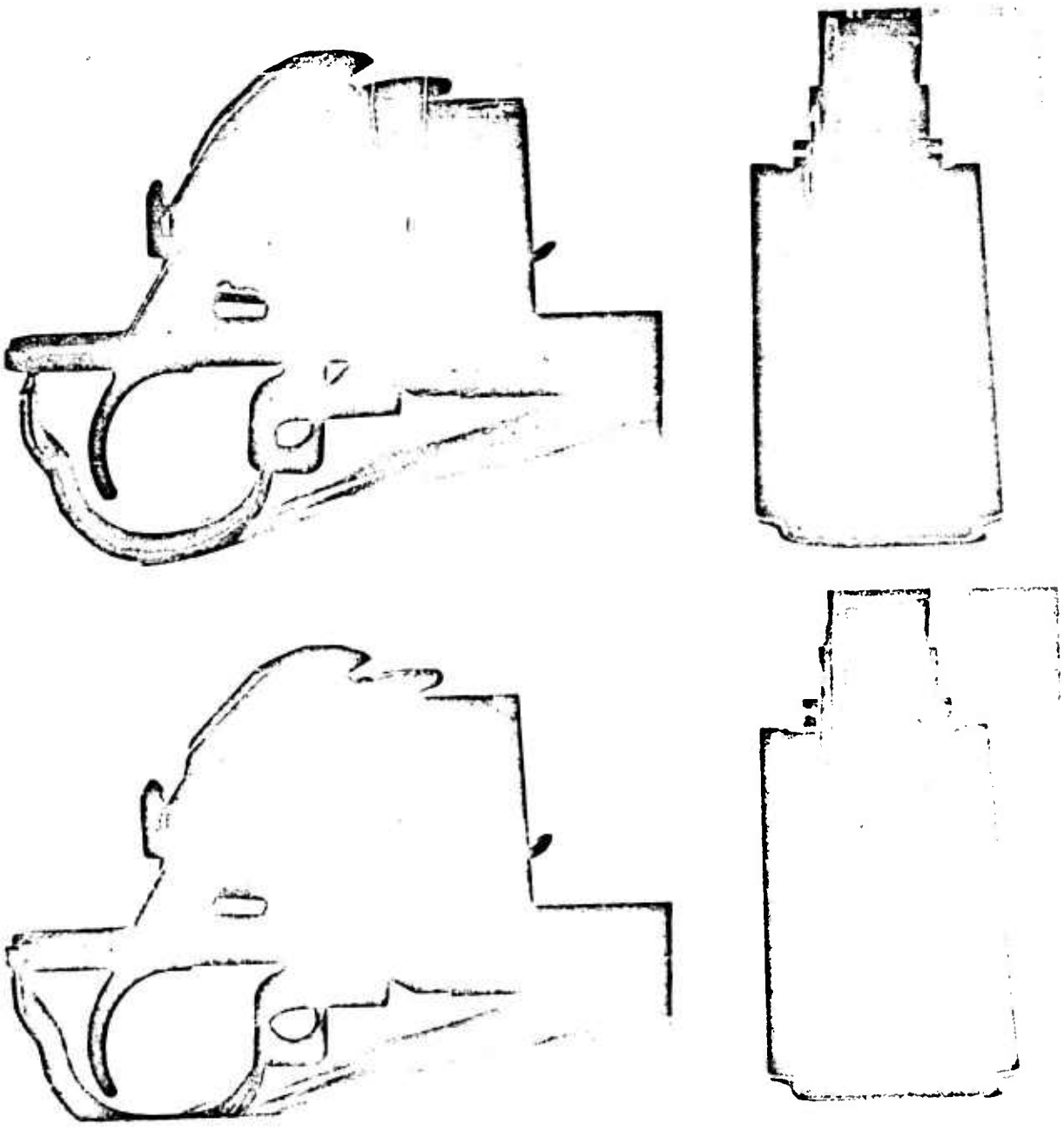
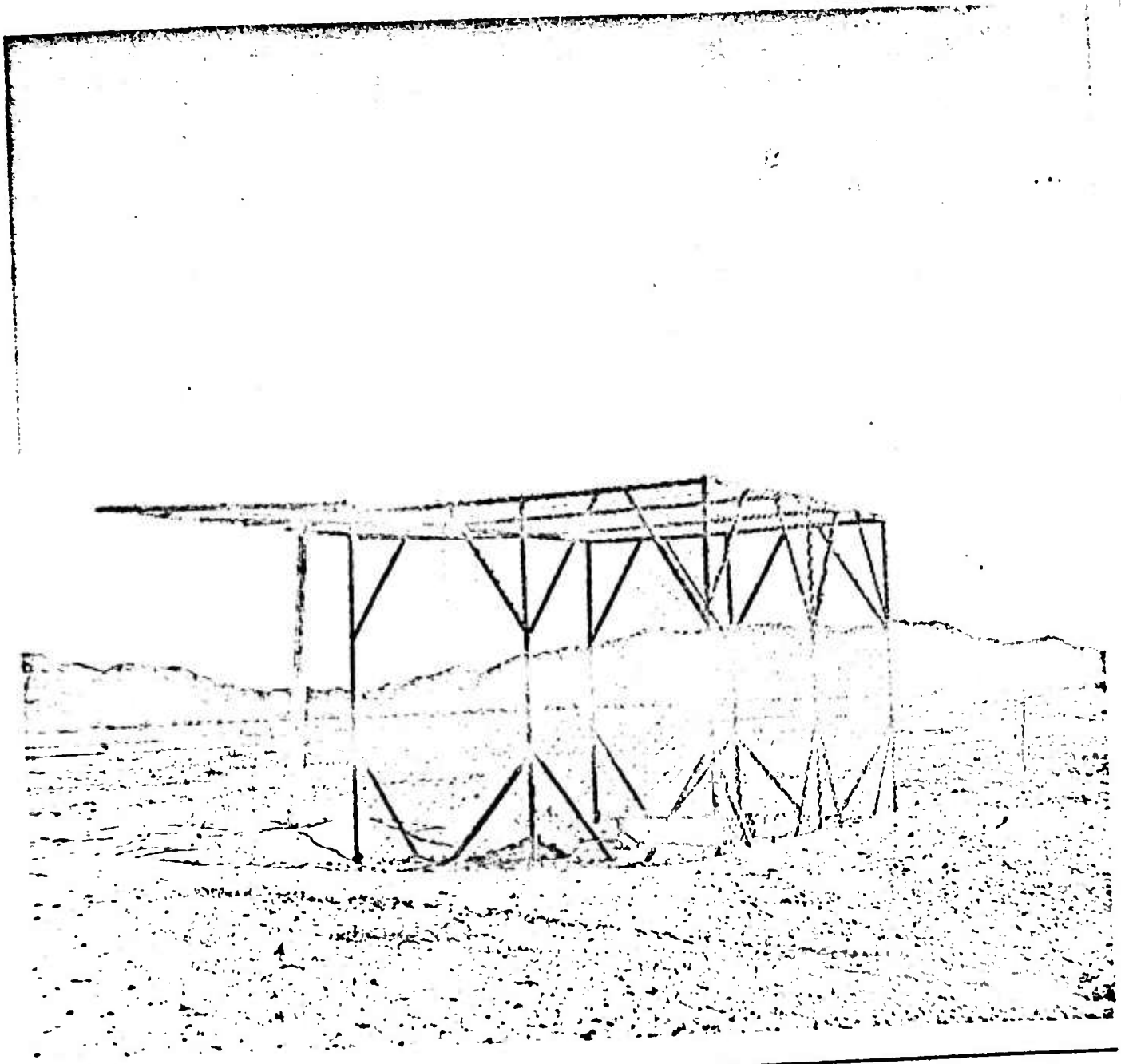
APPENDIX C

APG Photographs Number A91949 and A91973



A91949 [illegible] ABERDEEN PROVING GROUND 8 Sept. 1953
9301 TSU (ORD) CLIMATIC TEST DETACHMENT, YTS, YUMA, ARIZONA.
Project No. TS2-2023. Desert Tests 1953. Test of Experimental Lubricants. Comparsion of .30 Cal. M1, trigger housing group with lubricants NRL-E-51 and MIL-L-644A after ten day exposure to desert conditions. Top View MIL-L-644A (damp). Bottom View showing NRL-E-51 (dry).



ABERDEEN PROVING GROUND 17 Sept. 1953

A91973 9301 TSU (CRD) CLIMATIC TEST DETACHMENT, YTS, YUMA, ARIZONA
Project No. TS2-2023. Desert Tests 1953. Test of Experimental Lubricants. Enclosed cage used for exposed storage of weapons during test.