

TECHNICAL MANUAL

**OPERATORS INSTRUCTIONS
AND
ORGANIZATIONAL MAINTENANCE MANUAL**

**SIMULATOR, PROJECTILE AIRBURST,
LIQUID: M9
(NSN 1370-01-047-3479)**

This copy is a reprint which includes current pages from Change 1.

HEADQUARTERS, DEPARTMENT OF THE ARMY

OCTOBER 1980

WARNINGS

The actuating charges (actuators) may be initiated by static electricity, Radio Frequency (RF) signals, or Electromagnetic Radiation (EMR). To protect yourself from injury, heed the following warnings:

DO NOT use SPAL during electrical storms.

Do NOT set up SPAL within 300 feet (approximately 100 meters) of radio transmitter or Electromagnetic Radiation transmitter.

DO NOT remove actuating charges from their containers until ready to place them inside filled bottles at the launch site.

Before removing actuating charges from their containers, kneel and touch the ground with your bare hand. This will ground static electricity in your body and clothing.

Leave insulated leads twisted together and taped to base of actuating charge until ready to thread leads through bottle cap.

Keep all parts of the body clear of the loaded SPAL barrels.

To protect yourself against fragmentation hazards, heed the following warnings:

Fire the SPAL in a vertical position.

Stand at least 25 meters (approximately 80 feet) away from SPAL launch point at the time of firing.

Turn away when you see the airstream.

Wear steel helmets if within 300 feet (approximately 100 meters) of SPAL launch site.

Actuating charges containing black powder must be handled with care at all times. If the actuating charges are dropped, thrown, tumbled, or dragged, an explosion may result, causing death or injury and destruction of equipment.

DO NOT attempt to dismantle a SPAL that has failed to launch.

DO NOT attempt to dismantle a projectile bottle that has failed to burst in the air.

The simulant is toxic only if consumed. DO NOT drink the simulant. Serious illness or death may result.

Avoid being burned or shocked, if firing with a 24-V battery. Do not handle bare ends of firing line leads when touching them to battery posts. Hold the insulated portion of the leads.

CHANGE }
No. 1 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 7 March 1983

**Operators Instructions and Organizational
Maintenance Manual
SIMULATOR, PROJECTILE AIRBURST, LIQUID: M9
(NSN 1370-01-047-3479)**

The purpose of this change is to revise the safety warnings and to add first-aid instructions. TM 3-1370-100-12, 31 October 1980, is changed as follows:

1. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number.

2. Remove old pages and insert new pages as follows:

Remove pages	Insert pages
Inside front cover	A and B (front of manual)
I and II	i and ii
1-1 through 1.4	1-1 through 1-4
2-1 through 2-4	2-1 through 2-4
2-7 and 2-8	2-7 through 2-8
2-11 through 2-14	2-11 through 2-14
6-11(6-2 blank)	6-1/(6-2 blank) '
A-1/(A-2 blank)	A-1/(A-2 blank)

3. File this transmittal sheet in front of the publication.

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General United States Army
The Adjutant General

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Be sure launching site is safe distance from transmitting devices and energized power transmission lines.

DO NOT remove actuating charges from their containers until ready to place them inside filled bottles at the launch site.

Always use bare hands to handle actuating charges and make all wiring connections.

Before removing actuating charges from their containers, kneel and touch the ground with your bare hand. This will ground static electricity in your body and clothing.

Leave insulated leads twisted together and taped to base of actuating charge until ready to thread leads through bottle cap.

Keep all parts of the body clear of the loaded SPAL barrels.

To protect yourself against fragmentation hazards, heed the following warnings:

Fire the SPAL in a vertical position.

Stand at least 25 meters (approximately 80 feet) away from SPAL launch point at the time of firing.

Wear goggles to protect your eyes.

Wear steel helmets if within 300 feet (approximately 100 meters) of SPAL launch site.

Actuating charges containing black powder must be handled with care at all times. If the actuating charges are dropped, thrown, tumbled, or dragged, an explosion may result, causing death or injury and destruction of equipment.

DO NOT attempt to dismantle a SPAL that has failed to launch.

DO NOT attempt to dismantle a projectile bottle that has failed to burst in the air.

Avoid being burned or shocked, if firing with a 24-V battery. Do not handle bare ends of firing line leads when touching them to battery posts. Hold the insulated portion of the leads.

DO NOT drink the simulant. It could make you sick.

DO NOT splash simulant in your eyes. It could cause severe irritation.

Change 1 A

**OPERATOR'S INSTRUCTIONS AND ORGANIZATIONAL MAINTENANCE MANUAL
 SIMULATOR, PROJECTILE AIRBURST, LIQUID: M9
 NSN 1370-01-047-3479**

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to Commander, US Army Armament Materiel Readiness Command, ATTN: DRSAR-MAS-C, Aberdeen Proving Ground, MD 21010. A reply will be furnished to you.

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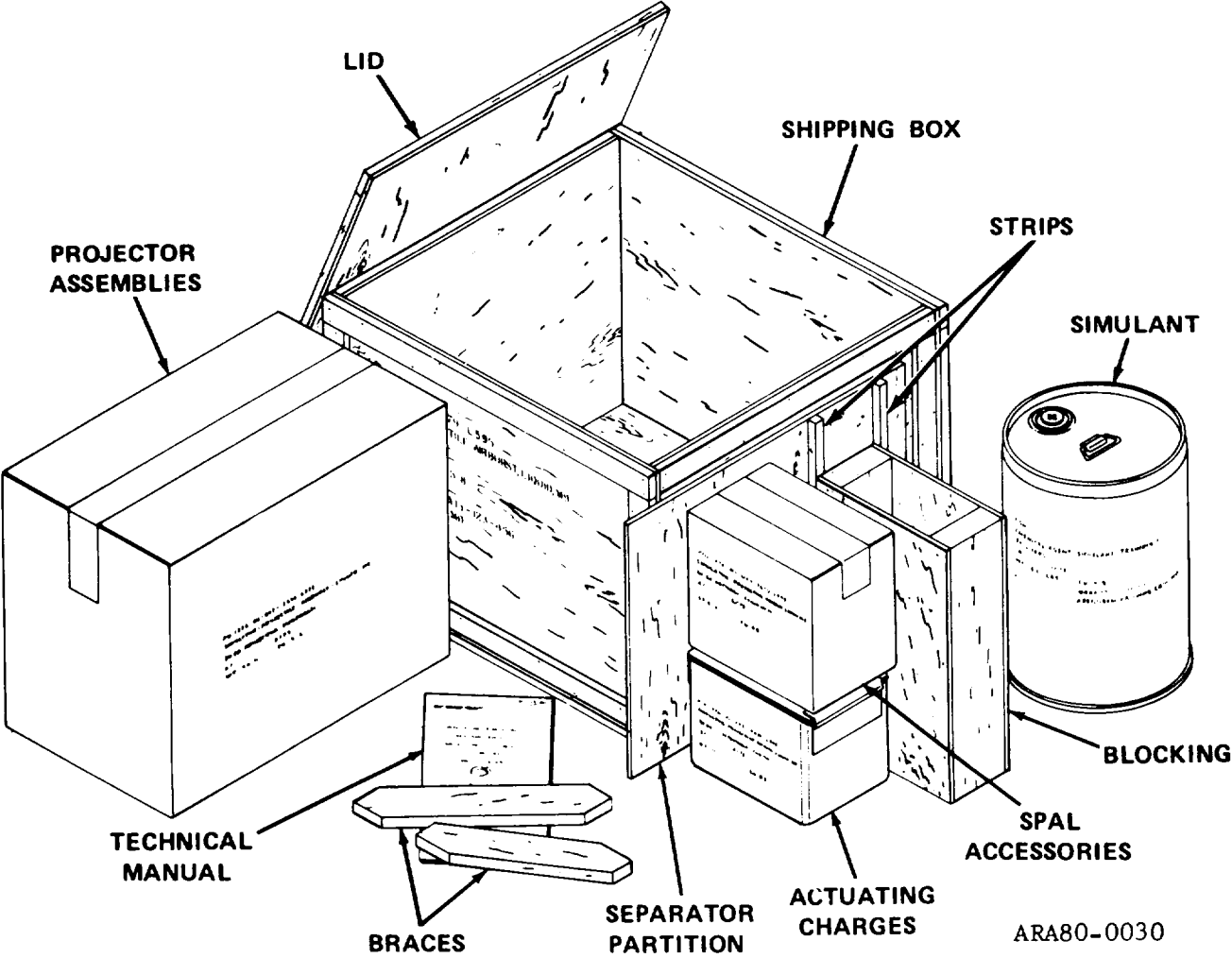
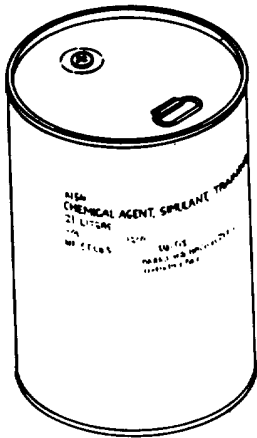
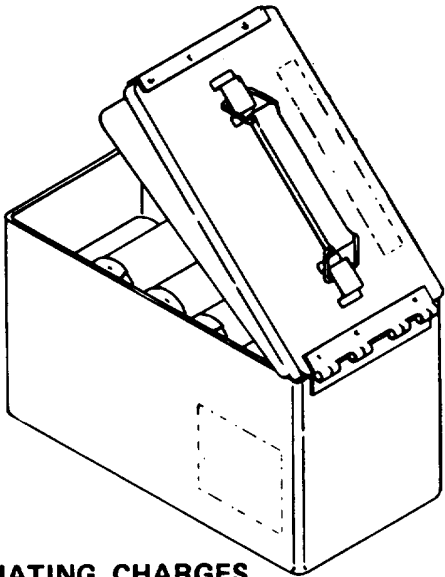


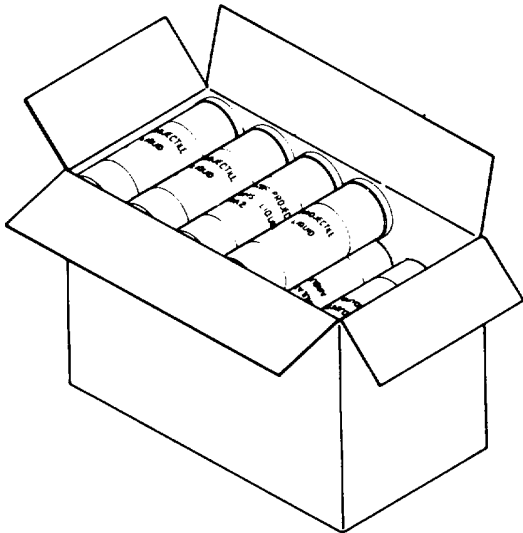
Figure 1-1. Simulator, Projectile, Airburst, Liquid: M9 and Associated Equipment (Sheet 1 of 3).



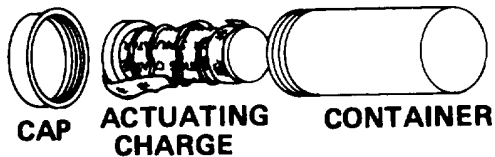
**CHEMICAL AGENT SIMULANT
IN SHIPPING PAIL**



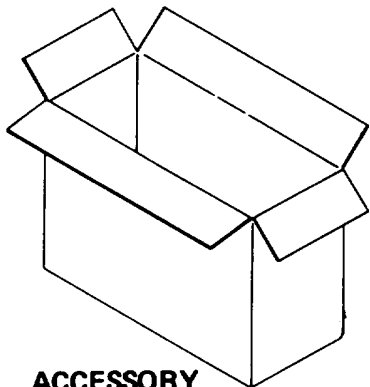
**ACTUATING CHARGES
IN AMMO CONTAINER**



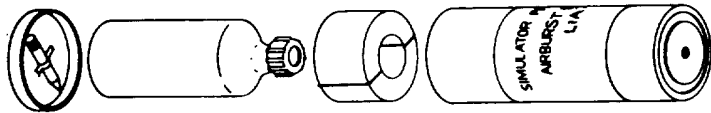
**PROJECTOR ASSEMBLIES
IN SHIPPING CONTAINER**



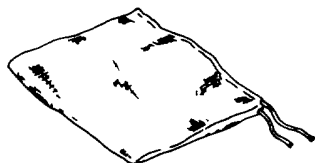
CAP ACTUATING CHARGE CONTAINER



**ACCESSORY
SHIPPING CONTAINER**



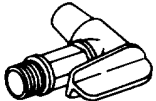
PROJECTOR ASSEMBLY (exploded view)



**CAP/PLUG
BAG**



CAP/PLUGS

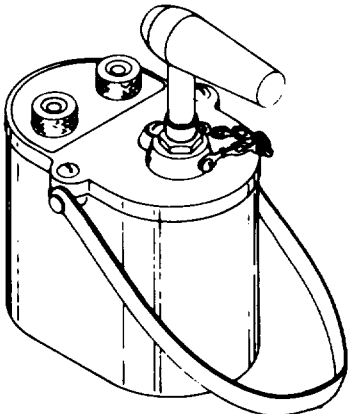


FAUCET

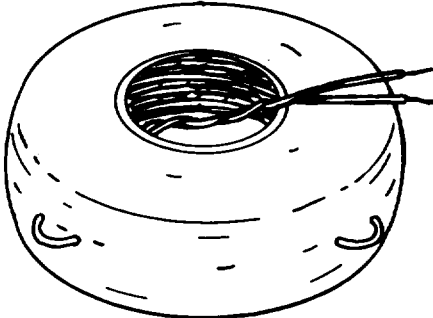
ARA80-0031

Figure 1-1. Simulator, Projectile, Airburst, Liquid: M9 and Associated Equipment (Sheet 2 of 3).

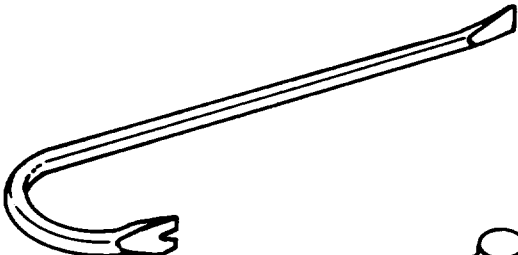
Associated Equipment—Not Supplied



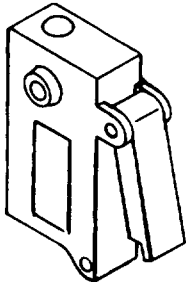
BLASTING MACHINE



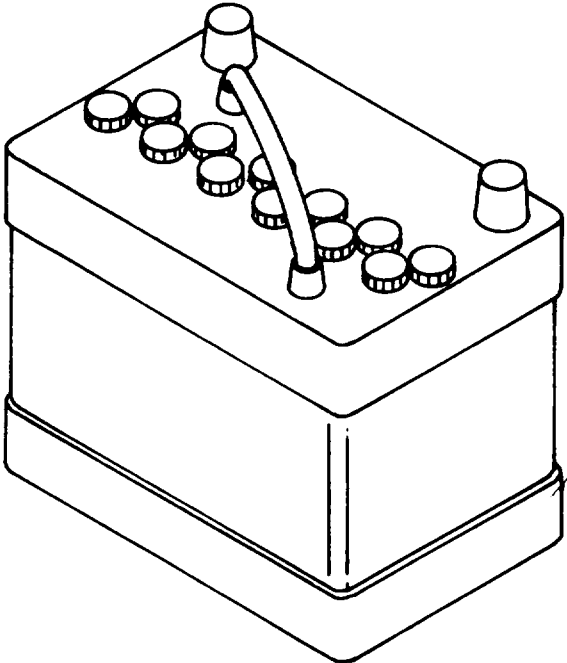
TELEPHONE CABLE



WRECKING BAR



M51 BLASTING CAP TEST SET



STORAGE BATTERY

ARA80-0032

Figure 1-1. Simulator, Projectile, Airburst, Liquid: M9 and Associated Equipment (Sheet 3 of 3).

CHAPTER 1 INTRODUCTION

Section I. GENERAL

1-1. Scope

- a. Operator, who will operate the SPAL (fig. 1-1).
- b. Organizational personnel who will inspect the SPAL. The manual covers preliminary inspection, unpacking, and set-up procedures, the operation of the SPAL, and post-operational procedures. The manual also contains inspection procedures to be performed by organizational personnel.

1-2. Forms, Records, and Reports

Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in TM 38-750.

1-3. Administrative Storage

See Chapter 6.

Section II. DESCRIPTION AND DATA

1-4. Description of Purpose, Function, and Features

a. *Purpose.* The SPAL, when fired, simulates a toxic rain attack. It provides realistic chemical defense training for Army troops.

b. *Function.* Five fired projector assemblies will produce a 50-meter-wide band of toxic agent simulant, 100 meters downwind (approximately 150 by 300 feet).

c. Features.

(1) Major Components.

- (a) Projector Assemblies (20 ea.).
- (b) Actuating Charges (20 ea.).
- (c) 5.5 gallons (21 liters) of

containerized chemical agent simulant.

(d) Accessories.

- (2) Portable.
- (3) Expendable.
- (4) Can be fired in winds up to 15 knots.

d. *Differences in End Item Nomenclature.* The shipping box is marked with US nomenclature (para (1)). The projector assemblies are marked with UK nomenclature (para (2)).

(1) United States: Simulator, Projectile Airburst, Liquid: M9.

(2) United Kingdom: Simulator, Projectile, Airburst, Liquid, Chemical Agent, L1A2.

1-5. Description of Major Components

a. *Projector Assembly.* The projector assembly (fig. 1-2) consists of:

(1) Barrel. Controls direction of bottle when fired. Has threaded bushing in center of base for implanting spike.

(2) Barrel Lid. Protects inside of barrel, and

secures bottle and obturator within barrel when not in use.

(3) Obturator. A split cylinder located in bottom of barrel to prevent gases from escaping on firing.

(4) Implanting Spike. Is screwed into threaded bushing in base of barrel. Pushed into ground to ensure retention of barrel in vertical position.

(5) Bottle with Screw Cap. Holds the simulant and the actuating charge.

(6) O Sealing Ring. Seals the simulant in bottle when actuating charge is inserted in bottle.

b. *Actuating Charge.* The actuating charge (fig. 1-3), when in firing configuration and electrically charged, propels a simulant-filled bottle (fig. 1-2) into the air. A one-second, burn-through delay fuse sets off a burster charge. This ruptures the bottle in the air to produce a cloud of spray from the simulant.

c. *Chemical Agent Simulant.* Chemical Agent Simulant (fig. 1-4), composed of 90 parts by weight technical grade polyethylene glycol 200 and 10 parts by weight water, is a substitute for liquid chemical agents. It causes color changes in chemical agent detector paper in much the same way as liquid toxic chemical agents. The 5.5 gallons (21 liters) of simulant is contained in a 6-gallon pail. The pail has a threaded plug which is removed for installation of a faucet (fig. 1-5). The faucet is used to transfer simulant to projector assembly bottles (fig. 1-2).

d. Accessories.

(1) The cap/plugs (fig. 1-5) seal the bottles (fig. 1-2) when filled in an area away from launch site.

(2) The faucet (fig. 1-5) screws into the pail (fig. 1-4) when plug is removed. It is used to transfer simulant from pail to projector assembly bottles (fig. 1-2).

1-6. Equipment Table

Equipment furnished is listed in paragraph 1-5a. through d. Equipment required, but not supplied, is

listed in Table 1-1 and shown in figure 1-1, sheet 3 of 3 (except hand tools and materials).

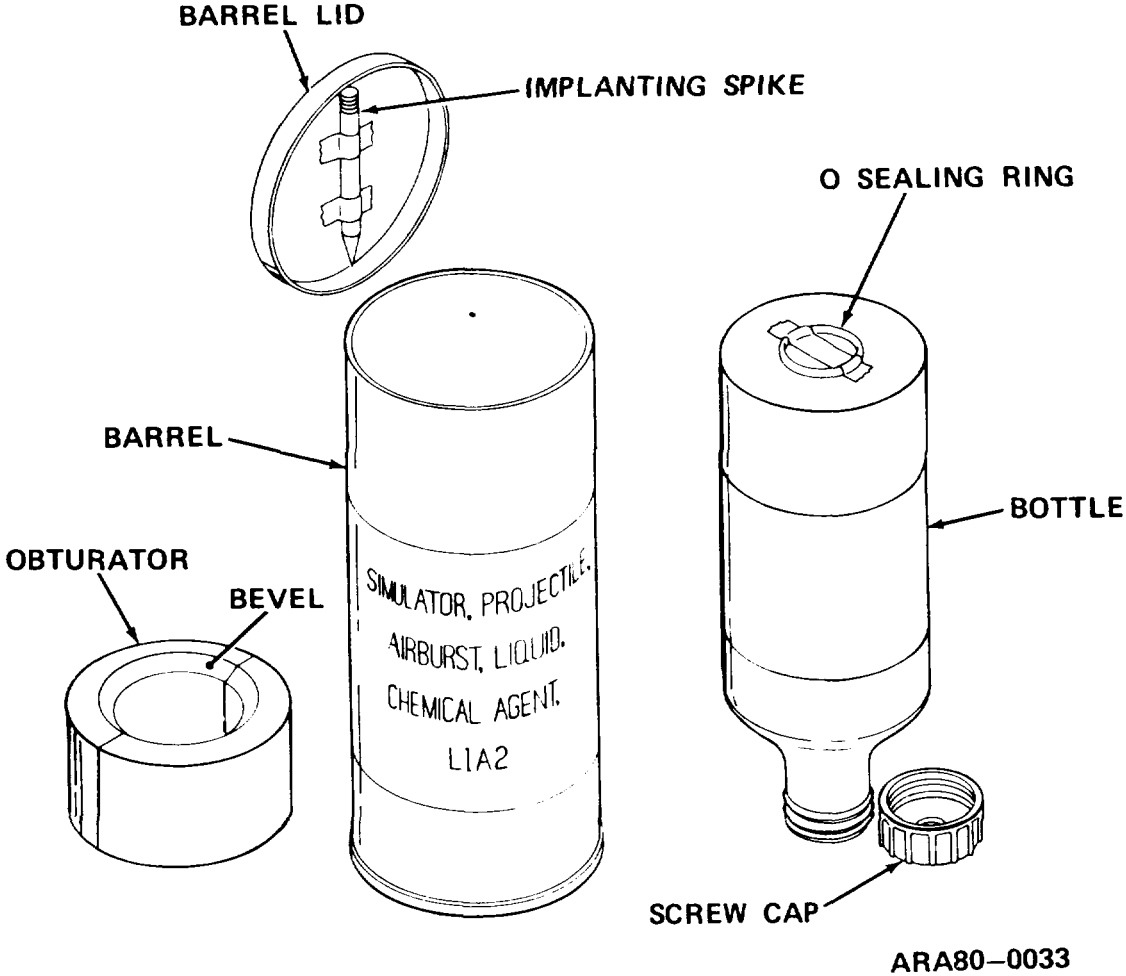


Figure 1-2. Projector Assembly.

Change 1 1-2

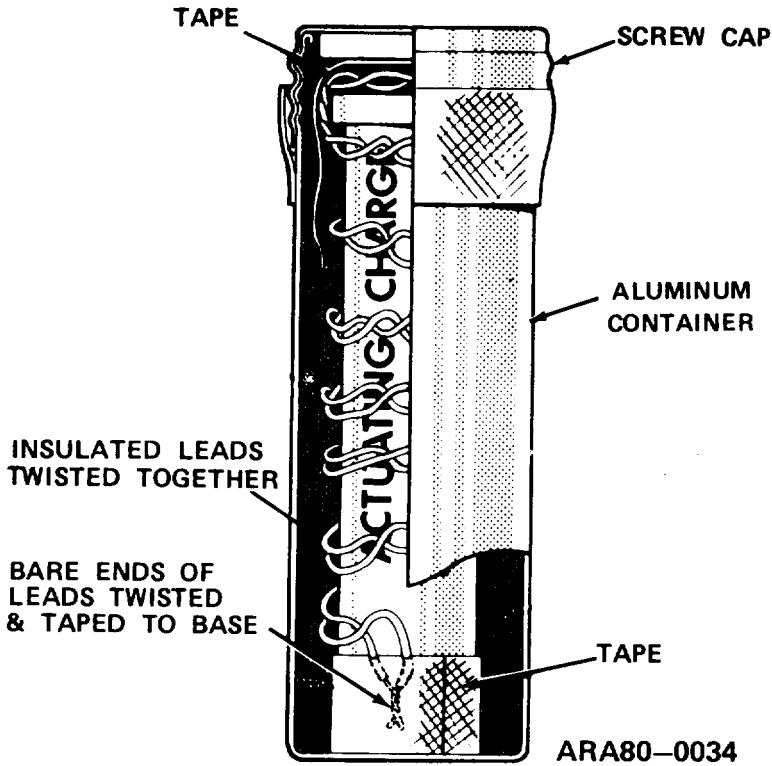


Figure 1-3. Actuating Charge.

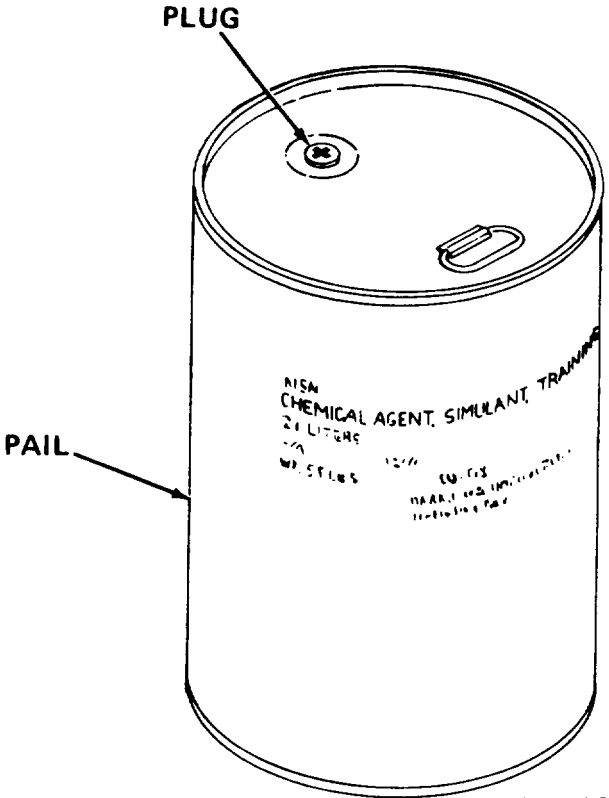


Figure 1-4. Chemical Agent Simulant and Pail.

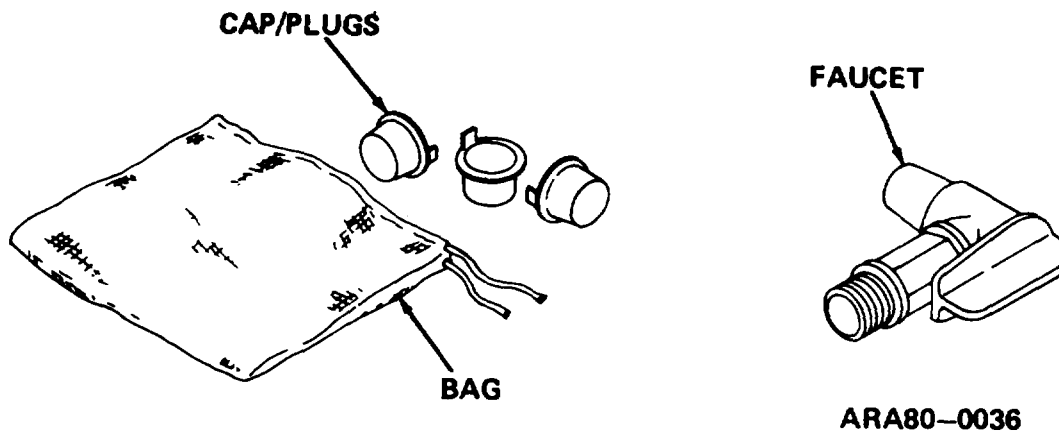


Figure 1-5. Accessories (ARA80-0036).

Table 1-1. Equipment Required But Not Supplied.

QUANTITY AUTH	SHORT FORM NOMENCLATURE	NATIONAL STOCK NUMBER
1 ea	Battery, Storage, 24 volts	6140-00-059-3528
	or	
1 ea	Blasting Machine, metal case, handle operated, 10 cap*	1375-00-782-5541
	or	
1 ea	Blasting Machine, metal case, handle operated, 10 cap	1375-00-212-4614
	or	
1 ea	Blasting Machine, lexan case, handle operated, 10 cap, (M32)*	1375-00-935-9173
1.320 ft	Cable, Telephone, WD-1/TI (813491, 2 conductor field wire, stranded No. 21 AWG, insulated.	6145-00-226-8812
1 ea	Pliers, Slip Joint, 8-inch	5120-00-240-6217
1 rl	Tape, Pressure Sensitive, 1/2-in w	8135-00-266-6716
5 yd	Cloth, Cheesecloth	8305-00-222-2423
1 ea	Test Set, Blasting Cap. M51	4925-00-999-3454
1 ea	Bar, Wrecking, 3/4 by 24 in	5120-00-224-1393
1 ea	Crimping Tool. Terminal Hand	5120-00-278-2423
1 ea	Goggles, Industrial	4240-00-816-3819

*These blasting machines are components of the Demolition Equipment Set, Explosive Initiating, Electric and Non-Electric (NSN 1375-00-47-3750)

1-7. Tabulated Data (Approximate)

a. SPAL Effective Range Downwind Coverage.

NOTE

In recommended setup of five projector assemblies each.

- (1) Width 50m (164 ft)
- (2) Length 50 to 100m (164 to 328 ft)

b. Projector Assembly.

- (1) Weight
 - (a) Empty 0.45 kg (1 lb)
 - (b) Filled (one liter chemical agent simulant) 1.6kg (3.5 lb)
- (2) Dimensions
 - (a) Height 30.5 cm (12 in)
 - (b) Diameter 10.7 cm (4.2 in)

c. Packaging Data.

- (1) SPAL Shipping Box
 - (a) Weight 70 kg (155 lb)
 - (b) Length 69 cm (27 in)
 - (c) Width 58 cm (23 in)

- (d) Height 51 cm (20 in)
- (2) Projector Assembly Shipping Container
 - (a) Number in container 20 ea
 - (b) Weight 11 kg (25 lb)
 - (c) Length 56 cm (22 in)
 - (d) Width 33 cm (13 in)
 - (e) Height 46 cm (18 in)
- (3) Actuating Charge Ammo Container
 - (a) Number in container 20 ea
 - (b) Weight 4 kg (9 lb)
 - (c) Length 30 cm (12 in)
 - (d) Width 15 cm (6 in)
 - (e) Height 20 cm (8 in)
- (4) Chemical Agent Simulant Shipping Pail
 - (a) Volume 21 liters (5.5 gal)
 - (b) Height 38 cm (15 in)
 - (c) Weight 27 kg (60 lb)
 - (d) Diameter 30 cm (12 in)
- (5) Accessory Shipping Container
 - (a) Weight 2.3 kg (5 lb)
 - (b) Length 30 cm (12 in)
 - (c) Width 15 cm (6 in)
 - (d) Height 22 cm (9 in)

CHAPTER 2 OPERATING INSTRUCTIONS

Section I. PREPARATION FOR OPERATION

2-1. General

The normal employment of SPAL will be five projectors. This number will produce at least a 50-meterwide band of simulant, 100 meters downwind (approximately 150 by 300 feet).

2-1.1. First Aid Instructions

The chemical agent simulant should be used only as described in this manual.

- a. If simulant gets in the eyes, flush with large amounts of water.
- b. If simulant is swallowed, seek medical attention immediately.

2-2. Preliminary Inspection

WARNING

Do NOT use SPAL during electrical storms. The actuating charges may be initiated by static electricity.

- a. Check weather conditions. Be sure no electrical storms are in or near the launching site. Be sure no electrical storms are expected.

WARNING

Be sure launching site is safe distance from transmitting devices and energized power transmission lines. Actuating charges may be initiated by static electricity, Radio Frequency (RF) signals, or Electromagnetic Radiation (EMR).

- b. To be sure launching site is safe distance from transmitting devices and energized power transmission lines, consult chapter 18 of AR 385-63 or table 2-1, para 2-9 of FM 5-25.

2-3. Unpacking

- a. Stop vehicle a safe distance upwind (approximately 100 yards) from firing source location.
- b. Remove lid (fig. 1-1, Sheet 1 of 3) from shipping box with a wrecking bar (table 1-1).
- c. Remove all contents of shipping box (fig. 1-1, sheet 1 of 3). Turn shipping box bottom up. This will provide a work surface.
- d. Place separator partition (from shipping box) with strips up (fig. 1-1, sheet 1 of 3) on top of box. The separator partition is the cradle for the pail.
- e. Open projector assembly shipping container

(fig. 1-1, sheet 2 of 3) and remove five projector assemblies. Lay aside until needed.

- f. Open accessory shipping container. Remove faucet and cap/plug bag. Lay aside until needed.

2-4. Preparation and Setup Procedures

a. Preparing Pail of Chemical Agent Simulant.

- (1) Use pliers to remove plug from pail (fig. 1-4). Cut bung seal with knife. Save plug.
- (2) Screw faucet into opening and hand tighten (fig. 2-1).
- (3) Make sure faucet is closed before performing step (4).
- (4) Place pail on separator partition.

b. Preparing Bottles.

- (1) Untape and remove barrel lid (fig. 1-2).
- (2) Remove bottle from barrel. Remove O sealing ring from bottom of bottle and tape it to inside of barrel lid.

NOTE

Be sure obturator is in bottom of barrel, with bevelled edge up. If not, turn obturator over.

- (3) Unscrew and remove bottle cap. Fill bottle to fill line with chemical agent simulant (fig. 2-1).

WARNING

Do not drink the simulant. It could make you sick. Do not splash simulant in your eyes. It could cause severe irritation.

- (4) Remove cap/plug from bag (fig. 1-5) and insert in neck of bottle (fig. 2-1). Replace screw cap and hand tighten.

NOTE

Make sure bottle is tightly sealed. Figure 2-6 shows the right and wrong ways of putting the cap on the bottle.

- (5) Turn bottle upside down and insert it in barrel. Replace barrel lid.

- (6) Repeat steps (1) through (5) for remaining four projector assemblies.

c. *Extension Leads and Firing Line Lead.* Use telephone cable for extension leads and firing line lead (table 1-1). Pace off each length of cable (one pace equals approximately 3 feet). Use crimping tool (table 1-1) to cut:

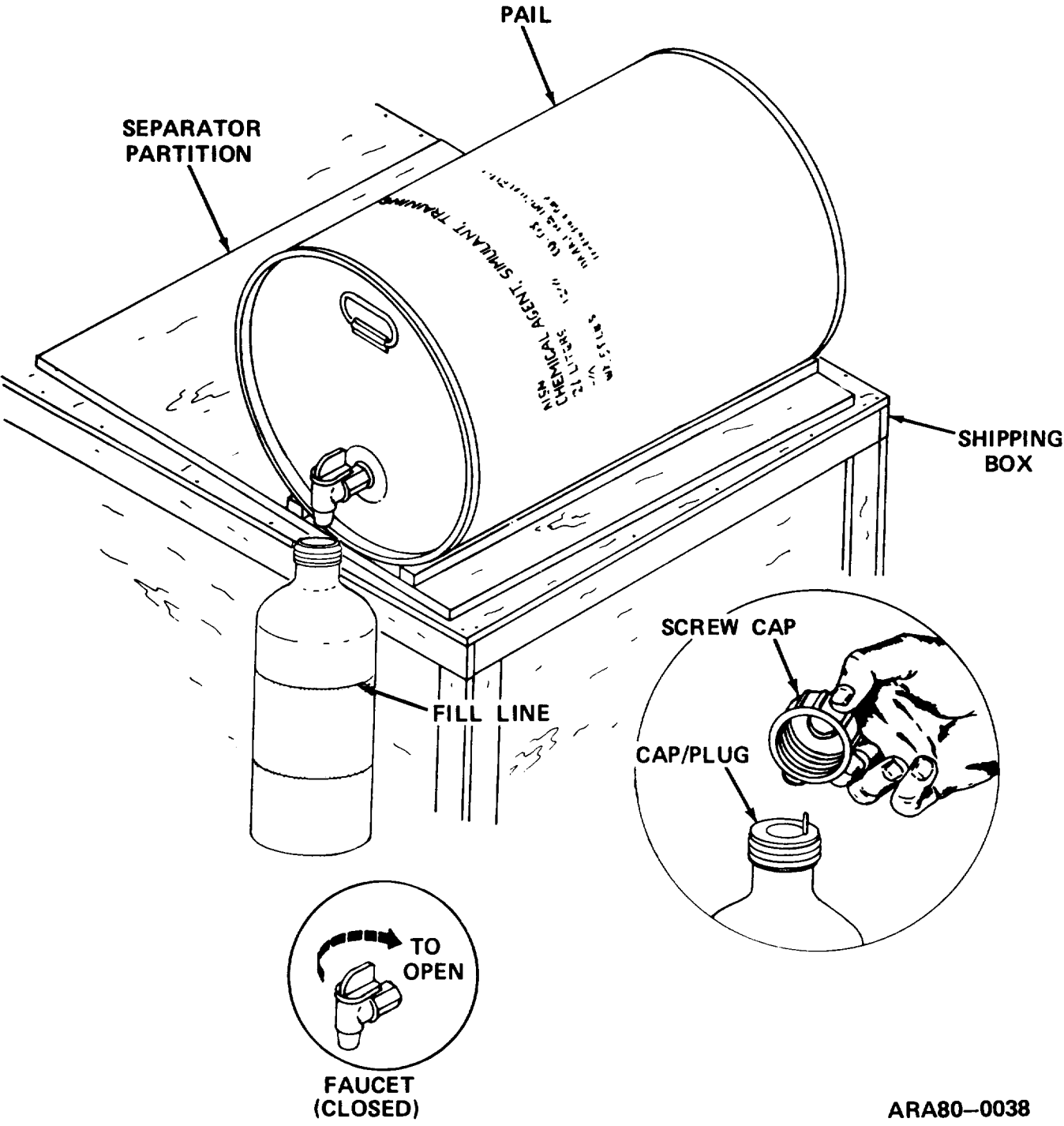


Figure 2-1. Filling Bottle with Simulant.

- (1) Two pieces, approximately 75 feet long (25 meters).
- (2) Two pieces, approximately 55 feet long (18 meters).
- (3) One piece, approximately 45 feet long (15 meters).
- (4) One piece, approximately 125 feet long (40 meters).
- (5) Use crimping tool to strip ends of all leads (fig. 2-2).

Twist strands of each bare conductor together.

d. *Setting Up Projector Barrels.*

WARNING

To protect yourself against fragmentation hazards, projector assemblies must be fired in a vertical position. Be sure that barrels cannot be tilted or knocked over.

- (1) Carry five projector assemblies, all leads, and ammunition container to emplacement site.
- (2) Place projector assemblies in straight line 30 to 35 feet apart (approximately 10 meters). Pace off distance between barrels (fig. 2-3).
- (3) Remove lid from barrel (fig. 1-2). Save lid.
- (4) Remove bottle from barrel. Set bottle aside.
- (5) Remove spike from lid and screw into bushing in base of barrel. Use pliers if necessary.

NOTE

Be sure base of barrel sits flat on ground.

- (6) Push spike into ground until base of barrel sits flat on ground (fig. 2-3).
- (7) Repeat steps (3) through (6) for remaining four barrels.

e. *Laying Out Extension Leads and Firing Line Lead*

- (1) Start with center barrel (fig. 2-3). Lay out shortest extension lead to Point A.

NOTE

Point A is the junction (meeting) point of all five extension leads.

- (2) From outermost barrels, extend longest extension leads to Point A.

- A.
 - (3) Lay out remaining extension leads to Point A.
 - (4) Lay out firing line lead from Point A to firing source.
 - (5) Twist bare ends of firing line together at firing point (fig. 2-3).

f. *Preparing Bottle at Launch Site.*

WARNING

The actuating charges may be initiated by static electricity, Radio Frequency (RF) signals, or Electromagnetic Radiation (EMR). To protect yourself from injury, heed the following warnings: Always use bare hands to handle the actuating charges and make all wiring connections.

Wear goggles when setting up the M9 SPAL. The goggles will protect your eyes from fragments when firing or in case of accidental initiation.

DO NOT remove actuating charges from their packing containers until ready to place them inside filled bottles.

Before removing actuating charges from their packing containers, kneel and touch the ground with your bare hand. This will ground static electricity in your body and clothing.

Leave actuating charge leads twisted together and taped to base of actuating charge until ready to thread leads through bottle cap.

NOTE

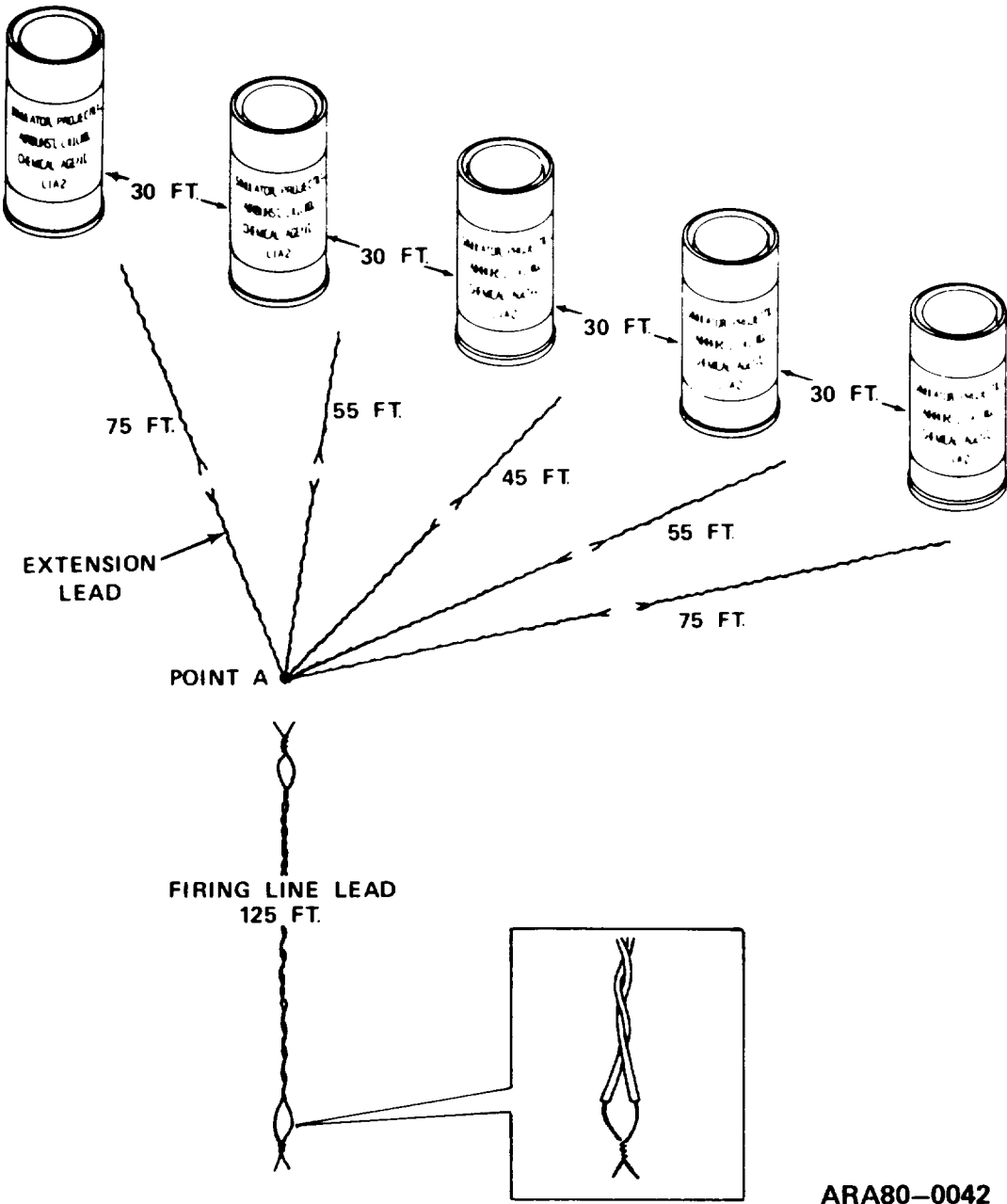
The DOT marking label on the ammunition box reads: "Explosive Power Devices, Class C, Handle Carefully, Keep Fire Away."

- (1) Don goggles. See table 1-1 for national stock number.
- (2) Remove one actuating charge container from ammunition container (fig. 2-4).
- (3) Remove screw cap and cap/plug from bottle (fig. 2-1).



ARA80-0040

Figure 2-2. Stripped End of Telephone Cable. (ARA80-0040).



ARA80-0042

Figure 2-3. Layout of Extension Leads, Firing Line Lead, and Projector Barrels.

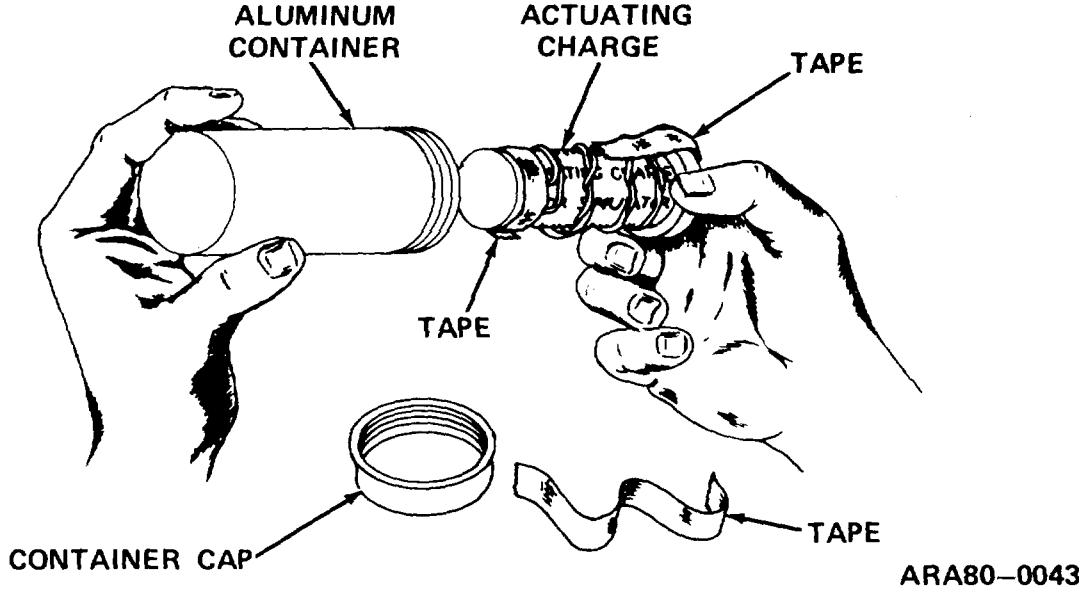
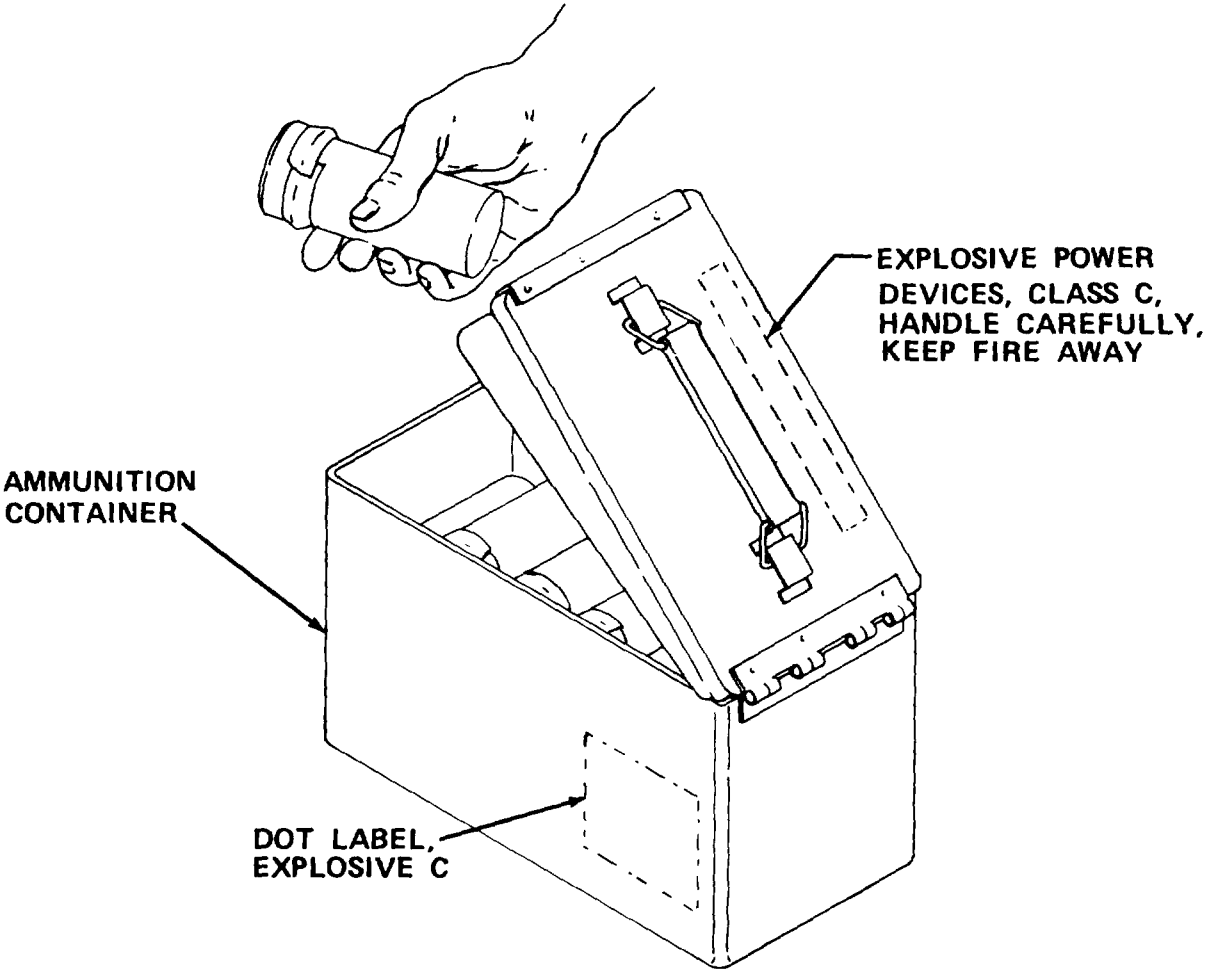


Figure 2-4. Removing Actuating Charge from Containers.

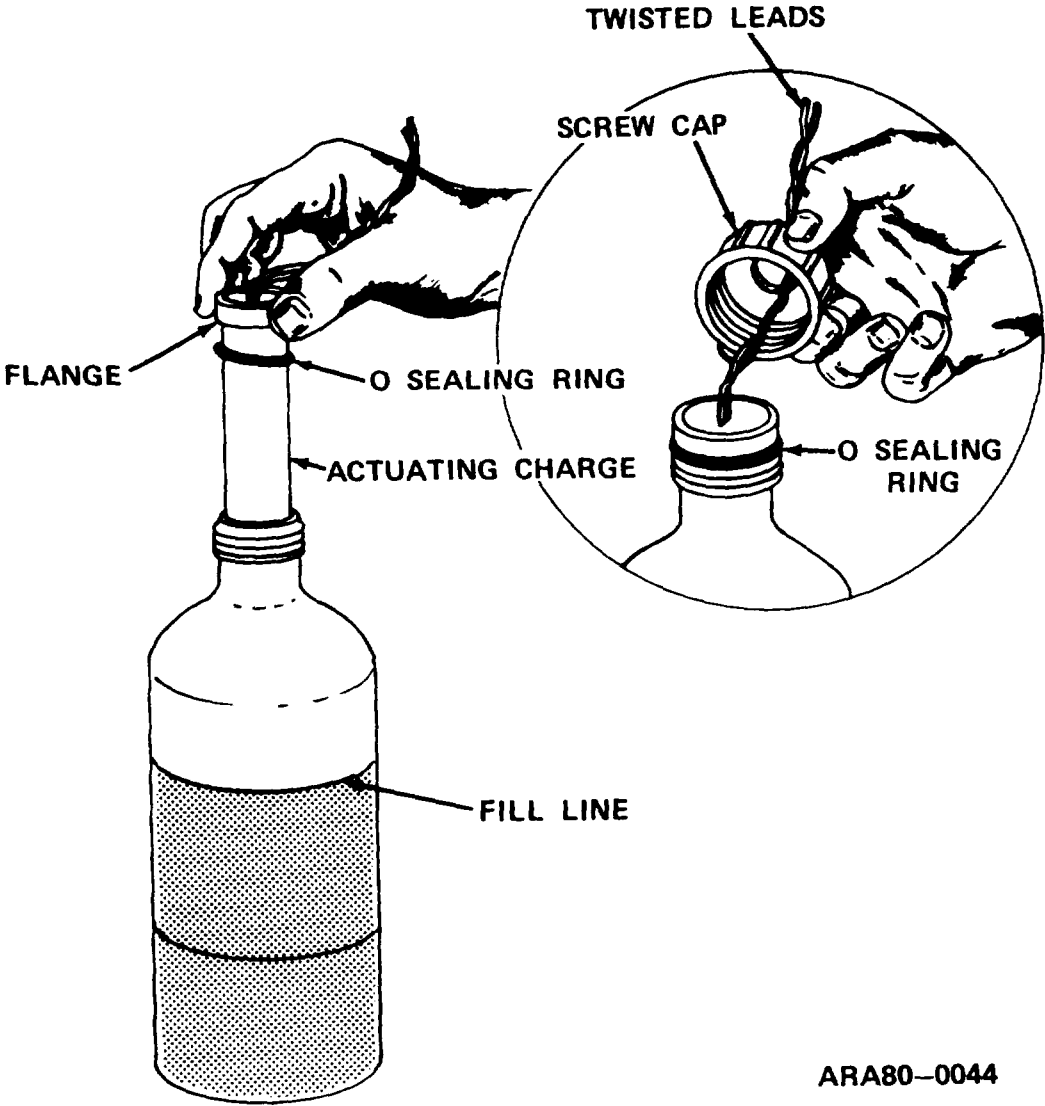


Figure 2-5. Preparing Bottle at Launch Site.

(4) Kneel, untape and remove container cap. Remove actuating charge from its container (fig. 2-4).

(5) Remove tape securing actuating charge leads to charge. Unwind leads from the body of the charge. Bring leads up to top of charge.

(6) Remove O sealing ring from inside barrel lid. Slide O sealing ring over end of actuating charge (fig. 2-5).

(7) Press actuating charge down through neck of bottle until flange of charge sets firmly on O sealing ring.

(8) Thread leads through screw cap.

(9) Screw cap firmly down to seal bottle and actuating charge (fig. 2-6).

CAUTION

If screw cap is not on straight, cap and actuating charge may separate from bottle on launch. Be sure cap is on straight and fully seated.

(10) Turn bottle upside down and check for leaks. If bottle leaks, remove actuator by performing steps (6), (7), and (8) in reverse order. With actuator out of bottle, perform steps (6), (7), and (8) in proper order. If bottle continues to leak, replace projector assembly.

(11) Check that split obturator is in bottom of barrel with bevelled edge up (fig. 2-7). If bevelled side is not up, turn obturator over.

(12) Run actuator charge leads up side of bottle. Hold leads in position while sliding bottle into barrel.

WARNING

To avoid injury, keep all parts of body clear of loaded barrels.

CAUTION

Do not pass actuator charge leads over bottle.

Do not replace lid on barrel. These may cause malfunction of equipment.

(13) Repeat steps (1) through (11) for remaining four bottles.

g. Connect Actuating Charge Leads to Extension Leads.

WARNING

To avoid injury, keep all parts of body clear of loaded barrels.

Before connecting actuating charge leads to extension leads, kneel and touch the ground with your bare hand. This will ground static electricity in your body and clothing.

(1) Attach conductors of actuating charge lead to conductors of extension lead for all five projector assemblies (fig. 2-8).

(2) Make sure bare connections are separated to avoid electrical short.

h. Connect Extension Leads to Firing Line Lead at Point A.

WARNING

Always use bare hands to handle the actuating charges and make all wiring connections.

Before connecting extension leads to firing line lead, kneel and touch the ground with your bare hand. This will ground static electricity in your body and clothing.

CAUTION

To avoid damage to equipment, do NOT trip over the extension leads or firing line.

(1) Connect conductors of extension leads to each other and connect conductors of firing line lead, as shown in figure 2-9.

(2) Make sure bare connections are separated to avoid electrical short.

(3) Remove wire and proceed to paragraph 2-5b.

(4) If set is inoperative, requisition new one.

b. Testing Firing Circuit.

(1) Kneel. Untwist and connect one wire of firing line lead to each binding post of the M51 blasting cap test set.

(2) Depress test set handle. Indicator lamp should flash. Disconnect test set and proceed with firing (para 2-6).

(3) If indicator lamp fails to flash, depress handle again. If indicator lamp still fails to flash, check for faulty circuit connections (a) below.

(a) Faulty circuit connections.

1. Check and be sure cable is properly attached to test set. Correct improper connection.

Section II. OPERATION OF SPAL

2-5. Preoperational Procedures

a. M51 Blasting Cap Test Set Serviceability Check. The M51 Test Set (table 1-1) is a self-contained unit with a magneto-type impulse generator, an indicator lamp, a handle to activate the generator, and two binding posts for attachment of firing leads. Test set is waterproof. It may be used at temperatures as low as -400F.

(1) Cut piece of cable, approximately 6 inches long. Strip ends, and connect between binding posts (fig. 2-10).

(2) Firmly depress handle while observing indicator lamp. If set is operative, indicator lamp will flash.

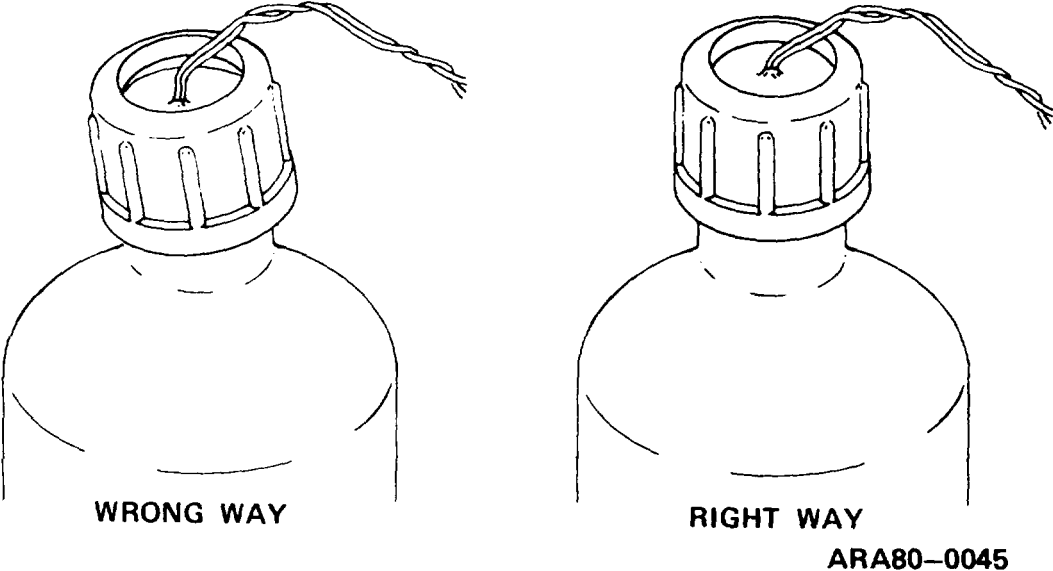


Figure 2-6. Proper Installation of Screw Cap.

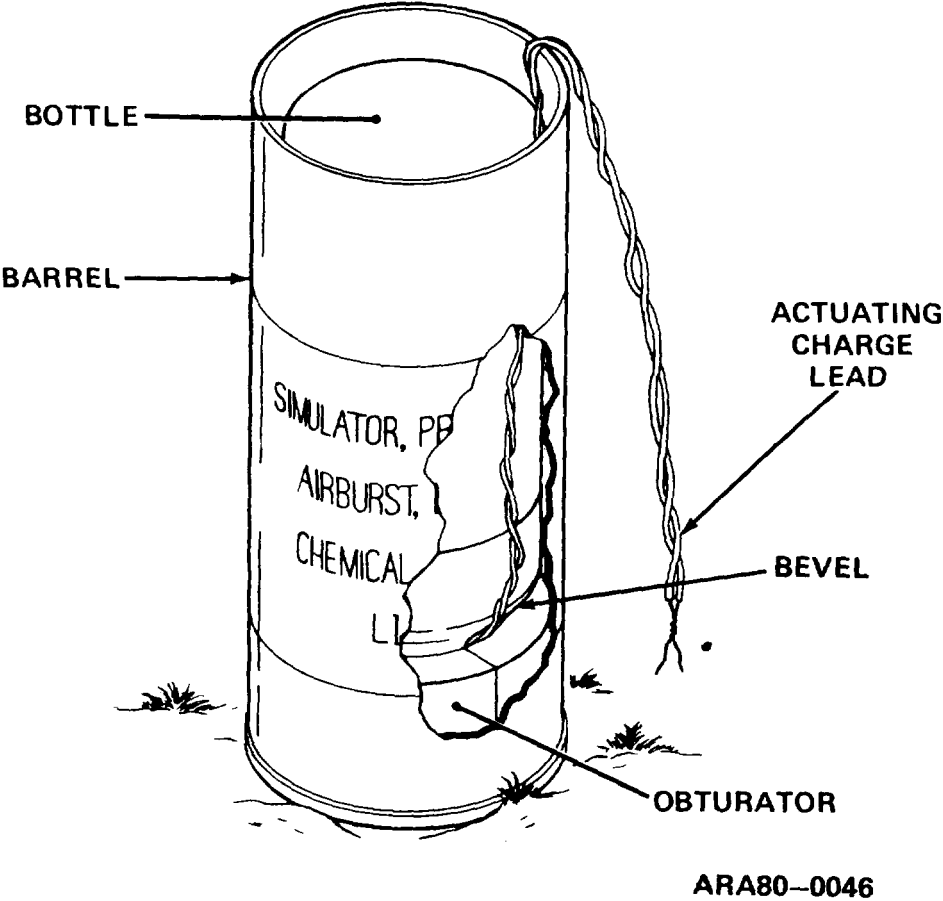
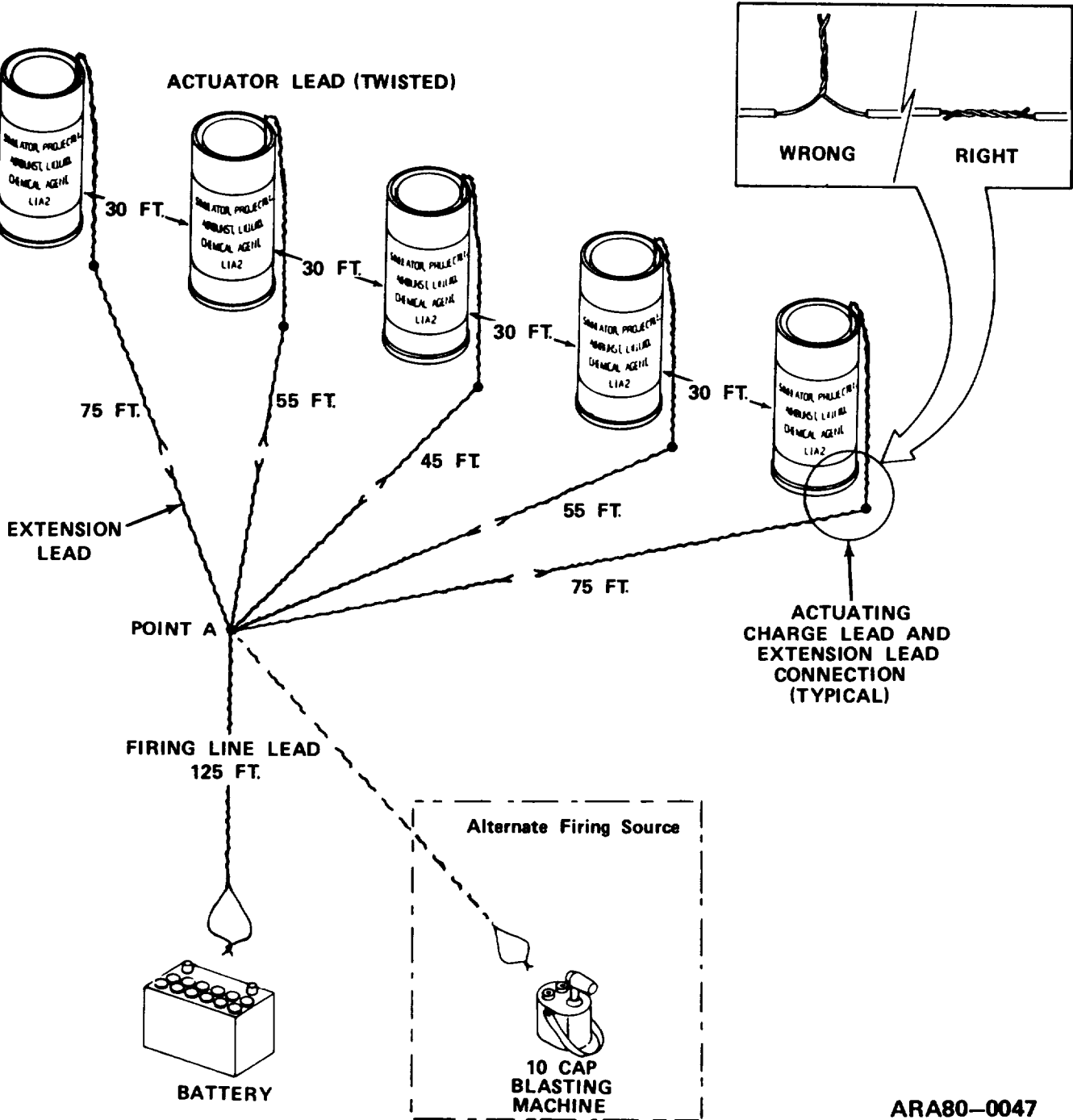


Figure 2-7. Assembled Projector.



ARA80-0047

Figure 2-8. Recommended Setup for SPAL.

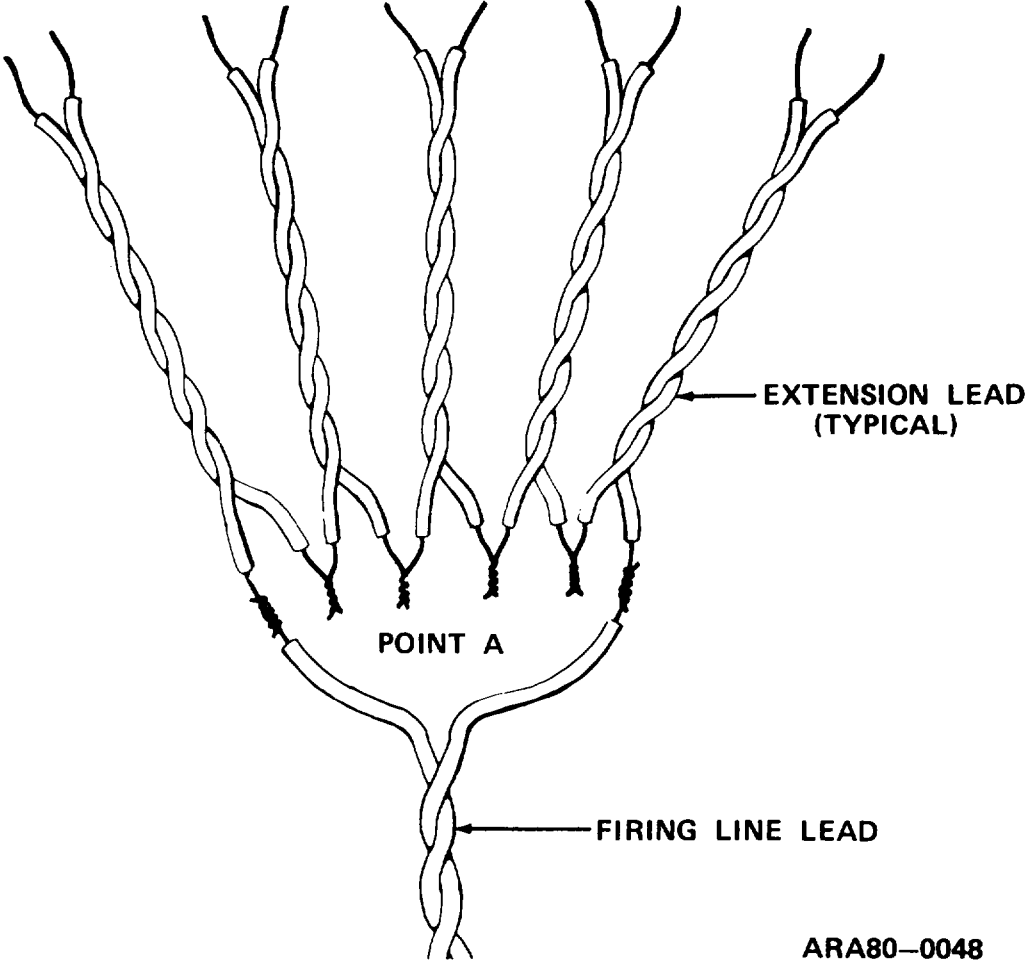


Figure 2-9. Extension Leads Connected to Firing Line Lead at Point A. (Illustration exaggerated for clarity.)

2. Check and be sure connections at point A are properly connected and separated from each other as shown in figure 2-9. Correct improper connection.

NOTE

Make sure bare connections are separated to avoid electrical short and misfire.

3. Check and be sure extension leads and actuating charge leads are properly connected and separated from each other (fig. 2-8). Correct improper connection.

4. Depress test set handle. Indicator lamp should flash. Disconnect test set and proceed with firing (para 2-6).

5. If indicator lamp fails to flash, check for broken conductor in firing line lead (b) below.

(b) Firing Line Lead Continuity Test.

1. Disconnect test set from firing line lead. Twist disconnected ends together.

2. At point A (fig. 2-9) disconnect firing line lead from extension leads.

3. Connect one wire of firing line lead to each binding post of the test set.

4. Depress test set handle. Indicator lamp should flash.

5. If indicator lamp fails to flash, cut new firing line lead.

6. Connect firing line lead to extension leads (fig. 2-9).

7. Connect new firing line lead to test set.

8. Depress test set handle. Indicator lamp should flash. Disconnect test set and proceed with firing (para 2-6).

9. If indicator lamp fails to flash, check for a faulty extension lead (c) below.

(c) Extension Lead Continuity Test.

1. Disconnect test set from firing line lead.

2. Disconnect extension leads from each other at point A (fig. 2-9).

3. Connect one wire of one extension lead to each binding post of the M51 test set. Depress test set handle; indicator lamp should flash. Repeat on each extension lead until faulty lead is found.

4. When faulty extension lead is found, disconnect from actuating charge lead. Twist bare ends of extension leads together.

5. Depress test set handle. If indicator lamp fails to flash, replace extension lead. If indicator lamp flashes, replace actuating charge.

6. Reconnect SPAL electrical circuit (para 2-4g and h).

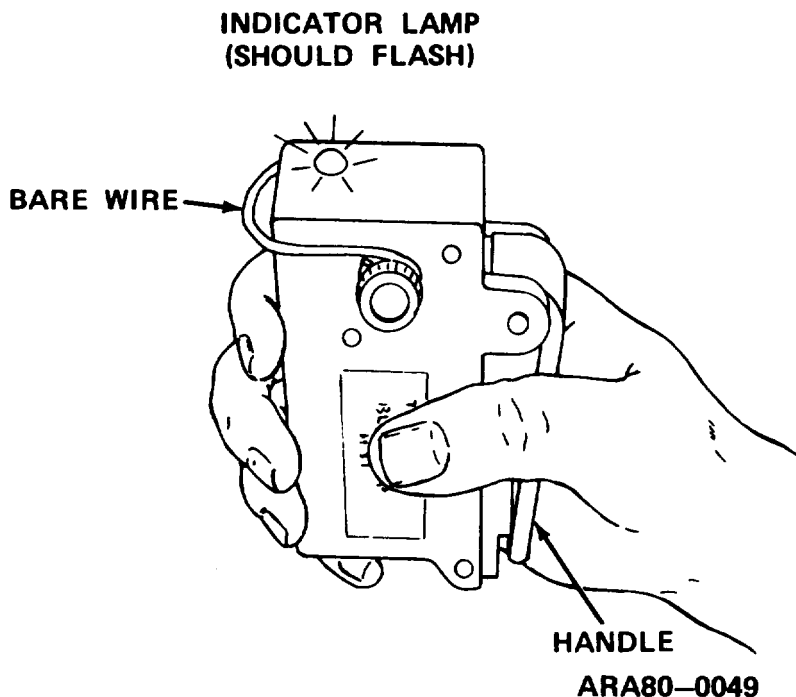


Figure 2-10. Checking Serviceability of M51 Blasting Cap Test Set. (ARA80-0049).

2-6. Operational Procedures

WARNING

To protect yourself against fragmentation hazards, heed the following warnings: Wear goggles to protect your eyes when operating the SPAL.

Fire the SPAL in a vertical position. Stay at least 80 feet (approximately 25 meters) away from the SPAL launch point at the time of firing. Wear steel helmets if within 300 feet (approximately 100 meters) of SPAL launch site.

a. *Firing Sources.* Use a 10-cap blasting machine or a 24-volt battery (fig. 2-11). Table 1-1 lists several types of blasting machines and a battery that may be used. Instructions for operating blasting machines are given in FM 5-25 and TM 91375-213-12.

b. *Connecting SPAL Firing Line to Firing Source.*

NOTE

Do not fire until circuitry checks and checks for proper connections have been performed successfully.

CAUTIONS

Touching firing line ends (conductors) to battery posts FIRES the SPAL. If blasting machine is used instead of battery, do not connect firing line to blasting machine until ready to fire.

- (1) At first point, untwist firing line ends.

WARNING

Avoid being burned or shocked, if firing with a 24-V battery. Do not handle bare ends of firing line leads (conductors) when touching them to battery posts. Hold the insulated portion of the leads.

- (2) If firing with a 24-V battery, take insulated portion of firing line lead and touch conductors to battery posts.

- (3) If firing with blasting machine, connect bare ends to connector posts of blasting machine. Operate blasting machine to fire.

2-7. Repacking SPAL

- a. Set pail on end with faucet on top (fig. 1-4). Remove faucet.
- b. Reinstall plug in pail. Hand tighten.
- c. Place pail and remaining SPAL contents in shipping box.

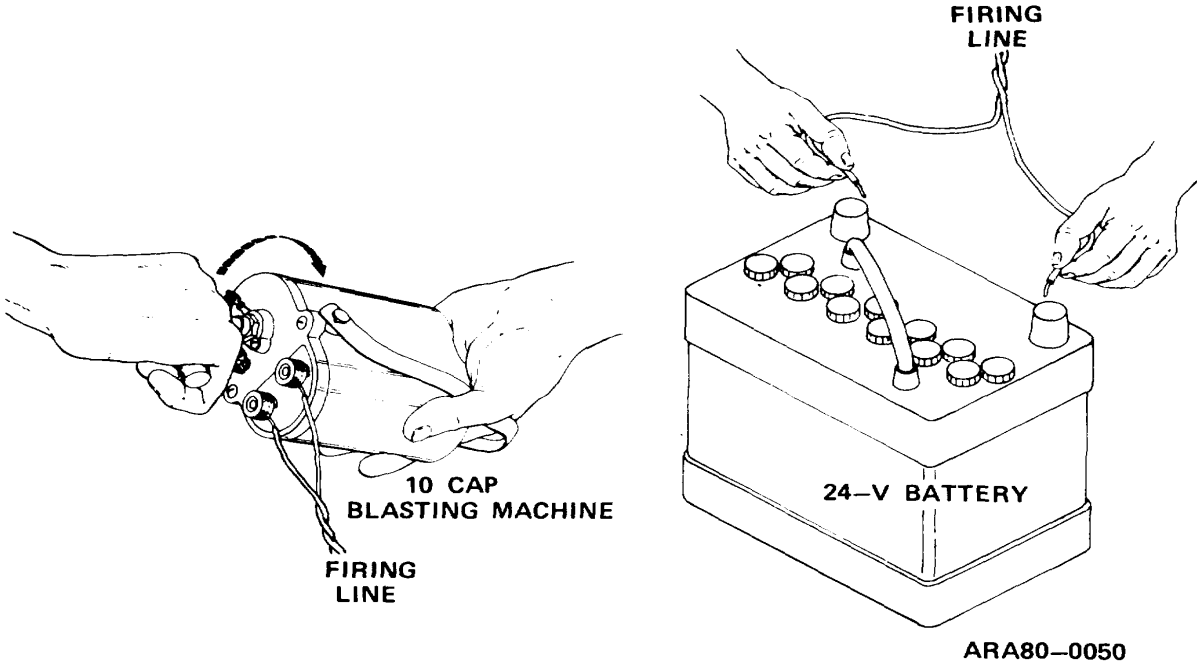


Figure 2-11. Firing the SPAL. (ARA80-0050).

2-8. Operating Principle of SPAL

(fig. 2-12)

a. On applying electric power to firing circuit, current flows through the leads to the electric fuze. The fuze ignites the propellant charge which in turn sets off the delay. The gases from the propellant charge propel the simulant-filled bottle into the air.

b. The delay, after burning for approximately 1 second, sets off the burster charge. This ruptures the bottle to produce a cloud of spray at a height of approximately 35 to 40 feet. The droplets extend over an area at least 150 feet wide and 150 to 300 feet downwind from the point of burst. The droplets are large enough to be detected by chemical agent detector paper.

2-9. Interrupted Mission

If mission is cancelled, dismantle SPAL setup (fig. 2-8).

WARNINGS

Always use bare hands to handle the actuating charges and make all wiring connections.

Wear goggles to protect your eyes.

Before disconnecting firing line leads, extension leads, or actuator leads, kneel and touch the ground with your bare hand. This will ground static electricity in your body and clothing.

To avoid injury, keep all parts of body clear of loaded barrels.

Actuating charges containing black powder must be handled with care at all times. If the actuating charges are dropped, thrown, tumbled, or dragged, an explosion may result, causing death or injury and destruction of equipment.

a. If blasting machine is used, kneel and disconnect firing line lead at blasting machine. Twist ends together.

b. At Point A (fig. 2-9), Kneel and disconnect extension leads from firing line lead. Twist end of firing line lead together.

c. Kneel and disconnect leads and twist ends together.

d. Kneel and disconnect actuating charge leads (fig. 2-8) from extension leads. Twist ends of actuator leads together.

e. Twist ends of extension leads together.

f. Roll up firing line lead and extension leads for future use.

g. Pull barrel from ground.

h. Turn barrel upside down and remove bottle.

i. Unscrew spike from barrel base and tape to inside of barrel lid (fig. 1-2).

j. Unscrew screw cap and remove actuating charge from bottle (fig. 2-5).

k. Remove O sealing ring from actuating charge.

l. Insert cap/plug (fig. 2-1) in bottle and install screw cap.

m. Tape O sealing ring to inside of barrel lid.

n. Wipe actuating charge with cheesecloth.

o. Repeat steps g. through n. for remaining projector assemblies.

p. After actuating charges have been dried, coil leads (fig. 1-3) around actuating charge and tape to base.

q. Place actuating charge in aluminum container (fig. 2-4) and replace cap.

r. Repeat steps p. and q. for each actuating charge.

s. Place actuating charge containers in ammunition container.

t. Set pail on end with faucet on top (fig. 1-4). Remove faucet.

u. Remove screw cap and cap/plug from bottle (fig. 2-1).

v. Pour chemical agent simulant into pail.

w. Screw cap on bottle and place cap/plug in bag.

x. Repeat steps u. through w. for each chemical agent simulant filled bottle.

y. Reinstall plug in pail (fig. 1-4). Hand tighten.

NOTE

Be sure obturator is in barrel.

z. Place bottle in barrel, neck down, and install lid on barrel. Tape lid to barrel.

aa. Repack SPAL in shipping box.

Section III. POST-OPERATIONAL PROCEDURES**2-10. Misfires**

a. *Projector Assemblies That Fail to Fire.*

WARNINGS

Actuating charges containing black powder must be handled with care at all times. If the actuating charges are dropped, thrown, tumbled, or dragged, an explosion may

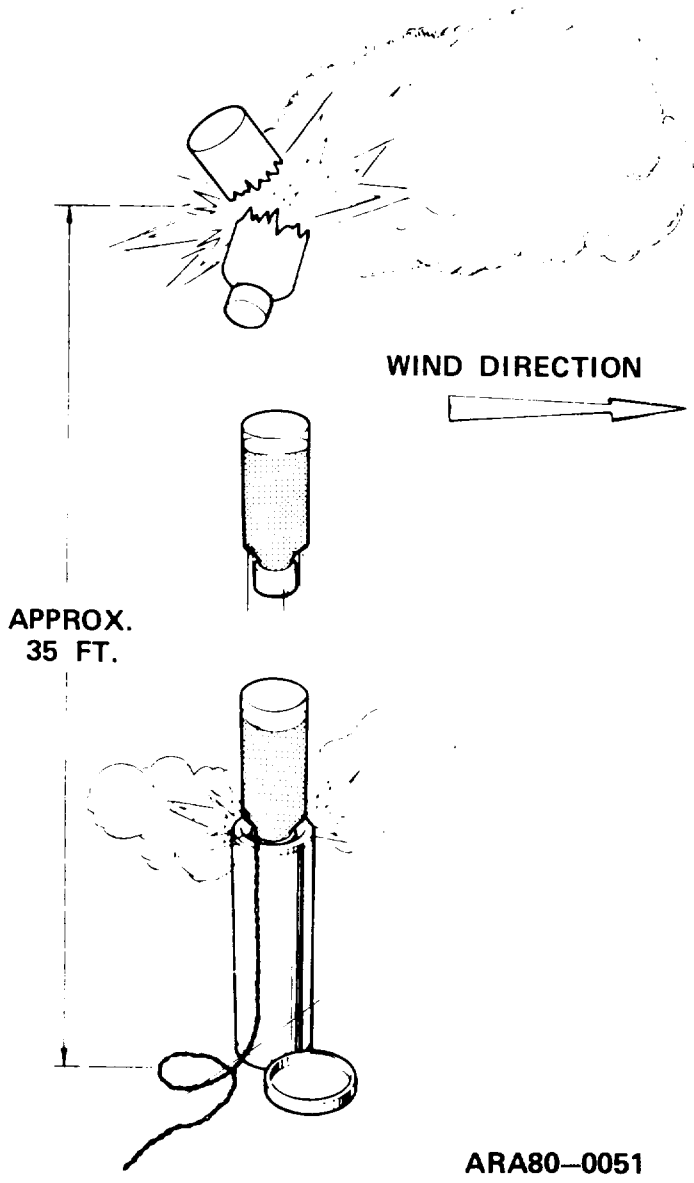
result, causing death or injury and destruction of equipment.

Do not attempt to dismantle a projector assembly that has failed to fire.

(1) In the event that one or more projector assemblies fail to fire, check connection at the power source. Attempt to fire a second time.

(2) If a projector assembly still fails to fire, disconnect firing line from the power source, twist the ends of the firing line together, and contact EOD.

b. Bottles That Fail to Burst. When projector assemblies fire and one or more projects a bottle that fails to burst, note ground impact location of the bottle. Call EOD personnel.



ARA80-0051

Figure 2-12. Operating Principle of SPAL.

Change 1 2-14

CHAPTER 4
ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Organizational personnel are authorized to open shipping box and inspect the contents (fig. 1-1, sheet 1 of 3). Table 4-1, "Service Upon Receipt," contains inspection instructions.

Table 4-1. Service Upon Receipt--M9 SPAL

Container	Item	Action
Wooden Shipping Box	SPAL	Inspect shipping box. If broken or crushed, reject SPAL. Report in accordance with TM 9-1300206. Remove lid. Inspect contents for moisture (water) damage. If found, reject SPAL. Report in accordance with TM 9-1300-206.

CHAPTER 6
ADMINISTRATIVE STORAGE

Storage as Required for Operational Necessity. The packaged M9 SPAL is designated Class 1.4 ammunition for storage purposes. Consult chapter 4,

TM 9-1300-206, Ammunition and Explosives Standards, for storage of Class 1.4 ammunition.

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APPENDIX A
REFERENCES

A-1. Scope

This appendix lists forms, field manuals, and technical manuals referenced in this manual.

A-2. Forms

Recommended Changes to Publications and Blank Forms	DA Form 2028
Recommended Changes to Equipment Technical Publications	DA Form 2028-2

A-3. Field Manual

Explosives and Demolitions	FM 5-25
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A-4. Technical Manuals

Ammunition and Explosives Standards.....	TM 9-1300-206
Army Maintenance Management System (TAMMS).....	TM 38-750
Operator's and Organizational Maintenance Manual (Including RPSTL), Demolition Materials	TM 9-1375-213-12

A-5. Army Regulation

Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat	AR 385-63
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GLOSSARY

SPAL Projector Assembly	Simulator, Projectile, Airburst, Liquid: M9 Sometimes referred to in the manual as projector. An electrically operated, muzzle-loading, barrel-type apparatus used to project the simulant into the air.
Actuating Charge	Sometimes referred to as actuator. A self-contained power transmitting device designed to convert electrical energy into a controlled mechanical force.
Chemical Agent Simulant: Training I (CAST 1)	Referred to as simulant throughout the manual. Used in training exercises to simulate toxic agents.
Blasting Machine	An item, key- or hand-operated, which is used to generate an electrical impulse to initiate an explosive charge.

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Glossary 1

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