DEFENSE TECHNICAL INFORMATION CENTER

Cameron Station
Alexandria, Virginia 22304-6145

PITMAN-DUNN LABORATORY
Frankford Arsenal

MEMORANDUM REPORT PDR-428

AGENCY PERFORMING WORK: Pitman-Dunn Laboratory

RES & DEV AGENCY AUTHORIZING WORK: ORDIR

PROJECT NUMBER: 2/198 - Erie

REPORT NUMBER: 5

TITLE: Long Term Storage Experimental Program - Annual Teardown Inspection, Erie Ordnance Depot, 20 June to 1 July 1949

REFERENCES: File 00 121.2/12585 (ORDIR), 16 May 49, 1st Ind to File FA 121/12610-3, 16 Mar 49

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OBJECT

To make an annual teardown and inspection of eight unit containers; to evaluate the effectiveness of the different types of containers.

SUMMARY

Eight unit containers stored outdoors at Erie Ordnance Depot for approximately three and a half years were opened, and the ordnance materiel stored in them was inspected. All containers had maintained satisfactory protective atmospheres, as evidenced by the good condition of the stored equipment. Some mechanical difficulties were observed, but these were not attributable to failures of either the storage methods or the containers. Deterioration of the materiel stored in these containers was no greater than that observed in an inspection conducted about two years ago.

AUTHORIZATION

00 121.2/12585 (ORDIR), 16 May 1949

MR-428

Distribution

1 - CG, Aberdeen Proving Ground, Attn: D&PS - Plant Eng

1 - CO, Erie Ordnance Depot, Attn: Insp & Eng Div, Lacarne, Ohio

1 - CO, Fort Churchill, Manitoba, Canada ✓

1 - Hq, Army Ground Forces, Pacific, APO 958 - c/o Postmaster, San Francisco, California

1 - Hq, U.S. Army, Caribbean, Amador, C.Z. ✓
Attn: Ordnance Officer

1 - CO, Pueblo Ordnance Depot, Pueblo, Colo.

1 - CO, Tooele Sub-Depot of Ogden Arsenal, Tooele, Utah

1 - CO, Watertown Arsenal, Attn: Insp Div

1 - Prevention Deterioration Center, National Research Council, 2101 Constitution Avenue, Washington, D. C.

2 - ORDIR

1 - ORDFM ✓

1 - ORDFT ✓

1 - ORDTX-AR ✓

1 - ORDTB ✓

1 - Field Service Division

1 - Fire Control Division

1 - LF File

1 - Mr. Prager

1 - Mr. Shields ✓

1 - Numerical File ✓

1 - Project File

INTRODUCTION

This report covers the second teardown inspection of a representative number of containers on exposure at Erie Ordnance Depot. (The first representative teardown and inspection was made under the supervision of the Davison Chemical Corporation in October 1947 and was reported by them in the "Long Term Storage, Exposure Site Analysis," dated October 1947.) Eight containers, which had been stored three and a half years, were selected: five nitrogen-filled, hermetically sealed, steel containers (Nos. 5025, 5152, 5158, 5310, and 8399), and three balanced pressure aluminum containers (Nos. 6503, 6518, and 6541). These particular containers were chosen because of their relatively less perfect conditions, as evidenced by one or more of the following: (a) loss of nitrogen atmosphere, (b) increase of relative humidity, (c) difficulty encountered in recoil gymnastication.

The results of the examination are briefly summarized for each container. These are followed by a more detailed account contained in inspection forms executed by Erie Ordnance Depot personnel.

INSPECTION REPORTS

Hermetically Sealed Steel Containers

The five hermetically sealed steel containers selected for teardown contained a nitrogen atmosphere under positive pressure (3 to 6 psi gage at 70°F, depending upon the type of container). In each, silica gel was used as the desiccant. Periodic pressure checks were performed during the period of storage, and repressurizations were made as needed.

Container No. 5025 90 mm AA M1A1 Packed Nov 1945

During several periods of pressure checking, the nitrogen pressure was found to be below the specified 6 psi at 70°F. Previous to opening the container, a 5 psi pressure at 80°F was noted. No leaks were evident immediately prior to opening.

Superficial examination of the contents of this barrier showed no damage caused by rust. Some discoloration was found on the

breech ring and breech block assembly. The elevation segment was slightly rusted, and the platform and outriggers showed some areas having chipped paint and rust.

The megger readings for insulation resistance taken on opening the container were very good. Readings taken at intervals of 24, 48, and 72 hours after opening are given in the detailed inspection account for this container to show the variations caused by exposure to ambient humidity.

The defects found with the fire control system were: an oil leak in the hydraulic system, and failure to synchronize properly on the AZ course signal. These were purely mechanical faults and were in no way caused by the method of preservation. Sufficient support for the latter statement is evident through an examination of the megger results tabulated in the detailed report on this weapon.

The Artillery Gun Book (OO Form 5325) for this weapon gave no indication of any defects at the time of packing.

WORK SHEET FOR HEAVY ANTI-AIRCRAFT ARTILLERY
LONG TERM EXPOSURE EXPERIMENTAL PROGRAM - TEARDOWN INSPECTION

Date Started	Date Completed	Model of Gun
27 June 1949	29 June 1949	90 mm AA M1
Gun No.	**Mount No.**	**Recoil No.**
5328 M1	2246 M1A1	6215 M1A1
	Tube No.	**Pack No.**
	2500 M1	5025

On-Carriage Fire Control Equipment

NOTE:

a. Unless indicated otherwise, the inspection shall be visual only
b. Disassembly not required, except for removal of cover plates to inspect wiring and bearings
c. The condition of nonmetallic components shall be indicated under COMMENTS

Legend for Marking
* Discoloration
* Recorded on Separate Sheet

GUN ASSEMBLY

*	Bore
	Exterior Finish
	Interrupted Threads (if visible)
	Recoil Slides
*	Breech Ring
*	Breech Block Assembly - Manual Operation

CRADLE ASSEMBLY

*	Recoil Assembly - Gymnastication
	Slide Rails
	Gun Jacks - Manual Operation
	Counter Recoil, Buffer Assembly - Check Operation
	Manual-Automatic Control Lever - Check Operation
*	Elevation Segment

TOP CARRIAGE ASSEMBLY

*	Platform
	Firing Linkage
	Elevating Mechanism - Manual Operation (Smoothness)
	Traversing Mechanism - " " "
	Seats

LOWER CARRIAGE ASSEMBLY

	Leveling Jacks - Manual Operation
	Pedestal
*	Outriggers

[ ] ECCM Assembly
Unusual Noises
Lunette

ON-CARRIAGE FIRE CONTROL EQUIPMENT

[*] Amplifier and Motor Drive
[*] Contact Ring Assembly - Operation, Megger (continuity of circuit and insulation resistance)
[ ] Junction Box - Megger (On opening and 24-48 hrs later)
[*] Amplifiers - Mold on Wires
[ ] Motor Controllers - Check insulation
[ ] Sights and Sight Mounts

OVERALL TESTS

[*] Insulation Tests - Megger
[ ] Hand Crank - Operation
[ ] Preservatives Present
[ ] Caution Plates
[ ] Canvas Covers - Mold
[ ] Tools
[ ] Gun Book Entry

COMMENTS

Wooden section of the fuze setter's seat had split.

There is a definite oil leak in the hydraulic system that cannot be found without disassembly.

The gun fails to synchronize properly in AZ on the course signal.

The recoil mechanism was not overhauled; the oil was changed to US 2-132; there was no indication of damage due to corrosion.

The recoil mechanism was gymnasticated and the nitrogen pressure was checked and found to be 870 psi at 80°F.

The throttling valve assembly had been Parco-Lubrized.

The tube was removed and boroscoped, and vapor-honed and re-boroscoped. It was found to be in good condition.

Table II. Record of Insulation Resistance

On Opening 90 mm Mount, M1A1

Apparatus: 90 mm, M1 Location: ECD Serial No. 2246 Date: 6-27-49

TERMINALS (On opening the container)

A to Ground	90
1 to Ground	250
6 to Ground	300
9 to Ground	500
11 to Ground	175
16 to Ground	300
A to 1	300
A to 6	400
A to 9	600
A to 11	300
A to 16	500
1 to 6	500
1 to 9	900
1 to 11	500
1 to 16	800
6 to 9	800
6 to 11	500
6 to 16	800
9 to 11	700
9 to 16	900
11 to 16	500
17 - G	400
17 - 4	500
17 - 6	500
17 - 9	1000
Dry Bulb Temp	78
Per cent Rel Humidity	64

NOTE: All switches closed

Table II. Record of Insulation Resistance

24 hrs after opening — 90 mm Mount, M1A1

Apparatus: 90 mm, M1A1 Location: ECD Serial No. 2246 Date: 6-28-49

TERMINALS (24 hours later)	
A to Ground	80
1 to Ground	275
6 to Ground	300
9 to Ground	400
11 to Ground	175
16 to Ground	300
A to 1	300
A to 6	400
A to 9	500
A to 11	275
A to 16	400
1 to 6	500
1 to 9	700
1 to 11	400
1 to 16	500
6 to 9	600
6 to 11	500
6 to 16	600
9 to 11	600
9 to 16	800
11 to 16	500
17 - G	500
17 - 4	750
17 - 6	750
17 - 9	1000
Dry Bulb Temp	82
Per cent Rel Humidity	60

NOTE: All switches closed

Table II. Record of Insulation Resistance

48 hrs after opening — 90 mm Mount, M1A1

Apparatus: 90 mm, M1A1 Location: ECD Serial No. 2246 Date: 6-29-49

TERMINALS (48 hours later)	
A to Ground	45
1 to Ground	175
6 to Ground	200
9 to Ground	300
11 to Ground	300
16 to Ground	250
A to 1	250
A to 6	300
A to 9	300
A to 11	400
A to 16	300
1 to 6	400
1 to 9	400
1 to 11	500
1 to 16	400
6 to 9	500
6 to 11	400
6 to 16	500
9 to 11	400
9 to 16	500
11 to 16	400
17 - G	500
17 - 4	500
17 - 6	500
17 - 9	500
Dry Bulb Temp	90
Per cent Rel Humidity	48

NOTE: All switches closed

Table II. Record of Insulation Resistance

72 hrs later — 90 mm Mount, M1A1

Before Functional Test in Remote Control

Apparatus: 90 mm, M1A1 Location: ECD Serial No: 2246 Date: 7-1-49

TERMINALS (72 hours later)	
A to Ground	50
1 to Ground	200
6 to Ground	250
9 to Ground	400
11 to Ground	150
16 to Ground	300
A to 1	275
A to 6	300
A to 9	500
A to 11	200
A to 16	350
1 to 6	400
1 to 9	700
1 to 11	400
1 to 16	600
6 to 9	500
6 to 11	400
6 to 16	600
9 to 11	500
9 to 16	800
11 to 16	400
17 - G	500
17 - 4	600
17 - 6	800
17 - 9	1000
Dry Bulb Temp	88
Per cent Rel Humidity	45

NOTE: All switches closed

TUBE, 90 mm, M1A1 Serial No. 2500

Manufactured at Watervliet Arsenal

6-29-49 After Proof

Subject tube was removed from canned storage and was gaged and borescoped. The following conditions were noted:

Light discoloration was found throughout the bore at the 12:00 o'clock position. Light discoloration was found at 12:00 o'clock position at origin of rifling. The chamber was clear.

The tube was vapor-honed; a bore inspection revealed that light discoloration had been removed; pitting was negligible.

Tube processed for Standby Storage and returned to Shop 20.

(J. Grim, Inspector, Erie Ord Depot)

Container No. 5252 75 mm Pack Howitzer M1A1 Packed Dec 1945

Failure of the recoil system to return the oil after exercising had been reported earlier. This indicated either loss of nitrogen pressure or a frozen floating piston and oil leak. A bulge on the outside of the container indicated motion of the recoil rod.

On opening the container, the recoil rod was found to be securely pressed against the container wall. No other damage was visible. The recoil mechanism was removed and found to have a leaky gas filling valve. Otherwise the recoil mechanism appeared to be in good condition.

Five pounds of charcoal were included in the container to absorb any corrosive gases which might be given off by slow deterioration of organic components.

Considerable rust was found in the bore, the breech operating lever and latch, and on the breech block recess of the breech ring. Discoloration and light rust were found on the breech ring and on the trigger fork. Some mold was found on the leather portions of the canvas covers.

The exact original condition of the materiel was not indicated in the Gun Book. The inside of the container and the cut ends and threaded areas of the bolts used for securing the load were not rusted. This definitely indicated that rust must have been present on the materiel at the time of packing.

WORK SHEET FOR ARTILLERY - 75 mm PACK HOWITZER
LONG TERM EXPOSURE EXPERIMENTAL PROGRAM - TEARDOWN INSPECTION

Date Started	Date Completed	Total Man Hours	Model of Gun
6-21-49	6-24-49	-	75 mm Pack Howitzer

Gun No.	Mount No.	Recoil No.	Tube No.
9257	7015 #3	6107	11030

On-Carriage Fire Control Equipment — Pack No. 5152

NOTE:
a. Unless indicated otherwise, the inspection shall be visual only. X
b. Disassembly not required, except for removal of cover plates to inspect wiring and bearings. X
c. The condition of nonmetallic components shall be indicated under COMMENTS. X

Legend for Marking
Satisfactory
+ Discoloration
++ Rust
+++ Rust with Pitting
++++ Inoperable
* Recorded on Separate Sheet

GUN ASSEMBLY

*	Bore - See comments
OK	Exterior Finish
	Interrupted Threads (if visible) - See comments
OK	Recoil Slides
*	Breech Ring - See comments
*	(Breech Block Assembly) - Manual Operation
	OK - See comments

CRADLE ASSEMBLY

*	Recoil Assembly - (Gymnastication-No) - See comments
OK	Slide Rails
*	Counter Recoil, Buffer Assembly - Check Operation - See comments
OK	Elevation Segment

TOP CARRIAGE ASSEMBLY

OK	Elevating Mechanism - Manual Operation (Smoothness)
OK	Traversing Mechanism - " " "

LOWER CARRIAGE ASSEMBLY

OK	Trails

BOGIE ASSEMBLY

	Unusual Noises - None
OK	Lunette

ON-CARRIAGE FIRE CONTROL EQUIPMENT

•	Sights and Sight Mounts - See comments

OVERALL TESTS

OK	Hand Crank - Operation
	Preservatives Present
OK	Caution Plates
•	Canvas Covers - Mold - See comments
•	Tools - See comments
OK	Gun Book Entry

COMMENTS

Howitzer

(1) The lands and grooves in the bore were rusted extending rearward approximately half the length of the bore between 9 o'clock to 3 o'clock positions.
(2) Dark discoloration and light spots of rust were observed on the interrupted thread area of the breech ring.
(3) Medium rust and discoloration were found in the breech block recess of the breech ring.
(4) Slight discoloration of the tray surface of breech block, and spots of light rust showed on side surfaces of the block.
(5) Heavy rust was found on the breech operating lever latch (A12125-3), and on its mating surface in the recess of the lever.
(6) Light rust showed on trigger fork (A12132-8).

Tools and Accessories

(1) Wood, canvas, rubber and rawhide were unaffected. Leather material on the canvas cover showed very light mold.
(2) Firing Lock, M13 was in good condition.
(3) Wire cutters in tool box were lightly rusted.
(4) The AMICI Prism of Telescope, Panoramic, M3, had surface condensate.

Carriage

(1) The traverse axle, sleeves and leather dust shield were in good condition.
(2) The elevation pinions and gear segments were free of corrosion.
(3) The equilibrator pins A21724 were rusted on the threaded area.
(4) The equilibrator sleeves B19163 were lightly rusted.
(5) The equilibrator springs A21723 were lightly rusted on under side.

(6) The wheel bearings were in good condition.
(7) Removal of the gear housing covers revealed the mechanisms to be in good condition. The grease was slightly emulsified.
(8) The top and bottom sleighs and the cradle sides were in good condition.

Recoil Mechanism

(1) Visual inspection (on carriage) showed the recoil mechanism to be in good state of preservation. (See report on Recoil).

(G. W. Kuhns, Inspector; Erie Ord Depot)

Howitzer, 75 mm, M1A1

Serial Number
9257

Date: 6-27-47

Tube Number
11030

The breech mechanism was inspected for rust. The tube threaded area of breech ring was found to have scattered rust, mostly at about 6:00 o'clock position. The breech block and parts had a small amount of light discoloration.

Boroscope inspection of tube revealed a streak of light rust at the positions between 6:00 o'clock and 8:00 o'clock, extending the full length of the bore. Other positions had sparsely scattered light rust throughout. Chamber of tube was free of discoloration. Tube was cleaned by vapor-honing. Boroscope inspection revealed a great number of pits of negligible depth where rust had been removed.

The howitzer was cleaned and processed for storage.

(J. Grim, Inspector, Erie Ord Depot)

75 mm Pack Howitzer Recoil, M1A4 — Serial Number 6107

Manufactured by Hannifin Manufacturing Co

Date 6-24-49 — Shift - Day — Building 160

Defect and Suggested Correction	Method of Correction Used
The mechanism was received with Gun No. 9257 and Carriage No. 7015 from "Long Term Storage Barrier" No. 5152.	No work performed. Classified Group "C."
The recoil mechanism was found to be unserviceable because of no nitrogen pressure. Further inspection revealed the Air Filling Valve and Seal B104103 and A9174 to be defective.	Unserviceable but repairable. Work Order 635
Pits were noted on the "C" recoil rod end, a noncritical surface. No indications of rust were noted in mechanism.	Slight discoloration was noted in "C" recoil cylinder at the piston wiper seat, due to not being exercised because of nitrogen pressure loss.
The recoil mechanism was not completely disassembled.	

(E. Peterson, Inspector, Erie Ord Depot)

Container No. 5158 75 mm Pack Howitzer M1A1 Packed Dec 1945

Failure of the recoil system to return the oil after exercising had been reported earlier.

The recoil mechanism, on visual examination, showed no deterioration. Detailed examination showed slight leakage of the gas filling valve. This leakage was the cause of the failure of this mechanism to function at the time of exercising. Valve replacement will correct the mechanical difficulties.

The howitzer showed considerable rust in the bore, and light rust and discoloration were throughout the chamber face, the threaded portion of the tube, the breech ring, trigger assembly, latch, and firing pin. The carriage was in excellent condition, except for some slight rust on the under side of the equilibrator spring.

The exact original condition of the materiel was not indicated in the Gun Book. The inside of the container and the cut ends and threaded areas of bolts used for securing the load were not rusted. This definitely shows the rust must have been present on the materiel at the time of packing.

WORK SHEET FOR ARTILLERY - 75 mm PACK HOWITZER
LONG TERM EXPOSURE EXPERIMENTAL PROGRAM - TEARDOWN INSPECTION

Date Started	Dated Completed	Total Man Hours	Model of Gun
6-27-49	6-29-49	-	75 mm Pack Howitzer

Gun No.	Mount No.	Recoil No.	Tube No.
9242	6556	5895	11015

On-Carriage Fire Control Equipment — Pack No. 5158

NOTE:
a. Unless indicated otherwise, the inspection shall be visual only. X
b. Disassembly not required, except for removal of cover plates to inspect wiring and bearings. X
c. The condition of nonmetallic components shall be indicated under COMMENTS. X

Legend for Marking
Satisfactory
+ Discoloration
++ Rust
+++ Rust with Pitting
++++ Inoperable
* Recorded on Separate Sheet

GUN ASSEMBLY
[*] Bore - See comments
[OK] Exterior Finish
[ ] Interrupted Threads (if visible) - See comments
[OK] Recoil Slides
[*] Breech Ring - See comments
[*] (Breech Block Assembly - Manual Operation OK - See comments

CRADLE ASSEMBLY
[*] Recoil Assembly-(Gymnastication-No) - See comments
[OK] Slide Rails
[*] Counter Recoil, Buffer Assembly - Check Operation - See comments
[OK] Elevation Segment

TOP CARRIAGE ASSEMBLY
[OK] Elevating Mechanism - Manual Operation (Smoothness)
[OK] Traversing Mechanism - " " "

LOWER CARRIAGE ASSEMBLY
[OK] Trails

BOGIE ASSEMBLY
[OK] Unusual Noises - None
[OK] Lunette

ON-CARRIAGE FIRE CONTROL EQUIPMENT

*	Sights and Sight Mounts - See comments

OVERALL TESTS

OK	Hand Crank - Operation
	Preservatives Present
OK	Caution Plates
*	Canvas Covers - Mold - See comments
*	Tools - See comments
OK	Gun Book Entry

COMMENTS

Howitzer

(1) The lands and grooves had considerable rust throughout the bore from 9 o'clock to 3 o'clock approximate position.
(2) Light spotted rust was found throughout the chamber and the chamber face.
(3) Interrupted threads in the breech ring had light spotty rust.
(4) Dark discoloration showed on the recess of the breech ring for the housing, brooch block.
(5) Surface rust was observed on the trigger assembly (A12136).
(6) Dark discoloration of the latch (A12125-3) was observed.
(7) Light rust was found on the latch recess in the operating handle.
(8) Light discoloration was found on the firing pin (B8187-2).

Carriage

(1) Removal of gear housing covers revealed slightly emulsified grease but no rust.
(2) Visual inspection of carriage surfaces showed it to be in an excellent condition.
(3) Elevation segment gears and pinions were in good condition.
(4) Slight rust was found on the under side of equilibrator springs.
(5) The wheel bearings and the cradle and slides were in good condition.

Recoil Mechanism

(1) Visual inspection showed no deterioration (See separate report).

Tools and Accessories

(1) The rawhide hammer head appeared to have shrunk so that it was loose in the band.
(2) The wood chest for Sight M3 had shrunk and pulled apart at the dovetailed joints.
(3) Some condensate was found on the surface of the AMICI Prism of the Panoramic Sight, M3.

Howitzer, 75 mm, M1A1

Serial Number
9242

Date: 6-27-49

Tube Number
11015

The howitzer was removed from the container, and the breech mechanism was inspected for rust. The tube threads of breech ring were found to have scattered rust, mostly at about 6:00 o'clock position. The breech block and parts had a small amount of light discoloration. Boroscope inspection of the tube revealed a streak of light rust at the following positions:

7:00	o'clock	at	3"	to	12:00	o'clock	at	6"	from muzzle end	
9:00	"	"	13"	"	1:00	"	"	15"	"	"
2:00	"	"	20"	"	3:00	"	"	OR.	"	"

This streak follows a spiral pattern throughout tube. The chamber of this tube was found to be lightly discolored.

The tube was cleaned by vapor honing. Boroscope inspection revealed innumerable small clusters of pits of negligible depth throughout the bore where rust had been removed by the cleaning process.

The howitzer was cleaned and processed for storage.

(J. Grim, Inspector, Erie Ord Depot)

75 mm Pack Howitzer Recoil, M1A4 — Serial Number 5895

Manufactured by Hannifin Manufacturing Company

Date: 6-24-49 — Shift - Day — Building 160

Defect and Suggested Correction	Method of Correction Used
The mechanism was received with Gun No. 923.2 and Carriage No. 6556 from "Long Term Storage Barrier" No. 5156. The recoil mechanism was found to be unserviceable because of no nitrogen pressure. Further inspection revealed nitrogen pressure loss due to defective valve, E104103 and air seal, A9174.	No work performed.
	Classified Group "C."
	Unserviceable, but repairable.
	Work Order 635.
No indication of rust was noted on "C" recoil rod or cylinder.	
The mechanism was not disassembled.	

(E. Peterson, Inspector, Erie Ord Depot)

Container 5310 155 mm Howitzer Packed Dec 1945

The recoil system of this howitzer had been reported as failing to function properly at periodic exercisings.

Considerable oil on the floor of the container, found on opening, indicated a leak from some reservoir, probably the recoil system. On investigation, the recoil oil reserve was found adequate and the nitrogen pressure was good. It was believed that the oil leakage occurred during the exercising operations because of a faulty connection to the recoil mechanism. The recoil mechanism was otherwise found in excellent condition.

The howitzer obturator spindle and plug showed some deposits of a foreign material which caused rusting and pitting of considerable depth. This material had the appearance of powder fouling. Light rust was noted on the firing mechanism; the tube and chamber had light to heavy rust with some pitting. Rust was noted also on the mating teeth of the traversing arc and traversing arc pinion. The mating teeth were found to be covered with grease and heavily corroded. It was noted that the visible teeth on both the arc and pinion were completely clean and free from rust. This condition appears to have been caused by improper cleansing of old grease from between the mating teeth at the time the materiel was prepared for storage. A similar condition has been reported in the October 1947 Quarterly Report issued by Davison Chemical Corporation.

The OO Form 5825 for this weapon gave no indication of any defects at the time of packing.

WORK SHEET FOR 155 mm HOWITZER MATERIEL
LONG TERM STORAGE EXPERIMENTAL PROGRAM - TEARDOWN INSPECTION

Date Started	Date Completed	Model of Carriage	How. No.
6-24-49	6-27-49	M1A2	5264

Mount or Carriage	Recoil No.	Pack No.
3525	3527	5310

NOTE:

a. Unless indicated otherwise, the inspection shall be visual only. X

b. Disassembly not required, except for removal of cover plates to inspect wiring or bearings. X

c. The condition of nonmetallic components shall be indicated under COMMENTS. X

Legend for Marking
Satisfactory
+ Discoloration
++ Rust
+++ Rust with Pitting
++++ Inoperable
* Recorded on Separate Sheet

GUN ASSEMBLY

*	Bore - See comments
OK	Exterior Finish - Good
*	Interrupted Threads (if visible) - See comments
*	Breech Ring - See comments
OK	Breech Block Assembly - Manual Operation
OK	Hand Operating Levers
*	Recoil Cylinder - Piston Rod and Function - See comments

TOP CARRIAGE ASSEMBLY

OK	Elevating Mechanism - Manual Operation (Smoothness)
OK	Traversing Mechanism - " " "
OK	Securing Straps
OK	Equilibrators

LOWER CARRIAGE ASSEMBLY

OK	Trails
OK	Jacks - Manual Operation
OK	Wheels and Tires

BOGIE ASSEMBLY

OK	Lunette

ON-CARRIAGE FIRE CONTROL EQUIPMENT

*	Sights and Sight Mounts - See comments

OVERALL TESTS

	Hand Crank - Operation
	Preservatives Present - Good, except oil when used on material where surface is curved permitting oil to run downwards
	Canvas Covers - Mold - Slight mold on leather portions of overall cover
*	Tools - See comments
OK	Gun Book Entry

COMMENTS

Tools and Accessories:

(1) One of the two split rings (B163661) had a rust spot at point where the ring mates. It is a common point for rust due to preservatives not being applied at this point.
(2) One 18 in. crescent wrench showed considerable rust.
(3) One adjustable spanner wrench showed considerable discoloration and rust.
(4) Telescope M12 did not contain any condensate but the AMICI Prism was tilted 45°.
(5) Wood, fibre and rubber materiel were in excellent condition.

Howitzer

(1) Gas check pads were in good condition.
(2) See Item (1) above as to split rings.
(3) Firing mechanism had a few spots of light rust (outer surface).
(4) Firing mechanism carrier (C7068) had light rust on threaded area.
(5) Obturator Plug (B241) appeared pitted and corroded, and contained a foreign substance similar to powder fouling.
(6) Obturator spindle had pits of discoloration on mushroom head.
(7) Bore showed a considerable amount of rust extending from breech ring face through tube to muzzle from 9 o'clock to 3 o'clock positions. (See defective materiel report on Howitzer.)

Recoil Mechanism

(1) No defects noted upon visual inspection. (See attached Recoil Report.)

Carriage

(1) Rust on traversing arc teeth and on mating teeth of traversing pinion.
(2) Elevating arc and pinion were in good condition.
(3) Carriage was found to be in excellent condition.
(4) Removal of gear housing covers revealed a slight emulsification of grease; however, no rust could be found.

DEFECTIVE MATERIEL REPORT

Howitzer, 155 mm, M1 Serial Number 5264

Manufactured by Yuba Manufacturing Company - Year 1945

Date: 6-29-49

After Proof

The howitzer was taken from a storage container. The tube was boroscoped, and the following conditions were found: light discoloration throughout chamber, heavy rust splotch about 8" x 2" extending from origin of rifling into chamber.

Light discoloration at 3:00 o'clock position at origin of rifling. A streak of very light discoloration was observed at the 12:00 o'clock position throughout entire length of bore.

The howitzer tube was cleaned by vapor-honing. Light discoloration was removed from the chamber and the bore. Where heavy rust was present in chamber, pits of considerable depth were left after the rust was removed by the vapor-hone method. These pits would not affect serviceability of howitzer.

The howitzer was prepared for storage as per SB 9-61 and T & E Bull. #30.

(J. Grim, Inspector, Erie Ord Depot)

DEFECTIVE MATERIEL REPORT

Recoil Mechanism M6, 155 mm — Serial Number 3527

Date: 6-29-49

This recoil mechanism was removed from Carriage #3525 and Howitzer #5264 after the unit had been stored in container #5210.

Upon inspection of recoil mechanism, the rod, cylinder and packings were found to be in an excellent state of preservation.

The oil, USA Spec 2-132, was in good condition.

No rust or any discoloration could be found on this mechanism.

(G. W. Kuhns, Inspector, Erie Ord Depot)

Container No. 8399 (Two) 81 mm Mortars M4 Packed Dec 1945

This container was a commercial steel drum, adapted for storage of small items by the addition of a ball check valve for pressurization with nitrogen.

Reports showed that this container was unable to maintain a positive pressure at 0°F.

Slight rust was found in the bores of both tubes. The rust, appearing as minute spots, was found only with the aid of a boroscope. All other parts of the mortars and accessories were found to be in good condition.

No records of the original condition of these weapons were found in the containers.

WORK SHEET FOR 81 mm MORTARS
LONG TERM STORAGE EXPERIMENTAL PROGRAM - TEARDOWN INSPECTION

Date Started	Date Completed	Total Man Hours	Model No.
6-25-49	6-25-49	-	(2 ea) 81 mm Mortars M1

Tube No.	Mount No.	Pack No.
29211	31214	8399
29917	31212	

NOTE:

a. Unless indicated otherwise, the inspection shall be visual only.
b. The conditions of nonmetallic components shall be indicated under COMMENTS.

	MORTAR ASSEMBLY
*	Bore - See comments
OK	Exterior Finish
OK	Interrupted Threads (if visible)
OK	Frame
OK	Canvas Components
OK	Leather Components
OK	Tools
OK	Mortar Book Entry

Legend for Marking	
	Satisfactory
+	Discoloration
++	Rust
+++	Rust with Pitting
++++	Inoperable
*	Recorded on Separate Sheet

COMMENTS

Base plates were in good condition.
Bipods worked freely. No rust or corrosion of any kind was visible on threaded areas.
The bores of both tubes had light, spotted surface rust scattered intermittently throughout. The firing pin and firing mechanism cap were in good condition.
The sighting equipment was found to be in good condition.

Balanced Pressure Aluminum Containers

The three aluminum containers selected for this teardown and inspection were equipped with solar radiation breathers and contained a charge of silica gel for static dehumidification.

Container No.	40 mm AA M2A1	Packed
6503		Dec 1945

This container had required several replacements of the desiccant charge to maintain a relative humidity of 30 per cent or lower. At the time of opening, the internal relative humidity was 30 per cent.

Light rust was found on the inner surface of the flash hider, on the top surface of the breech block, in the chamber, in the loading tray, and on the extractor. Considerable light rust was found on the top inner surface of the breech casing extension.

Disassembly of the recoil buffer cylinder showed considerable rust on the bottom of the cylinder (muzzle end) and sludge formation. The rod was pitted at the chevron packing seat.

The oil was found to contain glycerine and water. It is the opinion of the inspectors that this condition was not caused by the storage method or barrier failure, but that it was entirely due to packing of faulty material; however, this could not be substantiated from an examination of the Gun Book for this weapon.

Megger readings taken were above the minimum requirements.

WORK SHEET FOR 40 MM ANTI-AIRCRAFT MATERIEL
LONG TERM STORAGE EXPERIMENTAL PROGRAM - TEARDOWN INSPECTION

(75° temp; 30% humidity when removed from tank)

Date Started	Date Completed	Total Man Hours	Model of Carriage
6-21-49	6-23-49	-	40 mm AA, M2A1

Gun No.	Mount or Carriage	Tube No.	Pack No.
17735	12850	16435	6503

On-Carriage Fire Control Equipment

NOTE:

a. Unless indicated otherwise, the inspection shall be visual only.
b. Disassembly not required, except for removal of cover plates to inspect wiring or bearings.
c. The condition of nonmetallic components shall be indicated under COMMENTS.

Legend for Marking
Satisfactory
+ Discoloration
++ Rust
+++ Rust with Pitting
++++ Inoperable
* Recorded on Separate Sheet

GUN ASSEMBLY

	Bore
X	Exterior Finish
X	Interrupted Threads (if visible)
*	Flash Hider - Light rust on inner surface
X	Recuperator Spring
*	Breech Ring
	Breech Block Assembly - Manual Operation
*	Automatic Loaders - Food Pawls, Food Rollers
X	Gun Casing Assembly - Covers, Firing Linkage, Hand Operating Levers
	Recoil Cylinder - Piston Rod and Function

TOP CARRIAGE ASSEMBLY

OK	Elevating Mechanism - Manual Operation (Smoothness)
OK	Traversing Mechanism - " " "
OK	Platform - Cartridge Chutes, Seat Brackets, Securing Straps
OK	Firing Linkage
	Equilibrators - Rod rusty (left equil). Functioned satisfactorily.

LOWER CARRIAGE ASSEMBLY

X	Frame
X	Outriggers
X	Jacks - Manual Operation
X	Steering Assembly
X	Wheels and Tires
	Electrical System - Lights and Blackout Safety Switch and Brakes

Breech casing extension shows considerable rust (light) on top inner surface.
Chamber shows intermittent light rust.
Light rust beginning to form on breech block - top surface.
The loading tray was lightly rusted; spotted top surface D50006.
The extractors just beginning to rust (small spots).
Bore of tube was in good state of preservation.

ON-CARRIAGE FIRE CONTROL EQUIPMENT

	Oil Gears, M3 - Oil Level
X	Contact Ring - Operation, Megger (continuity of circuit and insulation resistance)
	Computing Sight - Operation - Not complete

OVERALL TEST PROBLEMS

OK	Operational test with Director, where available - Function only
OK	Hand Crank - Operation
*	Insulation Resistance
OK	Caution Instruction Plates
OK	Canvas Covers - Mold
OK	Gun Book Entry

COMMENTS

Both male plugs on the director cable had a greenish discoloration. (Leather covers on plugs may have induced discoloration of the copper.)
The wood crates were split along the grain of the wood.
The brakes, lights and breakaway switch were found to be in good condition.
The covers were removed from the chassis (front and rear). Inspection showed the inner sections to be in good condition.
The traverse bearing was observed to be in good condition.
The grease was emulsified.
The gun was fired manually and appeared to function satisfactorily.
The unit operated satisfactorily in remote control.

MOISTURE AND FUNGUS PROOFED
ERIE ORDNANCE DEPOT
6-21-49

Carriage No. 12850

(75° temp; 30% humidity)

Initial Reading

Insulation resistance readings taken at the input.

Megger Test (Min. Insulation Resistance Permitted 25 megohms)

Term	Reading
1	
2	40
3	75
4	100
5	100
6	75
7	75
8	75
9	40
10	40
11	40
12	100
13	75
14	-
15	-
	40

(Donohoe, Inspector, Erie Ord Depot)

24 hrs later 6-22-49 (85° temp; 45% humidity)

1	
2	40
3	80
4	150
5	100
6	75
7	100
8	100
9	40
10	40
11	150
12	100
13	80
14	-
15	-
	40

(Donohoe, Inspector, Erie Ord Depot)

40 mm Recoil Mechanism Assembly (Dwg D50000) For Carriage #12850

Date: 6-29-49

The recoil mechanism was removed from gun after storage in Container No. 6503. Upon disassembly, it was found to contain oil, USA Spec 2-132. There was a sufficient amount of oil; however, it was dirty and contained glycerin and water.

The cylinder (C95015) had considerable corrosion on the bottom muzzle end. There was a sludge formation throughout the cylinder.

The rod (B197156) was pitted and discolored at chevron packing seat.

The packing rings (A222577) contained sludge.

(G. W. Kuhns, Inspector, Erie Ord Depot)

Container No. 6518 40 mm AA M2A1 Packed Dec 1945

This container had required several silica gel replacements to maintain a relative humidity of 30 per cent or lower. At the time of opening, the relative humidity in the container was 38 per cent.

Inspection of the materiel showed the bore to be in good condition. Considerable rust was visible around the recuperator spring and interrupted threads on the tube, where a bag of silica gel had broken open. The breech block, the right and left feed control arms, and the extractor showed some rust. Paint flaking was noted on the rear compensating spring cover. The top carriage was in good condition.

Megger tests showed the insulation resistance to be well above the minimum acceptance level on opening. After 24 hours at ambient conditions, the readings showed a drop, in some cases, to a point below the acceptance level.

On disassembly, the recoil buffer cylinder showed considerable damage caused by water. Severe rust and pitting were observed on the rod. It is the opinion of the inspectors that this condition was not caused by the storage method or barrier failure, but that it was entirely due to packing of faulty material; however, this could not be substantiated from the data contained in the Gun Book for this weapon.

WORK SHEET FOR 40 MM ANTI-AIRCRAFT MATERIEL
LONG TERM STORAGE EXPERIMENTAL PROGRAM - TEARDOWN INSPECTION

(75° and 25% humidity when unit was removed from tank)

Date Started	Date Completed	Total Man Hours	Model of Gun
6-27-49	6-29-49	-	40 mm AA, M2A1

Gun No.	Mount or Carriage	Tube No.	Pack No.
5691	5772	8079	6518

On-Carriage Fire Control Equipment

NOTE:

a. Unless indicated otherwise, the inspection shall be visual only.
b. Disassembly not required, except for removal of cover plates to inspect wiring or bearings.
c. The condition of nonmetallic components shall be indicated under COMMENTS.

Legend for Marking
Satisfactory
+ Discoloration
++ Rust
+++ Rust with Pitting
++++ Inoperable
* Recorded on Separate Sheet

GUN ASSEMBLY

OK	Bore
OK	Exterior Finish
*	Interrupted Threads (if visible)
OK	Flash Hider - dented when removing
++	Recuperator Spring
OK	Breech Ring
	Breech Block Assembly - Manual Operation
OK	Automatic Loaders - Feed Pawls, Feed Rollers
	Gun Casing Assembly - Covers, Firing Linkage,
	Hand Operating Levers - see below
	Recoil Cylinder - Piston Rod and Function

TOP CARRIAGE ASSEMBLY

OK	Elevating Mechanism - Manual Operation (Smoothness)
OK	Traversing Mechanism - " " "
OK	Platform - Cartridge Chutes, Seat Brackets, Securing Straps
OK	Firing Linkage
OK	Equilibrators

LOWER CARRIAGE ASSEMBLY

OK	Frame - Rear compensating spring cover paint flaking
OK	Outriggers
OK	Jacks - Manual Operation
OK	Steering Assembly
OK	Wheels and Tires
OK	Electrical System - Lights and Blackout Safety Switch

Plates were removed from front and rear chassis. Interior OK.
Rust on gun casing (quadrant seat, machined section, left rear).
Rust around interrupted threads barrel assembly.
Small rust spots on top of breech block. Small rust spots on right and left feed control arms.
Extractors - small rust spots.

ON-CARRIAGE FIRE CONTROL EQUIPMENT

OK	Oil Gears, M3 - Oil Level
*	Contact Ring - Operation, Megger (continuity of circuit and insulation resistance
OK	Computing Sight - Operation Elevation grid broken

OVERALL TEST PROBLEMS

OK	Operational test with Director, where available - Function only
OK	Hand Crank - Operation
*	Insulation Resistance
OK	Caution Instruction Plates
OK	Canvas Covers - Mold
OK	Gun Book Entry

COMMENTS

The traverse bearing was found to be in good condition; the grease was slightly emulsified.
The wood tool chests appeared to be dried out and showed splitting at the grain.
Both male plugs of the director cable were covered with a copper compound (green).
All tools were in good condition.
The gun operates satisfactorily in remote control.
The breakaway switch, the lights and brakes were in good operating condition.
A bag of silica gel, which hung above the gun, had broken open.
As a result of above, the recuperator spring on barrel assembly, the top surface of the tube and other areas of the weapon showed rust wherever the gel came in contact with metal surfaces.
(Photograph taken).
The bore was in good state of preservation.

(G. W. Kuhns, Inspector, Erie Ord Depot)

MOISTURE AND FUNGUS PROOFED
ERIE ORDNANCE DEPOT
6-21-49

Carriage No. 5772

Initial Reading

Insulation resistance readings taken at the input.

Megger Test (Min. Insulation Resistance Permitted 25 megohms)

Term	Reading
1	30
2	75
3	100
4	100
5	75
6	75
7	75
8	30
9	30
10	100
11	100
12	75
13	-
14	-
15	30

(Kuhns, Inspector, Erie Ord Depot)

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24 hrs later 6-22-49 Temp 85°; humidity 45%

1	18
2	75
3	100
4	100
5	40
6	75
7	75
8	18
9	18
10	18
11	100
12	40
13	-
14	-
15	18

(Donohue, Inspector, Erie Ord Depot)

40 mm Recoil Mechanism (Dwg D50000) - For Carriage #5772

Date: 6-29-49

Defect and Suggested Correction	Method of Correction Used
The recoil mechanism was removed from the gun after storage in Container #6518. Upon disassembly, it was found to contain oil, USA Spec 2-132. The amount of oil was not sufficient and it was also very dirty, and contained water and glycerin. The cylinder (C95015) had considerable corrosion on the bottom, muzzle end. There was a sludge formation throughout cylinder. The rod (B197156) was pitted and discolored at the chevron packing seat. The packing rings (A222577) contained sludge.	This overall condition cannot be attributed to the method of storage.

(E. J. Petersen, Inspector, Erie Ord Depot)

Container No. 65:1 40 mm AA M2A1 Packed Nov 1945

High relative humidities and evidence of leaks had been noted in this container.

Inspection showed slight rust on the top of the breech ring and on four teeth of the elevation arc.

The remote control system displayed sluggishness in slewing and tracking. However, the megger tests of the electrical system were well above the minimum for acceptance immediately after opening and 24 hours after opening.

The recoil buffer cylinder showed water and glycerine in the oil with a consequent rusting of the rod at the chevron packing seat. It is the opinion of the inspectors that the poor state of this recoil buffer mechanism was the result of faulty conditions of the materiel when packed; however, this could not be substantiated from the recordings in the Gun Book. A similar condition in another 40 mm weapon inspected earlier at Erie Ordnance Depot was reported in the October 1947 Davison Chemical Corporation Quarterly Report.

WORK SHEET FOR 40 MM ANTI-AIRCRAFT MATERIEL
LONG TERM STORAGE EXPERIMENTAL PROGRAM - TEARDOWN INSPECTION

(90° Temp - 32% Humidity when unit was removed from tank)

Date Started	Date Completed	Total Man Hours	Model of Gun
6-21-49	6-23-49	-	40 mm AA, M2A1

Gun No.	Mount or Carriage	Tube No.	Pack No.
2974	M2A9	3240	6541

On-Carriage Fire Control Equipment

NOTE:

a. Unless indicated otherwise, the inspection shall be visual only.
b. Disassembly not required, except for removal of cover plates to inspect wiring or bearings.
c. The condition of nonmetallic components shall be indicated under COMMENTS.

Legend for Marking
Satisfactory
+ Discoloration
++ Rust
+++ Rust with Pitting
++++ Inoperable
* Recorded on Separate Sheet

GUN ASSEMBLY

	Bore
OK	Exterior Finish
	Interrupted Threads (if visible)
	Firak Rider - small spot of rust
	Recuperator Spring
OK	Breech Ring
	Breech Block Assembly - Manual Operation
OK	Automatic Loaders - Feed Pawls, Feed Rollers
OK	Gun Casing Assembly - Covers, Firing
	Linkage, Hand Operating Levers
	Recoil Cylinder - Piston Rod and Function

TOP CARRIAGE ASSEMBLY

OK	Elevating Mechanism - Manual Operation (Smoothness - Arc OK
	Traversing Mechanism - " " "
OK	Platform - Cartridge Chutes, Seat Brackets, Securing Straps - Cleaning staff strap broken
	Firing Linkage
	Equilibrators

LOWER CARRIAGE ASSEMBLY

OK	Frame
OK	Outriggers
OK	Jacks - Manual Operation
OK	Steering Assembly
OK	Wheels and Tires
	Electrical System - Lights and Blackout Safety Switch

Slight rust was found on breech ring top.
The elevation arc showed rust on 4 front teeth.
Inspection cover removed from top carriage; grease was good; bearing OK.

ON-CARRIAGE FIRE CONTROL EQUIPMENT

	Oil Gears, M3 - Oil Level - drained
*	Contact Ring - Operation, Megger (continuity of circuit and insulation resistance)
*	Distribution Box Assembly - Megger (on opening and 24-48 hrs later)
*	Computing Sight - Operation

OVERALL TEST PROBLEMS

	Operational test with Director, where available - Function only
	Hand Crank - Operation
*	Insulation Resistance
	Caution Instruction Plates
	Canvas Covers - Mold
	Gun Book Entry

COMMENTS

Covers removed from front and rear chassis. Inspection showed the inner sections to be in good condition.
The buffer rod showed rust on the bottom exposed surface.
The traverse bearing was observed to be in good condition. The grease was slightly emulsified.
Results of remote control test were as follows:

Azimuth	- Satisfactory
Elevation	- Very slow in slewing and tracking
Brakes	- Fair
Lights	- Good
Breakaway switch	- Good

The gun was fired manually and appeared to function satisfactorily.
The bore of the tube was in a good state of preservation.

MOISTURE AND FUNGUS PROOFED
ERIE ORDNANCE DEPOT
6-21-49

Carriage No. 1249

Initial Reading

Insulation resistance readings taken at the input.

Megger Test (Min. Insulation Resistance Permitted 25 megohms)

Term	Reading
1	45
2	100
3	200
4	200
5	150
6	100
7	100
8	45
9	45
10	200
11	150
12	100
13	-
14	-
15	45

(Donohoe, Inspector, Erie Ord Depot)

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24 hrs later 6-22-49 Temp 85°; Humidity 45%

1	40
2	100
3	200
4	200
5	150
6	100
7	100
8	40
9	40
10	200
11	150
12	100
13	-
14	-
15	40

(Donohoe, Inspector, Erie Ord Depot)

40 mm Recoil Mechanism (Dwg D50000) - For Carriage No. 1249

Date: 6-29-49

Defect and Suggested Correction	Method of Correction Used
The recoil mechanism was removed from the gun after storage in Container No. 6541. Upon disassembly, it was found to contain oil, USA Spec 2-132. The amount of oil was not sufficient and it was also very dirty, and contained water and glycerin. The cylinder (C95015) had considerable corrosion on the bottom, muzzle end. There was a sludge formation throughout the cylinder. The rod (B197156) was pitted and discolored at the chevron packing seat. The packing rings (A222577) contained sludge.	This overall condition cannot be attributed to the method of storage.

(E. J. Petersen, Inspector)

CONCLUSIONS

From this inspection, the second at this station, there seems to be little change in the amount or extent of corrosion found on any of the weapons which were examined.

The aluminum barriers, which have proved faulty at most stations, have proved to be capable of holding rather low relative humidities at Erie Ordnance Depot. One reason for the apparent success is the fact that, when the barriers were first received from the fabricator, each one was minutely examined for flaws and transportation damage, and complete repairs were made at once. A second reason may be that the packs are checked each week by the same group assigned to check the strippable film packs.

The rust and discoloration found on the inspected materiel may have been present at the time of packing, since almost comparatively equal amounts were found in the containers opened two years ago. The extent of corrosion found on the weapon examined at this time was not considered sufficient to render the weapons inoperable. The mechanical damages found, which would render the weapons unserviceable, cannot be attributed to the method of storage.

Damage and shrinkage of the wooden and rawhide accessories, which resulted because of low humidities inside the containers, are not considered serious as these are readily replaceable.

END

DATE

FILMED

10-19-67