

NAVWEPS 01-40ALF-2

Handbook  
Maintenance Instructions

*NAVY MODELS*

A-1H • A-1J

AIRCRAFT

SECTION IX  
ARMAMENT SYSTEMS

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SECTION IX

ARMAMENT SYSTEMS

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9-1. ARMAMENT.

9-2. DESCRIPTION. (See figure 9-1.) The armament installations on the airplane comprise the following:

- External-stores equipment
- Gunnery equipment
- Boresighting
- Armor plate
- Special stores.

9-2A. The Table of Contents on page 371 preceding this section should be consulted to determine where specific information can be found within the section. The Alphabetical Index at the end of the handbook should also be consulted for determining where specific information is contained within the handbook.

9-3. EXTERNAL-STORES EQUIPMENT.

9-4. DESCRIPTION. (See figure 9-1.) External stores, such as additional fuel and armament (table 9-1), can be carried on stores racks secured to the underside of the airplane. To facilitate identification of external stores installations, they are discussed in the following sequence:

- Inner stations
- Outer stations
- External-stores control systems.

9-5. EXTERNAL-STORES INNER STATIONS.

9-6. DESCRIPTION. The stores inner stations are identified and located as follows:

<u>Name</u>	<u>Location</u>
Fuselage ejector rack	Fuselage center line, stations 100 to 130
Wing external-stores racks	Each side of center wing, between wheel wells and wing joints

9-7. FUSELAGE EXTERNAL-STORES EJECTOR RACK.

9-8. DESCRIPTION. (See figure 9-2.) The fuselage stores rack is designed to carry stores up to 3600 pounds, and to eject the stores in flight as desired. Principal components of the fuselage external-stores ejector rack include:

- Fuselage ejector rack pylon
- Fuselage ejector rack mechanism.

9-9. FUSELAGE EJECTOR-RACK PYLON

9-10. DESCRIPTION. (See figure 9-2.) The fuselage ejector-rack pylon is attached to fuselage structure and houses the fuselage external-stores ejector rack. Doors

TABLE 9-1. EXTERNAL-STORES CONFIGURATIONS

WARNING

Do not exceed loading restrictions tabulated on figure 9-1A.

Station	Rack	Stores
1. Inner		
a. Fuselage.	Douglas Aero 3A and 30-inch 4 hook ejector rack ejector rack	<ol style="list-style-type: none"> <li>1. Bomb, 500 to 3600-pound class.</li> <li>2. Bomb, depth, 325-pound class.</li> <li>3. Cluster, incendiary, 500-pound class.</li> <li>4. Mine, 1000 to 2000-pound class.</li> <li>5. Torpedo, Mark 13, Mod 3.</li> <li>6. Dispenser, flare</li> <li>7. Tank, auxiliary fuel. (Refer to section V.)</li> <li>8. Special weapon, MK 43</li> <li>9. Special weapon, MK 57</li> <li>10. Rack, practice multiple bomb, A/A37B-3</li> </ol>
b. Center wing (2).	Mark 51-14, 14-inch, two hook rack, with or without Aero 1A 30-inch adapters.	<ol style="list-style-type: none"> <li>1. Bomb, 100 to 2000-pound class.</li> <li>2. Bomb, depth, 325-pound class.</li> <li>3. Cluster, incendiary, 500-pound class.</li> <li>4. Cluster, fragmentation, 100-pound class.</li> <li>5. Mine, 1000 to 2000-pound class.</li> <li>6. Torpedo, Mark 13-3.</li> <li>7. Rocket package, 2.75-inch.</li> <li>8. Rocket, aircraft, 11.75-inch.</li> <li>9. *Tank, Aero 14 spray.</li> <li>10. Dispenser, flare.</li> <li>11. Tank, auxiliary fuel. (Refer to section V.)</li> <li>12. Launcher, rocket package, LAU-10/A</li> </ol>
	Aero 65A rack with Aero 1A (or Aero 62B) adapter (alternate provisions).	
2. Outer (12).	†Aero 14 combination bomb rack and rocket launchers modified to Douglas part No. 5434825-501 for manual release; with or without Aero 1A sub-caliber adapter.	<ol style="list-style-type: none"> <li>1. Rocket package, 2.75-inch.</li> <li>2. Rockets, 5-inch HVA or HPAG.</li> <li>3. Bomb, 250 to 500-pound class.</li> <li>4. Mine, 500-pound class.</li> <li>5. Rack, practice multiple bomb, A/A37B-3</li> </ol>

\*The top fins of the spray tanks and the removable plates on the lower rear sides of the pylons must be removed when the tanks are installed on the center wing stores racks.

†Aero 14B combination bomb rack and rocket launcher furnished on BuNos. 134466-134574 inclusive; Aero 14D-2 combination launcher furnished on BuNos. 134575-134637, 135223-135406, 137492-137632, 139606-139821, and 142010-142081, inclusive.

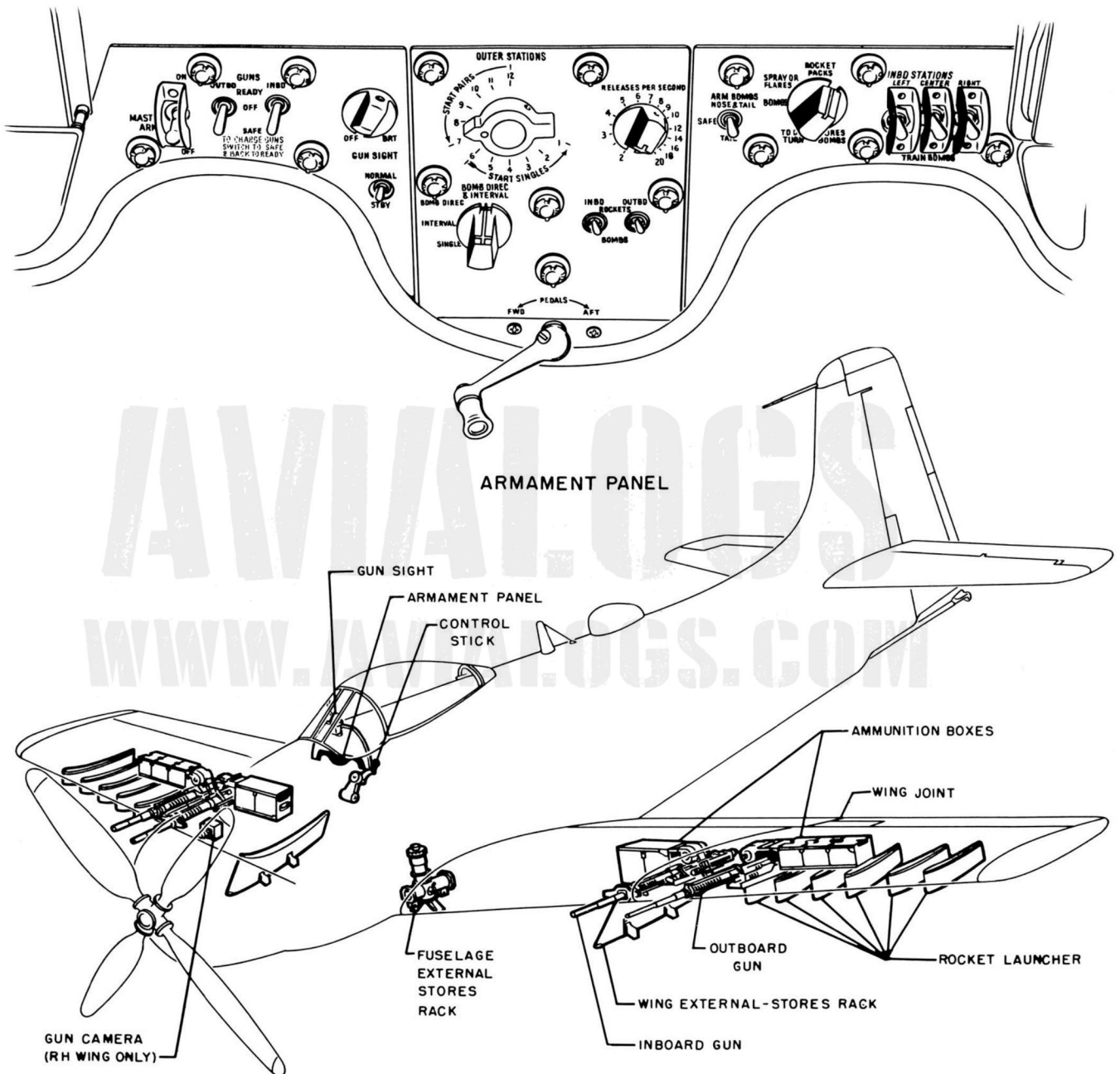
on each side of the pylon provide access to the ejector-rack mechanism.

### 9-11. REMOVAL. (See figure 9-2.)

- Remove screws which fasten rib to bottom of pylon, support rib, and disconnect arming wiring.
- Support pylon and unbolt from structure.

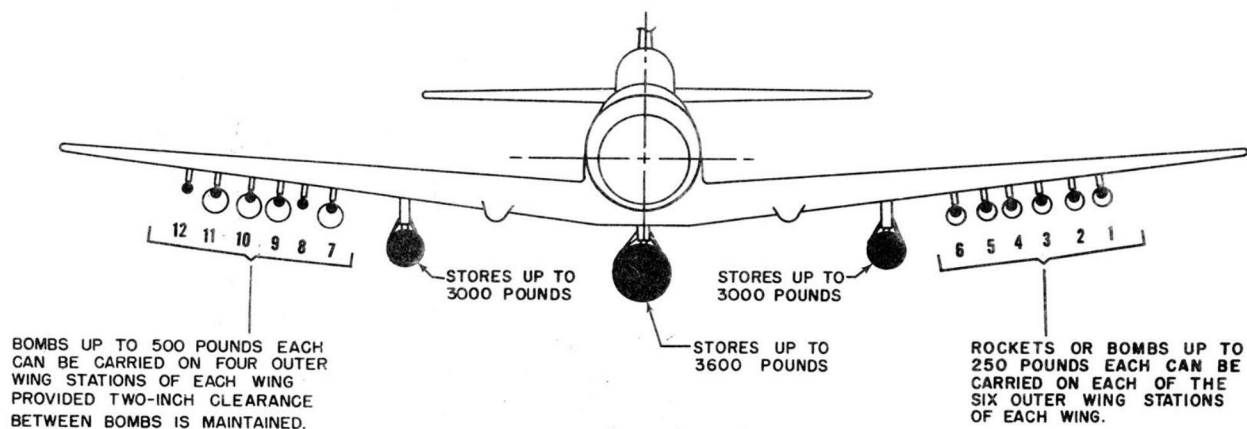
### 9-12. INSTALLATION. (See figure 9-2.)

- Bolt pylon to structure.
- Remove rib from pylon and lower it sufficiently for access to arming wire housing; connect arming wire to housing.
- Reinstall rib on pylon.



NOTE:  
LEFT AND RIGHT WING INSTALLATIONS SYMMETRICAL EXCEPT FOR GUN CAMERA.

Figure 9-1. Armament Installation

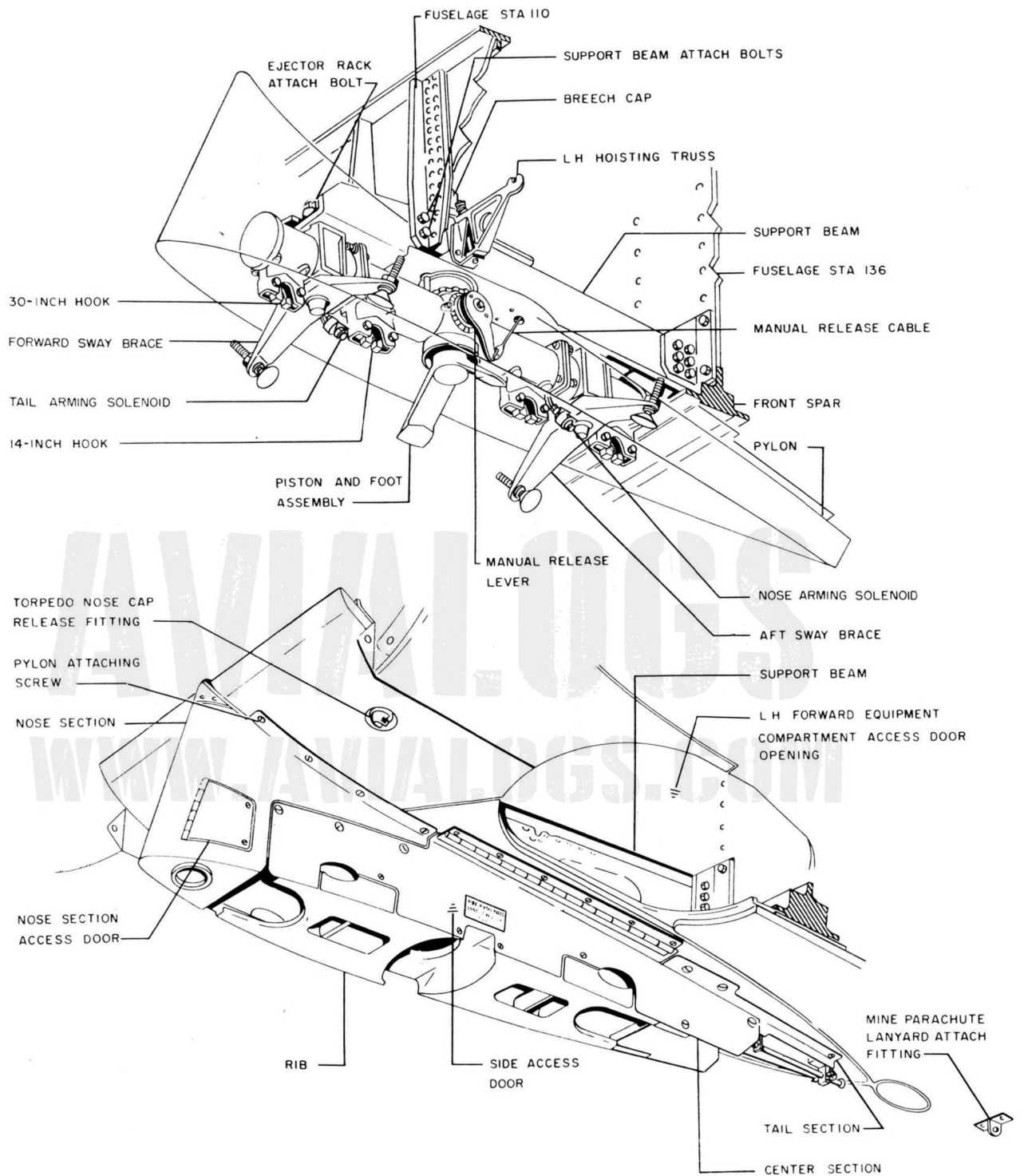


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### EXTERNAL STORES LOADING RESTRICTIONS

1. Catapult and Arrested Landings:
  - a. No weights greater than those shown.
  - b. Mark 13 Mod 3 torpedo, Mark 8 Mod 1 auxiliary fuel tank (with fuel), and Aero 14 spray tank may NOT be carried on 14-inch suspension of Mark 51 Mod 14 ejector rack.
2. Unbalanced Loads:
  - a. Maximum permissible unbalanced loads for inboard wing racks may be 540 pounds for left wing as compared to 1115 pounds for right wing, provided that outer station racks are loaded to laterally balance the airplane.
  - b. With no unbalance on inboard wing racks, maximum permissible unbalanced loads on outboard wings may be 270 pounds for left wing as compared to 552.5 pounds for right wing.

Figure 9-1A. External Stores Loading Restrictions



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Figure 9-2. Fuselage External-Stores Ejector Rack and Pylon Installation

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**9-12A. FUSELAGE EJECTOR-RACK HOISTING PROVISIONS.**

9-12B. DESCRIPTION. (See figure 9-3A.) Two bomb hoisting truss assemblies are installed aft of fuselage station 113, in the forward equipment compartment, for use with a Mark 8 bomb hoist. Each truss is attached to a bracket on opposite sides of the ejector-rack support beam and can be rotated outboard from the stowed position for use when loading or unloading external stores.

**9-13. FUSELAGE EXTERNAL-STORES EJECTOR-RACK MECHANISM.**

9-14. DESCRIPTION. (See figure 9-3.) The ejector serves both as a support for stores carried and as the mechanism for releasing them. Two configurations are available: an ejector containing two carrying hooks spaced 14 inches apart, as are the lugs on many types of external stores, and the same ejector lengthened by the addition of adapters to provide two additional hooks spaced 30 inches apart, for larger stores with wider spaced lugs. The basic configuration installed in the AD-6 airplane is the 30-inch ejector which will accommodate stores having either 14- or 30-inch spaced lugs. However, since the required ejection mechanism is contained in the 14-inch ejector, it can also be installed, as a self-contained unit, in place of the larger ejector. Conversion from the 30- to the 14-inch configuration can be made only when the ejector is off the airplane, but is quite simply accomplished—by removing the adapter and the extra hook link from each end of the 14-inch housing. The smaller ejector can be removed and installed in the same manner as detailed for the 30-inch configuration.

9-15. Operation of the ejector is normally electrical, although a manual release (jettison) system is also available. The normal operating components of the ejector are a detonating breech, telescoping sleeves, hooks and linkage, and a piston-and-foot assembly which is centered above the stores load. The normal electrical sequence of operation is as follows: a solenoid in the breech electrically detonates the cartridge; expanding gases lift the upper sleeve to operate the hook linkage, opening the hooks and releasing the store; the gases then act downward against the piston, forcing the foot downward against the load to eject it clear of the airplane. Electrically operated arming devices lock the arming wires, pulling them free of the fuses, thus arming the store as it is released. The load can be released unarmed, the arming wires slipping clear of the arming devices. If release is manually accomplished, a cable actuates the manual release lever to open the hooks and release the store. Sway braces are provided for stabilization of loads as required.

9-16. The ejector utilizes a Mark 1, Mod 2 cartridge for all stores except those of 325 pounds or less, which require a Mark 2, Mod 1 cartridge. Stores which can be carried at the fuselage station are listed in table 9-1.

9-17. REMOVAL. (See figure 9-3.)

a. Through forward equipment compartment, remove electrical plugs from breech and from arming control. If ejector contains live cartridge, unscrew breech cap and remove cartridge.

b. Through pylon side door, disconnect manual release arm from pulley housing.

c. Support piston-and-foot assembly; open lever on clamp and lower piston-and-foot clear of ejector.

d. Detach bottom rib from pylon; support rib and disconnect arming wiring.

e. Remove screws which attach blast tube to fuselage plating.

f. Support ejector and remove ejector attaching bolts.

9-18. CLEANING. Refer to table 9-2.

9-19. LUBRICATING. Refer to table 9-3.

9-20. BENCH ADJUSTMENT. (See figure 9-3A.)

**Note**

The procedure outlined is normally performed during overhaul, but the information is included for maintenance purposes, if required.

a. Place bomb ejector rack on suitable work bench.

b. With carrying hooks closed, press manual release lever forward; sear bolts should move upward simultaneously.

c. If sear bolts do not operate simultaneously, cut lock wire and loosen both manual release retainer clamp screws to permit rotation of retainer.

d. Rotate retainer slightly until sear bolts rise simultaneously when release lever is pressed forward.

e. Tighten one clamp screw, press manual release lever forward; sear bolts should rise simultaneously.

f. If sear bolts do not move at the same time, loosen clamp screw and repeat steps "d" and "e" until sear bolts do rise simultaneously.

g. Tighten clamp screws and install lock wire.

h. Check to insure carrying hooks open simultaneously.

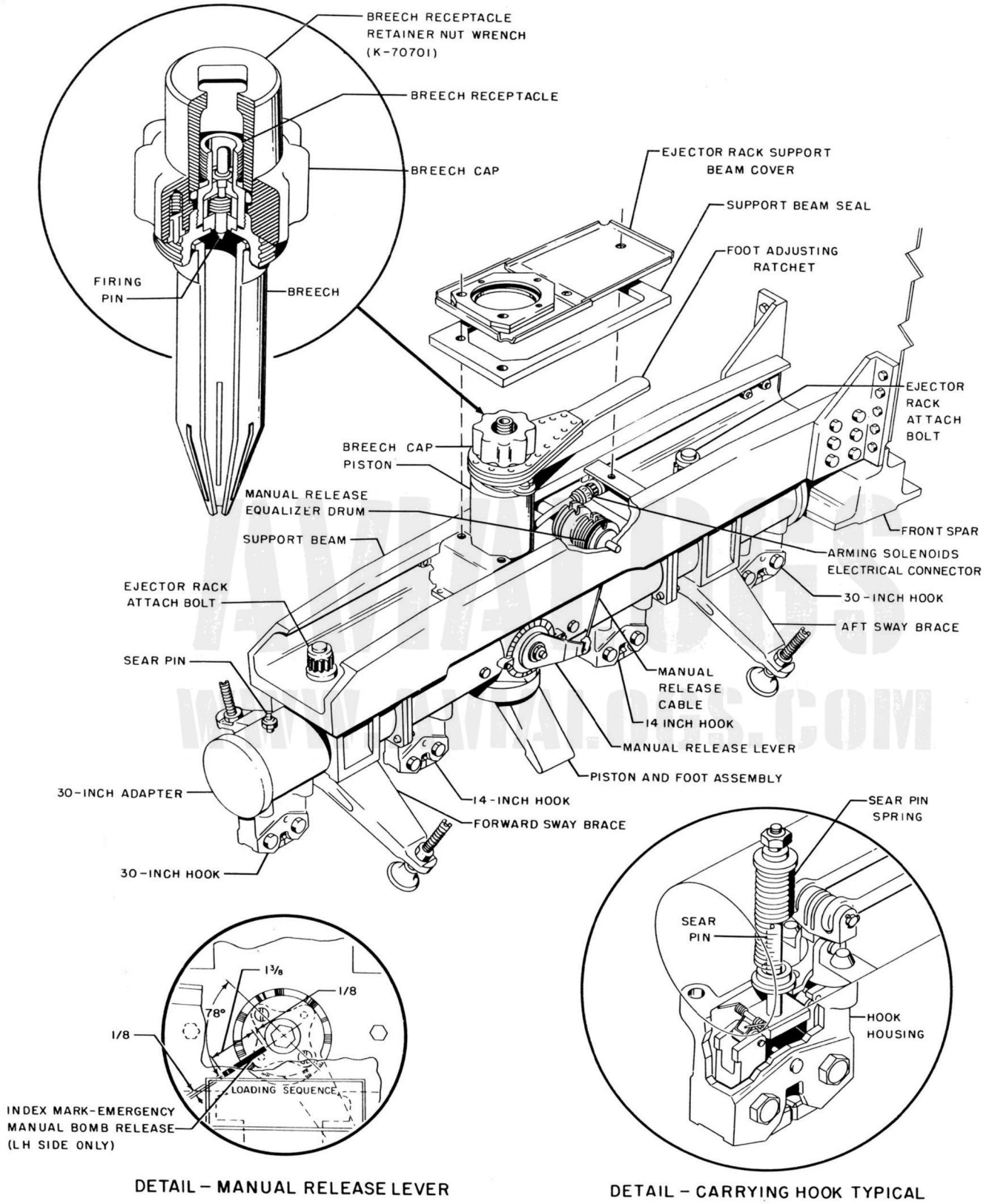
i. Tighten ratchet until sleeve assembly collar just touches ejector housing.

j. Open retainer clamp sufficiently to move keys slightly away from upper sleeve.

k. Install foot, and lock retainer clamp.

l. With cartridge container installed in upper sleeve, tighten breech cap on upper sleeve.

m. Rotate ratchet to obtain 0.010 to 0.020 (approximately  $\frac{1}{64}$ ) inch clearance, measured with feeler gage, between sleeve collar and ejector housing.



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Figure 9-3. Fuselage External-Stores Ejector-Rack Mechanism

**TABLE 9-2. FUSELAGE EXTERNAL-STORES EJECTOR RACK MECHANISM—CLEANING**

<i>Unit</i>	<i>Frequency</i>	<i>Method</i>
1. Breech receptacle.	After every day's firing.	Wash with cold water to remove carbon. Dry with clean rag. Wash in solvent (Fed Spec PS-661). Dry with clean rag. Apply thin film of grease (Spec MIL-L-7711). Wipe off excess.
2. Cartridge container.	Same as 1.	Same as 1.
3. Piston-and-foot assemblies.	Same as 1.	Same as 1.
4. Sleeve assemblies.	After every 60 shots.	Same as 1.
5. Complete bomb ejector.	At major overhaul.	Same as 1.

**TABLE 9-3. FUSELAGE EXTERNAL-STORES EJECTOR RACK MECHANISM—LUBRICATION****CAUTION**

Do not lubricate any part of ejector until carbon has been removed.

<i>Unit</i>	<i>Frequency</i>	<i>Method</i>
1. Piston-and-foot assembly.	After every 20 shots, but not to exceed 30 days.	Clean thoroughly. Apply thin film of grease (Spec MIL-L-7711) with rag. Wipe off excess.
2. Sleeve assemblies and O-rings.*	After every 60 shots, but not to exceed 60 days.	Same as 1.
3. Complete ejector mechanism.	At major overhaul.	Same as 1.
4. Hook assembly.	Same as 1.	Grease hook assembly rollers with grease (Specification MIL-G-3278).

**CAUTION**

Use extreme care to insure the ejector foot piston locking keys are firmly inserted in the keyway before retainer clamp is installed.

\* Inspect O-rings for deterioration. Replace if worn or damaged.

n. Slip pull rods into grooves in release sleeve and install retainer ring over ends of pull rods.

o. Raise sleeve assembly by lifting upward on ratchet; travel should be  $\frac{3}{8} + \frac{1}{16}$ ,  $-\frac{1}{32}$  inch, measured from ejector housing to lower surface of release sleeve.

**Note**

If travel is not within specified dimensions, rotate ratchet sufficiently to bring movement within specified tolerances. Be sure that adjustment obtained in step "m" is maintained.

p. Install pull-rod nuts finger tight; loosen nuts to obtain 0.030 to 0.040 inch clearance between ring and release sleeve shoulder.

q. Jiggle pull-rod retainer by hand to be sure there is no binding.

**9-21. INSTALLATION.**

a. Support ejector in place in pylon and secure with attaching bolts. Torque bolts to 2500-in. lb.

b. Fasten blast tube to fuselage plating with screws.

c. Connect arming wiring on rib housing and bolt rib to pylon.

d. Open lever on clamp, insert piston-and-foot assembly; close clamp.

e. Through pylon side door, connect manual release arm to pulley housing.

Section IX  
Paragraphs 9-21 to 9-22A

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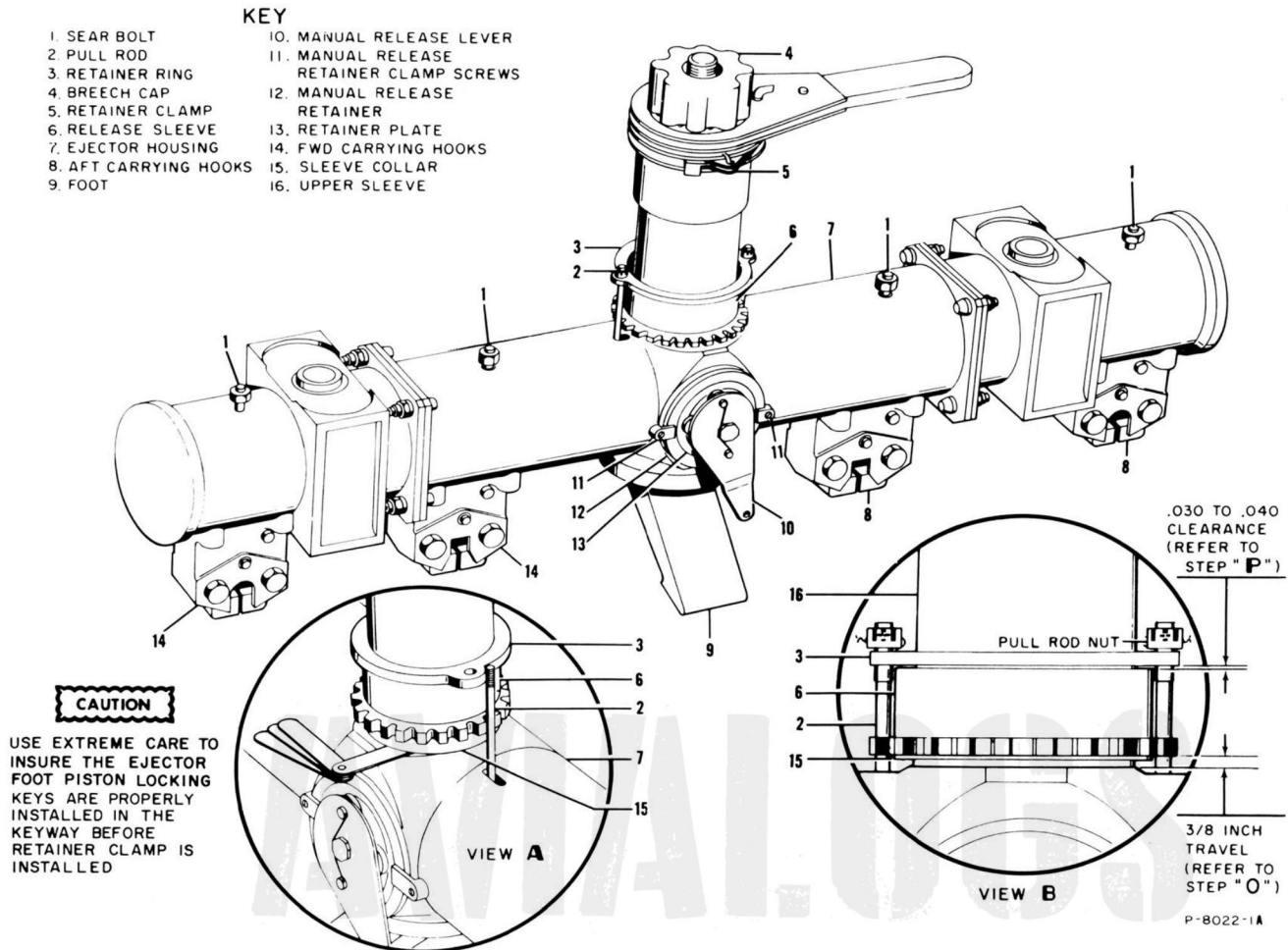


Figure 9-3A. Fuselage External-Stores Ejector Rack Adjustment

f. Through forward equipment compartment doors, connect electrical plugs to breech and to arming control.

9-22. TESTING.

a. Remove breech receptacle from ejector; insert cartridge in container; screw breech receptacle tightly into upper sleeve assembly.

b. Connect electrical lead to breech receptacle.

c. Turn on d-c power control (to "BAT ONLY") and master armament switches.

d. In left wheel well, close armament safety disabling switch.

**WARNING**

Gun-firing and stores-release switches on control stick in cockpit must NOT be actuated. Actuation might cause serious injury to personnel.

e. In left-hand wheel well, turn ejector test switch to "LAMP": bulb should light if lamp is satisfactory.

f. Turn ejector test switch to "CARTRIDGE": bulb should light if cartridge is satisfactory.

g. Turn off d-c power control, master armament, and ejector test switches.

**WARNING**

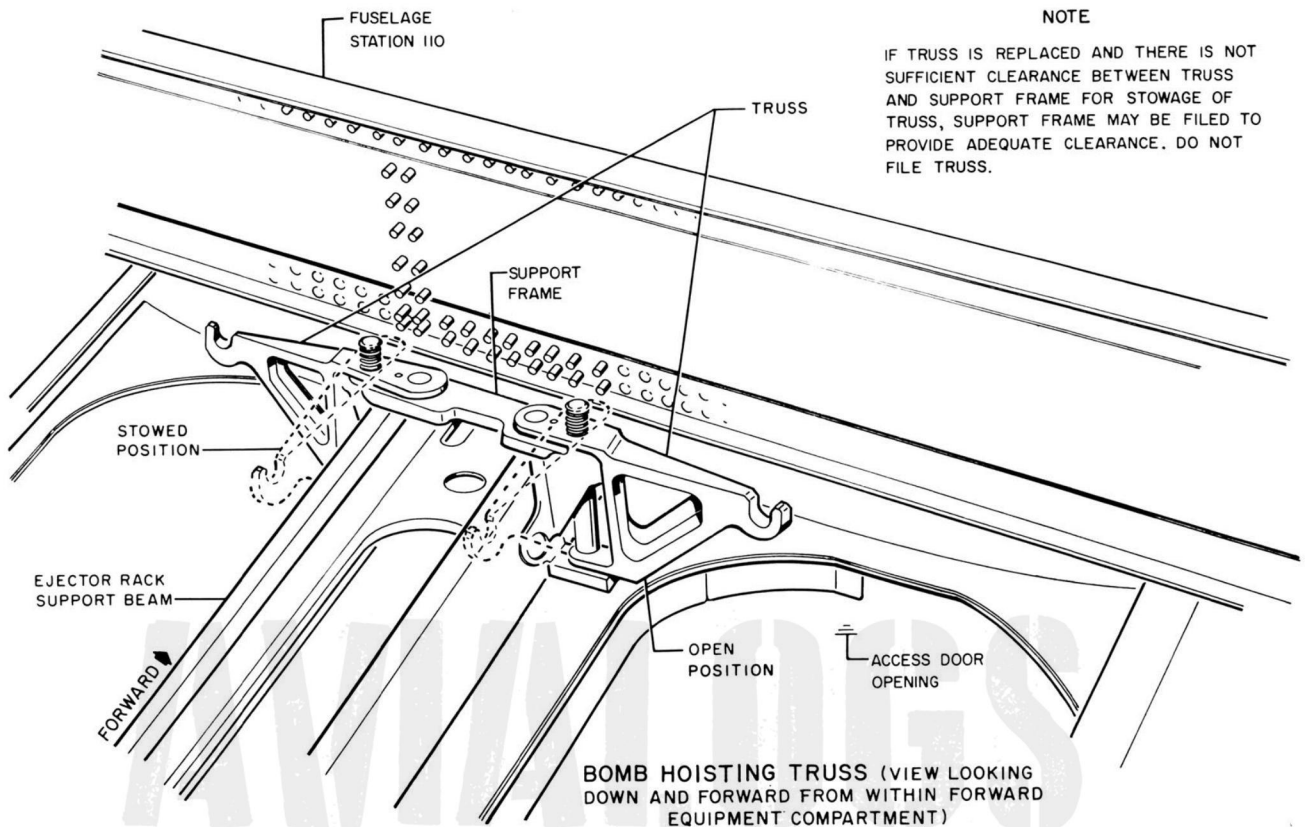
D-c power control switch must be turned "OFF" to permit armament safety system to function, once safety disabling switch has been closed.

9-22A. EMERGENCY MANUAL BOMB RELEASE FUNCTIONAL CHECK. (See figure 9-3.)

a. Place emergency manual bomb release handle in its receptacle on the left-hand console in the cockpit.

**Note**

With the emergency manual bomb release handle properly positioned in its receptacle there should be no appreciable slack and no preload on the release cable. The index line



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Figure 9-3B. Bomb Hoisting Truss Perspective

on the manual release lever and the bomb ejector housing should align. If they do not align it is evidence of improper rigging of the manual bomb release control cables in the airplane.

b. Check two (2) slides or carriages in equalizer assembly for proper positioning at the outer end of slots.

c. Check manual release lever for full down position against stops or fairing ( $28^{\circ}$  to  $30^{\circ}$  aft of vertical) and alignment of index mark on manual release lever with index mark on bomb ejector housing.

d. Latch bomb rack holding hooks and actuate emergency manual bomb release handle in cockpit. Observe holding hook release as manual bomb release lever moves from  $52^{\circ}$  to  $62^{\circ}$  in counterclockwise direction.

e. On release of bomb rack holding hooks, check for at least  $\frac{1}{2}$  inch of slide over-travel remaining in slots number one (1) and two (2) tracks of equalizer assembly.

**Note**

In the event of a malfunction of the external-stores ejector rack refer to the applicable handbook of Overhaul Instructions for the bomb ejector rack. (NAVAER 11-5E-507.)

9-23. **LOADING PROCEDURE.** Stores can be loaded on the fuselage ejector rack by using either a Mark 5, Mod 2 stores truck or two Mark 8, Mod 0 portable bomb hoists. Torpedoes require the use of a Mark 15, Mod 1 hoisting sling and two Mark 8, Mod 0 hoists. Stores must be loaded with the airplane in the three-point position only. The loading procedure is as follows:

- Remove forward equipment compartment access doors.
- Open pylon side doors.

**CAUTION**

Before loading store, foot assembly must be retracted and sway brace screw assemblies must

## Paragraphs 9-23 to 9-23A

be backed off to insure carrying hooks latch properly when store is raised into position.

c. Retract foot assembly by turning foot-adjusting handle.

d. Insure that rack carrying hooks are open, and that sway brace screw assemblies are backed off to clear store.

**Note**

If a Mark 5 stores truck is being used for loading, operate hydraulic lift to raise store in position on rack (carrying hooks automatically close when store lugs enter hook recesses), then complete loading operations as noted in steps j through o. If Mark 8 bomb hoists are being used for loading, complete steps e through j before proceeding with steps j through o.

e. Fasten suitable hoisting band to store.

f. Swing hoisting trusses outboard until perpendicular to airplane center line and engage swivel ends of portable bomb hoists.

g. Extend hoist cables and attach ends to band on store.

h. Raise store by operating hoists simultaneously, and insure that rack hooks automatically close when store lugs enter hook recesses.

i. Remove hoists and hoisting band and swing hoisting trusses inboard to stowed position.

j. Adjust foot assembly to rest firmly against store. (2-inch adjustment maximum.)

k. For stores above 1600 pounds (14 in. diameter) adjust all sway brace screw assemblies down until they make light contact with store.



Do NOT exceed Aero 3A sway brace adjustment value of 1½ turns.

l. Turn both left-hand sway brace screw assemblies 1½ turns, then turn both right-hand sway brace screw assemblies 1½ turns.

m. Connect arming wires to arming solenoids.

**Note**

When a mine or torpedo is carried instead of a bomb, connect mine lanyard and torpedo nose-cap release lanyard. For information regarding installation of external fuel tank, refer to section V

n. Remove ejector breech; insert cartridge; reinstall breech.



For stores weighing more than 325 pounds, a Mark 1, Mod 2 (long) cartridge must be used. For stores of 325 pounds or less, or an external fuel tank, a Mark 2, Mod 0 (short) cartridge must be used.

o. Screw firing plug into breech.

p. Close pylon side doors.

q. Install forward equipment compartment access doors.



If store carried extends aft of station 220, close dive-brake lock-out valve (in radio compartment) to prevent opening of bottom dive brake during flight.

9-23A. UNLOADING PROCEDURE. Stores can be unloaded from the fuselage ejector rack by using a Mark 5, Mod 2 stores truck or two Mark 8, Mod 0 portable bomb hoists. Torpedoes require the use of a Mark 15, Mod 1 hoisting sling and two Mark 8, Mod 0 hoists. Stores must be unloaded with the airplane in the three-point position only. The unloading procedure is as follows:

a. Remove forward equipment compartment access doors.

b. Open pylon side doors.

c. Disconnect arming wires from arming solenoids.

**Note**

When a mine or torpedo is carried instead of a bomb, disconnect mine lanyard and torpedo nose-cap release lanyard. If an external fuel tank is carried, remove fuel and air line adapter segments.

d. Remove ejector breech; remove cartridge; reinstall breech.

**Note**

If a Mark 5 stores truck is being used for unloading, operate hydraulic lift until cradle engages stores; secure store to cradle then complete unloading operations as noted in steps g, j, and k. If Mark 8 bomb hoists are being used for unloading, complete steps e through l.

e. Fasten suitable hoisting band to store.

f. Swing hoisting trusses outboard until perpendicular to airplane center line; engage swivel ends of portable bomb hoists; extend hoist cables; attach cable ends to hoisting band and operate hoist simultaneously to take up cable slack and tighten hoisting band.

g. Manually actuate release mechanism on rack to release store.

#### WARNING

Do not release ejector rack hooks electrically with airplane on ground, or operate manual release handle in cockpit, identified as CTR WING BOMB RELEASE. Operation of manual release handle in cockpit will open carrying hooks on fuselage ejector rack and each wing rack simultaneously.

h. Operate hoists simultaneously and slowly lower store to suitable carrier.

i. Remove hoisting equipment and swing hoisting trusses inboard to stowed position.

j. Close pylon side doors.

k. Install forward equipment compartment access doors.

#### NOTE

Open dive brake lock-out valve (in radio compartment) if closed to accommodate store.

#### 9-24. FUSELAGE TORPEDO NOSE CAP RELEASE FITTING.

9-25. DESCRIPTION. (See figure 9-2.) The fitting is installed in the center wing adjacent to the forward end of the fuselage ejector rack, and is utilized when a torpedo is installed on the rack. It is a spring-loaded hook which secures the lanyard so that the nose cap is released when the torpedo is ejected. The weight of the torpedo on the lanyard, following ejection, pulls the hook down. Upon release of the nose cap from the torpedo, the spring returns the hook to its fully closed position, the closing action guiding the lanyard clear of the hook.

#### 9-26. REMOVAL.

a. In the forward equipment compartment, remove nuts, bolts, and washers attaching release fitting to release fitting support.

b. Remove release fitting.

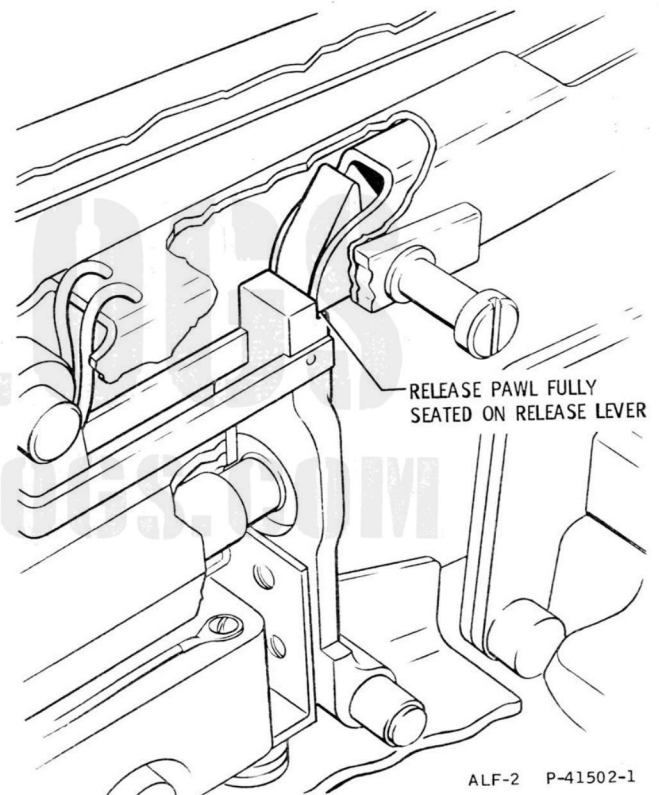
#### 9-27. INSTALLATION.

a. Place release fitting in position on release fitting support.

b. Secure release fitting with attaching nuts, washers, and bolts.

#### 9-27A. FUSELAGE MINE PARACHUTE LANYARD ATTACHING FITTING.

9-27B. DESCRIPTION. (See figure 9-2.) A mine parachute lanyard attaching fitting is installed aft of the fuselage ejector rack pylon. When a mine is installed on the fuselage external-stores ejector rack, the parachute lanyard is attached to the opening in the fitting. Following ejection, the fitting retains the lanyard which acts to open the mine parachute.



ALF-2 P-41502-1

Figure 9-3C. Release Pawl Engaged with Release Lever

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9-28. WING EXTERNAL-STORES RACKS.

9-29. DESCRIPTION. (See figure 9-4.) Each wing external-stores rack is designed to carry stores up to 2000 pounds, and to release the stores in flight. Principal components of the wing stores rack include:

Wing rack fairing	Forward gusset
Mark 51, Mod 14 rack	Aft gusset
Aero 1A 30-inch adapter	Manual release cable link
Upper support	Torpedo nose cap release fitting
Forward support	
Aft support	Sway braces

9-30. The Mark 51-14 stores rack houses the electrical and manual release components. The supports attach the rack to the airplane, and provide support for the sway braces as well. The gussets are utilized to secure the forward and aft supports to the stores rack; the forward gusset likewise supports a bracket to which the torpedo nose cap release fitting can be attached. The wing rack can be installed in either of two configurations: the Mark 51 rack, which has two carrying hooks spaced 14 inches apart, or the Mark 51 rack with the Aero 1A adapter, which adds two more hooks spaced 30 inches apart. The manual release link provides an attaching point for the manual release cable from the manual release handle in the cockpit, and a link to the internal cables and manual release lever. The fairing provides a streamlined housing for the wing rack. Doors on each side of the fairing provide access to the units within. The fairing and stores rack can be removed together or each unit can be removed from the airplane separately.

## 9-31. REMOVAL.

- Through fairing access door, disconnect manual release cable terminal and remove adjacent pulley from rack.
- Disconnect electrical wiring.
- Remove torpedo nose cap release fitting by removing attaching screws.
- To remove fairing, remove external screws securing fairing to structure.
- Support rack and unbolt upper support from wing structure.

## 9-32. INSTALLATION.

## CAUTION

Do not lubricate installation bolt threads.

- Lubricate installation bolt shanks with antisieze graphite petrolatum. (Spec. MIL-C-5544A.)
- Hold rack in place and bolt upper support to wing structure. Torque bolts to 70 inch-pounds.
- Place fairing in position and secure attaching screws to structure.
- Attach torpedo nose cap release fitting to bracket on forward gusset (or adapter).
- Connect electrical wiring.
- Connect manual release cable pulley to rack; connect cable terminal to manual release link.

## 9-33. TESTING.

- Latch rack. Operate manual release lever: lever, connecting cables, and release mechanism should move freely without binding; hooks should spring open.
- Relatch rack.
- Operate electrical release control to energize release solenoid: hooks should spring open.
- Set arming switch at TAIL: tail arming wire retainer should retain arming wire; nose retainer should not lock on arming wire.
- Set arming switch at NOSE AND TAIL: neither retainer should open under a 25-pound downward pull.
- Set arming switch at SAFE: retainers should open under a pull of not less than two pounds, nor more than eight pounds.

9-34. LOADING PROCEDURE. Similar equipment to that required for loading the fuselage ejector rack is used for loading the wing stores racks. (Refer to paragraph 9-23.)

## WARNING

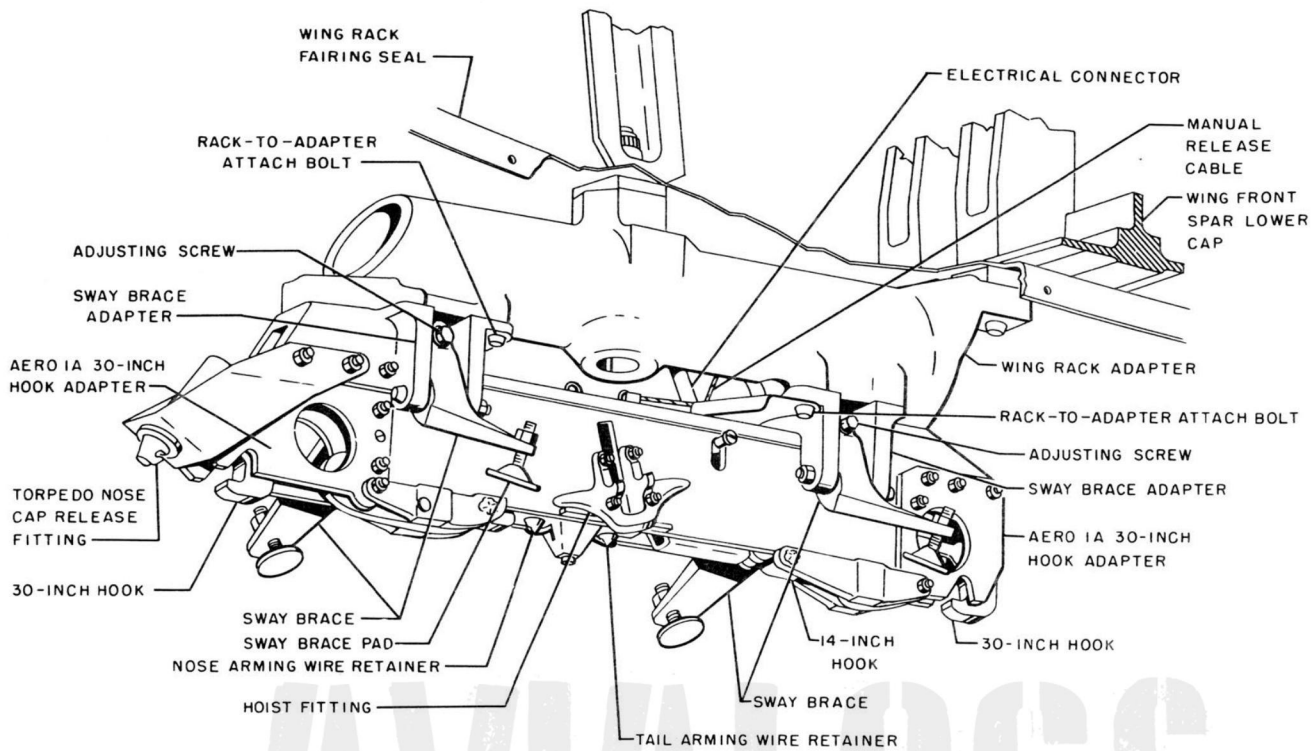
Before proceeding be sure that master armament switch is OFF.

- Open wing stores rack fairing access doors.
- Manually open rack hooks at rack.
- Loosen adjustable sway braces.
- Place suitable hoisting band on store.
- Engage Mark 8, Mod 0 bomb hoist with hoist fitting on inboard side of rack; insert end of cable through rack.
- Extend hoisting cable and connect end fitting to store hoisting band.
- Operate hoist to raise store and guide lugs into rack hook recesses. Ensure hooks close securely on lugs. Check for proper seating of the release pawl tips with the release lever (figure 9-3C).
- Remove hoisting equipment.
- Adjust sway braces to rest firmly against store; be sure that sway braces are bracing, but not pushing on store.

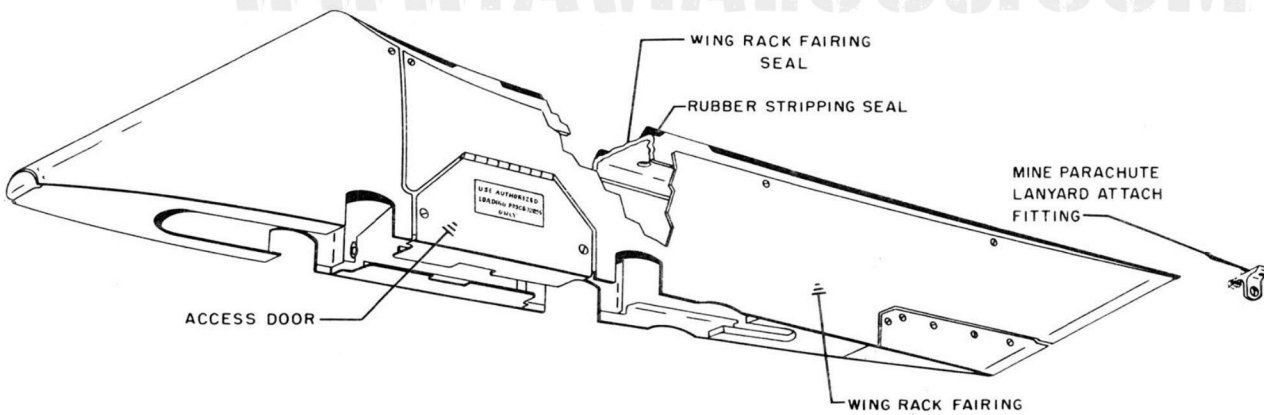
## NOTE

On airplanes BuNo. 134525-134637, 135223-135406, 137492-137632, 139606-139821, 142010-142081, and prior airplanes reworked to A-1/ASC, a displacing strut must be installed when MK 8, MOD 1 external fuel tanks are carried on wing external-stores racks. To install strut, insert in displacing strut socket aft of wing rack and secure strut to tank with pin. For further information, refer to section V.

- Connect arming wires to arming solenoids.



MARK 51 STORES RACK  
(FAIRING REMOVED)



MARK 51 RACK FAIRING

EFFECTIVITY - BUNO.  
FACTORY:  
SERV CHG: ALL AIRPLANES REWORKED  
TO A-1/ASC 449

ALF-2 P-4796-1D

Figure 9-4. Wing External-Stores Rack Installation

## NOTE

When a mine or torpedo is carried instead of a bomb, connect mine lanyard and torpedo nose-cap release lanyard.

- k. Close wing stores rack fairing access doors.

9-34A. UNLOADING PROCEDURE. Similar equipment to that required for unloading the fuselage ejector rack is used for unloading the wing stores racks. (Refer to paragraph 9-23A.)

## WARNING

Before proceeding be sure that master arming switch is OFF.

- a. Open wing stores rack fairing access doors.  
b. Disconnect arming wires from arming solenoids.

## NOTE

When a mine or torpedo is carried instead of a bomb, disconnect mine lanyard and torpedo nose-cap release lanyard. If an external fuel tank is carried, remove fuel and air line adapter segments and displacing strut when utilized.

- c. Fasten suitable hoisting band to store.  
d. Engage Mark 8, Mod 0 bomb hoist with hoist fitting on inboard side of rack; insert end of cable through rack; connect end fitting to store hoisting band and operate hoist to tighten cable.  
e. Manually actuate release mechanism on rack to release store.

## WARNING

Operation of manual release handle in cockpit, identified as CTR WING BOMB RELEASE, will open carrying hooks on fuselage ejector rack and each wing rack simultaneously.

- f. Operate hoist and slowly lower store to suitable carrier.  
g. Remove hoisting equipment.  
h. Close wing stores rack fairing access doors.

9-35. MARK 51, MOD 14 STORES RACK.

9-36. DESCRIPTION. (See figure 9-4.) The Mark 51, Mod 14 stores rack houses two carrying hooks spaced 14 inches apart. Normal operation is electrical. The sequence of operation is as follows: energizing the rack solenoid actuates linkage which releases the pawls to open the hooks and release the

store. The pawls can also be actuated mechanically. The store can be armed either at the tail, or at both nose and tail, but arming is not necessary for release.

9-37. AERO 1A 30-INCH ADAPTER.

9-38. DESCRIPTION. (See figure 9-4.) The Aero 1A adapter comprises two sections which can be added to the Mark 51 rack to provide 30-inch hook spacing in addition to the standard 14-inch hook spacing of the rack.

9-39. INSTALLATION.

- a. Through fairing access doors, unbolt forward gusset from forward support and from torpedo-release-fitting bracket.  
b. Bolt forward section of Aero 1A adapter to forward support, and torque to 70 inch-pounds maximum.  
c. Fasten torpedo-release-fitting bracket to forward section of Aero 1A adapter.  
d. Unbolt aft gusset.  
e. Bolt aft section of Aero 1A adapter to aft support, and torque to 70 inch-pounds maximum.

## WARNING

Tighten bolts sufficiently to make certain threads are cut through fiber of nut (minimum 3 threads showing) and nut is bearing firmly against washer.

9-40. WING STORES-RACK TORPEDO-NOSE-CAP RELEASE FITTINGS.

9-41. DESCRIPTION. (See figure 9-4.) The torpedo-nose-cap release fitting is installed on the nose section of the wing stores rack. The fitting is designed to engage the torpedo lanyard until the nose cap has been removed from the torpedo, then to release the lanyard. Removal and installation of the fitting are obvious.

9-41A. WING EXTERNAL-STORES RACK MINE PARACHUTE LANYARD ATTACHING FITTING.

9-41B. DESCRIPTION. (See figure 9-4.) A mine parachute lanyard attaching fitting is installed on the lower surface of the wing just aft of each wing external-stores rack fairing. The fitting is designed to retain the parachute lanyard when the mine is released.

9-42. WING STORES-RACK SWAY BRACES.

9-43. DESCRIPTION. (See figure 9-4.) The wing rack sway braces are designed to prevent excessive motion of the store. The sway braces have adjustable pads that can be raised or lowered to accommodate the varying sizes of stores carried. The sway braces can be removed by removing the attaching bolts. An additional adjustment to the sway brace is

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accomplished by turning the adjustment screw at the upper end of the sway brace.

9-43A. LAU-10/A ROCKET LAUNCHER PACKAGE SYSTEM.

9-43B. DESCRIPTION. Provision is made for carrying the LAU-10/A rocket launcher package on the in-board wing bomb racks. Each launcher is capable of carrying up to four ZUNI rockets. The left or right-hand launchers may be fired individually or simultaneously. The ZUNI control panel containing the control switches is located on the right-hand control console in the pilot's cockpit. Electrical connection to the launcher is made by means of an adapter cable connected to the aft receptacle of the launcher and the receptacle within the rear of the bomb rack fairing.

9-43C. The inner station release relay circuit receives power from the armament bus through the trigger circuit on the control stick grip to the inner station release relays. With the inner station release relays energized, the rocket package firing circuit is completed from the armament bus through the inner station release relays, the interval selector switch, the inner station selector switch in FLARES-SPRAY, and the ZUNI control panel to the left and right-hand wing rack rocket release terminals. To electrically test firing circuit, set armament controls as follows:

- a. Armament panel
 

METHOD SELECTOR switch	SINGLE
INBD/OUTBD BOMB ROCKET switches	OFF
INNER STATION SELECTOR switch	FLARES or SPRAY
INBOARD STATION (3)	OFF

- b. ZUNI control panel
 

POWER switch	ON
LW/RW STATIONS	SINGLE or RIPPLE
- c. Armament panel
 

ARMAMENT MASTER switch	ON
INNER STATION RELEASE PICKLE switch	<u>DEPRESS</u>

9-43D. SPRAY TANK PROVISIONS.

9-43E. DESCRIPTION. Provision is made for installation of spray tanks on the center wing racks. An electrical adapter assembly is provided in the bomb rack fairing for use with the spray tank unit. A receptacle is provided for installation of the spray tank control console on the right-hand control panel in the cockpit. The spray tank unit arming and control switches are located on the spray tank control console. The spray tank firing circuit is completed through the inner station selector switch, in SPRAY, and the control stick grip.

9-43F. FLARE DISPENSER PROVISIONS.

9-43G. DESCRIPTION. The necessary electrical wiring for use with a flare dispenser control console and a sonobuoy-flare dispenser is installed in the airplane. A receptacle is provided for installation of a flare dispenser control console on the right-hand control panel in the cockpit. The sonobuoy-flare dispenser may be carried on any one or all three of the inner wing bomb racks.

9-44. EXTERNAL-STORES OUTER STATIONS.

9-45. DESCRIPTION. The outer stores stations are used for external stores up to and including 500 pounds.

## Paragraphs 9-45 to 9-53

There are six store stations on the lower surface of each outboard wing panel:

Station No.		Location
LH	RH	(Wing Sta)
1	12	229.250
2	11	215.563
3	10	198.250
4	9	181.781
5	8	167.750
6	7	151.750

9-46. Each store is carried on an Aero 14 combination bomb rack and rocket launcher, modified by the addition of a manual release system, which incorporates a push-rod and spring mechanism. Stations 3 through 10 require push rods on the outboard side of the combination racks; stations 1, 2, 11 and 12 have push rods on the inboard side of the launchers. An Aero 1A sub-caliber adapter can be used with the modified rack. Stores that can be carried at the outer stations are listed in table 9-1.

#### 9-47. OUTER STATION COMBINATION BOMB RACK AND ROCKET LAUNCHERS.

9-48. DESCRIPTION. (See figure 9-5.) The modified Aero 14 combination bomb rack and rocket launcher is basically a streamlined pylon which houses rocket supports and carrying hooks to carry and release external stores. The combination rack can be electrically or manually operated, and if carrying rockets, electrically fired.

9-48A. On BuNo. 134466-134574 inclusive, the Aero 14D combination rack is installed, while on BuNo. 134575-134637 and 135223-135374, the Aero 14D-2 combination rack is installed. The two racks differ only in that the Aero 14D-2 rack bomb and rocket release circuits are separated. The following sequences of operation apply to both configurations except that on the Aero 14D combination racks, the rack release solenoid is energized when the rocket latch solenoid is energized. On airplanes BuNo. 135375-135406, 137492-137632, 139606-139821, and 142010-142081 inclusive, the Aero 14E combination racks are installed. The Aero 14E rack is fundamentally the same rack as the Aero 14D-2.

9-49. The sequence of operation for launching *rockets* is as follows: the rocket latch solenoid is energized to permit release of the rocket; the arming solenoids for nose and tail are energized to lock the arming wires; the rocket igniter is energized to launch the rocket. (Rockets can be released unarmed if desired.)

9-50. The sequence of operation for electrically releasing *stores other than rockets* is as follows: the arming solenoids are energized for armed release; the rack release solenoid is energized to actuate the linkage to open the hooks; the lugs are released and the stores fall free of the rack.

#### 9-51. REMOVAL.

##### Note

Before removing a reusable combination rack, make certain that wing station number (of its

location) is stencilled on rack housing: inboard side if on left wing, outboard side if on right wing.

a. Insert  $\frac{3}{8}$ -inch socket wrench into cut-outs in fairing base plate and, while supporting rack, remove hanger bolts.

b. Lower launcher and disconnect electrical plugs.

9-52. INSTALLATION. A combination rack must always be installed at the wing station for which it is marked, since it has previously been fitted to the wing contour at the station indicated; for such an installation, steps b through k should be omitted. If a *new* rack is to be installed, it must be adapted to fit a particular station, and special tools, which are included with each set of combination racks, are required; for such an installation, all of the following steps are applicable:

a. Screw supporting adapters into wing fitting, using Douglas special tool No. K-40202; tighten each to 10 foot-pounds.

b. Screw installation adapters (rack tool No. 50A70B77) into supporting adapters until adapter shoulders are seated solidly against fittings.

c. Loosen hanger bolt locks in combination rack.

d. Hold rack in position, and align hanger bolts with adapters. Tighten hanger bolts *simultaneously* until they are seated solidly against adapters.

e. Scribe fairing with scribing tool (50A70C92).

f. Unscrew hanger bolts and remove rack from wing.  
g. Cut fairing on or slightly above scribed line. Smooth rough edges with file.

h. Remove installation adapters from support adapters.

i. Install combination rack in position.

#### CAUTION

Electrical fittings on combination racks and airplane wing must be in perfect alignment to prevent possible failure of rack.

j. Measure clearance between combination rack and wing; should be  $\frac{1}{16}$  to  $\frac{3}{16}$  inch.

k. Remove rack from wing.

l. Fit sealing gasket over trimmed edge of housing. If housing has been cut flush with upper bulkhead, trim inside leg of gasket to clear.

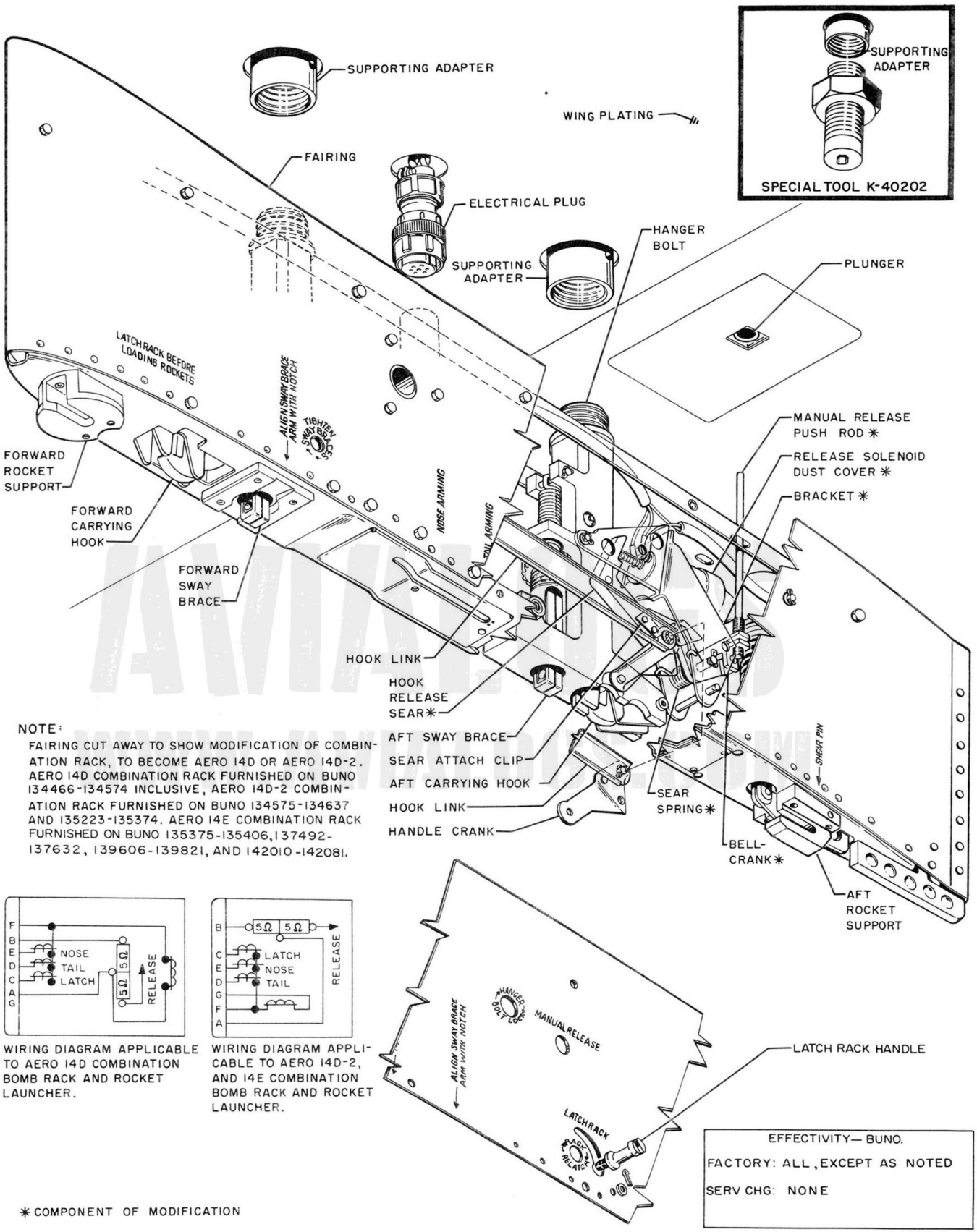
m. Support rack and use  $\frac{3}{8}$ -inch socket wrench to tighten hanger bolts (in supporting adapters). Take up bolts alternately and gradually to prevent distortion of launcher.

n. Tighten hanger bolt locks.

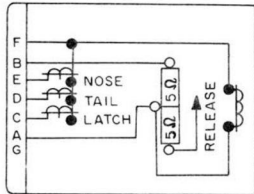
o. Test combination rack.

#### 9-53. TESTING.

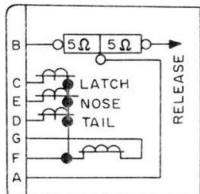
a. Check hanger bolts, hanger bolt locks, fairing screws, and sway braces for tight fit.



**NOTE:**  
 FAIRING CUT AWAY TO SHOW MODIFICATION OF COMBINATION RACK, TO BECOME AERO 14D OR AERO 14D-2. AERO 14D COMBINATION RACK FURNISHED ON BUNO 134466-134574 INCLUSIVE, AERO 14D-2 COMBINATION RACK FURNISHED ON BUNO 134575-134637 AND 135223-135374. AERO 14E COMBINATION BOMB RACK FURNISHED ON BUNO 135375-135406, 137492-137632, 139606-139821, AND 142010-142081.



WIRING DIAGRAM APPLICABLE TO AERO 14D COMBINATION BOMB RACK AND ROCKET LAUNCHER.



WIRING DIAGRAM APPLICABLE TO AERO 14D-2, AND 14E COMBINATION BOMB RACK AND ROCKET LAUNCHER.

\* COMPONENT OF MODIFICATION

EFFECTIVITY— BUNO.  
 FACTORY: ALL, EXCEPT AS NOTED  
 SERV CHG: NONE

P-4008-1E

Figure 9-5. Combination Bomb Rack and Rocket Launcher Installation

b. Push up on aft end of rocket latch. Note whether latch moves freely around shear pin. Replace shear pin if it interferes with latch movement.

**CAUTION**

Use only AN470AD3-8 shear pin.

c. Push arming wire loops under each cone in arming slots. Energize arming solenoids: it should not be possible to pull wires from slots. De-energize arming solenoids: wires should pull out easily.

d. Pull down handle at LATCH RACK to latch rack.

e. Insert operating lever (rack tool No. 50A70B53) in each TIGHTEN SWAY BRACE access. Simultaneously turn lever counterclockwise and pull sway brace arms down: they should snap into spread and locked position. Operate lever clockwise: arms should release from spread position and retract upward into rack.

f. Operate manual release handle in cockpit: carrying hooks on combination rack should open.

9-54. LOADING—ROCKETS.

**WARNING**

Before proceeding, be sure that master arming switch is "OFF."

a. Pull LATCH RACK handle down to latch combination rack.

b. Raise rocket to position under rack, with rocket lugs forward of supports, and slide button lug into forward support and tunnel lug into aft support.

c. Push rocket aft until tunnel lug is locked between latch and aft support. (If properly installed, there should be no clearance between rocket latch and forward edge of rocket tunnel lug.)

d. Insert arming wire loop in slot in bottom of rack at point marked NOSE ARMING and force it upward until loop is retained. Cut wire to length and insert end in hole provided for it in rocket fuse. Remove fuse safety pin.

**WARNING**

Do not pull arming wire after safety pin is removed from fuse.

e. Plug rocket firing pigtail into receptacle aft of rack.

9-54A. UNLOADING—ROCKETS.

**WARNING**

Before proceeding, be sure that master arming switch is "OFF."

a. Unplug rocket firing pigtail from receptacle aft of rack.

b. Insert safety pin in fuse.

**WARNING**

Do not pull arming wire until safety pin is installed in rocket fuse.

c. Remove arming wire from rocket fuse and rack.

d. Provide support for rocket; manually release latch forward of aft support and slide rocket forward clear of supports.

e. Use operating lever (rack tool No. 50A70B53) to retract sway braces to stowed position.

9-55. LOADING—BOMBS.

**WARNING**

Before proceeding, be sure that master arming switch is "OFF."

a. Insert operating lever (rack tool No. 50A70B53) in MANUAL RELEASE access. Turn lever clockwise to open hooks.

b. Insert operating lever into each TIGHTEN SWAY BRACE access (left-hand side for forward sway brace, right-hand side for aft sway brace); simultaneously turn lever counterclockwise and pull sway brace arms down until they snap into extended position; if necessary, turn arms to align with notches marked on sides of fairing.

c. Raise bomb so that rack hooks engage lugs. Close hooks by pulling LATCH RACK handle down.

d. Insert operating lever into each TIGHTEN SWAY BRACE access; turn clockwise until sway brace arms are snug against bomb.

**Note**

Lower sway braces evenly so that bomb is suspended parallel to launcher lower surface.

e. Insert arming wire loop in NOSE ARMING slot and force it past cone so that loop is retained. Cut arming wire to length and connect end to nose fuse.

f. In manner noted in step e connect arming wire between TAIL ARMING slot and tail fuse.



## 9-55A. UNLOADING - BOMBS.

## WARNING

Before proceeding, be sure that master armament switch is OFF.

- a. Carefully remove nose and tail arming wires.
- b. Support bomb and operate LATCH RACK handle to open carrying hooks.
- c. Use operating lever (rack tool No. 50A70B53) to retract sway braces to stowed position.

9-55B. AERO 6A ROCKET LAUNCHER PACKAGE.

9-55C. DESCRIPTION. (See figure 9-5A.) The Aero 6A rocket package is designed to transport and launch seven 2.75-inch folding-fin type aircraft rockets. Hangers are provided for installation of the package on the combination bomb rack and rocket launcher.

9-55D. LOADING PROCEDURE - AERO 6A ROCKET PACKAGE.

- a. Inspect combination rack for damage and positive attachment; insert operating lever (rack tool No. 50A70B53) in MANUAL RELEASE access and turn lever clockwise to open carrying hooks.
- b. Insure master armament switch and station selector switches are in OFF position.
- c. Support Aero 6A rocket package in position on rack and close hooks by pulling LATCH RACK handle down.
- d. Insert operating lever (rack tool No. 50A70B53) into each TIGHTEN SWAY BRACE access and turn counterclockwise. Simultaneously pull down on arms until they extend and lock in spread position.
- e. Turn operating lever clockwise to tighten sway braces against package.
- f. Remove nose and tail fairing from package.
- g. Install war heads on rocket motors in launcher tube.

- h. Inspect ignition "spider legs" to make sure firm contact is made with rocket discs.

## NOTE

To increase "spider leg" spring pressure, unlatch rocket and pull forward to clear. Gently bend "spider leg" forward into tube; relatch rocket and recheck connection.

- i. Install nose and tail fairings on package.
- j. Stand outboard of package and plug ignition lead into wing receptacle above combination rack.

9-55E. UNLOADING PROCEDURE - AERO 6A ROCKET PACKAGE.

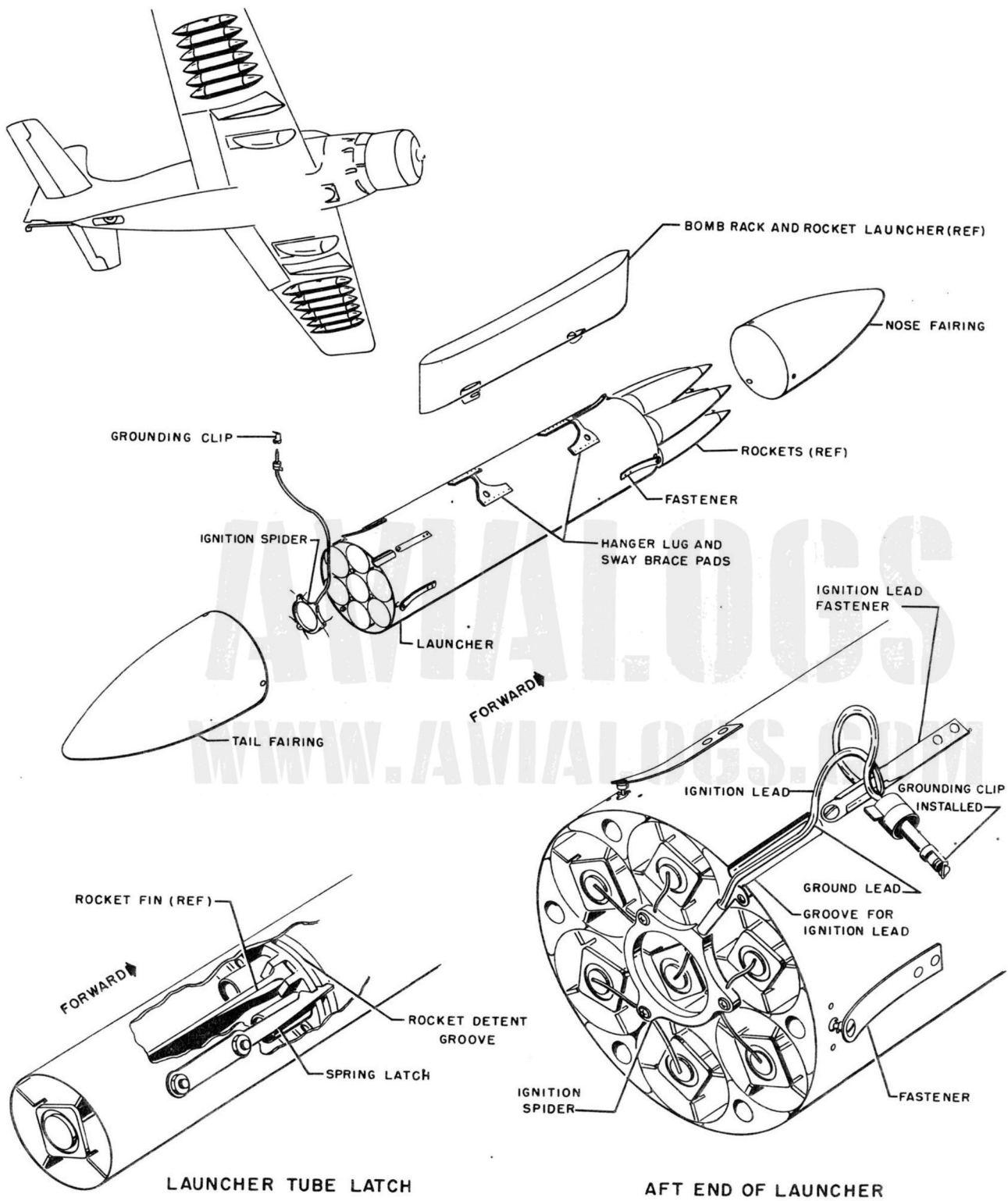
- a. Unplug ignition lead from wing receptacle.
- b. Remove nose and tail fairings from package.
- c. Install shipping pan assemblies on launcher.
- d. Support launcher package; insert operating lever (rack tool No. 50A70B53) in MANUAL RELEASE access and turn lever clockwise to open carrying hooks.

9-56. AERO 1A SUB-CALIBER ROCKET ADAPTER.

9-57. DESCRIPTION. The Aero 1A adapter can be mounted under a combination rack, making it possible to fire sub-caliber rockets by using the electrical circuit incorporated in the modified Aero 14 combination bomb rack and rocket launcher.

9-58. INSTALLATION.

- a. Remove shear wire from adapter.
- b. Pull LATCH-RACK handle on rack just enough to raise rocket firing arm away from forward rocket support, but not enough to latch rack. Hold in position.
- c. Align forward and aft lugs of adapter with forward and aft supports of rack.
- d. Push adapter aft until aft lug is locked between latch and aft support.
- e. Release LATCH RACK handle so that firing arm rests on adapter lug button.
- f. Reinstall shear wire on adapter.



P-8024-1

Figure 9-5A. Aero 6A Rocket Package Installation

## 9-59. LOADING SUB-CALIBER ROCKETS.

**WARNING**

Before beginning loading operation make certain master armament switch is "OFF."

a. Pull LATCH RACK handle on rack sufficiently to raise firing arm away from adapter lug button but not enough to latch rack. Hold in position.

b. Insert rocket lugs into T-slot on adapter and push rocket aft as far as it will go.

c. Release latch handle slowly until firing arm rests on adapter forward lug.

d. Plug firing pigtail into receptacle on aft end of adapter.

## 9-59A. UNLOADING SUB-CALIBER ROCKETS.

**WARNING**

Before beginning unloading operation make certain master armament switch is "OFF."

a. Unplug firing pigtail from receptacle on aft end of adapter.

b. Pull LATCH RACK handle on rack sufficiently to raise firing arm away from adapter lug but not enough to unlatch rack; hold handle in this position and push rocket forward clear of adapter T-slot.

## 9-60. EXTERNAL-STORES CONTROL SYSTEMS.

9-61. DESCRIPTION. The external stores control systems are designed to release stores from both inner and outer stores stations electrically or, if desired, manually. Most of the electrical control switches are located in the armament panel in the cockpit.

## 9-62. EXTERNAL-STORES ELECTRICAL CONTROL SYSTEM.

9-63. DESCRIPTION. The external stores electrical control system is used to release, in predetermined combinations, the stores carried at the inner and outer stations. Most of the control switches are located in the armament panel, although the actuating (release) switches for inner and outer stores stations are located on the control stick grip. Principal circuits comprising the electrical control system are:

Name	Para Ref
Armament power supply circuit	9-68
Armament safety and disabling circuit	9-71

Name	Para Ref
Interval generator control circuit	9-74
Arming circuit	9-78
Chemical tank and flare dispenser circuit	...
Rocket latch circuit	9-81
Ejector test circuit	9-84

## 9-64. ARMAMENT PANEL.

9-65. DESCRIPTION. (See figure 9-1.) The armament panel houses control switches for the external stores, guns, and gun sight. The panel is located directly below the instrument panel in the cockpit.

## 9-66. REMOVAL.

- Remove chartboard from tracks above panel.
- Remove switch knobs to release lucite lighting panels.
- Disconnect panel light wiring at terminal panel No. 19.
- Remove control switches.
- Disconnect rudder pedal adjustment crank which extends through panel. (Refer to section II.)
- Remove screws securing armament panel to instrument panel and supports.

## 9-67. INSTALLATION.

- Secure armament panel to instrument panel and supports with screws.
- Connect panel light wiring at terminal panel No. 19.
- Install control switches, lucite panels, and switch knobs.
- Connect rudder pedal adjustment crank through panel. (Refer to section II.)
- Install chartboard on tracks above panel.

## 9-68. ARMAMENT POWER SUPPLY CIRCUIT.

9-69. DESCRIPTION. (See figure 9-6.) Principal components of the armament power supply circuit are:

Name	Location
Master armament switch, circuit breaker type, 5-amp	Armament panel
Resistors, 4.5-ohm	Forward equipment compartment—sta 110, center
Master armament relay	Forward equipment compartment—terminal panel No. 17

9-70. When the master armament switch is closed, secondary bus power energizes the master armament relay coil, closing the circuit between the primary bus and the armament bus. D-c power then energizes the armament bus.

**9-71. ARMAMENT SAFETY AND DISABLING CIRCUIT.**

9-72. DESCRIPTION. (See figure 9-6.) The composite safety and disabling circuit provides (1) the means of safeying the armament equipment when the airplane is on the ground and (2) the means of disabling the safety feature when ground operation of the equipment is necessary. Principal components of the circuit include:

<i>Name</i>	<i>Location</i>
Circuit breaker, 10-amp	LH wheel well
Armament safety disabling relay	Forward equipment compartment—terminal panel No. 17
Armament safety disabling switch	LH wheel well
Armament safety switch	Forward equipment compartment—firewall LH side

9-73. When the landing gear is down, the armament safety switch is closed by the landing gear control handle linkage, thus de-energizing the armament bus. Actuation of the safety disabling switch takes power from the secondary bus to energize the safety disabling relay to permit current to energize the armament bus; the safety switch is then bypassed, and remains inoperative until battery power has been turned off.

**9-74. ARMAMENT INTERVAL GENERATOR CONTROL CIRCUIT.**

9-75. DESCRIPTION. (See figure 9-6.) Principal components of the interval generator control circuit include:

<i>Name</i>	<i>Location</i>
Circuit breaker, 15-amp, marked INT GEN	Cockpit circuit breaker panel
Interval generator	Forward equipment compartment—RH
Interval selector switch	Armament panel
Inner-station stores selector switch	Armament panel
Inner-station selector switches	Armament panel
Release method selector switch	Armament panel
Inner-station bomb-director-channel selector switch	Armament panel
Bomb director	(Refer to section VIII.)
Inner-station relays	Forward equipment compartment—terminal panel No. 17
Outer-station relays	Forward equipment compartment—terminal panel No. 17
Outer-station stores selector switch	Armament panel
Outer-station selector switch	Armament panel
Bomb-rocket selector relays	Outboard front wing spar—sta 170
Inner-station release switch	Control stick
Outer-station release switch	Control stick

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9-76. The interval generator circuit connects with the receptacles at all stores stations. The circuit comprises the necessary control elements to permit wide variations of release procedures. Basic release patterns and switch positions to accomplish the patterns are:

**INNER STATION RELEASE ONLY.** Bomb director used, three releases per second, stores armed. (See figure 9-6.)

Master armament switch	"ON"
Inner-station bomb-director-channel selector switch	"BOMB"
Inner-station-stores selector switch	"BOMBS"
Release method selector switch	"BOMB DIREC & INTERVAL"
Interval selector switch	"3"
Inner-station selector switches	"TRAIN"
Outer-station-stores selector switch	"BOMBS"
Arming switch	"NOSE AND TAIL"
Outer station release switch	Off
Inner station release switch	On

**OUTER STATIONS RELEASE ONLY.** Firing armed rockets, six pairs per second, undirected. (See figure 9-6.)

Master armament switch	"ON"
Release method selector switch	"INTERVAL"
Outer-station bomb-director-channel selector switch	"ROCKETS"
Outer-station selector switch	"7"
Interval selector switch	"6"
Arming switch	"NOSE AND TAIL"
Inner station release switch	Off
Outer station release switch	On

**COMBINED RELEASE.** Bombs free release, rockets single release, all stores armed, 20 per second. (See figure 9-6.)

Master armament switch	"ON"
Release method selector switch	"INTERVAL"
Outer-station bomb-director-channel selector switch	"ROCKETS"
Outer-station selector switch	"1"
Interval selector switch	"20"
Inner-station-stores selector switch	"BOMBS"
Arming switch	"NOSE & TAIL"
Inner-station selector switch	"LEFT," "CENTER," "RIGHT"
Inner-station bomb-director-channel selector switch	"BOMB"
Outer station release switch	On
Inner station release switch	On

9-77. All settings of switches must be made prior to actuation of the release switches. The release switches must be held closed until completion of the release pattern. (Complete wiring diagrams are shown in section X.)

### 9-78. EXTERNAL-STORES ARMING CIRCUIT.

9-79. DESCRIPTION. (See figure 9-6.) Principal components of the arming circuit include:

Name	Location
Circuit breaker, 15-amp	Cockpit circuit-breaker panel
Arming switch	Armament panel
Nose-arming solenoid, inner station	Each stores rack
Tail-arming solenoid, inner station	Each stores rack
Nose-arming solenoid, outer station	Each combination bomb rack and rocket launcher
Tail-arming solenoid, outer station	Each combination bomb rack and rocket launcher

9-80. D-c power from the armament bus is connected with the arming switch, where it is fed either to the tail arming solenoids, or to the nose-and-tail arming solenoids, at all stations, depending on the position of the switch. When energized, the circuit provides armed release of the stores.

### 9-81. ROCKET LATCH CIRCUIT.

9-82. DESCRIPTION. (See figure 9-6.) Principal components of the rocket latch circuit include:

Name	Location
Circuit breaker, 10-amp	Forward equipment compartment—circuit-breaker panel
Inner station rocket latch solenoid	Each stores rack
Outer station rocket latch solenoid	Each rocket launcher

9-83. D-c power from the armament bus is connected through the circuit breaker to the rocket latch solenoids at all stores stations and energizes the solenoids to ready the rockets for firing.

### 9-84. FUSELAGE EJECTOR-RACK TEST CIRCUIT.

9-85. DESCRIPTION. (See figure 9-6.) The ejector test circuit provides the means of testing ejector operation while the airplane is on the ground. Principal components of the circuit include:

Name	Location
Circuit breaker, 5-amp, marked BOMB EJECT TEST	Forward equipment compartment—circuit-breaker panel
Test lamp	LH wheel well
Resistor, 120-ohm	LH wheel well
Test switch	LH wheel well

9-86. On airplanes prior to BuNo. 139695, except 137495, the circuit receives power from the armament bus through the BOMB EJECT TEST 5-ampere circuit breaker. On airplanes BuNo. 137495, 139695-139821, and 142010-142081, the circuit receives power from the secondary bus through the BOMB EJECT TEST 5-ampere circuit breaker. Positioning the test switch to "LAMP" permits power to reach the lamp, and causes the lamp to light if the bulb is functioning. Positioning the test switch at "CARTRIDGE" allows power to flow to the cartridge connection in the fuselage stores rack. If the connection is satisfactory, the lamp will light.

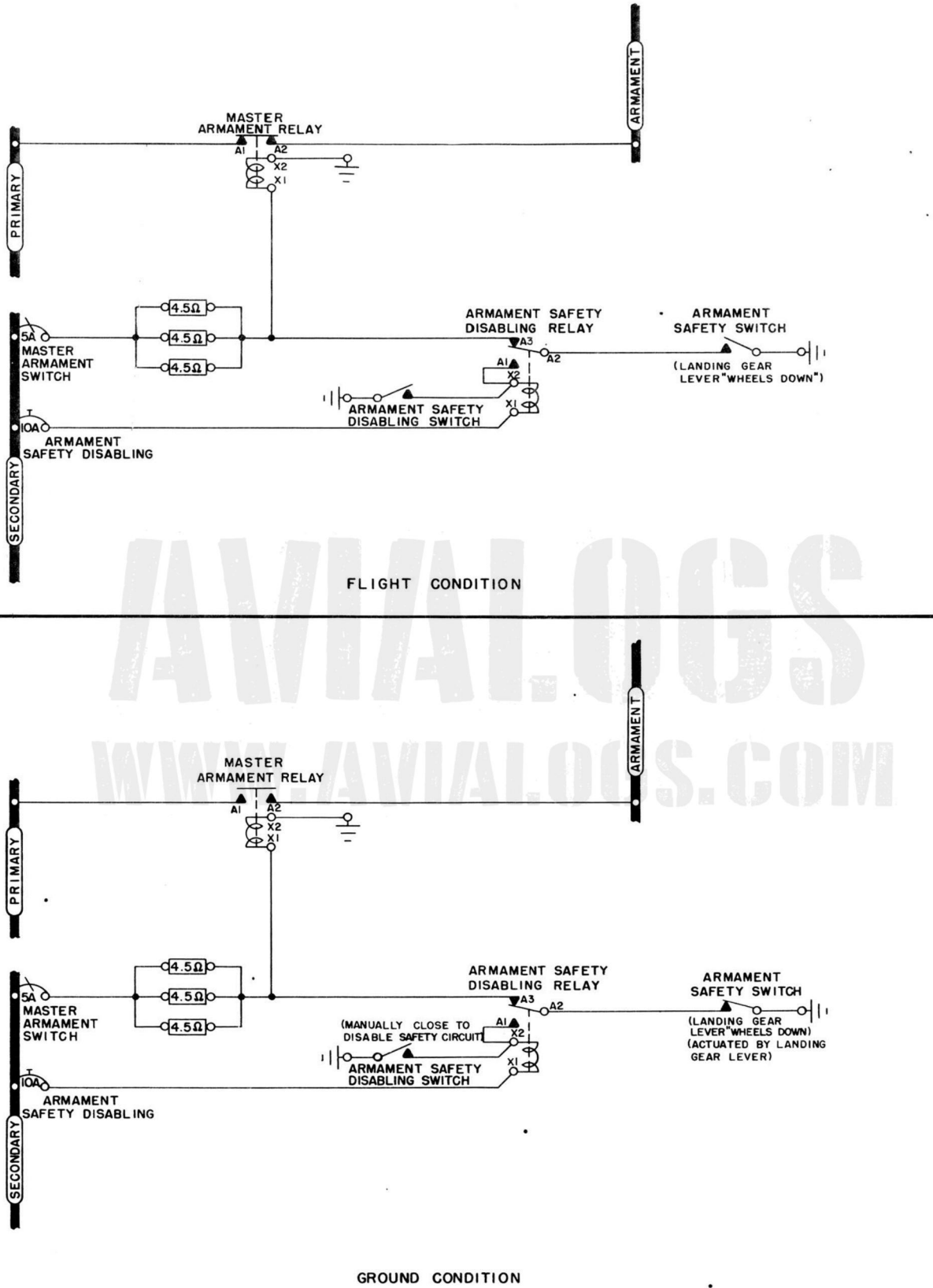
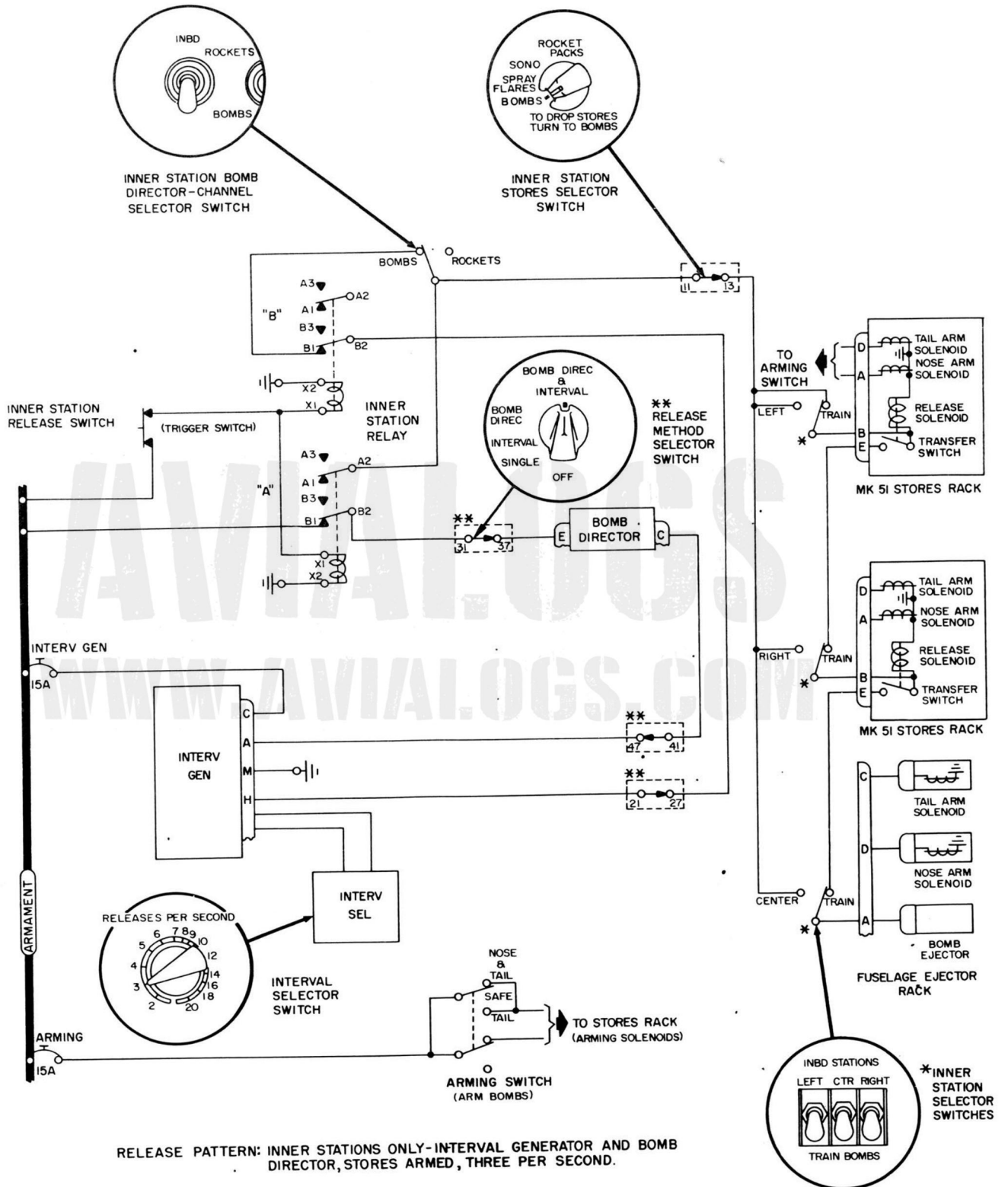


Figure 9-6. External-Stores Control Schematic Diagrams (Sheet 1)

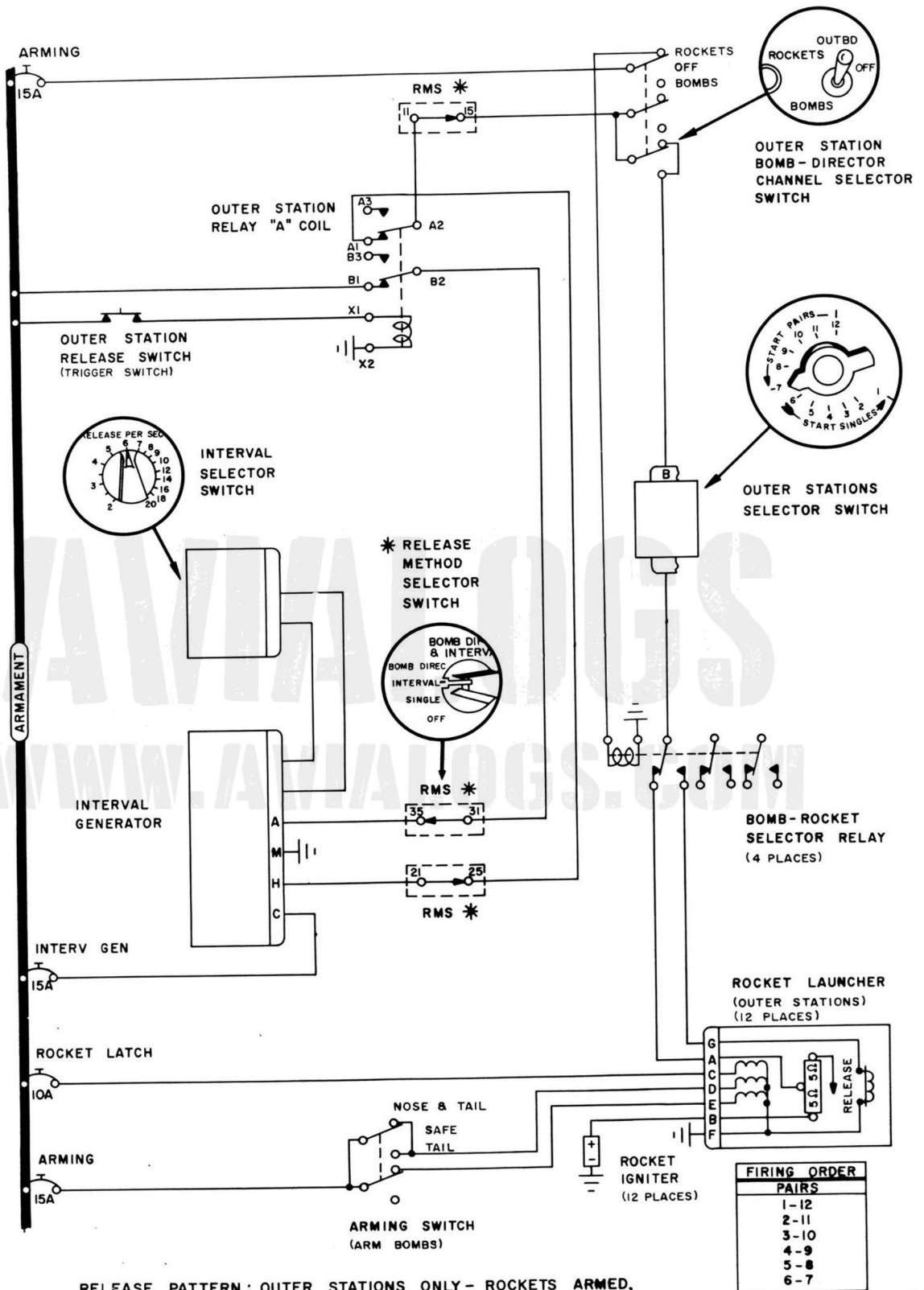


P-4009-2-B

Figure 9-6. External-Stores Control Schematic Diagrams (Sheet 2)

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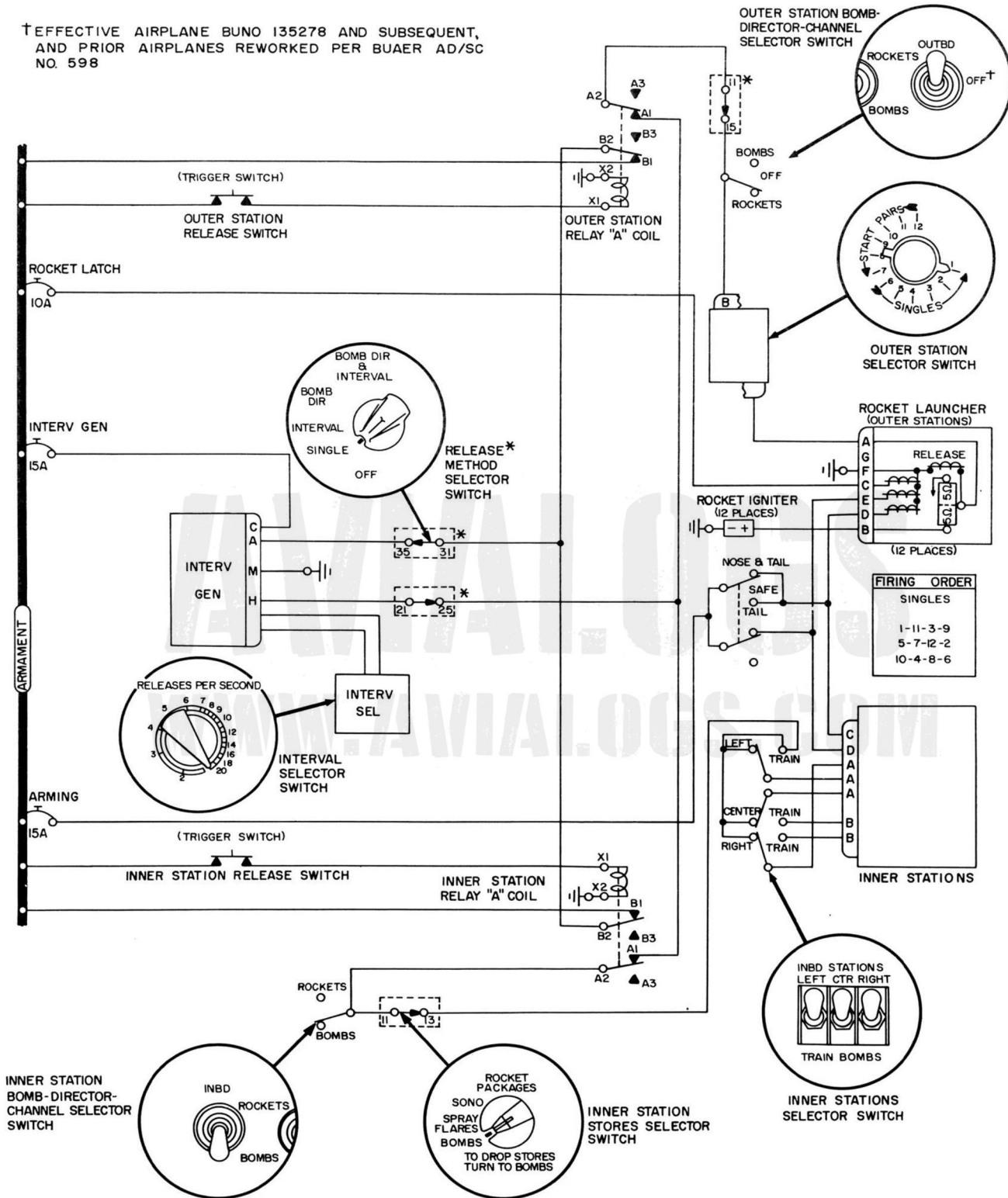


RELEASE PATTERN: OUTER STATIONS ONLY - ROCKETS ARMED, SIX PAIRS PER SECOND, UNDIRECTED  
EFFECTIVITY BUNOS 135278 & SUBSEQUENT & PRIOR AIRPLANES REWORKED PER BUAER AD/SC NO 598

P-4009-6-A

Figure 9-6. External-Stores Control Schematic Diagrams (Sheet 4)

† EFFECTIVE AIRPLANE BUNO 135278 AND SUBSEQUENT, AND PRIOR AIRPLANES REWORKED PER BUAEF AD/SC NO. 598

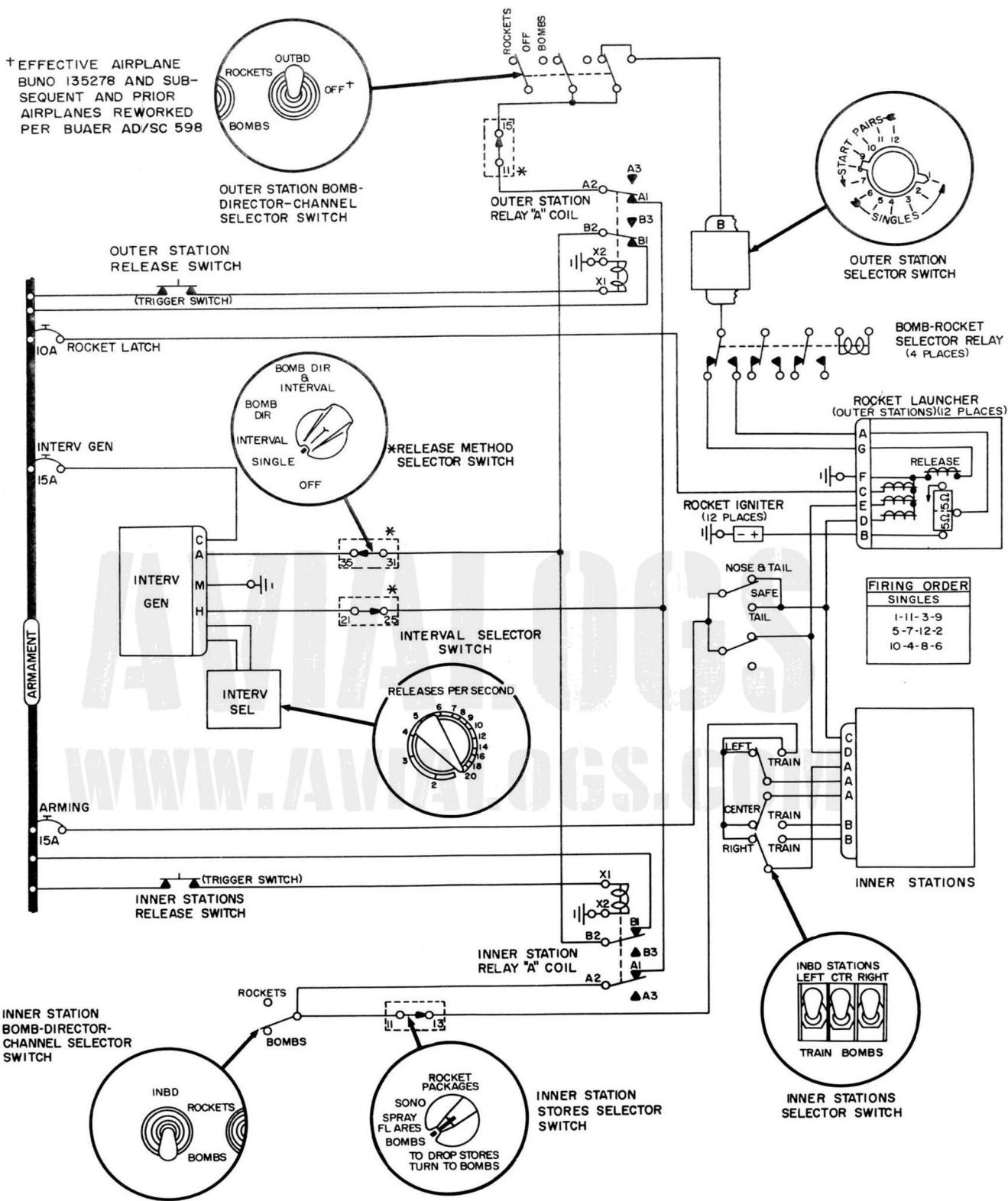


RELEASE PATTERN: COMBINED-BOMBS FREE, ROCKETS SINGLE, ALL STORES ARMED, 20 PER SECOND

EFFECTIVE BUNOS 134466-134575

P-4009-4-B

Figure 9-6. External-Stores Control Schematic Diagrams (Sheet 5)

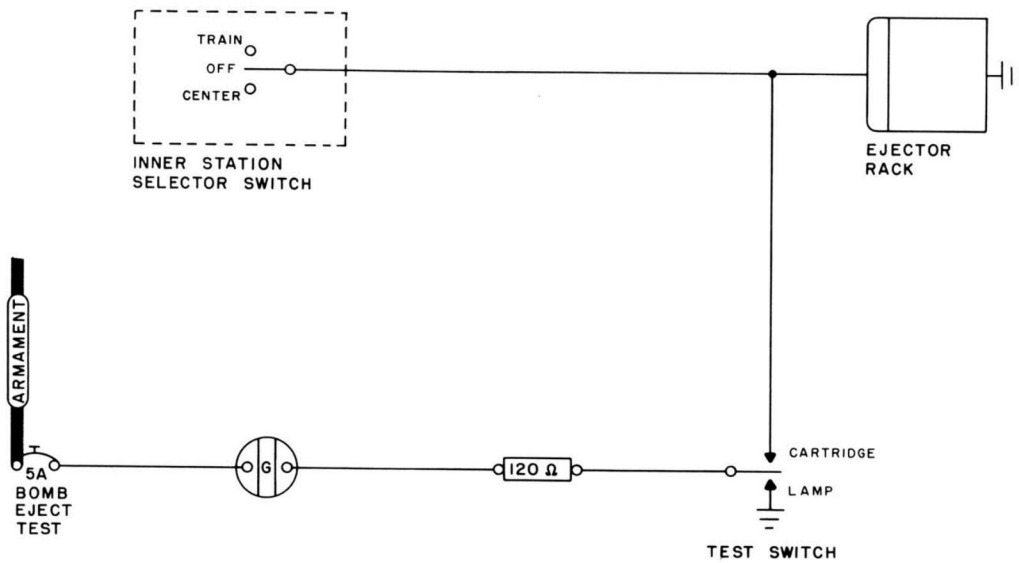


RELEASE PATTERN: COMBINED-BOMBS FREE, ROCKETS SINGLE, ALL STORES ARMED, 20 PER SECOND

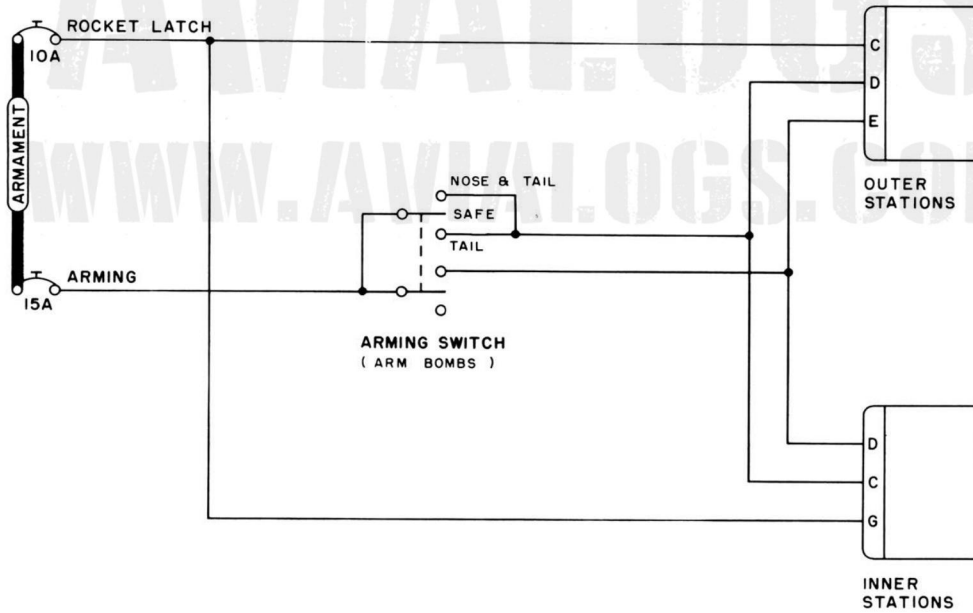
EFFECTIVE BUNOS 134576 AND SUBS

P-4009-7-A

Figure 9-6. External-Stores Control Schematic Diagrams (Sheet 6)



FUSELAGE EJECTOR - RACK TEST CIRCUIT



ARMING CIRCUIT & ROCKET LATCH CIRCUIT

P-4009-5-A

Figure 9-6. External-Stores Control Schematic Diagrams (Sheet 7)

9-87. EXTERNAL-STORES MANUAL-RELEASE SYSTEMS.

9-88. DESCRIPTION. There are separate external stores manual release systems provided for inner stations and outer stations.

9-89. EXTERNAL-STORES INNER-STATION MANUAL-RELEASE SYSTEM.

9-90. DESCRIPTION. (See figure 9-7.) Principal components of the inner station release system include:

<u>Name</u>	<u>Location</u>
Manual release control handle	Cockpit - LH control panel
Handle cable guide	Cockpit - LH control panel
Handle cable	From handle to equalizer mechanism
Equalizer mechanism, fuselage	Forward equipment compartment - LH
Equalizer mechanism, center wing	Forward equipment compartment - LH
Fuselage rack manual-release locking mechanism	Cockpit - LH control panel

9-91. The inner stores station manual release handle is identified as CTR. WING BOMB RELEASE. The handle is connected by cable to the center wing equalizer mechanism, which consists of a carriage-and-slider, a spring, and pulleys, and to the fuselage equalizer mechanism, which is similar to the center wing equalizer. Pulling the handle in the cockpit pulls the two mechanisms toward each other. The fuselage carriage connects by cable with the manual release lever of the fuselage stores rack. The center wing carriage connects by cable with each wing stores rack manual release lever. Movement of the mechanisms thus actuates the respective manual release levers to open the carrying hooks and release the stores at the inner stations. Locking provisions on each carriage permit locking out either the fuselage or wing stations prior to flight by inserting a safety bolt into the carriage. A locking device is provided to lock out the fuselage station during flight, thus permitting manual release of the wing stations only.

9-92. FUSELAGE RACK MANUAL-RELEASE LOCKING MECHANISM.

9-93. DESCRIPTION. (See figure 9-7.) The fuselage rack locking mechanism consists of a control knob and cable, and the necessary pulleys and clamps to connect the cable to the fuselage stores rack

manual-release carriage. The control knob is located just below the inner station manual-release handle in the cockpit and is identified by PULL TO LOCK CENTER STATION. Pulling the control knob causes a lever to block movement of the fuselage carriage when the manual-release handle is pulled. This action prevents actuation of the fuselage stores rack manual-release lever. For adjustment of the locking mechanism see figure 9-7A. This is a safety of flight item; therefore, adjustment instructions should be carefully adhered to.

9-94. EXTERNAL-STORES OUTER-STATION MANUAL-RELEASE SYSTEM.

9-95. DESCRIPTION. (See figure 9-8.) Principal components of the outer-station manual-release system include:

<u>Name</u>	<u>Location</u>
Manual-release control handle and cable	Cockpit - LH control panel
Equalizer bracket	Cockpit - inside LH control panel
Sector cables, inboard	Equalizer mechanism to barrels
Sector cables, outboard	Barrels to sectors
Control sectors	Inboard of wing joints
Return springs, center wing	Sectors to structure
Torque tubes, center wing	Sectors to wing joints
Actuator arms	Wing joints - inboard
Actuator cams	Wing joints - outboard
Return springs, outboard	Cams to structure
Torque tubes, outboard wing	Cams to outboard stations
Release levers	Above each combination rack
Plunger guides	Above each combination rack
Plungers	Release lever to lower surface at each rack

9-96. The outer-stores-station manual-release system can be used only when the stores to be released are carried by the combination bomb rack and rocket launcher hooks. Rockets cannot be manually released from the

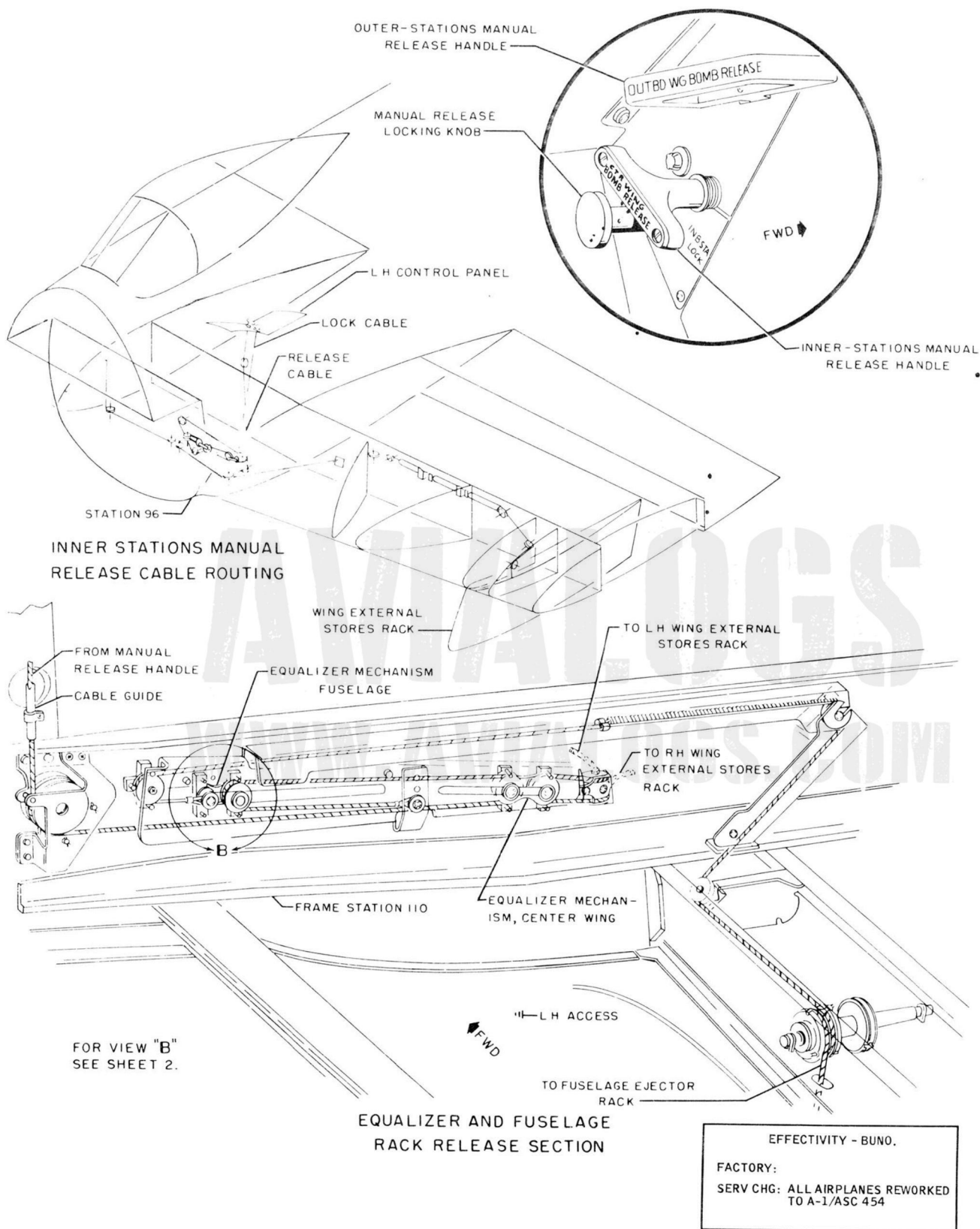
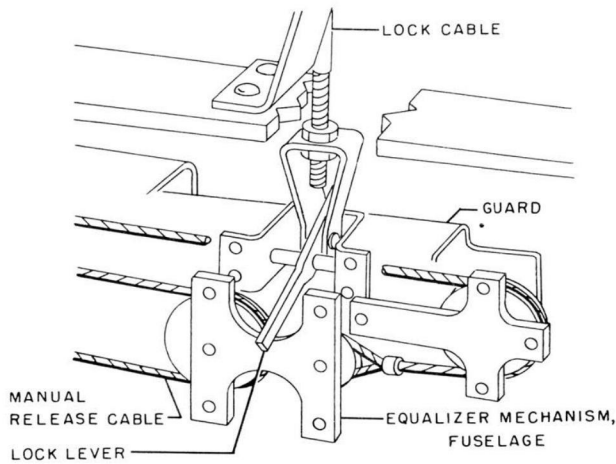


Figure 9-7. External-Stores Inner-Station Manual Release System (Sheet 1)



MANUAL RELEASE LOCKING MECHANISM

VIEW B

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Figure 9-7. External-Stores Inner-Station  
Manual Release System (Sheet 2)

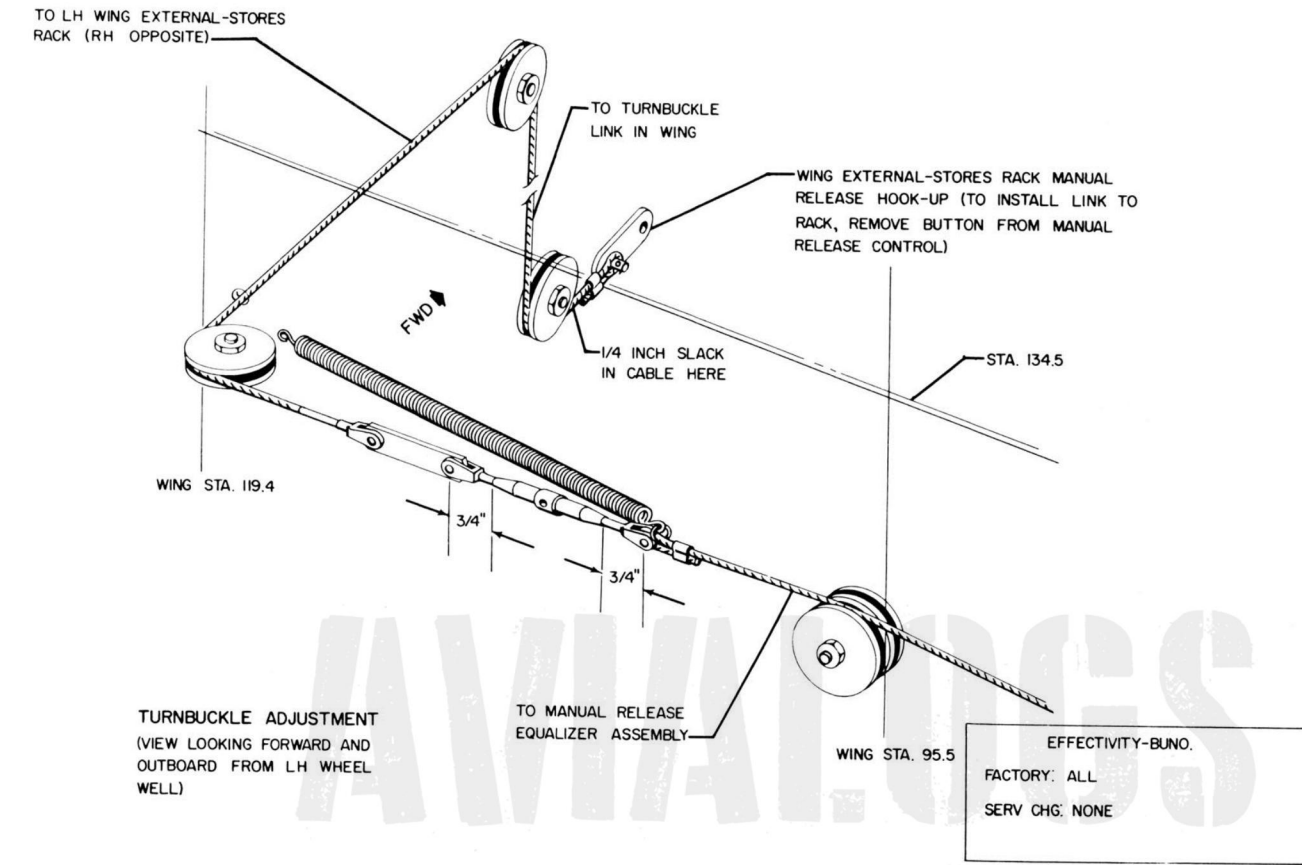
outer stations. The outer-stations manual-release control handle is identified as OUTBD. WG. BOMB RELEASE. The handle and cable connect with pulleys at the equalizer bracket inside the panel to affect both left-hand and right-hand outer-stores stations. Pulling the manual release handle in the cockpit causes the control sector to rotate. The center wing torque tube and actuator arm are connected to the sector and rotate as the sector turns. The actuator arm at the wing joint links with the actuator cam and forces the cam aft. Movement of the cam is reflected in rotation of the outboard wing torque tube, on which is mounted the release lever above each outer station. The release lever depresses the release plunger in its guide to actuate linkage within the combination rack to open the carrying hooks and release the stores. When the control handle is released, the return springs rotate the torque tubes to their unreleased position.

**WARNING**

Be sure that actuator arm and cam have returned to their fully unreleased position before attempting to spread wing; serious damage might result if arm and cam fail to clear during wing-spreading operation.

9-97. ADJUSTMENT. Refer to figure 9-8A.

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### Adjustment Procedure

- Remove forward equipment compartment doors.
- Route manual-release wing cables from equalizer assembly through wings. (See figure 9-7.)
- Route wing-external-store-rack manual release cables from manual-release handle links of wing external-store racks to wing cables from equalizer assembly.
- Install turnbuckles and links between cables routed in steps b and c.
- Adjust turnbuckle forks  $\frac{3}{4}$  inch from turnbuckle barrels.

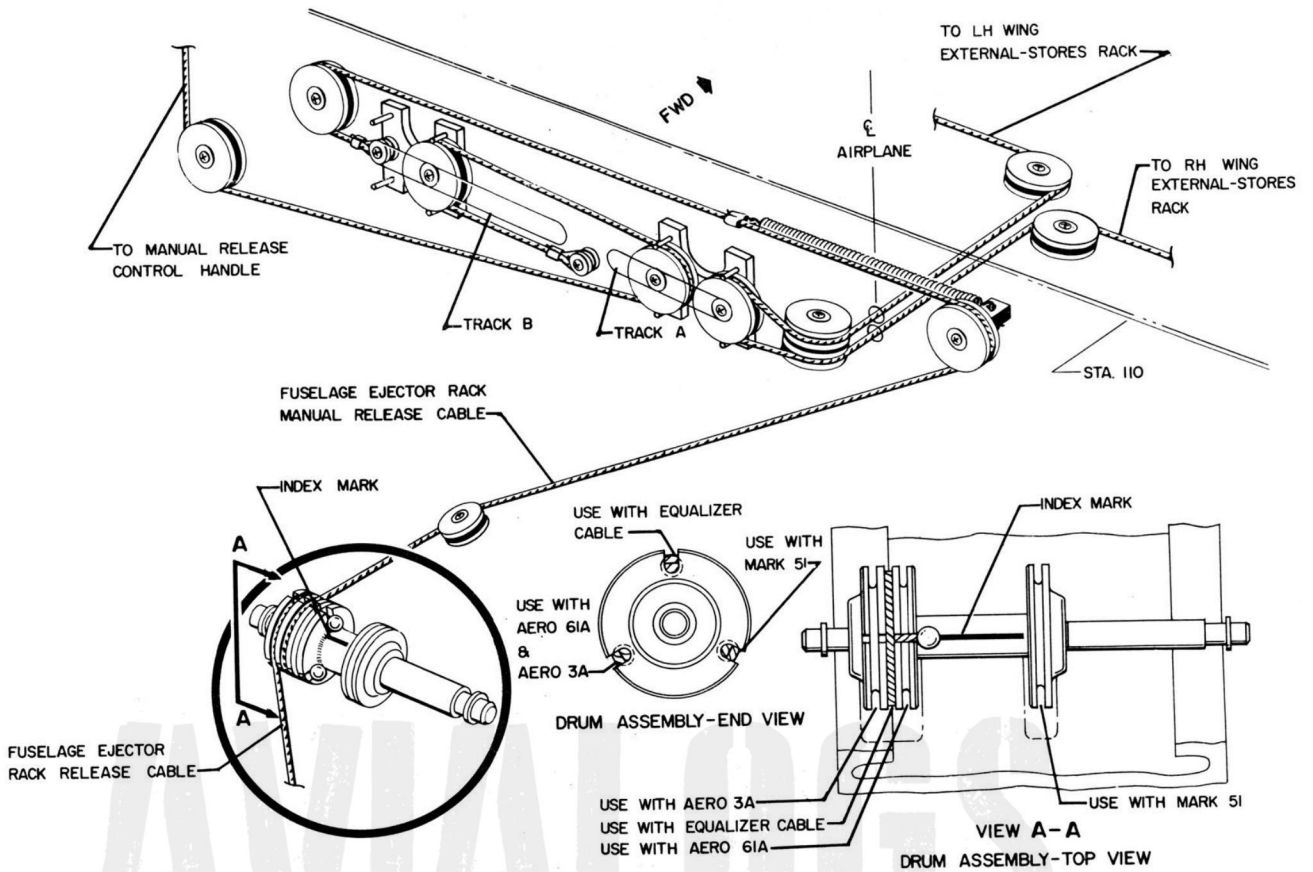
#### Note

There should be no slack in cable system from wing external-store racks to equalizer assembly at this stage of adjustment.

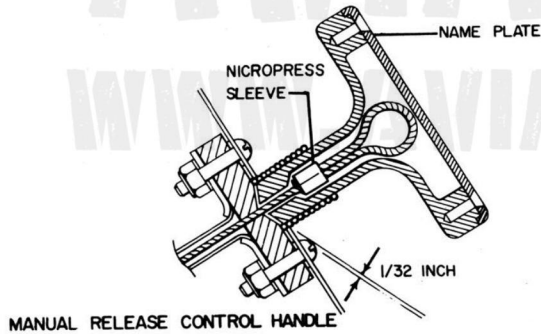
- Install springs between inboard ends of turnbuckles and pulley brackets outboard of turnbuckles.
- Back-off turnbuckles to provide approximately  $\frac{1}{4}$  inch slack in cables between turnbuckle links and wing-external-store-rack manual release links.
- Looking forward in left-hand forward equipment access, equalizer carriages should be bottomed in outboard ends of tracks A and B.
- Route cable from equalizer assembly to manual release handle in cockpit using aft pulley on bracket which lies to left of equalizer assembly.
- Move control rod of fuselage-ejector-rack locking mechanism upward locking fuselage ejector rack in closed position.
- Adjust locking nuts on fuselage-ejector-rack locking mechanism to position locking lever approximately  $\frac{1}{16}$  inch from bottom of equalizer carriage slot.
- Unlock fuselage-ejector-rack equalizer carriage.
- In cockpit, remove nameplate from manual release handle, and string manual release cable through handle.
- Adjust Nicropress sleeve to cable protruding through manual release handle allowing handle  $\frac{1}{32}$  inch cable slack.
- Install cable loop to Nicropress sleeve, crimp, and reinstall nameplate to manual release handle.
- In forward equipment compartment, remove cover plates from fuselage ejector rack pylon.
- Route fuselage ejector rack cable to equalizer drum; equalizer drum assembly is located just forward of fuselage ejector rack breech.

Figure 9-7A. External-Stores Inner Station Manual Release Adjustment (Sheet 1)





**Adjustment Procedure (Continued)**



r. Place ball of fuselage ejector rack cable into equalizer drum slot which is adjacent to index marking on drum.

s. Wrap fuselage ejector rack cable around middle equalizer drum groove twice, and place index mark of equalizer drum up.

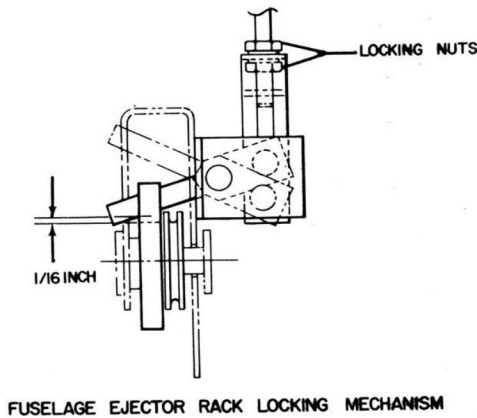
t. Select equalizer drum groove which is applicable to type of ejector rack installed on fuselage centerline. (See view A.)

u. Place ball of cable, which runs between equalizer drum and fuselage-ejector-rack manual release handle, into bottom groove opposite ball in step r, and wrap groove in forward direction one complete turn letting cable hang down through pylon. Lock wire both balls to equalizer drum.

v. Install cable from step u to relaxed position of manual release arm of fuselage ejector rack.

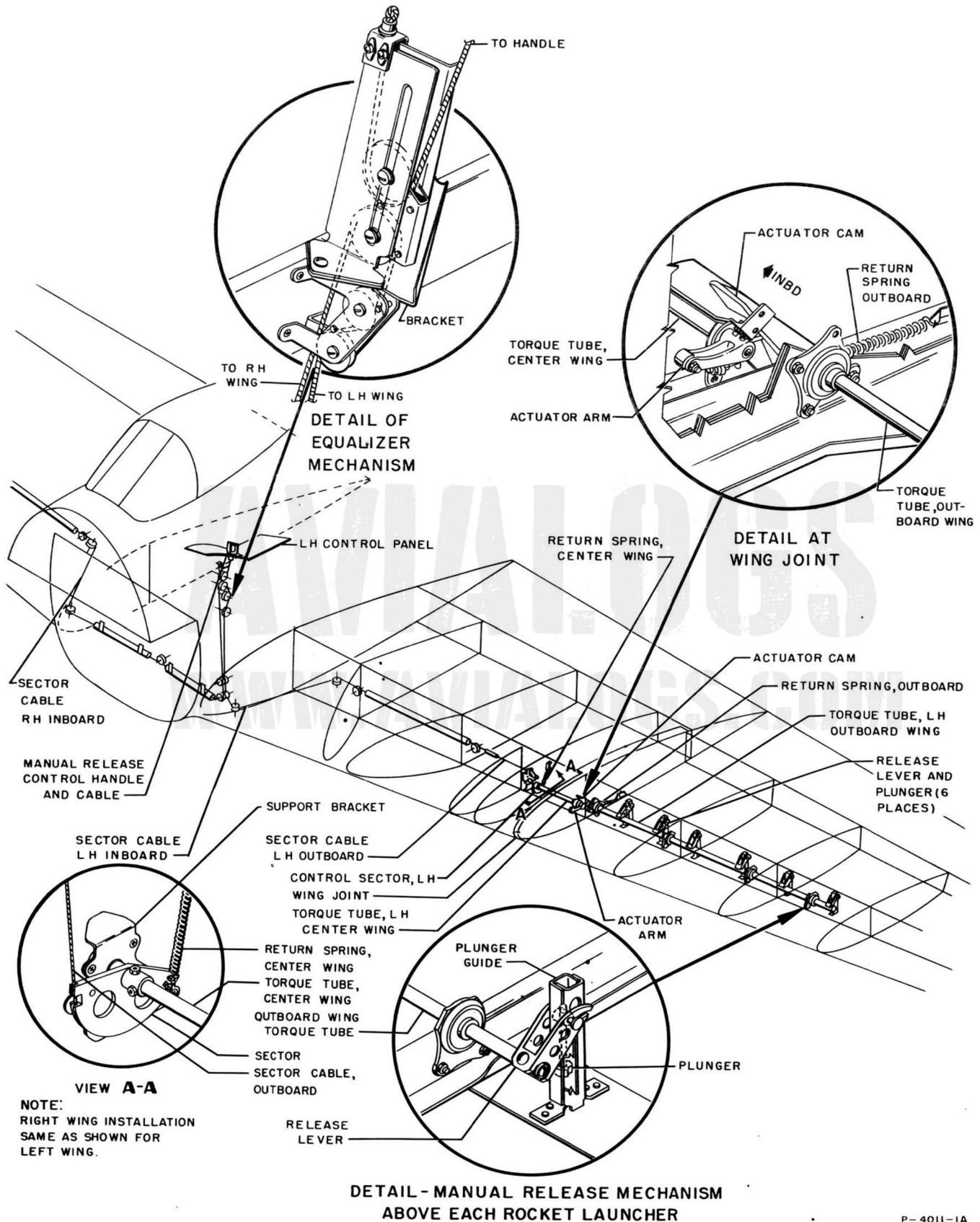
**Note**

Manual release arm on ejector rack should be in free position with manual release cable installed. Free position is determined by rotating manual release arm clockwise until arm bottoms. Manual release cable should have a minimum of  $\frac{1}{16}$  inch over length.



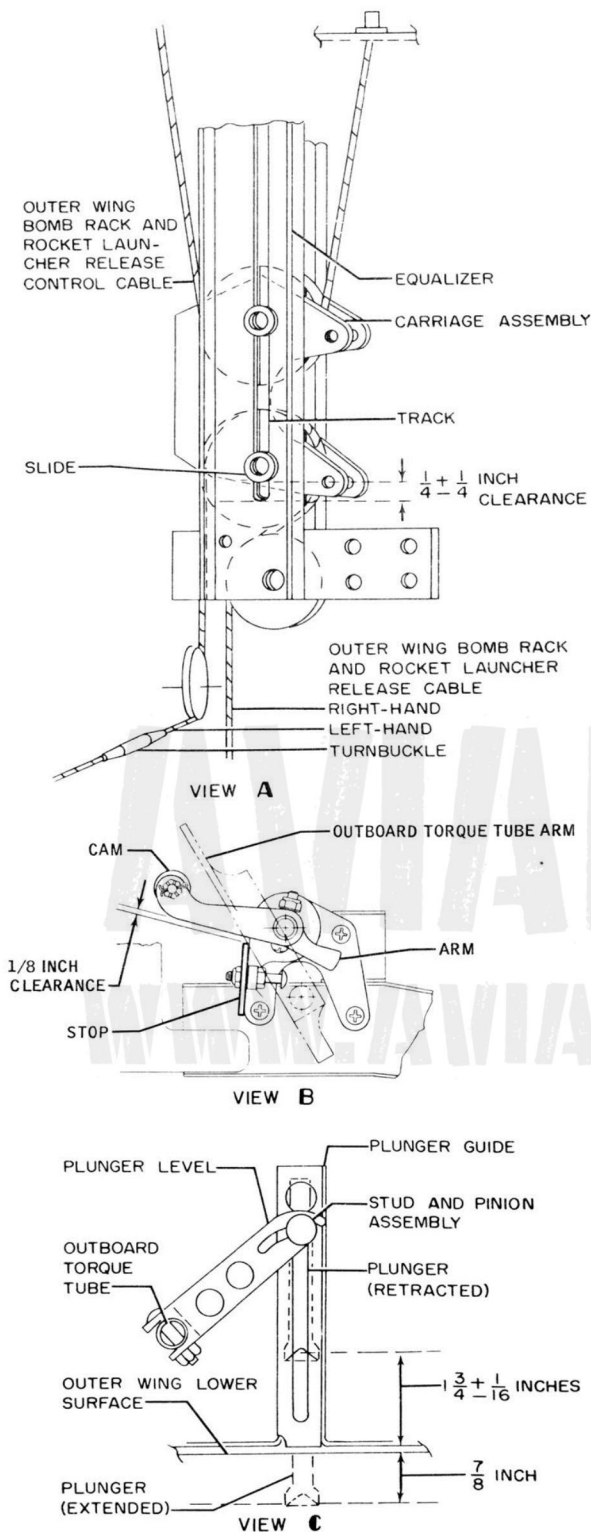
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**Figure 9-7A. External-Stores Inner Station Manual Release Adjustment (Sheet 2)**



DETAIL - MANUAL RELEASE MECHANISM ABOVE EACH ROCKET LAUNCHER

Figure 9-8. External-Stores Outer-Station Manual Release System



EFFECTIVITY - BUNO.  
 FACTORY: ALL  
 SERV CHG: NONE

ALF-2 P-8807-1A

- a. Fold wings.
- b. Open forward compartment access doors.
- c. In forward compartment, remove lockwire on release cable turnbuckle (view A), and adjust turnbuckle to obtain 1/8 inch clearance between stop and arm at left- or right-hand wing fold joint (view B).

NOTE

Arm and stop at one wing fold joint should have 1/8 inch clearance. Arm at opposite wing fold joint should contact spacer stop.

- d. Position carriage and slide assembly (view A), to obtain  $\frac{1}{4} \pm \frac{1}{4}$  inch clearance between slide and bottom of track.

- e. Safety wire release cable turnbuckle.

- f. If it is necessary to adjust bomb rack and rocket launcher plungers, spread wings and accomplish the following:

- g. Tag racks to be removed with location numbers and remove racks.

- h. Fold wings.

- i. Rotate outboard torque tube (view C) through full travel (including overtravel) and secure in place.

- j. Spread wings.

- k. Adjust plunger (view C) to obtain 7/8-inch dimension from lower surface of wing to lower edge of plunger.

- l. Fold wings.

- m. Release outboard torque tube.

- n. Spread wings.

- o. Check for  $1\text{-}\frac{3}{4} \pm \frac{1}{16}$  inch dimension from lower surface of wing to top of plunger cup (view C).

- p. Install racks.

- q. Close forward compartment access doors.

Figure 9-8A. External Stores Outer Station Manual Release System Adjustment

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**9-98. GUNNERY EQUIPMENT.**

9-99. DESCRIPTION. (See figure 9-9.) The gunnery equipment includes the following:

Name	Para Ref
Inboard guns	9-101
Inboard-gun forward mounts	9-107
Inboard-gun rear mounts	9-111
Outboard guns	9-115
Outboard-gun forward mounts	9-121
Outboard-gun rear mounts	9-125
Gun accessories	9-129
Gun control system	9-147
Gun sight	9-182
External sight post	9-187A
Gun camera	9-188

9-100. Gun-charging is electro-hydraulic, firing is electrical, gun feeding is recoil and counter-recoil operated.

**9-101. INBOARD GUNS.**

9-102. DESCRIPTION. (See figure 9-9.) Two type AN-M3, forward-firing, 20-mm automatic aircraft machine guns are mounted in the center wing section just inboard of each wing joint. The guns are installed on fixed front mounts and adjustable rear mounts to facilitate boresighting. To facilitate servicing the inboard guns without removing them from the airplane, each is equipped with a spring-loaded arm by which the gun can be steadied after it is swung outboard.

**CAUTION**

\*Check inboard gun barrels for painted stripe around barrels (in area nearest to wing) before spreading outboard wing panels. When stripe is visible from pilot's cockpit, guns are in their correct position and it is safe to spread outboard wing panels. Do not spread outboard wing panels when painted stripe is not visible.

\*Applies to airplanes BuNo. 137493-137632, 139606-139821, and 142010-142081, inclusive.

**9-103. REMOVAL.**

- Open circuit breakers for all guns.
- Fold wing.
- Open gun access panel in wing upper plating.
- Remove wing joint cover.
- If belt of ammunition has been completely expended, disconnect feed chute and link chute from feed mechanism, raise magazine slide lever, disconnect feed mechanism heater electrical lead, and lift feed mechanism from gun.
- If belt of ammunition has not been completely expended, push feed-mechanism drive-spring release shaft in about  $\frac{3}{16}$  inch and, at same time, turn shaft about

three-quarters of a turn (in direction opposite to that of feeding) to completely unwind drive spring. Pull belt from feed mechanism and continue as noted in step e.

**WARNING**

Before proceeding further, make certain that a round of ammunition does not remain in gun.

- Remove gun charger from gun.
- Disconnect electrical lead to gun-firing solenoid. Plug connectors into adjacent dummy receptacles.
- Release forward mount from front support by rotating mount handle 45 degrees against spring.
- Remove gun by sliding it aft against stops and lifting it off and out of dovetail plate of rear mount.

**9-104. INSTALLATION.**

- Fold wing.
- Open gun access panel in wing upper plating.
- Remove wing joint cover.
- Verify that springs in forward mount housing are in unlocked position.
- Ease muzzle of gun into ball-and-socket joint of forward mount support and position gun as far forward as it will go. Engage dovetail of rear mount so that gun is resting against stops on bottom of cradle.
- Allow mount handle to move into locked position to lock front mount to front support.
- Align  $\frac{1}{2}$  inch black or white line, on underside of handle, within area between the two  $\frac{1}{16}$  inch drilled holes.
- Boresight guns. (Refer to paragraph 9-207.)
- Connect electrical lead to gun-firing solenoid.
- Install feed mechanisms.
- Connect feed chute to feed mechanism.
- Install gun charger.
- Connect link ejection chute to feed mechanism.
- Replace gun access panel.
- Replace wing joint cover.

**9-105. LOADING.**

- Place gun control switches in "SAFE."
- Open gun access panel.
- Install loaded ammunition boxes.
- Disconnect link from feed end of leading ammunition box and pull belted cartridges through feed chute.
- Engage first cartridge in feed mechanism.
- Using a  $\frac{5}{8}$ -inch wrench, rotate spring-wound feed mechanism shaft until clutch slips approximately two full turns.

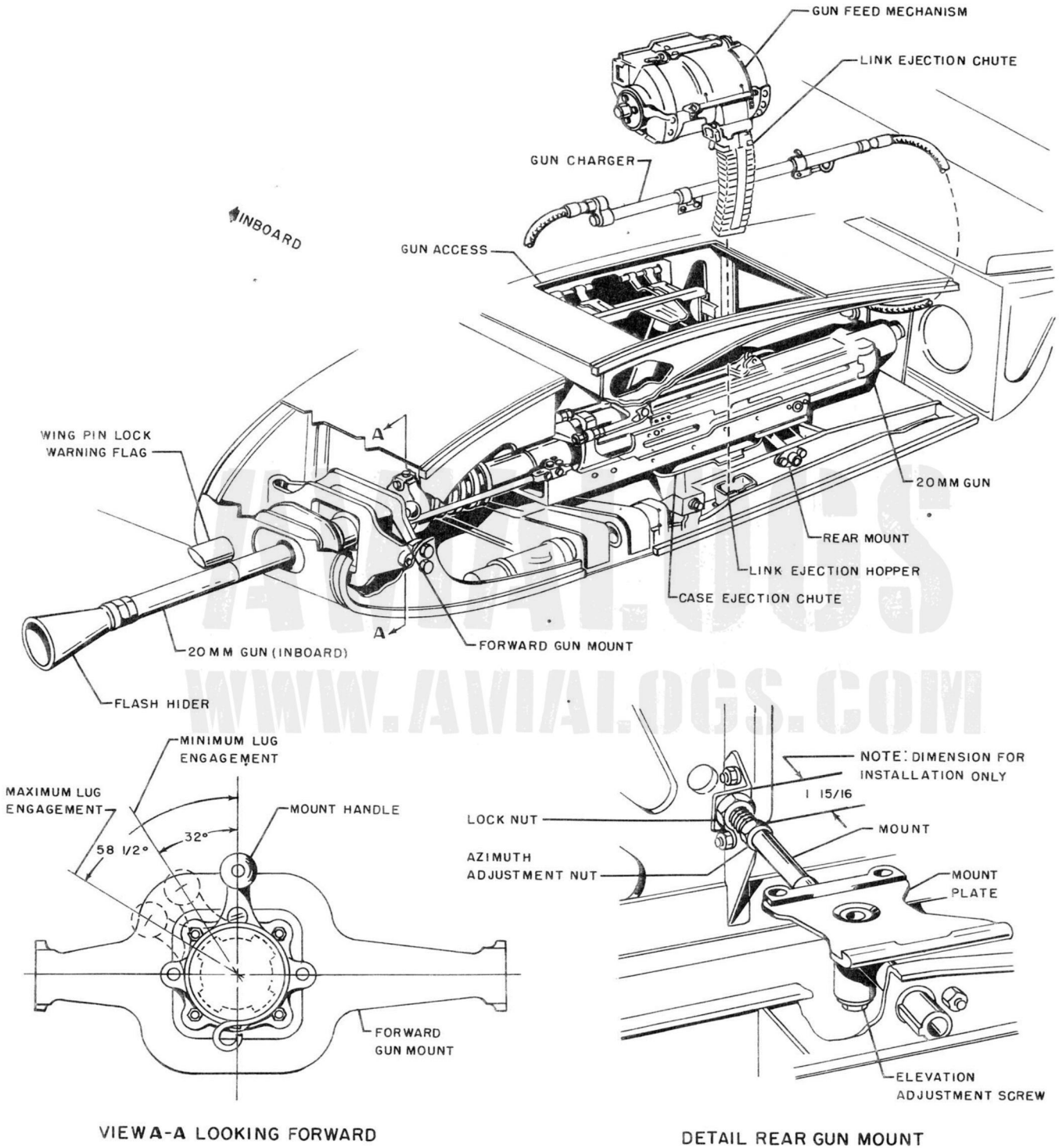
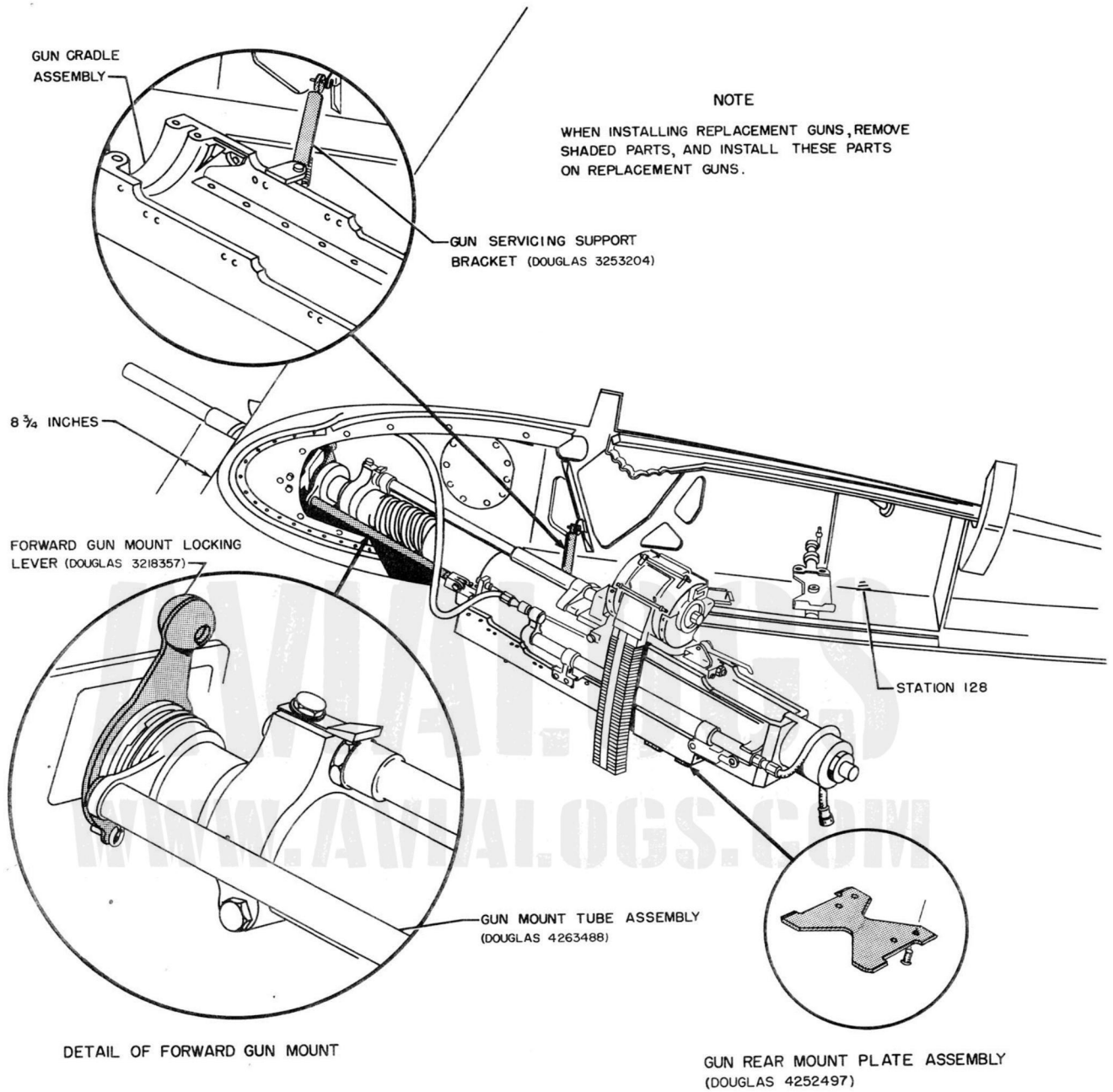


Figure 9-9. Inboard Gun Installation (Sheet 1)



## GUN SERVICING PROVISIONS

- A. ROTATE FORWARD GUN MOUNT LOCKING LEVER 45 DEGREES AGAINST SPRING.
- B. SLIDE GUN AFT AGAINST STOPS.
- C. LIFT AFT END OF GUN AND MOVE OUTBOARD APPROXIMATELY 8 INCHES.
- D. SUPPORT GUN WITH BRACKET (DOUGLAS 3253204).

P-4797-2

Figure 9-9. Inboard Gun Installation (Sheet 2)

**CAUTION**

When loading outboard guns, be sure that link ejection chutes are installed and all loose cartridge links are removed to prevent interference with aileron control.

g. Close gun access cover.

**9-106. UNLOADING.**

- a. Place gun control switches in "SAFE."
- b. Open gun access panels.
- c. Open feed chute section on end of box and break ammunition belt.
- d. Unwind feed mechanism by pushing drive-spring release shaft in about  $\frac{3}{16}$  inch, and at the same time rotate shaft about  $\frac{3}{4}$  turn in direction opposite to that of feeding.
- e. Disconnect feed and link ejector chutes and pull belt from feed mechanism.
- f. Remove broken section of belt from chute.
- g. Remove feed mechanism and determine that no loose rounds remain in gun.
- h. Replace feed mechanism and attach feed and ejector chutes.
- i. Close gun access panels.

**9-107. INBOARD GUN FORWARD MOUNTS.**

9-108. DESCRIPTION. (See figure 9-9.) The inboard gun forward mount is of the ball-and-socket type and absorbs gun recoil. The mount consists of a frame and a support plate bolted to the wing nose structure. The frame contains a mechanism which locks the mount to the support plate and secures the gun barrel in place.

**9-109. REMOVAL.**

- a. Remove gun.
- b. Remove bolts securing support plate to wing structure.

**9-110. INSTALLATION.**

- a. With wing folded, place mount in position and bolt support plate to wing nose structure.

**Note**

Make certain that ball has free rotation in support. Use shims as necessary to obtain free rotation with no perceptible looseness.

b. Install gun.

**9-111. INBOARD GUN REAR MOUNTS.**

9-112. DESCRIPTION. (See figure 9-9.) The inboard gun rear mount is a plate assembly with adjusting screws

for making vertical and horizontal adjustments during boresighting. A grooved section of the plate assembly, attached to the vertical adjustment post, serves to hold the gun in the adjusted position.

**9-113. REMOVAL.**

- a. Remove gun.
- b. Remove mount attaching bolts.

**9-114. INSTALLATION.**

- a. With wing folded, place mount assembly in position and install attaching bolts.
- b. Install guns.

**9-115. OUTBOARD GUNS.**

9-116. DESCRIPTION. (See figure 9-10.) Two type AN-M3, forward-firing, 20-mm automatic aircraft machine guns are mounted in the outboard wing panels, one just outboard of each wing joint. The guns are installed on fixed front mounts and adjustable rear mounts.

**9-117. REMOVAL.**

- a. Open circuit breakers for all guns.
- b. Open gun access panel in outboard wing panel.
- c. Open access panel at gun port.
- d. Continue removal as noted in paragraph 9-103, steps e through h.
- e. Rotate two yoke latch handles of forward mount down and aft to release gun from mount.
- f. Squeeze two spring-loaded release pins on rear mount. While holding pins in, rotate latch outboard and pull gun away from rear mount keyway. Lift and slide gun aft and out of wing.

**9-118. INSTALLATION.**

- a. Open gun access panel in outboard wing panel.
- b. Open access panel at gun port.
- c. Position gun barrel in yoke of forward gun mount and slide gun forward, inserting barrel through gun port.
- d. Fit gun mounting slide into rear mount keyway.
- e. Lock yoke latch handles of forward mount. Lock rear mount by rotating locking latch inboard.
- f. Boresight guns. (Refer to paragraph 9-208.)

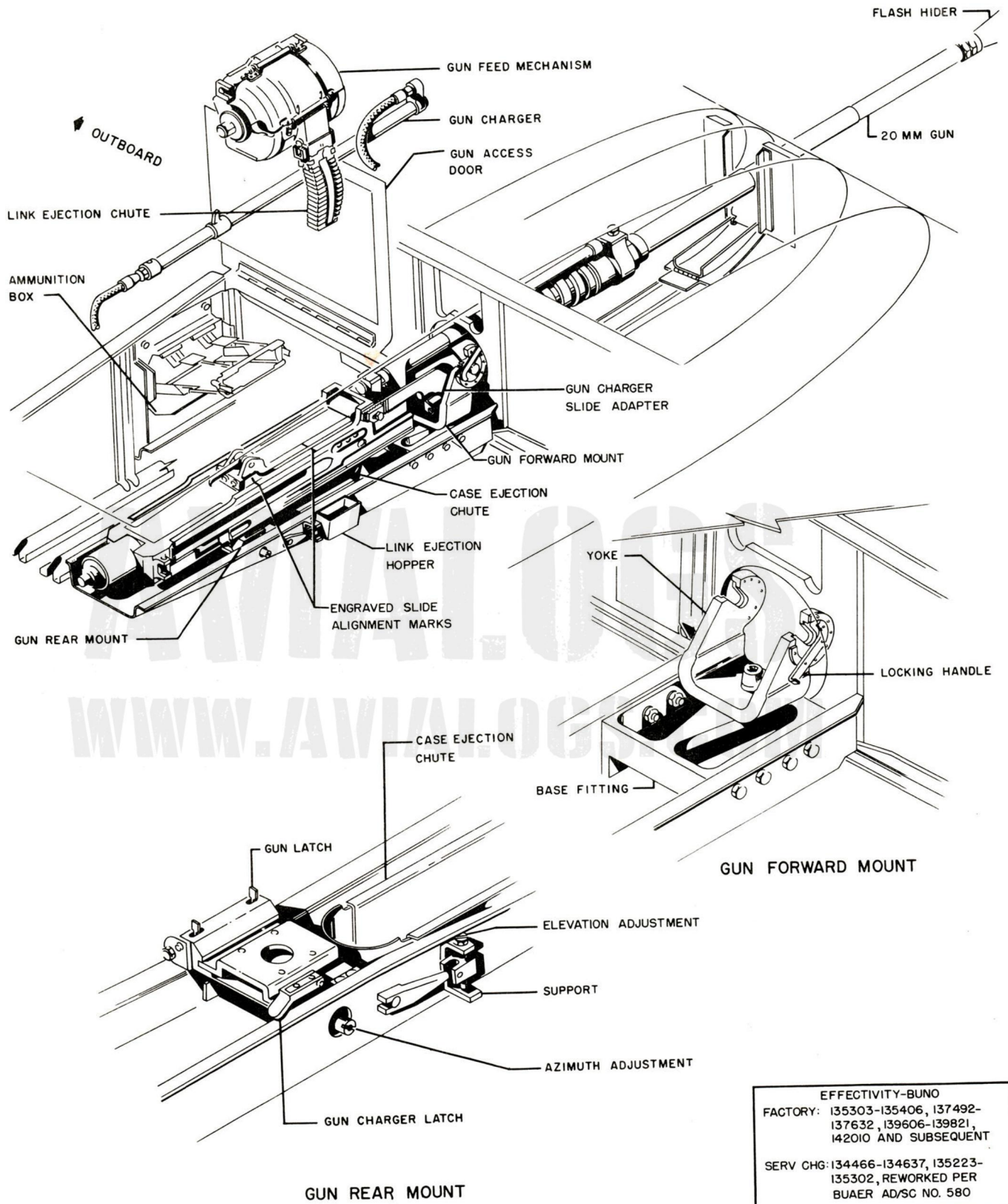
9-119. LOADING. Refer to paragraph 9-105.

9-120. UNLOADING. Refer to paragraph 9-106.

**9-121. OUTBOARD GUN FORWARD MOUNTS.**

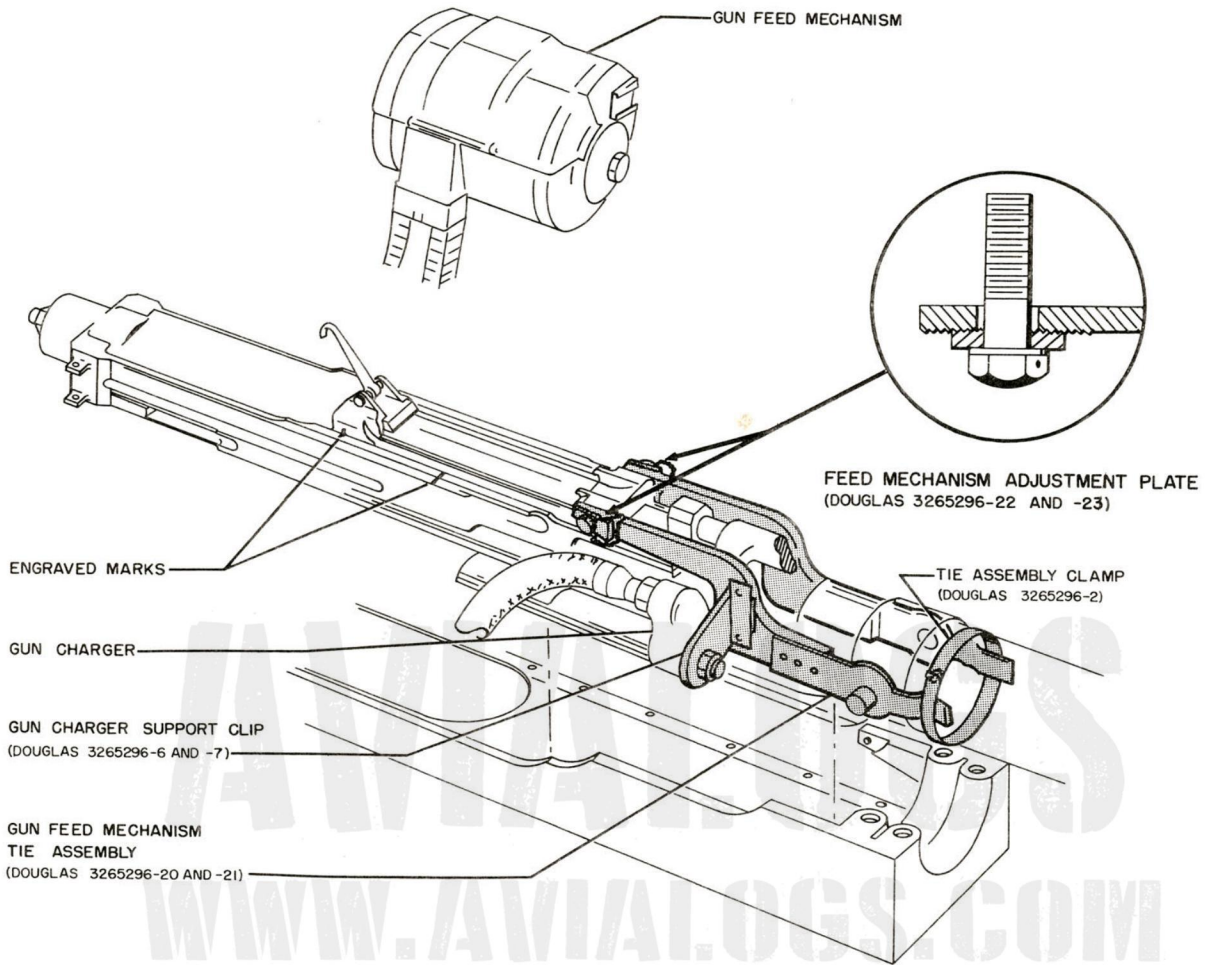
9-122. DESCRIPTION. (See figure 9-10.) The outboard gun forward mount is installed on a base fitting which is bolted to the wing structure directly aft of the front spar. The mount assembly consists of a yoke and integral locking plates attached to locking handles. Ro-





P-4798-1A

Figure 9-10. Outboard Gun Installation (Sheet 1)



**GUN FEED MECHANISM AND  
GUN CHARGER INSTALLATION**

**NOTE**

ALIGN ENGRAVED MARKS ON GUN AND GUN SLIDE BEFORE INSTALLING GUN-FEED-MECHANISM AND GUN-CHARGER TIE ASSEMBLY.

WHEN INSTALLING REPLACEMENT GUNS, REMOVE SHADED PARTS, AND INSTALL THESE PARTS ON REPLACEMENT GUNS.

<p>EFFECTIVITY-BUNO.                  FACTORY: 135303-135406, 137492-137632, 139606-139821, 142010 AND SUBSEQUENT                  SERV CHG: 134466-134637, 135223-135302 REWORKED PER BUAER AD/SC NO. 580</p>
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P-4798-2

**Figure 9-10. Outboard Gun Installation (Sheet 2)**

tation of the handles locks and unlocks the mount around the gun barrel.

#### 9-123. REMOVAL.

- a. Remove gun.
- b. Remove bolt attaching mount to base fitting.

#### 9-124. INSTALLATION.

- a. With gun removed, place mount assembly on base and install attaching bolt.
- b. Install gun.

#### 9-125. OUTBOARD GUN REAR MOUNTS.

9-126. DESCRIPTION. (See figure 9-10.) The outboard gun rear mount consists of a base assembly which is adjusted vertically and horizontally to facilitate bore-sighting the gun.

#### 9-127. REMOVAL.

- a. Remove gun.
- b. Remove mount attaching bolts.

#### 9-128. INSTALLATION.

- a. With gun removed, place mount assembly on base and install attaching bolts.
- b. Install gun.

#### 9-129. GUN ACCESSORIES.

9-130. DESCRIPTION. Gun accessories include the following:

Name	Para Ref
Ammunition boxes	9-131
Feed chutes	9-137
Feed mechanisms	9-139
Link ejection chutes	9-143
Case ejection chutes	9-145

#### 9-131. AMMUNITION BOXES.

9-132. DESCRIPTION. (See figures 9-11 and 9-12.) Ten ammunition boxes are carried in the wing: four in the center wing section, two inboard of each gun; and three in each outboard wing panel outboard of each gun. Each of the center-wing (inboard) ammunition boxes contains 100 rounds, and each of the outboard ammunition boxes contains 66 rounds, of 20-mm belted ammunition. Ammunition for each gun is drawn by the feed mechanism from the nearest box and is conveyed through the feed chute to the gun. All ammunition boxes have feed rollers which minimize friction on the ammunition belt.

#### 9-133. REMOVAL—INBOARD AMMUNITION BOXES. (See figure 9-11.)

- a. With wing folded, remove wing joint cover.
- b. Disconnect ammunition belt at feed chute.
- c. From within wheel well, open ammunition compartment door.

- d. Remove inboard box and disconnect ammunition belt.
- e. Remove outboard box.

#### 9-134. INSTALLATION—INBOARD AMMUNITION BOXES. (See figure 9-11.)

- a. Load ammunition boxes as instructed on decalcomania.
- b. Through wheel well, slide outboard ammunition box into ammunition compartment, and hook ammunition belt to clip at ammunition compartment door.
- c. Slide inboard ammunition box into place; unhook ammunition belt from clip, and connect to inboard ammunition box belt.
- d. Close and latch ammunition compartment door.
- e. Connect ammunition belt to gun feed mechanism.

#### 9-135. REMOVAL—OUTBOARD AMMUNITION BOXES. (See figure 9-12.)

- a. Open gun and ammunition access panels in wing upper plating.
- b. Disconnect ammunition belt at feed chute.
- c. Disconnect ammunition belt between boxes.
- d. Unlock box-retaining latches and lift boxes through access.

#### 9-136. INSTALLATION—OUTBOARD AMMUNITION BOXES. (See figure 9-12.)

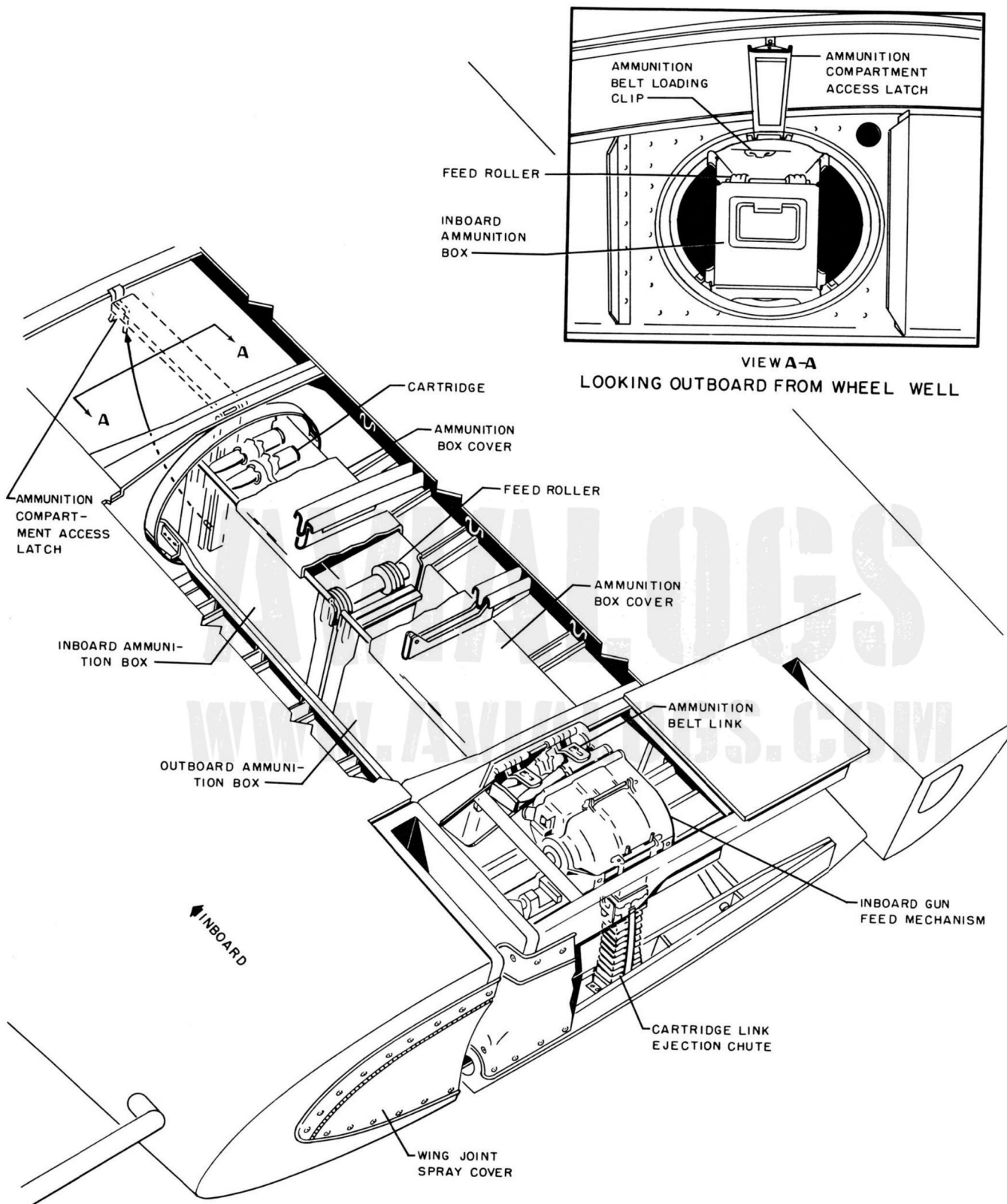
- a. Load ammunition boxes as instructed on decalcomania.
- b. Install ammunition boxes through ammunition access in following sequence: outboard, inboard, and center.
- c. Lock box-retaining latches.
- d. Connect ammunition belt between boxes.
- e. Connect ammunition belt to gun feed mechanism.

#### 9-137. GUN FEED CHUTES.

9-138. DESCRIPTION. An adjustable feed chute assembly which guides belted ammunition from the ammunition box to the feed mechanism is attached to the wing bulkhead adjacent to the feed mechanism of each gun. It is fitted with spring-steel ears which engage and lock the feed chute to the locking plate on the feed mechanism. The feed chutes are accessible through the gun access panels.

#### 9-139. GUN FEED MECHANISMS.

9-140. DESCRIPTION. An AN-M2 (T-14) feed mechanism is installed adjacent to each gun. It is operated by the recoil and counter-recoil of the gun, and its function is to draw ammunition from the ammunition boxes and supply it to the gun firing chamber. The feed mechanism is operable when gun recoil is between  $\frac{5}{8}$  inch and  $1\frac{3}{16}$  inches. The drive system regains full drive-spring



P-4760-1

Figure 9-11. Inboard-Gun Ammunition Box Installation

torque after a dud has been encountered and removed from the gun by recharging.

#### 9-141. REMOVAL.

- a. Fold wing.

#### Note

For the removal of the outboard-gun feed mechanisms, folding of the wing is not necessary.

- b. Open gun access panel in wing upper plating.
- c. Disconnect feed chute from feed mechanism lock plate.
- d. Lift magazine slide latch and remove feed mechanism.

#### 9-142. INSTALLATION.

- a. Fold wing.
- b. Open gun access panel in wing upper plating.

c. Lift magazine slide latch and engage with feed mechanism; lower slide latch to lock.

d. Insert and lock feed chute into feed-mechanism lock-plate.

#### 9-143. CARTRIDGE LINK EJECTION CHUTES.

9-144. DESCRIPTION. Each gun is equipped with a flexible ejector chute that guides expended links overboard. The chute connects the link ejector of the feed mechanism to the link hopper, which is riveted to the wing lower plating. The link ejection chutes are accessible through the gun access panels.

#### 9-145. CARTRIDGE CASE EJECTION CHUTES.

9-146. DESCRIPTION. Each gun is provided with a corrosion-resistant steel case ejection chute through which expended cartridge cases are thrown overboard. The ejection chutes are located directly beneath the gun feed mechanisms and are riveted to the wing lower plating.

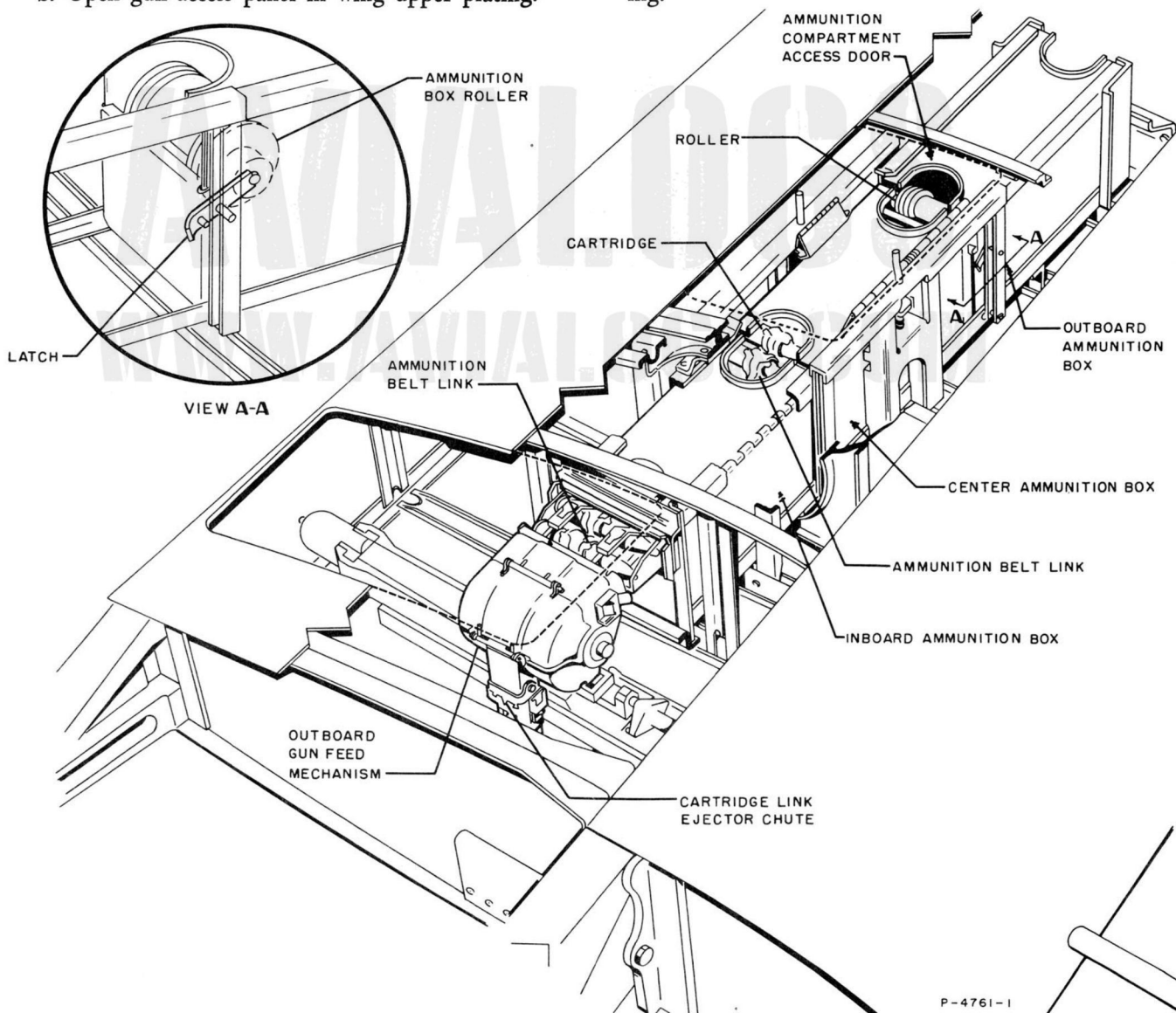


Figure 9-12. Outboard-Gun Ammunition Box Installation

## Paragraphs 9-147 to 9-155

**9-147. GUN CONTROL SYSTEM.**

9-148. DESCRIPTION. (See figure 9-13.) The gun control system includes hydraulic and electrical units operating together to accomplish gun-charging and an electrical circuit for gun-firing. The principal components of the composite system are:

Name	Location
Pressure-reducing valve	Fwd equip. compt—LH, pressure line
Pressure-relief valve	Fwd equip. compt—LH, pressure line
Gun-charger control valve	Fwd equip. compt—LH
Gun-charger pressure switch units	Wing joints
Gun-charger cylinders	On guns
Circuit breaker, 20-ampere, marked LH OUTBD GUN, LH INBD GUN; RH OUTBD GUN, RH INBD GUN	Cockpit circuit-breaker panel
Circuit breaker, 10-ampere, marked GUN CHARGE	Cockpit circuit-breaker panel
Gun trigger switch	Control stick
Gun-firing relay	Fwd equip. compt—terminal panel 17
Gun control switches	Armament panel
Gun safety switches	Arresting-hook control-handle linkage
Gun-charging-and-firing relay	Fwd equip. compt—terminal panel 17
Gun-firing solenoids	On guns

9-149. The gun control system comprises two parallel electro-hydraulic systems for gun charging, and an electrical circuit for gun firing. The charging systems affect the inboard and outboard guns respectively, and are controlled by separate switches on the armament panel. However, all four guns can be fired simultaneously, when both inboard and outboard gun control switches have been placed in the "READY" position.

9-150. Hydraulic pressure for gun charging is received from the hydraulic power supply system through the spring-loaded pressure reducing valve, which reduces system pressure to 1300-1600 psi. The relief valve, which is set to open at  $1700 \pm 50$  psi, prevents overloading of the gun charger system. Self-sealing hydraulic disconnect fittings are installed at the hoses of each gun charger. Hydraulic fuses are installed at critical points in the gun charger hydraulic system.

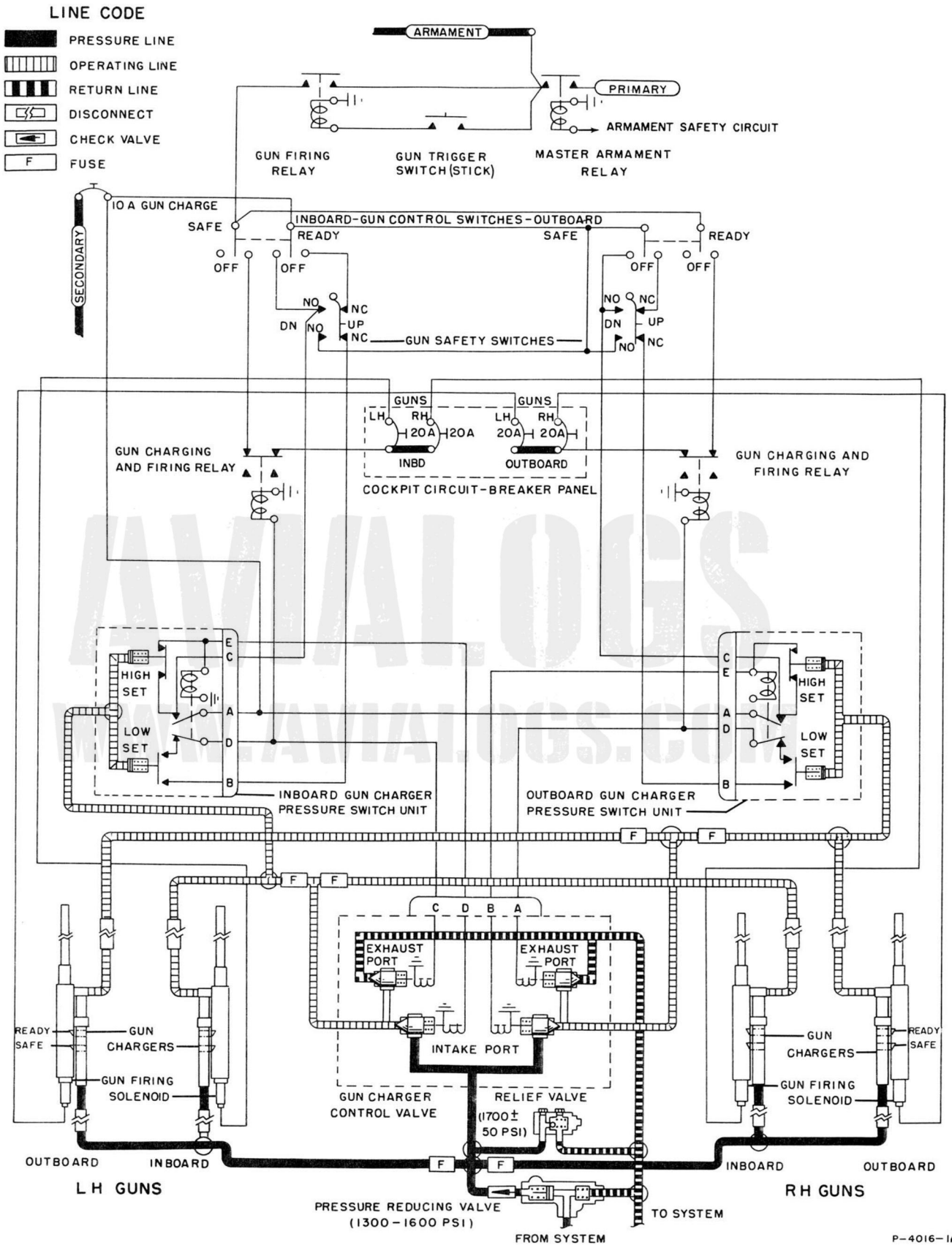
9-151. From the pressure-reducing valve hydraulic fluid flows simultaneously to the aft end of each gun-charger cylinder where it holds the piston in the retracted position, and to the pressure intake ports of the control valve. The valve ports are normally closed by solenoid-operated poppets. When the gun control switches are placed in "SAFE" the solenoids are energized, causing the poppets to retract and open the intake ports. Fluid then flows to the closed exhaust ports of the control valve, to the forward end of the gun charger cylinders which are actuated to charge the guns, and to the hydraulic pressure switch units.

9-152. One hydraulic pressure switch unit is in the outboard gun control system; the other pressure switch unit is in the inboard gun control system. Each pressure switch unit contains a high-pressure switch, a low-pressure switch, and a two-contact relay. The contacts of the high-pressure switch are normally closed and are in series between the "SAFE" position of the gun control switch and the intake port solenoid of the gun-charger control valve. The high-pressure switch opens at  $1225 \pm 25$  psi and closes at  $1100 \pm 50$  psi. The contacts of the low-pressure switch are normally open and are in series between the "READY" position of the gun control switch and the exhaust-port solenoid of the gun charger control valve. The low-pressure switch closes at  $100 \pm 5$  psi and opens at  $85 \pm 5$  psi. The coil of the control relay in the pressure-switch unit is energized across the contacts of the high-pressure switch when the gun control switch is placed in "SAFE." One contact of the control relay is normally closed and is in series with the low-pressure switch contacts between the "READY" position of the gun control switch and the exhaust-port solenoid in the gun-charger control valve. When the coil of the relay is energized, the normally closed contact is opened to prevent premature actuation of the exhaust port poppets in the gun-charger control valve. The other contact is normally open and is in series with the high-pressure switch between the GUN CHARGE circuit breaker and the coil of the control relay, so that when the control relay becomes energized by placing the gun control switch in "SAFE," holding current is maintained on the relay coil even though the control switch is moved from "SAFE" to "READY" before the charging cycle is complete.

9-153. When hydraulic pressure within the gun control system reaches  $1225 \pm 25$  psi, the high-pressure switch opens to de-energize the coil of the valve intake port solenoid and the coil of the control relay. With the coil of the control relay de-energized, and the gun control switch in "READY," the normally closed contacts of the control relay complete the circuit to energize the exhaust port solenoid, thus causing the hydraulic fluid to be returned to the hydraulic system reservoir.

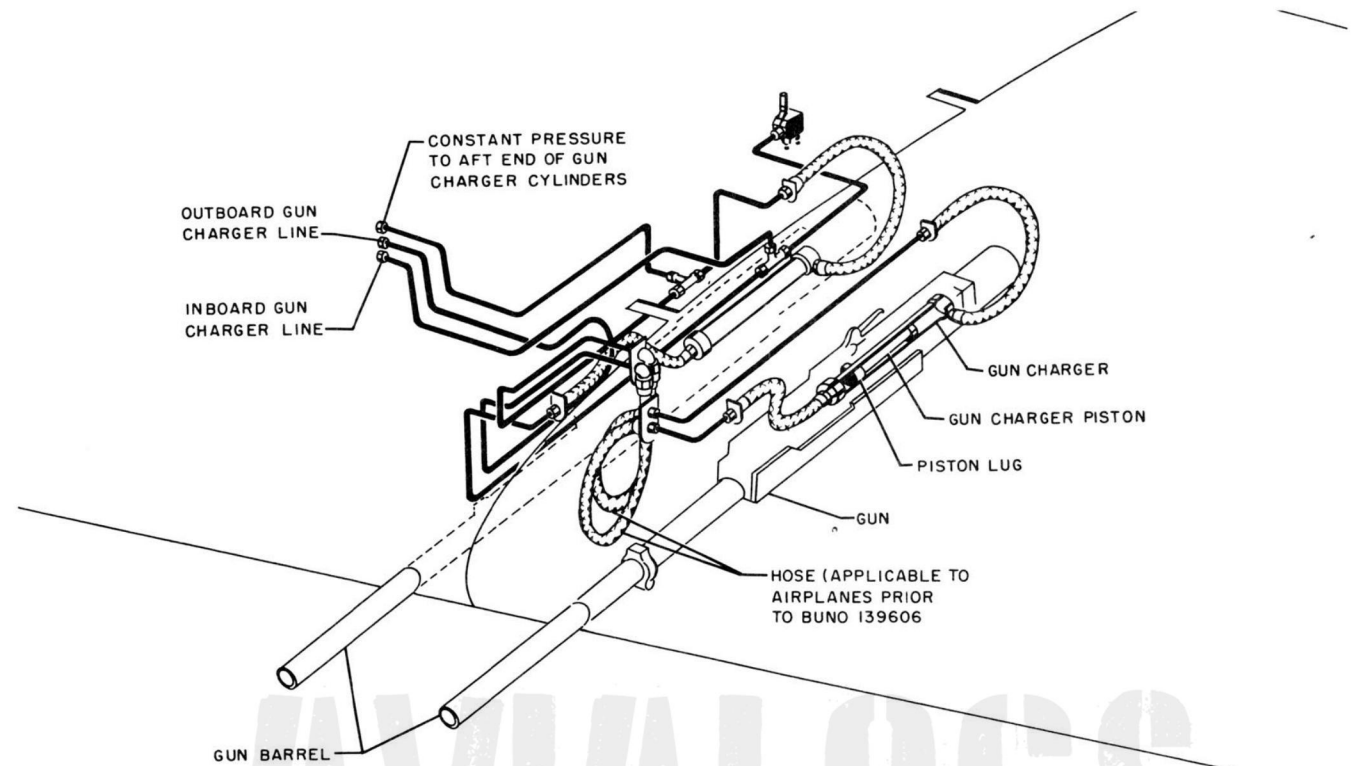
9-154. During the period of the gun-charging cycle when the low-pressure switch is closed, the coil of the gun-firing relay is energized and the contacts of the relay are opened to break the gun-firing circuit. After fluid is exhausted from the system, the low-pressure switch opens to de-energize the gun-firing relay and to restore the firing circuit to a condition ready for firing.

9-155. The gun-firing circuit functions as follows: when the gun trigger switch on the control stick is closed, power from the armament bus energizes the coil of the gun-firing relay, the contacts of which close to transfer power across two of the "READY" contacts of the gun control switch to the gun-charging-and-firing relay. Power is then directed across the normally closed con-



P-4016-1A

Figure 9-13. Gun Control System (Sheet 1)



GUN CHARGER INSTALLATION

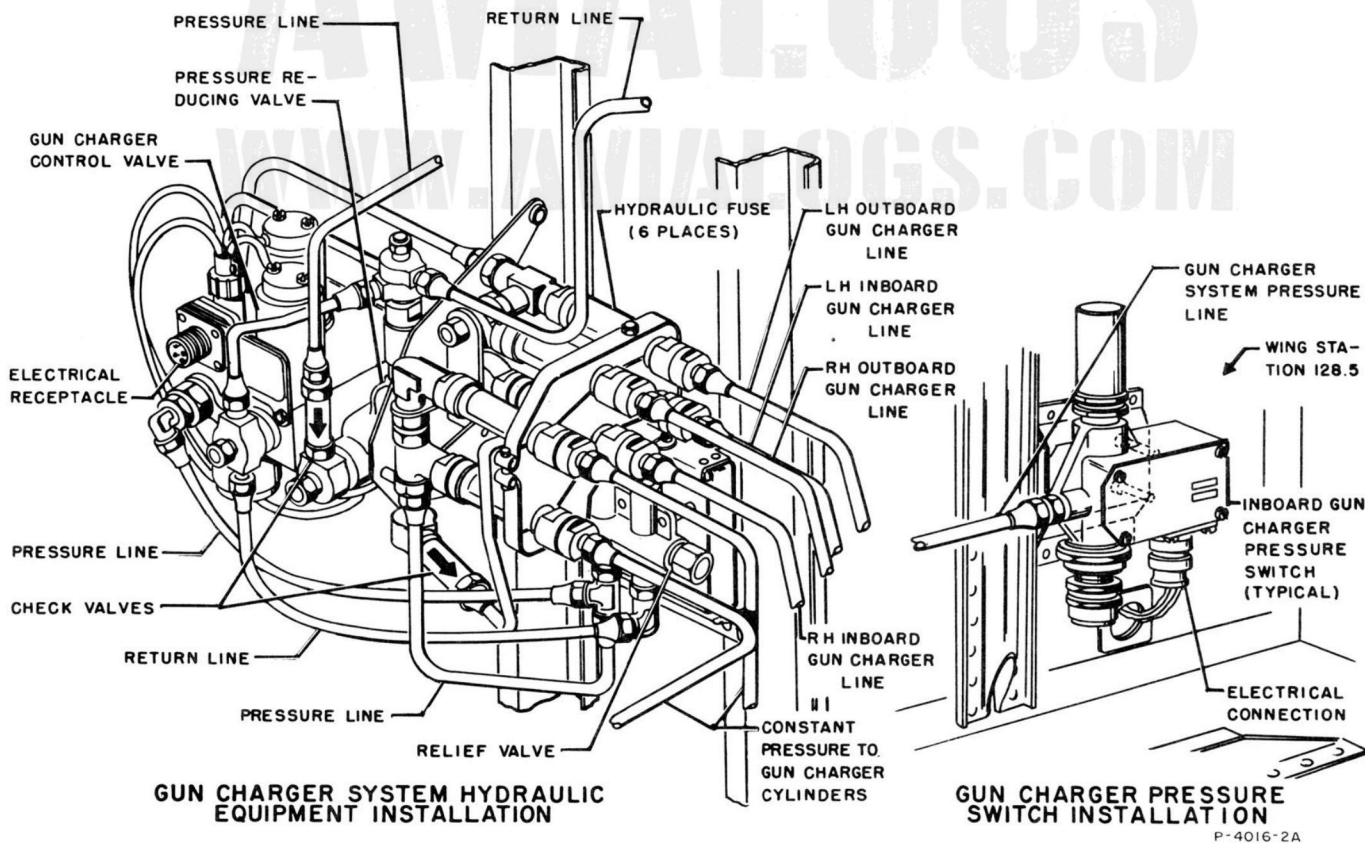
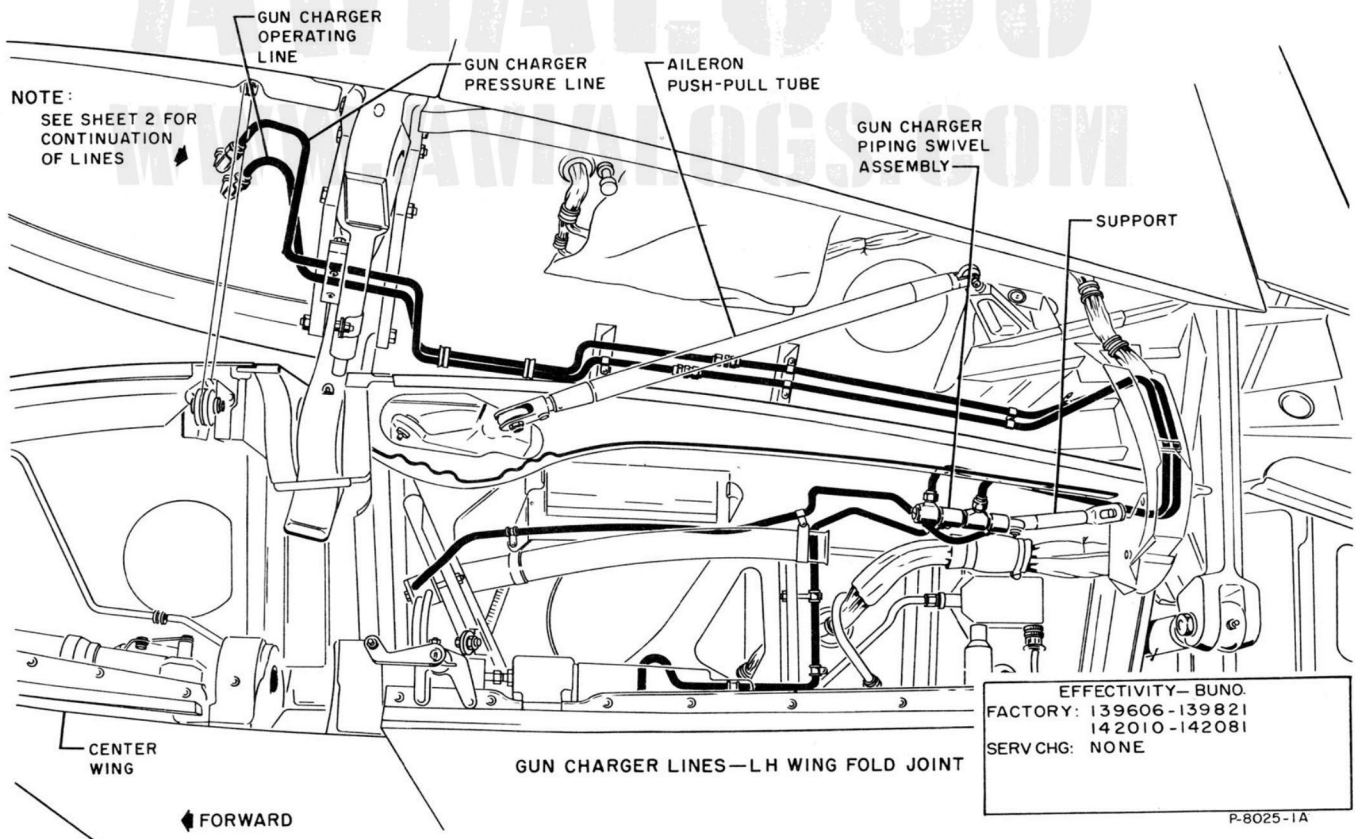
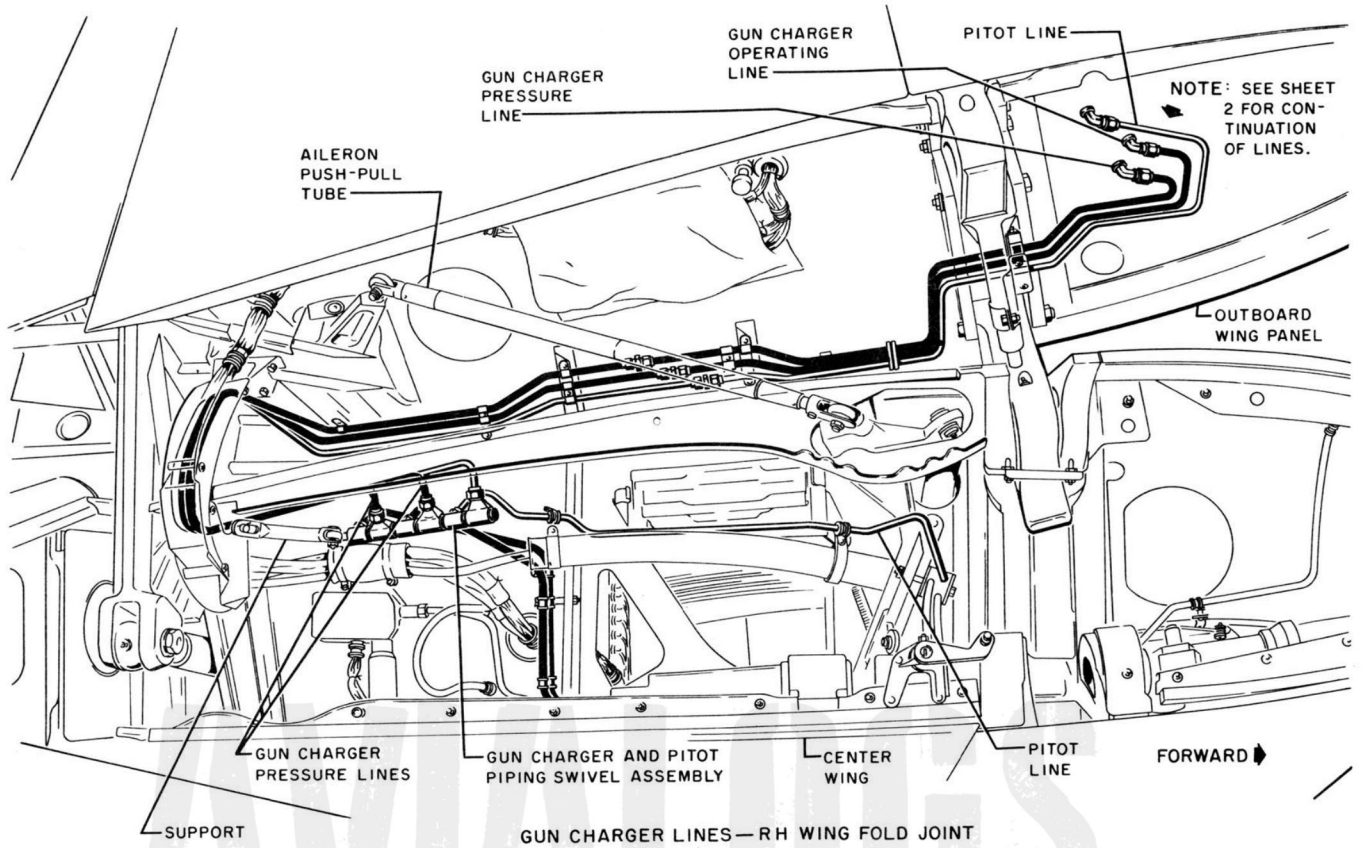


Figure 9-13. Gun Control System (Sheet 2)





EFFECTIVITY—BUNO  
 FACTORY: 139606-139821  
 142010-142081  
 SERV CHG: NONE

P-8025-1A

Figure 9-13. Gun Control System (Sheet 3)

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tacts of the gun-firing relay through the two paralleled sets of GUN circuit breakers to the related gun-firing solenoids, causing the guns to fire.

9-156. TROUBLE SHOOTING. Refer to table 9-4.

9-157. TESTING.

a. Connect external d-c power and hydraulic pressure sources to airplane.

b. Maintain 2000 psi minimum pressure in hydraulic system.

### WARNING

When performing this test make certain guns contain no live ammunition. Use dummy cartridges.

c. Turn master armament switch "ON."

d. Lower arresting hook control handle and check actuation of gun safety switch.

e. Raise arresting hook control handle.

f. Place gun control switch in "SAFE": charger piston should extend and open breechblock.

g. Turn gun control switch to "READY": charger piston should retract, leaving breechblock held open by gun sear.

h. Depress trigger switch on control stick: gun-firing solenoids should operate to release gun breechblock, allowing it to move forward against dummy cartridge.

i. Repeat steps f through h five times to verify operation.

#### 9-158. GUN-CHARGER CONTROL VALVE.

9-159. DESCRIPTION. The gun charger control valve actually comprises two identical valves contained in two

housings combined to form the body. One valve controls the charging of the inboard guns and the other valve controls the charging of the outboard guns. Each valve is electrically operated in conjunction with the related pressure switch units. The valve contains an intake poppet and an exhaust poppet. The intake poppet opens when the high-pressure switch of the pressure switch unit closes, thereby admitting pressure to the control valve and directing it to the gun-charger cylinders and to the pressure-switch unit. The exhaust poppet opens when the low-pressure switch closes, permitting hydraulic pressure in the gun-charger cylinders to return to the supply system reservoir.

9-160. REMOVAL.

a. Make certain that d-c power control switch is "OFF."

b. Relieve hydraulic system pressure by operating system bypass valve until pressure gage reads zero.

c. Disconnect electrical connection at gun-charger control valve.

d. Disconnect and cap hydraulic lines at valve.

e. Remove attaching nuts from studs and lift control valve from support.

9-161. INSTALLATION.

a. Make certain that d-c power control switch is "OFF."

b. Position control valve on studs and install attaching nuts.

c. Connect hydraulic lines to corresponding valve ports: pressure lines to intake ports and return lines to exhaust ports.

d. Connect electrical plug.

e. Bleed gun charger hydraulic system by operating system until gun charger cylinder piston extends and retracts smoothly.

**TABLE 9-4. TROUBLE SHOOTING GUN CONTROL SYSTEM**

<i>Trouble or Symptom</i>	<i>Probable Cause</i>	<i>Correction</i>
1. One gun charger fails to operate.	Incorrectly installed. Extend piston and check for complete engagement with gun bolt.	Adjust as necessary.
2. All gun charger cylinders fail to operate.	Insufficient hydraulic pressure: (1) Reservoir level low. (2) Engine-driven pump air-locked. (3) Engine-driven pump shaft sheared. (4) External leak in system.	Add fluid to correct level. Bleed line from reservoir to disconnect fitting. Replace pump. Repair leak and fill reservoir.
3. Pressure switch does not operate.	a. Hydraulic lines or passages clogged. b. Electrical wiring broken, cracked, or shorted.	Remove and flush switch and lines. Repair or replace wiring.

**9-162. GUN CONTROL HYDRAULIC PRESSURE-SWITCH UNITS.**

9-163. DESCRIPTION. (See figure 9-13.) The hydraulic pressure-switch units provide the means of controlling fluid flow for gun charging. A pressure-switch unit is connected to each operating line which extends from the respective gun-charger control-valve intake port to the corresponding set of gun-charger cylinders. Each switch case contains low-pressure and high-pressure microswitches which are actuated by the prevailing pressure in the hydraulic line between the control valve and the cylinders. The microswitches are, in turn, the means of actuating the solenoids in the control valve. The pressure-switch unit in the left-hand wing joint controls the inboard guns; the pressure switch in the right-hand wing joint controls the outboard guns.

**9-164. REMOVAL.**

- a. Make certain that d-c power control switch is "OFF."
- b. Relieve system hydraulic pressure by operating bypass valve until pressure gage reads zero.
- c. Disconnect electrical connection at switch.
- d. Disconnect and cap hydraulic lines at switch.
- e. Remove attaching screws and lift switch from support assembly.

**9-165. INSTALLATION.**

- a. Position pressure switch on support; install and safetywire attaching screws.
- b. Connect hydraulic lines to switch assembly.
- c. Connect electrical plug.
- d. Bleed gun charging system by operating system until gun-charger cylinder pistons extend and retract smoothly.

**9-166. GUN-CHARGER CYLINDERS.**

9-167. DESCRIPTION. (See figure 9-13.) A gun-charger cylinder is attached to the side of each gun. The cylinder comprises a barrel containing a piston which incorporates a lug for engaging the gun bolt during the charging cycle. Hydraulic lines are connected to both ends of the barrel. The line at the aft end originates at the pressure reducing valve and contains pressure fluid whenever the system is pressurized; the aft end of the piston is then under pressure and is held forward and disengaged from the gun bolt. The forward end is connected with a line from the gun-charger control valve and the head of the piston is under pressure only when the valve intake port is open. When pressure is applied to the head of the piston, the piston is driven aft until the lug engages the gun bolt and moves it to the recoiled position, ready for firing. When the bolt is fully retracted, pressure in the system reaches approximately 1225 psi and causes the high-pressure microswitch in the pressure-switch unit to open. When the gun control switch is placed in "READY," the solenoid which opens the return port in the control valve is energized and

hydraulic pressure is relieved so that the piston is able to return to its retracted or normal position, to remain there as long as normal firing and charging continue.

**9-168. REMOVAL.**

- a. Remove gun access panel in wing upper plating; for inboard-gun cylinders, also remove wing joint cover.
- b. Relieve hydraulic system pressure.
- c. Disconnect gun charger cylinder operating lines at disconnect couplings.
- d. Depress cylinder latch and pull cylinder aft to disengage from forward attaching fitting.

**9-169. INSTALLATION.**

- a. Position gun charger cylinder on gun and slide forward, engaging forward end of cylinder with attaching fitting on gun, locking cylinder latch at same time.
- b. Connect cylinder operating lines at disconnect couplings.
- c. Bleed gun charging system by operating system until cylinder piston extends and retracts smoothly.

**9-170. GUN TRIGGER SWITCH.**

9-171. DESCRIPTION. The gun trigger switch is connected in series between the master armament relay and the gun control switches and operates to fire the guns when either or both of the control switches are in the "READY" position.

**9-172. GUN-FIRING RELAY.**

9-173. DESCRIPTION. The gun-firing relay is in series between the gun trigger switch and the gun control switches. When the trigger switch is closed, power from the armament bus energizes the coil of the gun-firing relay, closing the contacts to transfer armament bus power across the "READY" contacts of the gun control switches to the two parallel sets of GUN circuit breakers; power from the circuit breakers is directed to the firing solenoids in the guns.

**9-174. GUN CONTROL SWITCHES.**

9-175. DESCRIPTION. One set of contacts ("READY" position) in each of the gun control switches is connected with both the gun-charging and the gun-firing circuits, controlling the operation of the firing solenoids and of the gun-charger control valve. When the switch is in "SAFE," hydraulic pressure from the control valve is directed to the forward ends of the gun-charger cylinders, forcing the gun bolts open and at the same time opening the gun-firing circuit. Placing the gun charger control switch in "READY" completes the circuit to the exhaust solenoid of the gun-charger control valve, relieves hydraulic pressure in the system, and permits the gun-charger cylinder pistons to retract, completing the charging cycle.

**9-176. GUN SAFETY SWITCHES.**

9-177. DESCRIPTION. The gun safety switches, mounted inside the arresting hook control panel, are in series between the gun control switches and the pressure-switch units, and are operated by movement of the ar-

resting-hook control handle. When the handle is lowered, contact is made between the handle linkage and the switch contacts to open the switch, breaking the circuit to the pressure switch units and preventing inadvertent gun firing during arrested landings. When the control handle is raised, the safety switch contacts close to complete the circuit to the pressure switch units, allowing the charging cycle to be completed when the gun control switches are placed in "READY."

#### 9-178. GUN-CHARGING-AND-FIRING RELAYS.

9-179. DESCRIPTION. During the charging cycle, the charging-and-firing relay is energized to open its contacts and thus prevent the guns from firing. When the charging cycle is complete, the relay is de-energized, its contacts close, and normal gun firing is possible.

#### 9-180. GUN-FIRING SOLENOIDS.

9-181. DESCRIPTION. A gun-firing solenoid is mounted under the breech of each gun. When the gun control switch is in "READY," and the trigger switch is depressed, power is transmitted through the firing circuit to the firing solenoid. The solenoid then pulls the actuating lever of the gun forward to release the sear and fire the first round. The actuating lever remains in this position during automatic fire.

#### 9-182. GUN SIGHT.

9-183. DESCRIPTION. (See figure 9-14.) A Mark 20, Mod 4 illuminated gun sight is used on all AD-6 airplanes in aiming guns, gun camera, and external stores and as an adjunct to bomb-director controlled release. AD-6 airplanes BuNo. 134466 through 134637, originally equipped with a Mark 8, Mod 12 gun sight, have been 100 per cent reworked per BuAer AD/SC No. 447 to incorporate the Mark 20, Mod 4 gun sight. The gun sight is mounted on the glare shield aft edge and utilizes its own reflector to reflect the reticle image to the pilot. The controls for the gun sight light are located in the armament panel. The gun sight is adjustable both horizontally and vertically for boresighting. A knob on the left-hand side of the gun sight, noted TO ADJUST DETENTS REMOVE, provides access to detents which can be adjusted as marked for guns, rockets, and/or bombs. Removal and installation of the gun sight are obvious.

#### Note

Compensation of the standby compass must be accomplished whenever the MK 20 MOD 4 gunsight has been removed and re-installed.

9-184. ADJUSTMENT (BORESIGHTING). Refer to paragraph 9-210.

#### 9-185. GUN-SIGHT LIGHT CONTROL CIRCUIT.

9-186. DESCRIPTION. The gun-sight light control circuit is powered by the d-c armament bus and includes:

Name	Location
Circuit breaker, 5-amp	Cockpit circuit-breaker panel
Rheostat	Armament panel
Control switch	Armament panel

9-187. The following procedure should be followed for operating the gun sight light:

- Turn master armament switch "ON."
- Turn gun-sight rheostat on and to desired brightness: clockwise increases, counterclockwise decreases, brightness.
- Turn light control switch to "NORMAL," unless normal filament is burned out; then place switch in "STBY."

#### 9-187A. EXTERNAL SIGHT POST.

9-187B. DESCRIPTION. (See figure 9-14.) An external sight post is installed through a bolt hole in the armor plate on the left-hand side of the fuselage at approximately station 99. The sight post is mounted parallel to the fuselage reference plane and is used in conjunction with angle dots painted on the interior surface of the left-hand windshield side panel. The dots are located at angles of 45, 50 and 55 degrees from the sight post at approximately fuselage station 106 to enable the pilot to establish a line of sight with a fixed object in juxtaposition to the selected target.

#### 9-188. GUN CAMERA PROVISIONS.

9-189. DESCRIPTION. (See figure 9-15.) The airplane contains provisions for mounting an AN-N-6A gun camera and a model GH-10 camera lens heater. Installed equipment includes a model N 203A (Robinson) mount attached to brackets in the right-hand center wing nose, just outboard of the wheel well. The gun camera mount consists of a housing and a camera attaching plate, which contains horizontal and vertical adjusting knobs for boresighting the camera. It is accessible through the wing lower plating.

#### 9-190. REMOVAL.

- To remove gun camera, disconnect wiring and stow in adjacent dummy receptacle; slide mount base plate, with camera attached, out of mount.
- To remove camera mount, first remove camera (if installed) and then remove mount attaching bolts.

#### Note

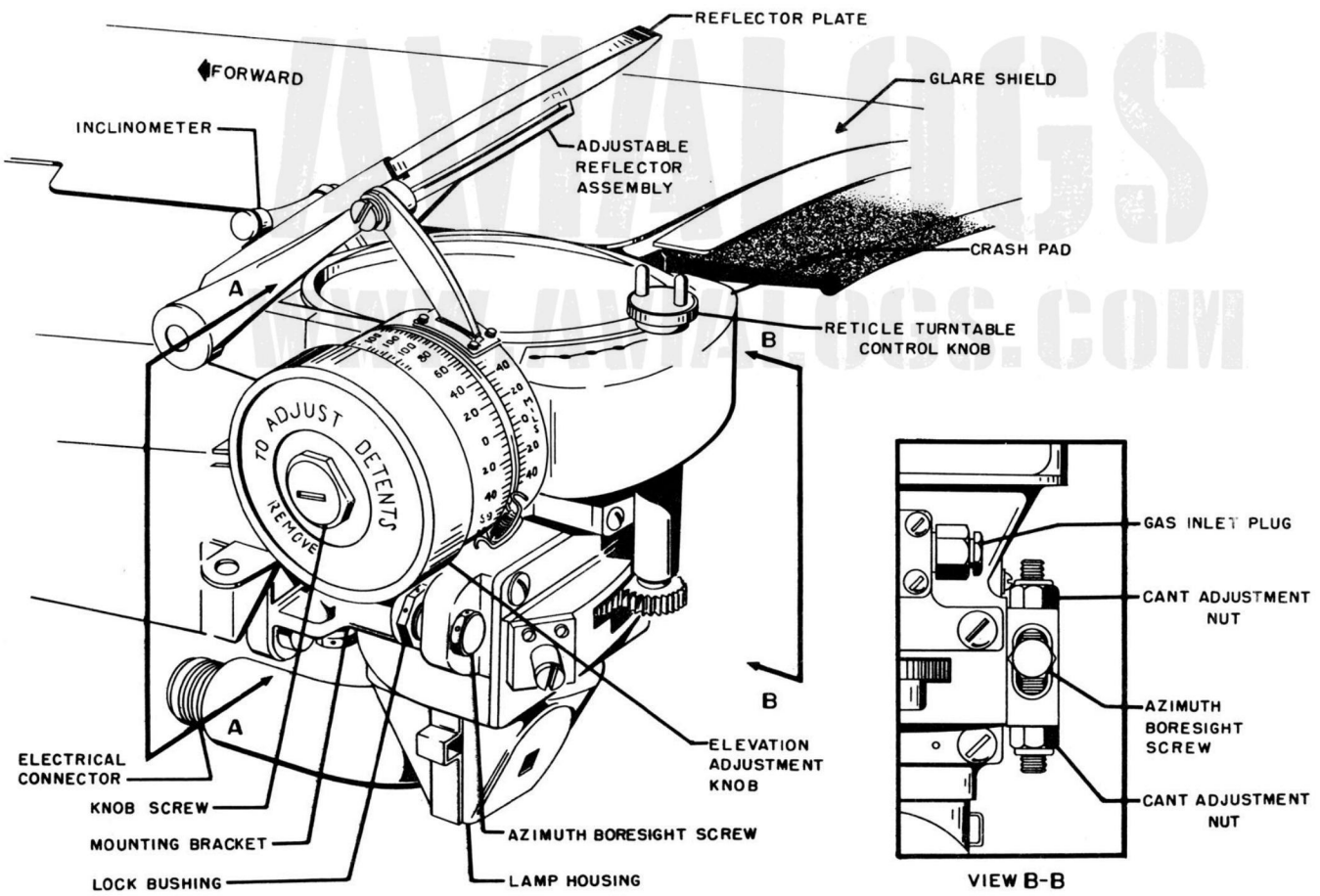
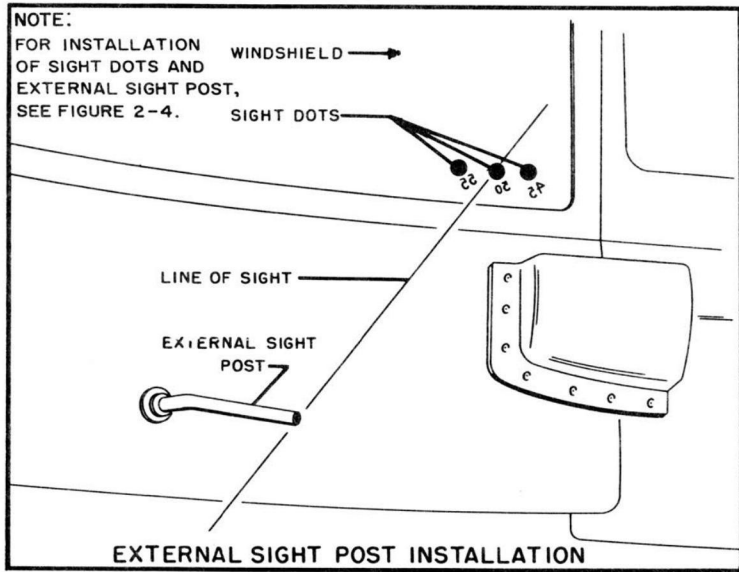
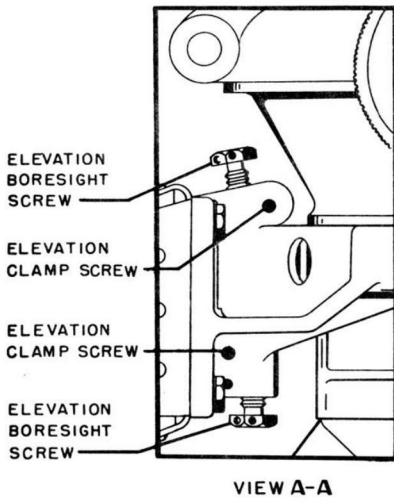
When camera is not installed, seal cutout with black waterproof adhesive tape (Specification NavAer M-582).

#### 9-191. INSTALLATION.

- To install camera mount, bolt it to support brackets.
- To install camera on mount, fasten base plate to camera; then slide plate into mount case.
- Boresight camera. (Refer to paragraph 9-211.)

#### 9-192. GUN CAMERA CONTROLS.

9-193. DESCRIPTION. Operation of the gun camera in flight is effected by an electrical control circuit. A paral-



MARK 20 MOD 4 GUN SIGHT

P-4791-1A

Figure 9-14. Gun Sight Installation

lel test circuit is also provided for ground checking. Principal components of the circuits include:

Name	Location
Gun Camera Control Circuit	
Circuit breaker, 5-amp	Fwd equip. compt circuit-breaker panel
Gun camera relays	Fwd equip. compt—terminal panel 17
Trigger switches	Control stick
Gun Camera Test Circuit	
Circuit breaker, 5-amp	Fwd equip. compt circuit-breaker panel
Gun camera test switch	RH wing at camera location

9-194. Control of the camera coincides with firing of the guns or with firing of rockets from the external stores outer stations. The camera comes into operation when either the gun trigger or outer station release switch is closed. When either of the switches is depressed, power is transmitted to the coils of the gun camera relays which are energized to incorporate the gun camera into the gun firing circuit. Power for operating the gun camera comes from the d-c monitor bus and is directed through the normally closed contacts of the gun camera test switch (switch in "NORMAL") to the gun camera and heater.

9-195. For ground operation of gun camera the gun camera test switch is held in "TEST"; power is then received from the battery bus, energizing the test circuit to operate both the camera and the lens heater. When

the switch is released it reverts to the "NORMAL" position and to its function in the camera control circuit.

**9-196. BORESIGHTING EQUIPMENT.**

9-197. DESCRIPTION. (See figure 9-16.) The boresighting equipment consists of a ring sight and a peep sight at each wing joint. The ring sights are stowed in spring-steel clips beneath the inboard gun forward mounts. The peep sights are bolted to the rear shear web and should be folded along the shear web when not in use.

**9-198. FRONT (RING) SIGHTS.**

9-199. DESCRIPTION. (See figure 9-16.) Each front sight consists of a 7/16-inch tube with a 3/4-inch ID ring spot-welded on its outboard end. When in use the sight is inserted in the hole in the outboard end of the gun forward mount support and is held in its proper boresighting position by a centering pin. The sight is stowed in spring-steel clips below the outboard end of the gun mount support.

**9-200. REAR (PEEP) SIGHTS.**

9-201. DESCRIPTION. (See figure 9-16.) The rear sights are made of sheet metal. The inboard end of each sight is bolted to the rear shear web; the peep hole is drilled near the opposite end. The sight incorporates a centering hole that engages a centering pin in the shear web for alignment during boresighting.

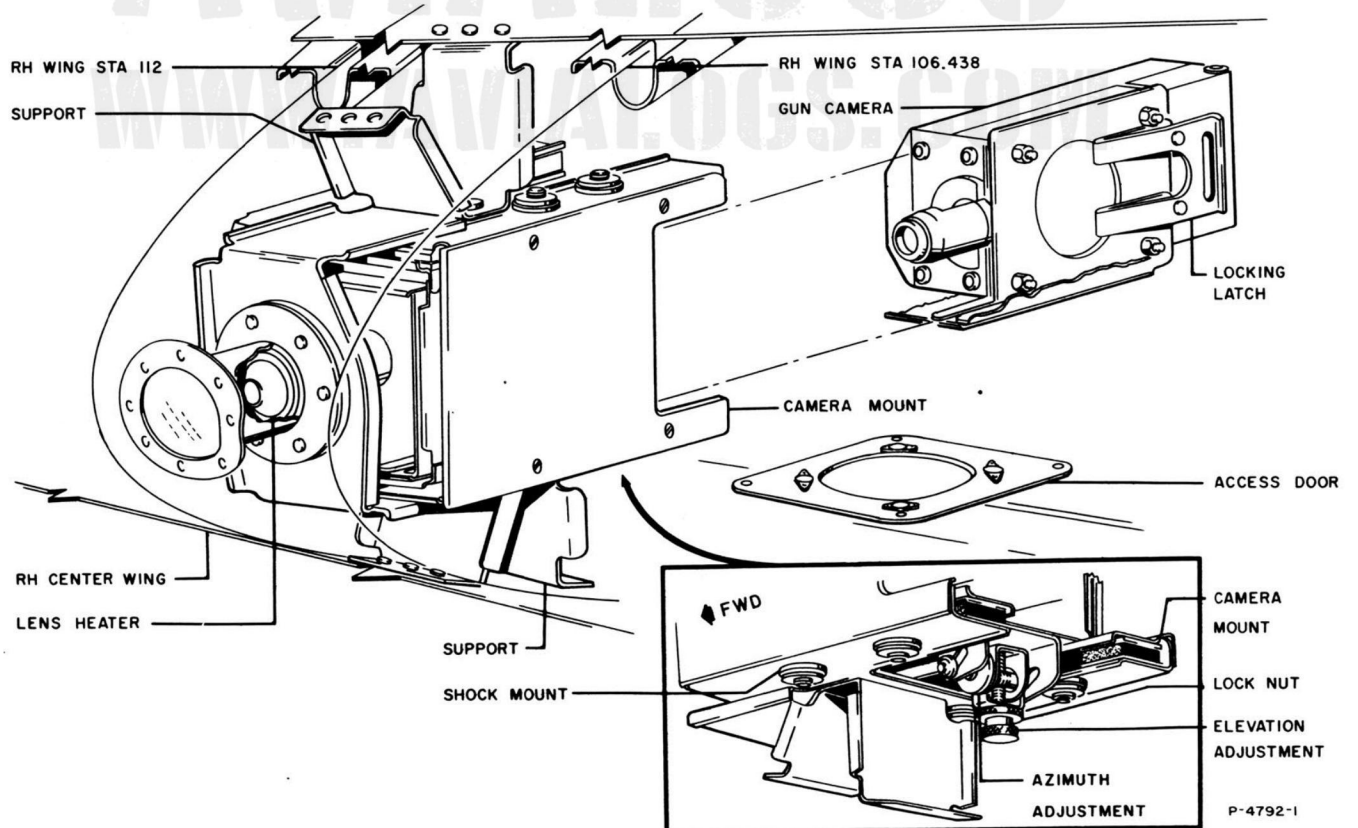


Figure 9-15. Gun Camera Installation

## Paragraphs 9-201A to 9-207

**9-201A. ARMAMENT DATUM LINE.**

9-201B. DESCRIPTION. The armament datum line or combat attitude of the airplane at V max critical altitude, one-half fuel, full ammunition, and without bombs, is 2.2 degrees nose down. The armament datum line is located by the use of the ring and peep sight fixtures. The armament datum line and armament coordinates are shown on figure 9-18.

**9-202. BORESIGHT SCREENS.**

9-203. DESCRIPTION. (See figure 9-17.) Two different screens can be used for boresighting the guns, gun camera, and gun sight. One screen is for use at 1000 inches, the other for use at 30 feet. Sighting *the inboard guns* on the screen target rings will provide a gunfire pattern that converges with the sight line at 600 yards in azimuth and 400 yards in elevation. Sighting *the outboard guns* on their target rings will result in a pattern that converges at 700 yards in azimuth and 300 yards in elevation. Aligning *the gun sight* with the screen target ring boresights the sight parallel to the armament datum line in elevation and parallel to the airplane center line in azimuth. The *gun camera* is boresighted parallel to the armament datum line in elevation and parallel to the airplane center line in azimuth.

**9-204. BORESIGHT PROCEDURE.**

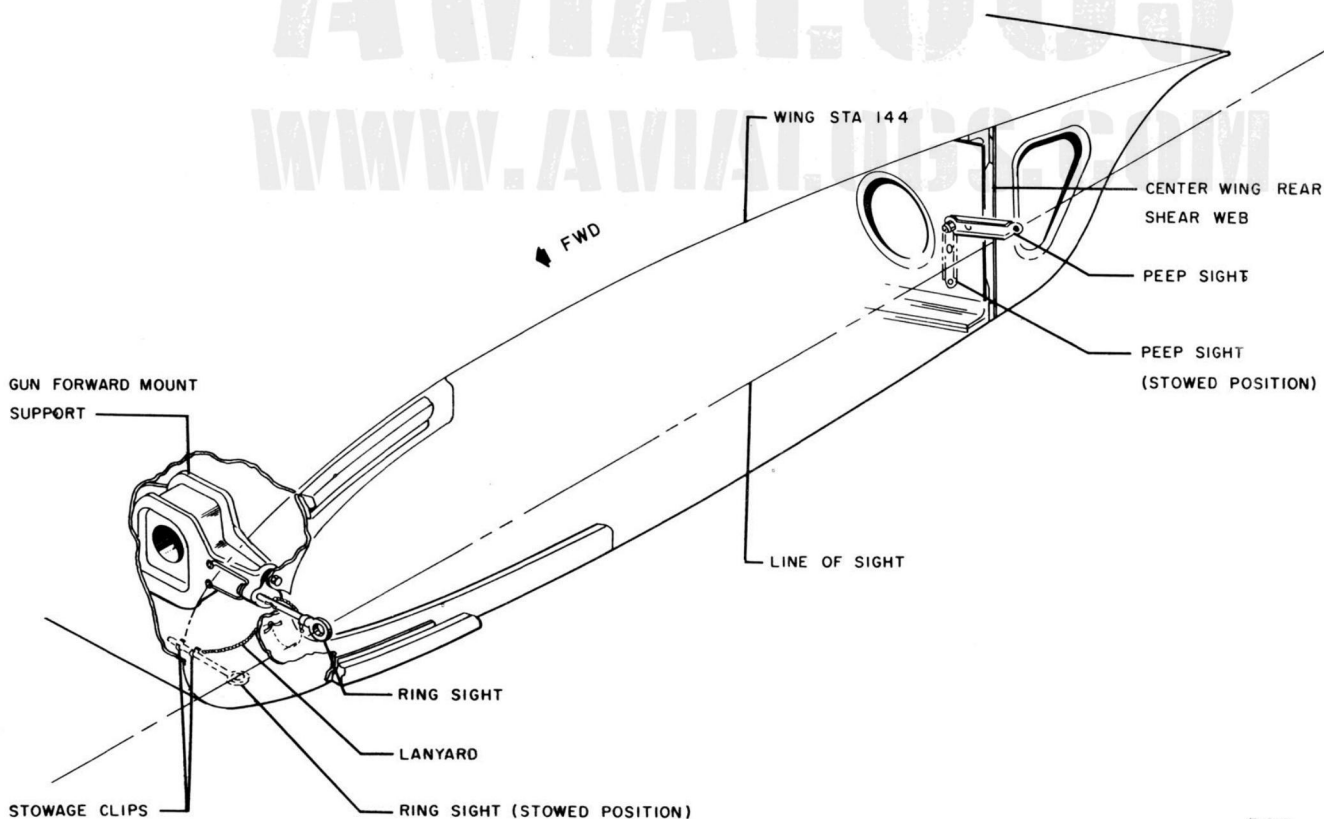
9-205. DESCRIPTION. Boresighting the airplane and such adjustable items of its armament equipment as the guns, the gun sight, and the gun camera, requires the use of a boresight screen in conjunction with the ring and peep sights.

9-206. ALIGNING AIRPLANE WITH BORESIGHT SCREEN. The airplane can be aligned with the boresighting screen as follows:

- a. Fold wing.
- b. Insert ring-sight posts into horizontal holes in gun forward mount supports; lock sights in place.
- c. Swing peep sights outboard and upward until they engage centering pins in rear shear web.
- d. Raise tail of airplane until fuselage reference line is nearly level; chock main wheels.
- e. Orient boresight screen so that left-hand target dot is concentric with left-hand ring sight and right-hand target bar bisects right-hand ring sight horizontally.

**9-207. BORESIGHTING INBOARD GUNS.**

- a. Align boresight screen with airplane.
- b. Insert boresight fixture into barrel of gun.



P-47041

**Figure 9-16. Boresighting Equipment Installation**



c. Loosen locking bolt at bottom of post on gun rear mount:

d. Rotate adjusting nut until horizontal lines on boresight screen and boresight fixture coincide.

e. Loosen lock nut on inboard end of rear mount.

f. Rotate bushing until vertical lines on boresight screen and boresight fixture coincide.

g. After final check of horizontal and vertical alignments tighten locking nut and tighten and safetywire locking bolt.

#### 9-208. BORESIGHTING OUTBOARD GUNS.

a. Align boresight screen with airplane.

b. Insert boresight fixture into gun barrel.

c. Through gun access in wing upper plating, turn horizontal adjustment screw on gun rear mount until horizontal lines on boresight screen and boresight fixture coincide: clockwise to turn gun barrel outboard, counterclockwise to turn gun barrel inboard.

d. Turn elevation adjustment screw on rear mount until vertical lines on boresight screen and boresight fixture coincide: clockwise to depress gun muzzle, counterclockwise to elevate gun muzzle. Turn adjustment screw fractionally, as necessary, so that screw indexes against its locking clip.

9-209. If a boresight for the guns is desired that will intersect with the sight line at distances other than those specified in paragraph 9-203, the boresight screen target rings can be changed as follows:

a. Using graph accompanying figure 9-17 which indicates elevation offsets, proceed vertically from selected range in feet to intersection with curve. From this point proceed horizontally to left and read offset in inches: this new dimension will elevate vertical location of gun boresight target rings above armament datum line on new screen layout.

b. Using graphs accompanying figure 9-17 which indicate azimuth offsets, determine desired offsets in inches for new convergence line: this new dimension will determine location of horizontal distance of gun boresight target rings from center line of airplane on new screen layout.

#### 9-210. BORESIGHTING GUN SIGHT.

a. Align airplane and boresight screen.

b. Turn on master armament switch and adjust gun-

sight light rheostat (on armament panel) to obtain optimum light.

c. Set gun-sight light control switch (on armament panel) to "NORMAL."

d. Rotate elevation adjustment knob on left-hand side of gunsight until inner and outer zero markings on dials are aligned.

e. If pip is off target in azimuth, loosen lock bushings and adjust azimuth boresight screws until pip is on target. Tighten lock bushings after adjustment is made.

f. To correct for cant (or tilt) of reticle pattern, back off upper cant adjustment nut and adjust lower cant adjustment nut until vertical line of reticle pattern is superimposed on vertical reference line on boresight screen. Tighten upper nut.

g. Observe position of reticle pip relative to target in elevation. If it is off target, loosen elevation clamp screws, back off upper elevation boresight screw and adjust lower elevation boresight screw until pip is on target in elevation. Tighten upper elevation boresight screw and clamp screws after adjustment is complete.

#### Note

Since the azimuth boresight adjustments will disturb elevation boresight, final adjustment to elevation boresight should be made after azimuth boresight adjustment is complete. If insufficient adjustment exists in gun sight to allow it to be boresighted, AN960-D516 washers should be placed at either the top or bottom between gun sight and structure. Sufficient washer shimming should be used to allow sight to be boresighted with its adjustment approximately at midpoint, to allow for subsequent minor adjustment when necessary.

Since the Mark 20, Mod 4 gun sight uses its own reflector it is *not* necessary to allow a 5 mil elevation adjustment to allow for windshield deflection in flight.

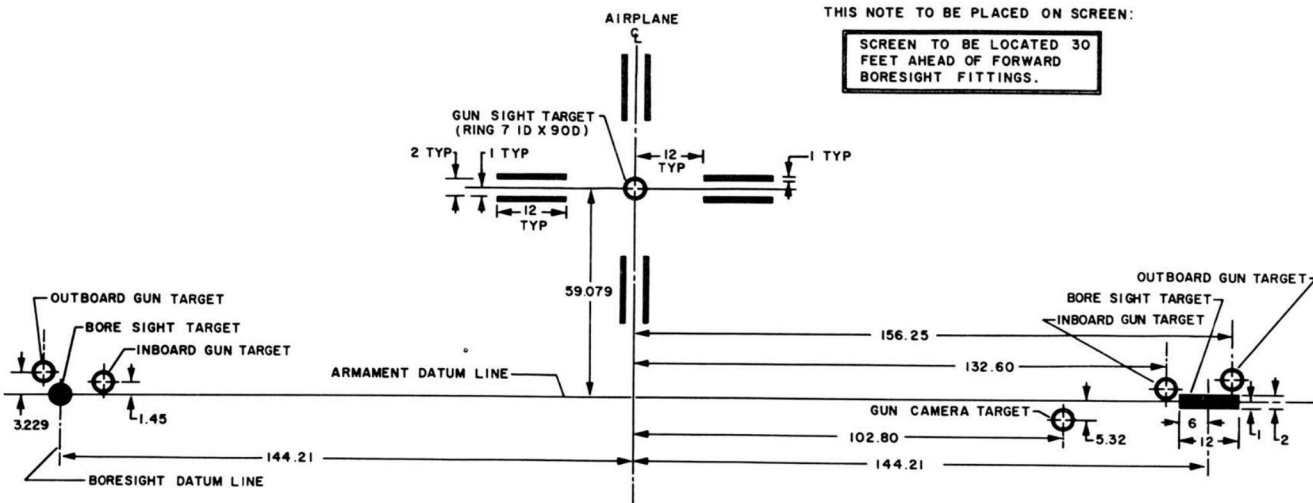
h. Check tightness of opposed screws and nuts.

#### 9-211. BORESIGHTING GUN CAMERA.

a. Align airplane with boresight screen.

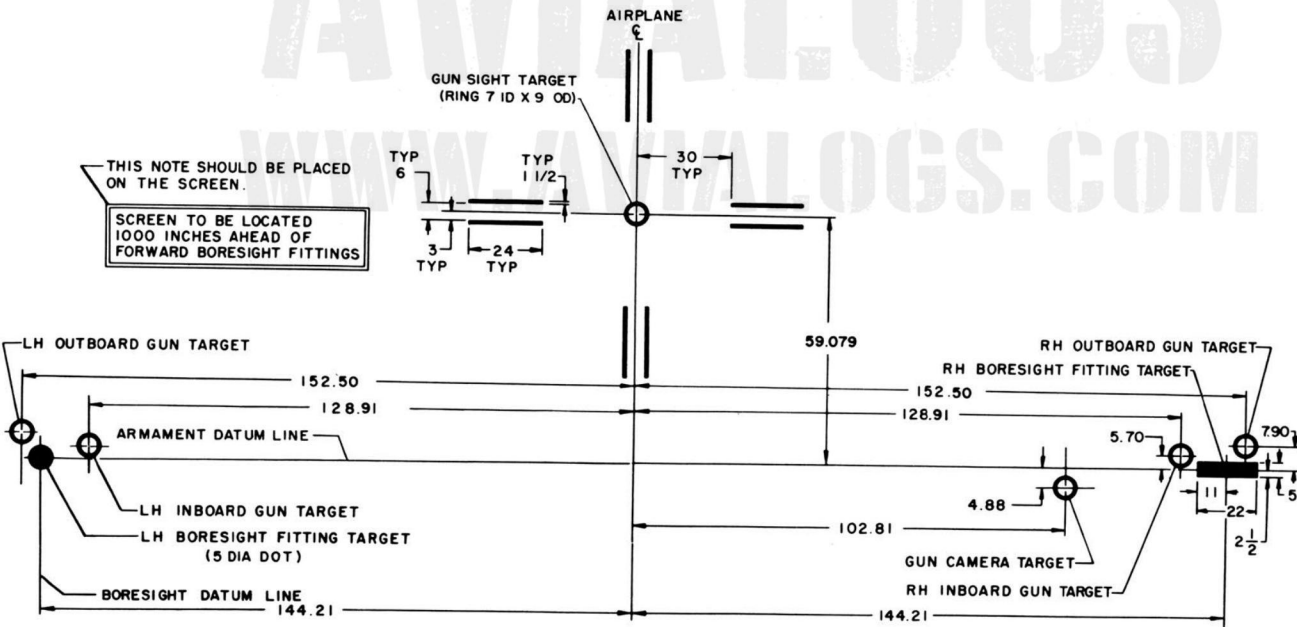
b. Remove camera access cover.

c. Insert boresight fixture into camera so that eye-piece extends through access opening.



1. ALL DIMENSIONS SHOWN ON BOARD IN INCHES.
2. INBOARD GUNS BORESIGHTED TO CONVERGE WITH SIGHT LINE AT 600 YARDS IN AZIMUTH AND 400 YARDS IN ELEVATION.
3. OUTBOARD GUNS BORESIGHTED TO CONVERGE WITH SIGHT LINE AT 700 YARDS IN AZIMUTH AND 300 YARDS IN ELEVATION.
4. GUN CAMERA BORESIGHTED PARALLEL TO ARMAMENT DATUM LINE IN ELEVATION AND TO AIRPLANE CENTER LINE IN AZIMUTH.
5. GUNSIGHT BORESIGHTED PARALLEL TO ARMAMENT DATUM LINE IN ELEVATION AND PARALLEL TO AIRPLANE CENTER LINE IN AZIMUTH.

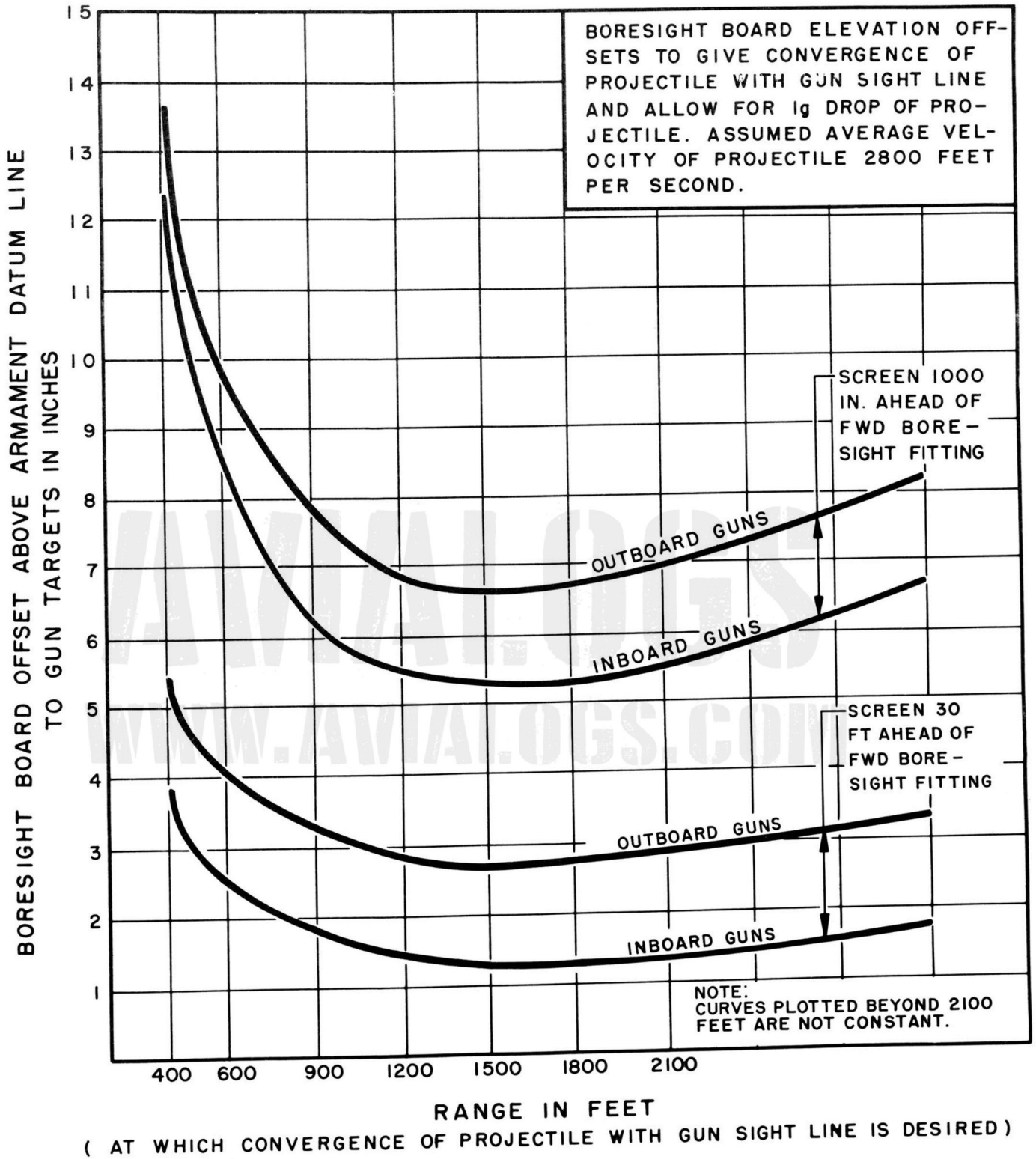
30 FOOT BORESIGHT SCREEN DATA



1. ALL DIMENSIONS SHOWN ON BOARD IN INCHES.
2. INBOARD GUNS BORESIGHTED TO CONVERGE WITH SIGHT LINE AT 600 YARDS IN AZIMUTH AND 400 YARDS IN ELEVATION.
3. OUTBOARD GUNS BORESIGHTED TO CONVERGE WITH SIGHT LINE AT 700 YARDS IN AZIMUTH AND 300 YARDS IN ELEVATION.
4. GUN CAMERA BORESIGHTED PARALLEL TO ARMAMENT DATUM
5. GUNSIGHT BORESIGHTED PARALLEL TO ARMAMENT DATUM LINE IN ELEVATION AND PARALLEL TO AIRPLANE CENTER LINE IN AZIMUTH.

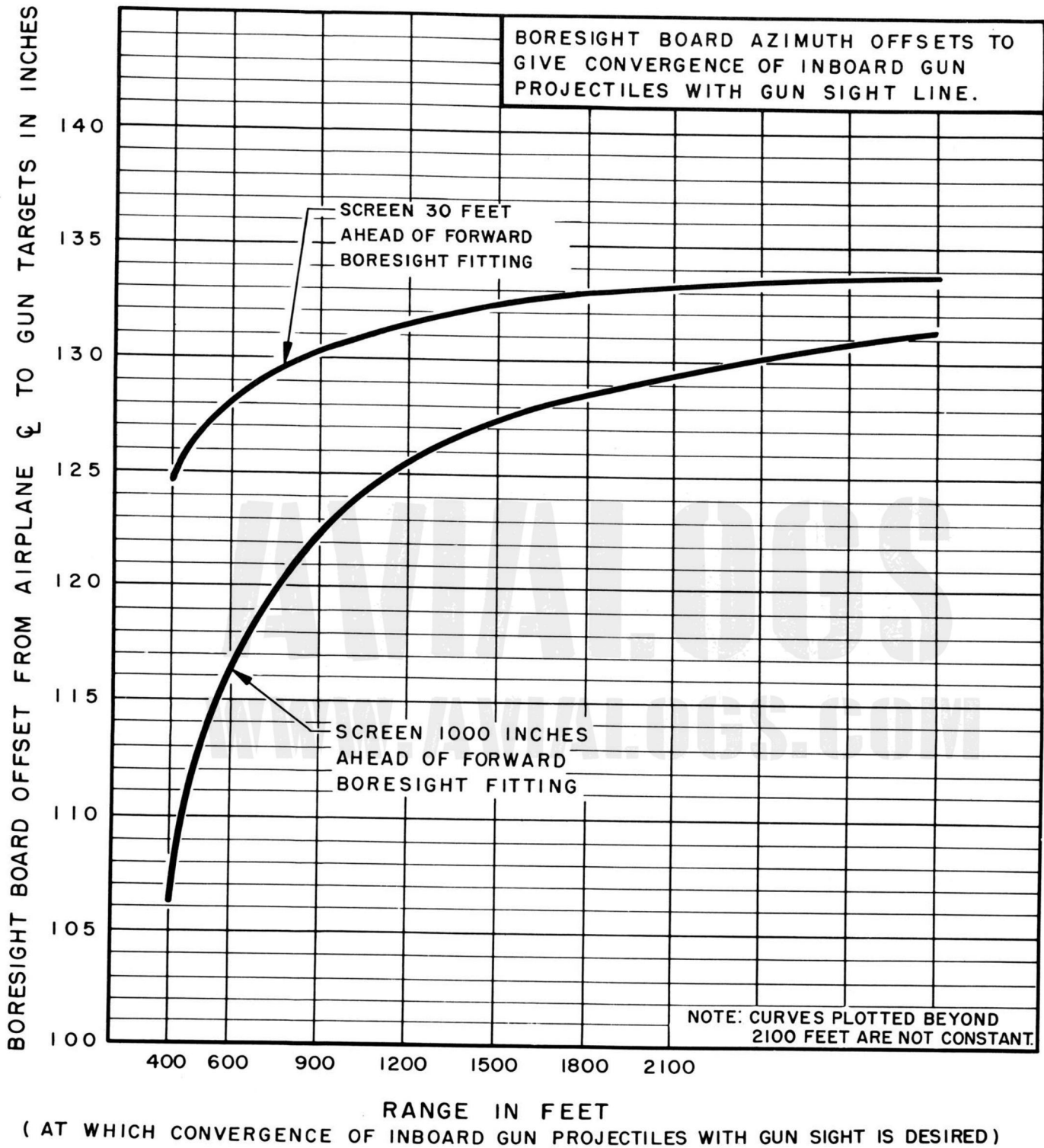
1000 INCH BORESIGHT SCREEN DATA

Figure 9-17. Boresighting Screen Data (Sheet 1)



P-4020-2A

Figure 9-17. Boresighting Screen Data (Sheet 2)



P-4020-3A

Figure 9-17. Boresighting Screen Data (Sheet 3)

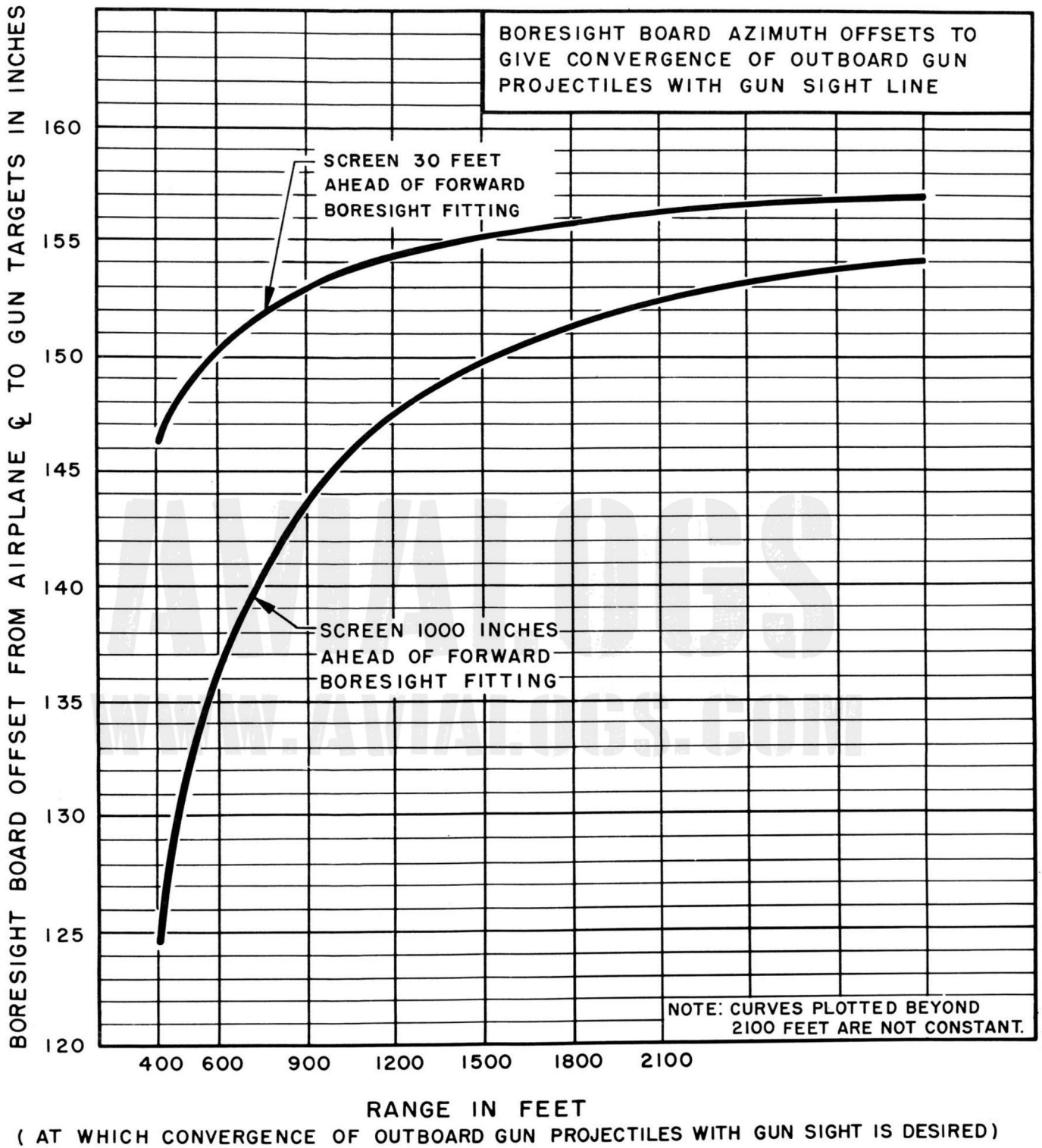
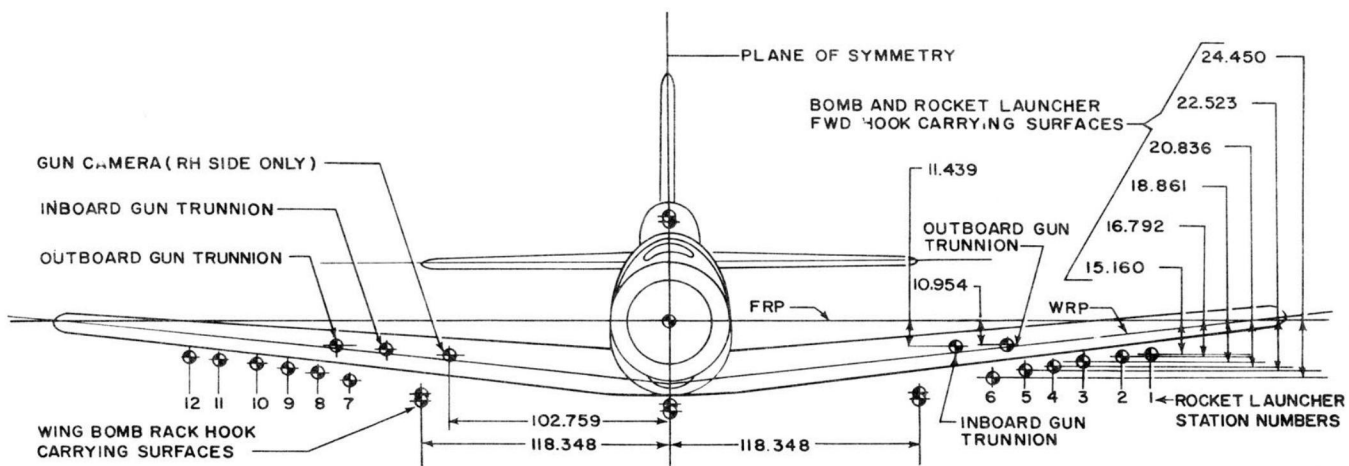
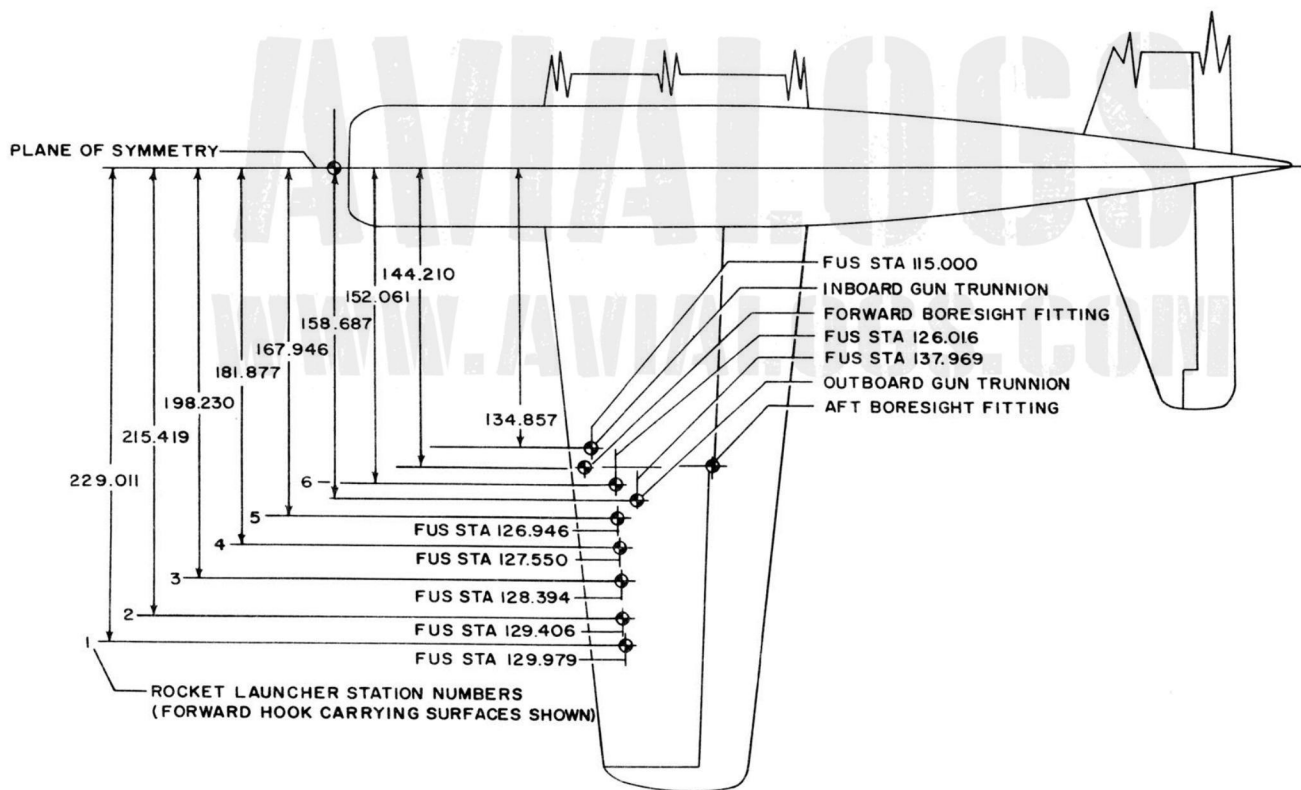


Figure 9-17. Boresighting Screen Data (Sheet 4)



VIEW OF AIRPLANE LOOKING AFT



VIEW OF AIRPLANE LOOKING DOWN

P-6431-1

Figure 9-18. Armament Coordinates (Sheet 1)

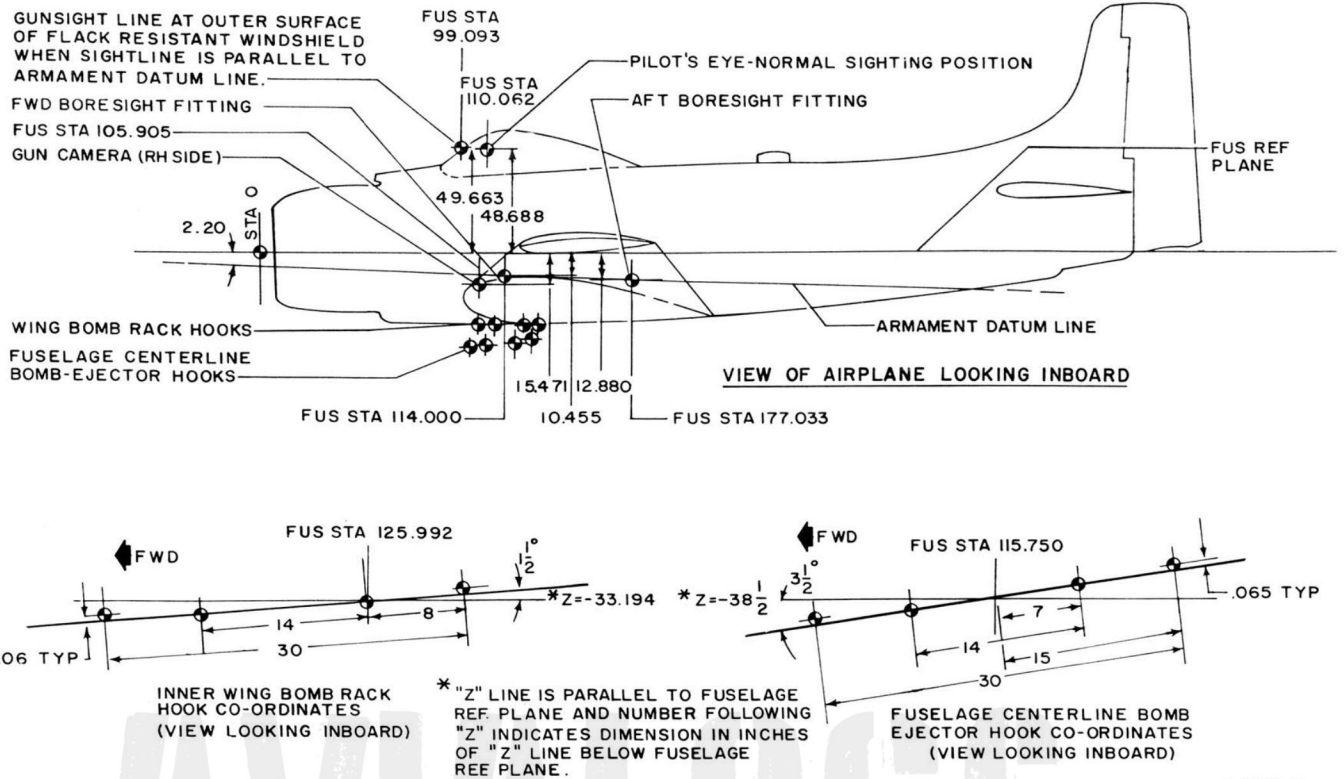


Figure 9-18. Armament Coordinates (Sheet 2)

- d. Loosen large knurled locking knob on camera mount.
- e. Adjust vertical (elevation) adjusting knob until horizontal lines on boresight screen target and boresight fixture coincide.
- f. Adjust horizontal (azimuth) adjusting knob until vertical lines on boresight screen target and boresight fixture coincide.
- g. Tighten knurled locking knob.
- h. Remove boresight fixture.
- i. Reinstall gun camera access cover.

9-212. **ARMOR PLATE.** Armor plate is installed internally and externally in the airplane to protect the pilot and vulnerable areas of the airplane. Removal and installation of armor plate are obvious.

9-213. **SPECIAL STORES.**

9-214. **DESCRIPTION.** Provisions have been made for the use of flare dispensers and spray tanks at the center wing stations and for the special weapons DCU-75/A and T-349 control panels. When the control panels for the flare dispensers or spray tanks

are used, they are installed in place of the blank console in the right-hand control panel in the cockpit. Jumpers are used to connect the flare dispensers at the inner-stations' wing racks to the airplane wiring. The T-349 warning light is mounted on the right-hand side of the cockpit glareshield. Refer to NAVWEPS 01-40ALF-503 for special weapon application.

9-214A. **ARMAMENT CONTROL SYSTEMS.**

9-214B. **DESCRIPTION.** Release of external stores is controlled by one of three armament control systems. The installations are not interchangeable and their airplane effectivity is noted, as follows:

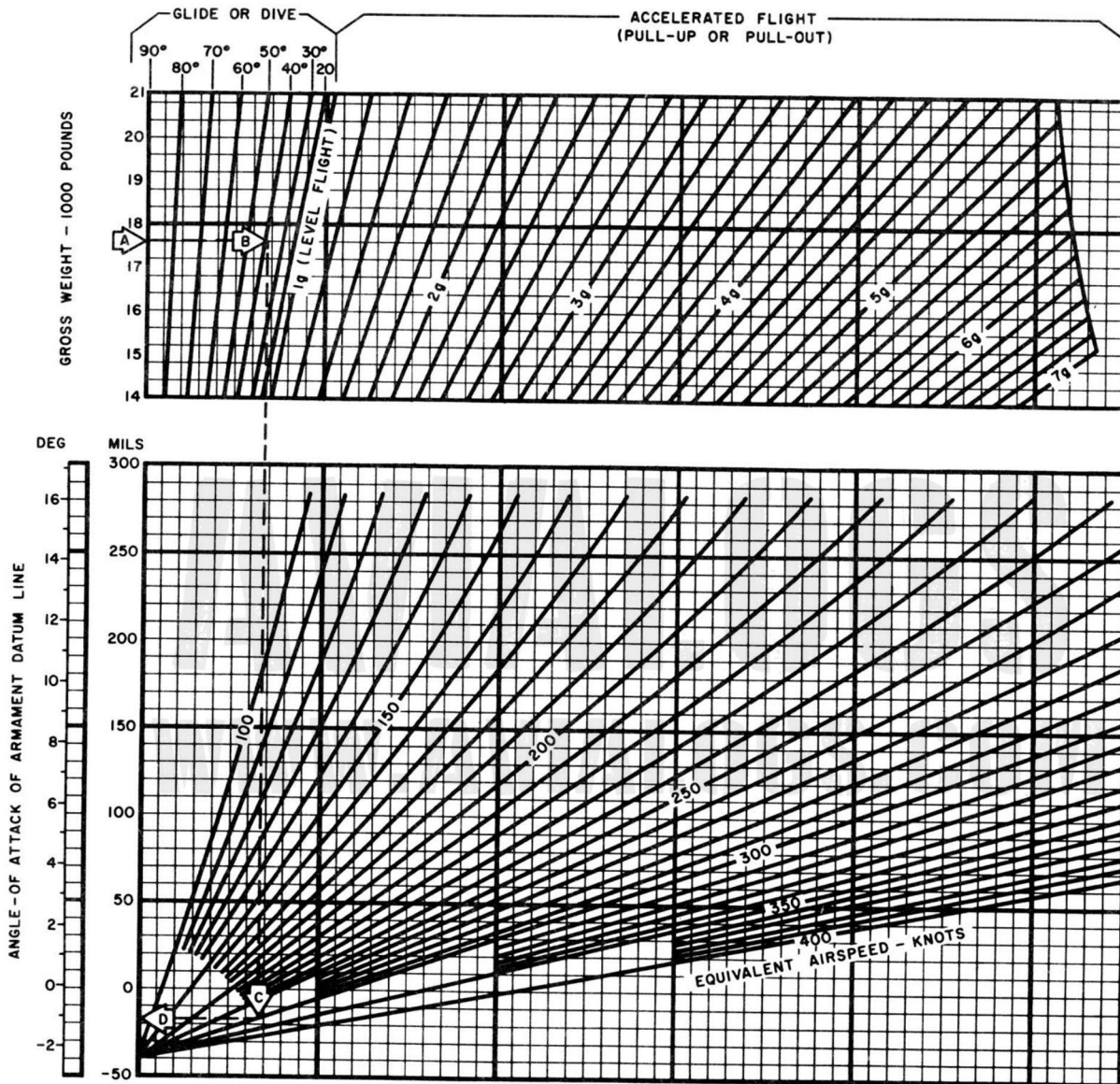
Mark 3 Mod 5 bomb director system (airplanes BuNo. 135278-137632 and prior airplanes reworked to A-1/ASC 461).

Aero 18A/B armament control system (airplanes BuNo. 139606-139821).

Aero 18A/C armament control system (airplanes BuNo. 142010-142081).

9-214C. Each system is electrically operated and functions in conjunction with certain other external stores electrical control equipment.

ANGLE OF ATTACK RELATIONSHIP



REMARKS:

- (1) Dive brakes closed OR side dive brakes open, bottom brake closed.
- (2) Subtract 0.6 degrees (10.5 Navy mils) for all brakes open or bottom brake open.
- (3) Subtract 2.2 degrees (38.4 Navy mils) to obtain angle of attack of fuselage reference line.
- (4) Zero propeller thrust.
- (5) To determine Equivalent Airspeed (E.A.S.), refer to AIRSPEED CORRECTIONS in Appendix I of Flight Handbook.

EXAMPLE:

Determine the gunsight offset in mils for a dive-bombing run under the following condition WITH ALL DIVE BRAKES OPEN.

- (a) Gross weight at time of release = 17,600 lb (A).
- (b) Dive angle = 40 degrees (B).
- (c) Stabilized dive speed = 300 knots E.A.S. (C).
- (d) Angle of attack of armament datum line = -17 mils (D) - 10.5 mils (note 2) = -27.5 mils.

Therefore reticle of sight should be raised 27.5 mils.

DATA AS OF: 1 March 1954

DATA BASIS: Wind tunnel tests of full scale Douglas XBT2D.

PS5957:IA

Figure 9-19. Attitude Data Chart



**9-215. MARK 3 MOD 5 BOMB DIRECTOR SYSTEM.**

9-216. DESCRIPTION. (See figure 9-21.) The Mark 3 Mod 5 bomb director system is installed on airplanes BuNo. 135278 through 137632, and prior airplanes reworked per BuAer AD/SC No. 461. This installation is replaced by the Aero 18A ACS in AD-6 BuNos. 134466 through 134637, 135223 through 135406 and 137492 through 137632 upon backfit of AD/SC No. 581. The major components of the system include the following:

<i>Name</i>	<i>Location</i>
Circuit breaker, 10 amp	Cockpit circuit breaker panel
Mk 27 Mod 1 director control console	RH control panel
Mk 6 Mod 1 bomb director altimeter	Radio compartment center shelf—LH
Mk 63 Mod 3 bomb director computer	Radio compartment center shelf—LH
Mk 42 Mod 2 bomb director power supply junction box	Radio compartment center shelf—RH
Bomb director indicating light	Cockpit glare shield
Mk 3 Mod 0 interval timer	Cockpit—armament panel

9-217. The Mark 3 Mod 5 bomb director system, which serves as a pilot-operated, external stores release, electronically integrates bombing information received from its associated equipment and computes the correct instant for automatic armament release. The armament may consist of bombs, rockets, or a torpedo. The information supplied to the computer is of two kinds: constant factors (target altitude, target barometric pressure, ballistic of stores, temperature of rocket propellant, and lanyard effect) and variable factors (airplane altitude, dive-angle, and rate of pull-up). When the computer has been properly aligned in the airplane, the constant factors are fed into the computer prior to take-off. The variable factors are supplied by the altimeter and two accelerometers and are fed into the computer during dive and pull-up. All information supplied to the computer is in the form of voltage or current. Having automatically calculated the release point of the applicable store, the computer then actuates the armament release circuits at the appropriate time. (Refer to section X.)

9-218. The Mark 3 Mod 5 bomb director system receives power from the bomb director power supply junction box, which in turn receives 28-volt d-c power from the secondary bus through a circuit breaker. The system is energized when the POWER switch on the control console is ON.

9-219. GROUND TESTING. For information concerning ground testing and other essential tests, refer to the applicable technical publication.

**9-220. MARK 27 MOD 1 BOMB DIRECTOR CONTROL CONSOLE.**

9-221. DESCRIPTION. (See figure 9-21.) The Mark 27 Mod 1 bomb director control console contains the following controls and switches: a TARGET ALTITUDE control which is calibrated in increments of 100 and 1000 feet, with a total range of zero to 10,000 feet; a power control toggle switch, identified as POWER with "ON" and "OFF" positions; a selector dial, identified as BARO PRESS, calibrated in increments of 0.1 within a range of "28.5" to "31.0"; a press-to-test type plunger switch, identified as TEST; and a small, window-type indicator located directly above the BARO PRESS dial. The TARGET ALTITUDE control is used for pre-setting the altitude (above seal level) of the target. The POWER switch controls the power input to the bomb director system. The BARO PRESS dial and its associated indicator are used in the various methods of setting barometric pressure. The TEST switch is used for ground test procedure.

**9-222. MARK 6 MOD 1 BOMB DIRECTOR ALTIMETER.**

9-223. DESCRIPTION. (See figure 9-21.) The Mark 6 Mod 1 bomb director altimeter provides the bomb director computer with a voltage proportional to altitude. This voltage is used by the computer to determine range.

**Note**

The altimeter is connected to the static pressure system, which must be functioning satisfactorily to assure proper operation of the bomb director altimeter. (Refer to pitot-static system text in section VI.)

**9-224. (Deleted.)**

9-225. (Deleted.)

**9-226. MARK 63 MOD 2 BOMB DIRECTOR COMPUTER.**

9-227. DESCRIPTION. (See figure 9-21.) The Mark 63 Mod 2 bomb director computer contains six dials which are adjusted prior to flight to correspond with the ballistics of the armament to be released. (Adjustment procedure for these dials is outlined in the applicable technical publication.) The rocket channel incorporates a switching feature that provides an alternate solution for rockets of varying ballistics, allowing for the tactical handling of the airplane with two types of rockets. For efficient operation of the bomb director system, it is important that the computer be accurately installed and aligned in the airplane. The computer

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mounting rack is designed so that it can be adjusted, prior to flight, to vary the mounting angle of the computer so that it will be level to the flight path during a dive. (Further information concerning the computer alignment will be added when available.)

Table 9-5. (Deleted.)

**9-228. MARK 42 MOD 2 BOMB DIRECTOR SUPPLY JUNCTION BOX.**

9-229. DESCRIPTION. (See figure 9-21.) The Mark 42 Mod 2 bomb director power supply junction box receives power from the circuit breaker and contains all the required electrical connections between the bomb director equipment and the airplane electrical system.

**9-230. BOMB DIRECTOR INDICATING LIGHT.**

9-231. DESCRIPTION. (See figure 9-21.) The bomb director indicating light receives power from the junction box when the computer is in operation. The indicating light is on during the time (approximately 10 seconds) the computer is functioning, and is energized when the POWER switch on the control console is placed in the "ON" position and the "B" or "R" release switches on the control stick grip are depressed. The indicating light incorporates a push-to-test feature for testing the lamp; push-to-test power is received from the primary bus through the DC INSTR circuit breaker.

9-232 through 9-236. (Deleted.)

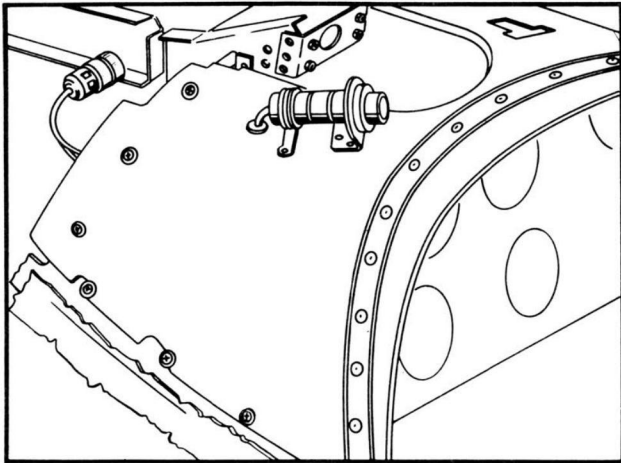
**9-237. AD-6 AERO 18A ARMAMENT CONTROL SYSTEM (LOW ALTITUDE BOMBING SYSTEM.)**

9-238. DESCRIPTION. (See figure 9-22). The Aero 18A armament control system is installed on airplanes BuNo. 139606 through 139790 and 139793 through 139817. On airplanes BuNo. 139791, 139792 and 139818 through 139821, it is supplied as a loose equipment item. Principal components of the system are as follows:

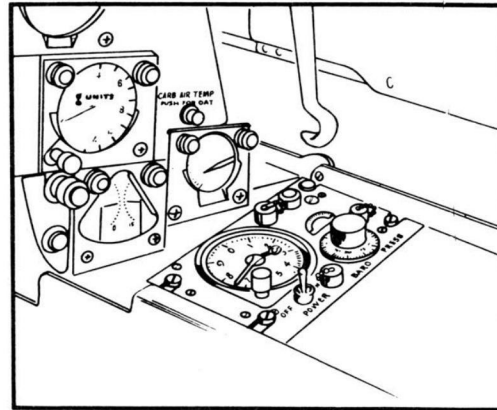
<i>Name</i>	<i>Location</i>
Timer	Cockpit—instrument panel
Indicator	Cockpit—instrument panel
Bomb director indicating light	Cockpit—glare shield
Yaw-roll gyro	Radio compartment—center shelf
Vertical gyro	Radio compartment—center shelf
Accelerometer	Radio compartment—center shelf
Relay box	Radio compartment center shelf
Calibrator	Radio compartment—center shelf

9-239. The Aero 18A armament control system electrically operates the external stores to provide precision low-altitude bomb release. Operation of the system ne-

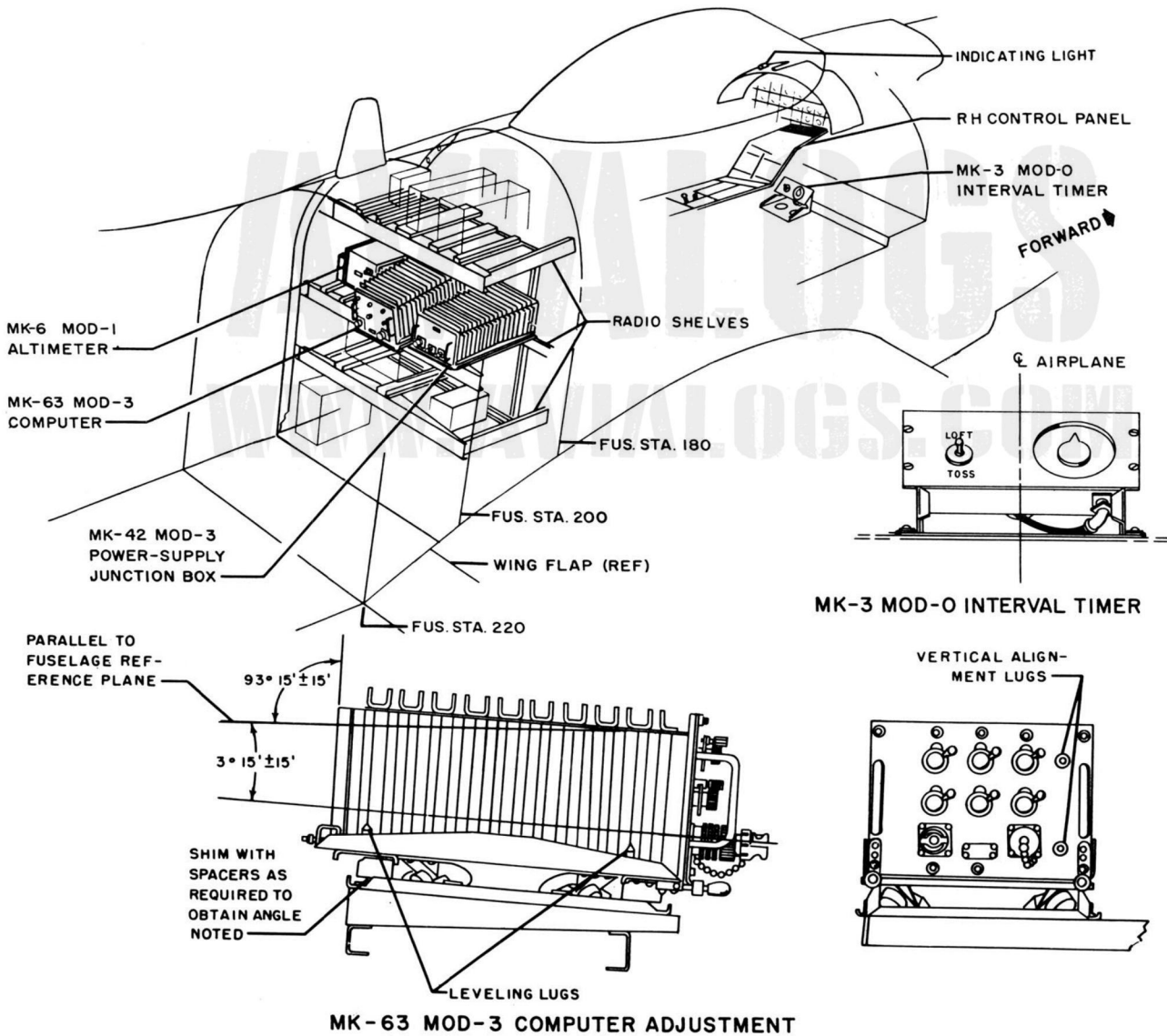
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**BOMB DIRECTOR INDICATING LIGHT  
(COCKPIT--GLARE SHIELD)**

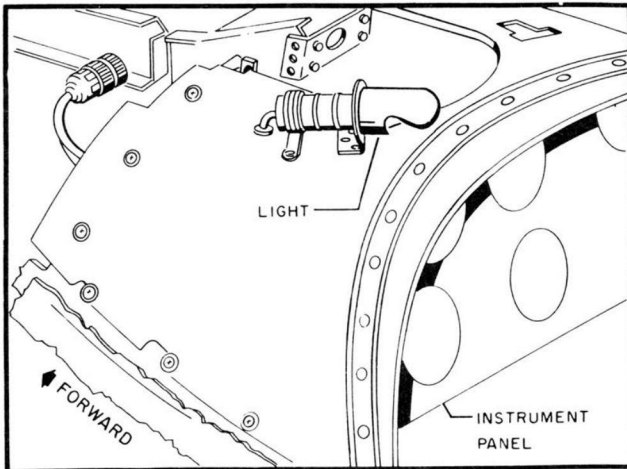


**MK-27 MOD-1 CONTROL CONSOLE  
(COCKPIT-R H CONTROL PANEL)**

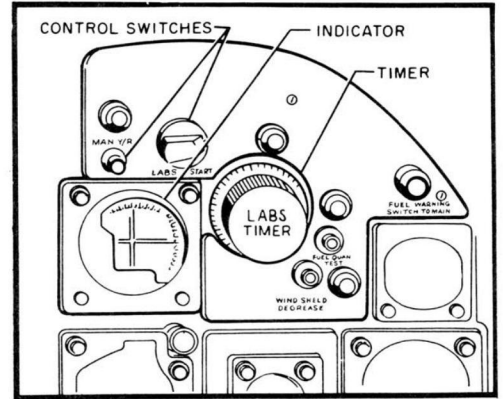


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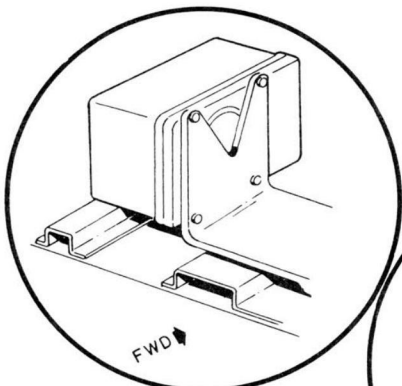
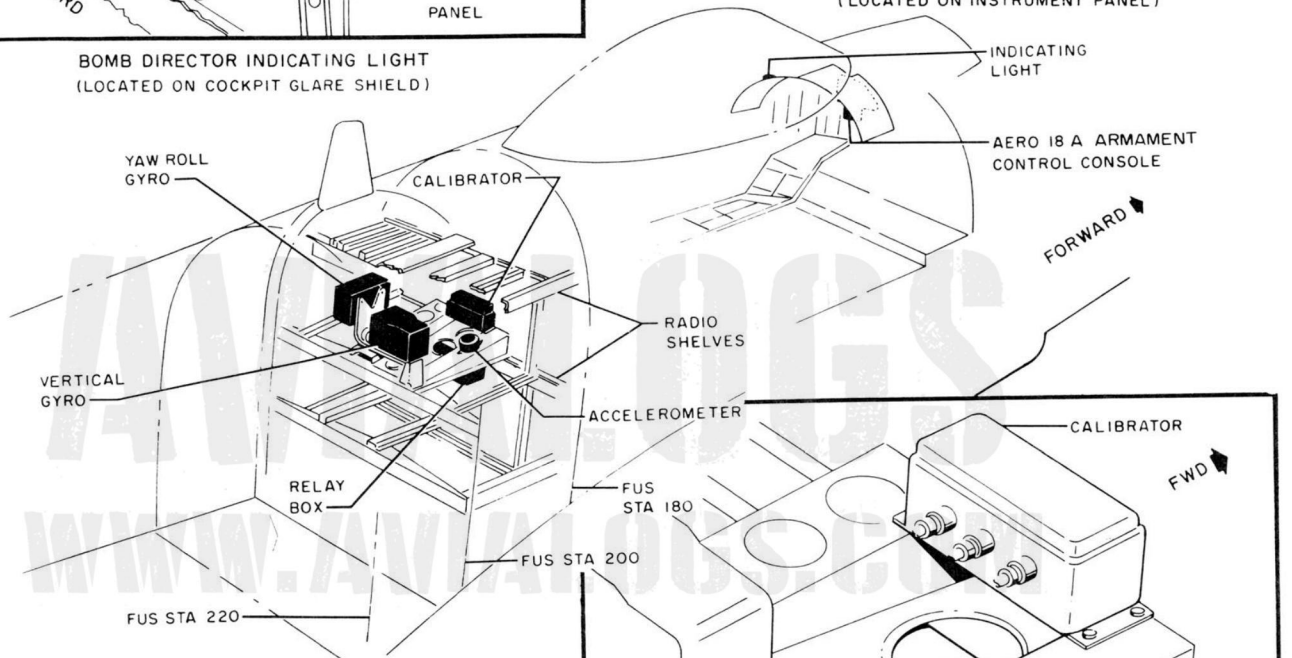
**Figure 9-21. Mark 3 Mod 5 Bomb Director System**



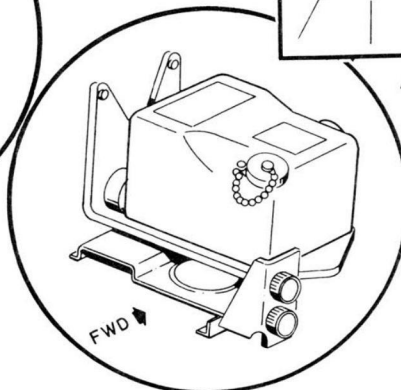
BOMB DIRECTOR INDICATING LIGHT  
(LOCATED ON COCKPIT GLARE SHIELD)



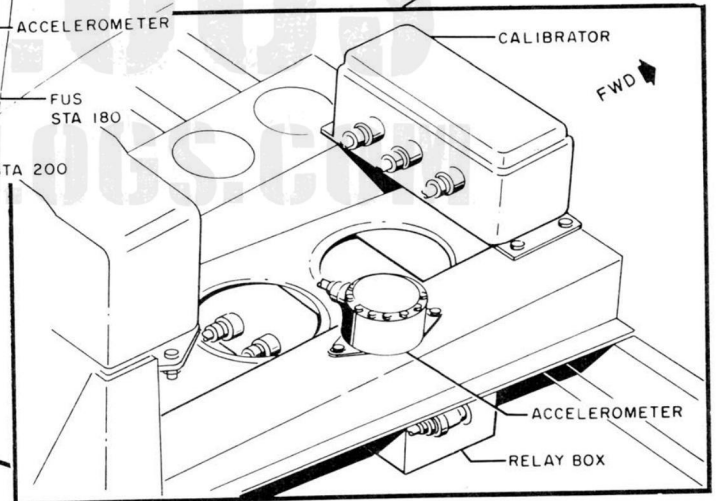
AERO 18A ARMAMENT CONTROL CONSOLE  
(LOCATED ON INSTRUMENT PANEL)



YAW ROLL GYRO



VERTICAL GYRO



ACCELEROMETER, CALIBRATOR, AND RELAY

EFFECTIVITY-BUNO  
 FACTORY: 139606-139821  
 SERV CHG: NONE

P-8026-1B

Figure 9-22. Aero 18A Armament Control System

cessitates the use of certain other external stores electrical control equipment (refer to section X). The system receives power from the 115-volt, 400-cycle, constant frequency ac power supply and 2-volt dc power from the secondary bus through the release method selector switch.

9-240. INSTALLATION AND ADJUSTMENT. Refer to figure 9-23, Steps 1 through 5 are applicable to airplanes BuNo. 139606 through 139686 inclusive, not reworked to A-1/ASC 656. Step 6 is applicable only to airplanes BuNo. 139687 through 139821, and to airplanes reworked to A-1/ASC 656.

9-240A. RAPID LABS LEVELING PROCEDURE. This method of leveling does not eliminate the requirements of paragraph 9-240. The method must not be used to reposition the equipment in pitch or roll. The method is a rapid means of determining the installed level adjustment of AERO 18 equipment in pitch.

a. Place airplane in normal landing configuration. Suspend a plumb bob to measure airplane datum line (ADL) position by use of cockpit calibrated card. The angle will measure approximately 12.5 degrees.

b. Place the LABS equipment in the airplane at approximately the 11.4 degree position using a gunners quadrant. This would be 18.4 degrees below the ADL at 240 X knots airspeed.

NOTE

One man will be required in the aft equipment compartment and one man in the cockpit.

c. Apply external power to the airplane.

d. Operate the armament disabling switch in the port wheel well. Allow 5 minutes to elapse after power is applied to permit gyros to reach full RPM of 27,000.

e. Position the normal sector switch at 10 degrees higher than airplane attitude.

f. Place the LABS gyro switch in the uncaged position and the LABS indicator light will come on. Wait 6 minutes to allow the self-erecting mechanism of the vertical gyro indicator to seek true horizon.

g. With the vertical gyro indicator at true horizon, depress the "pickle" switch on the control stick and commence positioning of the normal sector switch toward zero position.

NOTE

Positioning must be done slowly and carefully for accuracy. When normal sector contact makes contact with the erected vertical gyro indicator, release will take place. Release will be irrespective of elapsed LABS time. However, for coordination between the two personnel, a short LABS time may be used to ensure proper sequence indications.

h. Read setting on normal sector switch the instant the normal sector makes contact.

NOTE

The release solenoid can be heard in the aft radio compartment the instant normal sector makes contact.

NOTE

The reading on the normal sector switch will be the number of degrees that the LABS equipment is actually positioned in respect to true horizon.

i. When angle read on normal sector switch is more than reading of plumb bob on ADL angle card, add difference to angle of release setting. Subtract difference when reverse is true.

j. Repeat above procedure, commencing at step f, after caging and uncaging if desired. The repeat performance should give identical answers on normal sector switch. Should they not be appreciably the same, check vertical gyro indicator's erection mechanism.

9-241. GROUND TESTING. For information concerning ground testing and other essential tests, refer to the Handbook Operation and Service Instructions, Aero 18A Armament Control System.

9-242. A-1J AERO 18C ARMAMENT CONTROL SYSTEM (LOW ALTITUDE BOMBING SYSTEM).

9-243. DESCRIPTION. (See figure 9-22A.) The Aero 18C armament control system is installed on A-1J airplanes BuNo. 142010 through 142081. Principal components of the system are as follows:

<u>Name</u>	<u>Location</u>
Timer	Cockpit—instrument panel
Indicator	Cockpit—instrument panel
Bomb director indicating light	Cockpit—glare shield
Yaw-roll gyro	Radio compartment—center shelf
Vertical gyro	Radio compartment—center shelf
Accelerometer	Radio compartment—center shelf
Relay box	Radio compartment—center shelf
Calibrator	Radio compartment—center shelf

9-244. The Aero 18C armament control system functions essentially the same as the A-1H Aero 18A armament control system. Operation of the system necessitates the use of certain other external stores electrical control equipment (refer to section X). The system receives power from the 115-volt, 400-cycle, constant frequency ac power supply and 28-volt dc power from the secondary bus through the method selector switch.

9-245. GROUND TESTING. For information concerning ground testing and other essential tests, refer to the applicable technical publication.

9-246. Deleted.

9-247. MISSILE PROVISIONS.

9-248. DESCRIPTION. Missile provisions are installed on airplanes BuNo. 139791, 139792, and 139818 through 139821. For information pertaining to missile wiring and to location of missile launching components refer to the applicable wiring diagram in section X of this handbook.

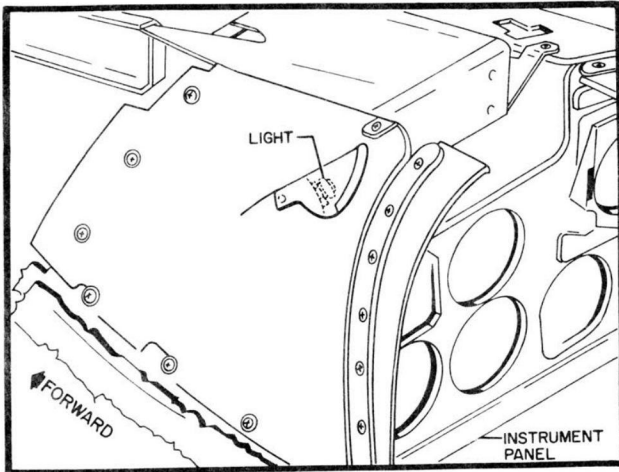
9-249. When reconverting from missile configuration to Aero 18A armament control system on airplanes BuNo. 139791, 139792, and 139818 through 139821 it is necessary, in order to complete the armament circuit, to install a missile adapter panel (Douglas 3558590) in place of the missile console.

The missile console is located in the sloping portion of the left-hand console of the cockpit. The missile adapter panel (Douglas 3558590) is included with these airplanes as loose equipment. If A-1/ASC 656 has been accomplished on these airplanes, the Aero 18A console panel (Douglas 4558840) is used in place of missile adapter panel (Douglas 3558590). To complete 18A armament system, the missile transmitter is removed from the center shelf of the radio compartment equipment rack, and the Aero armament equipment assembly (Douglas 5542122) is installed in place of the missile transmitter. The Aero 18A armament equipment is also included on these airplanes as loose equipment. For proper installation and adjustment of Aero 18A armament equipment assembly refer to paragraph 9-240.

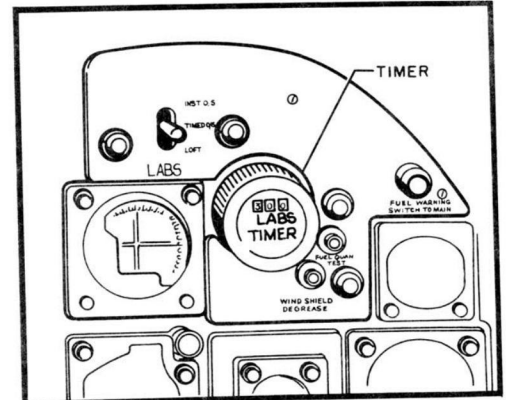
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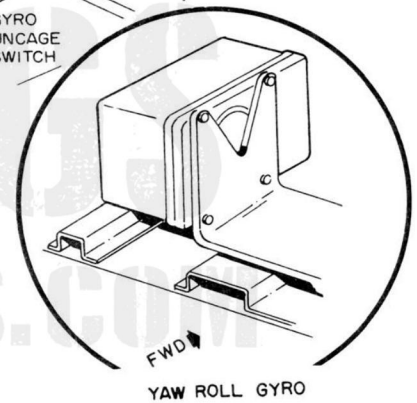
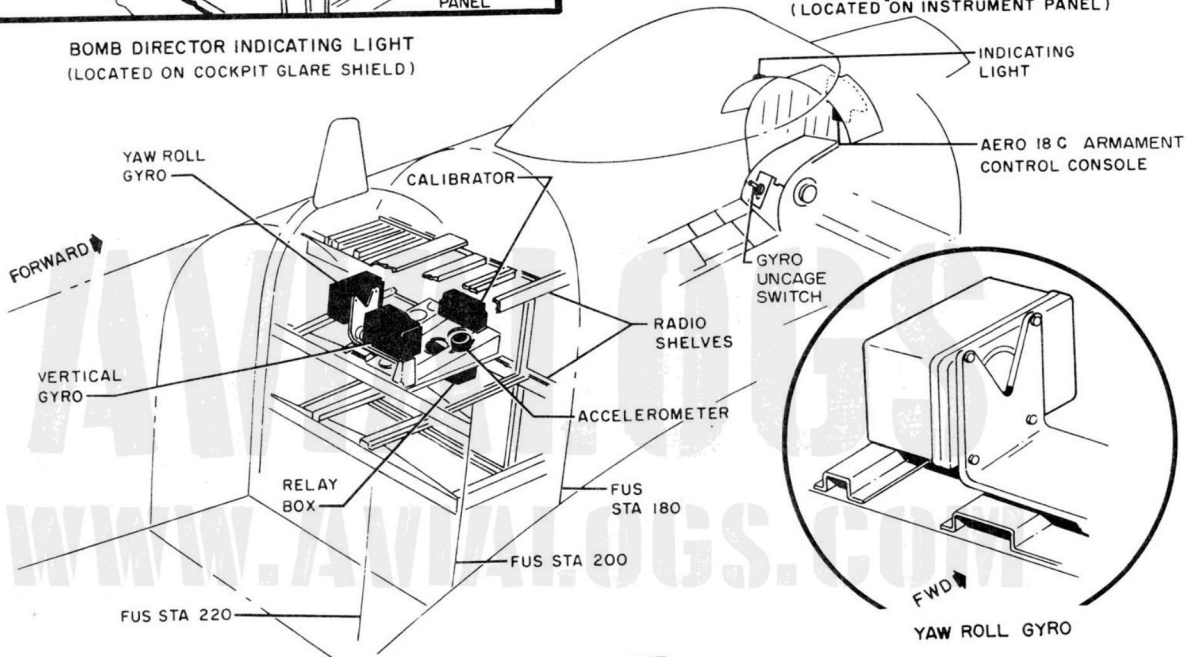




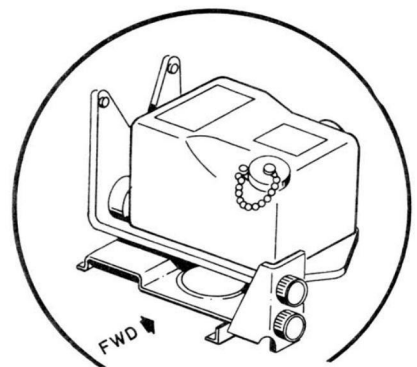
BOMB DIRECTOR INDICATING LIGHT  
(LOCATED ON COCKPIT GLARE SHIELD)



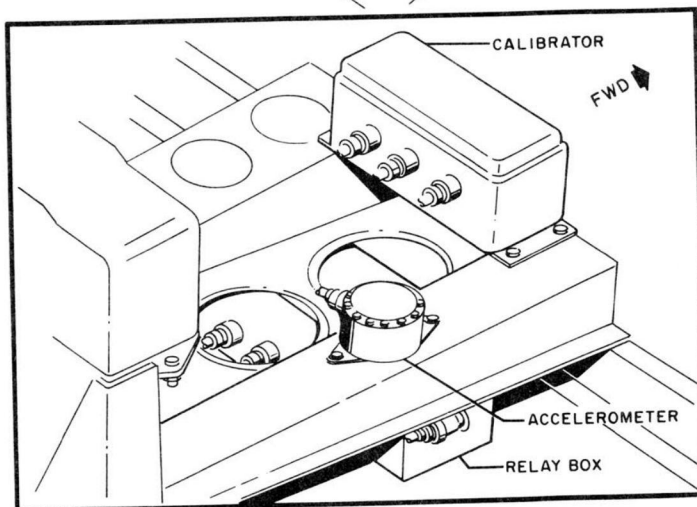
AERO 18C ARMAMENT CONTROL CONSOLE  
(LOCATED ON INSTRUMENT PANEL)



YAW ROLL GYRO



VERTICAL GYRO

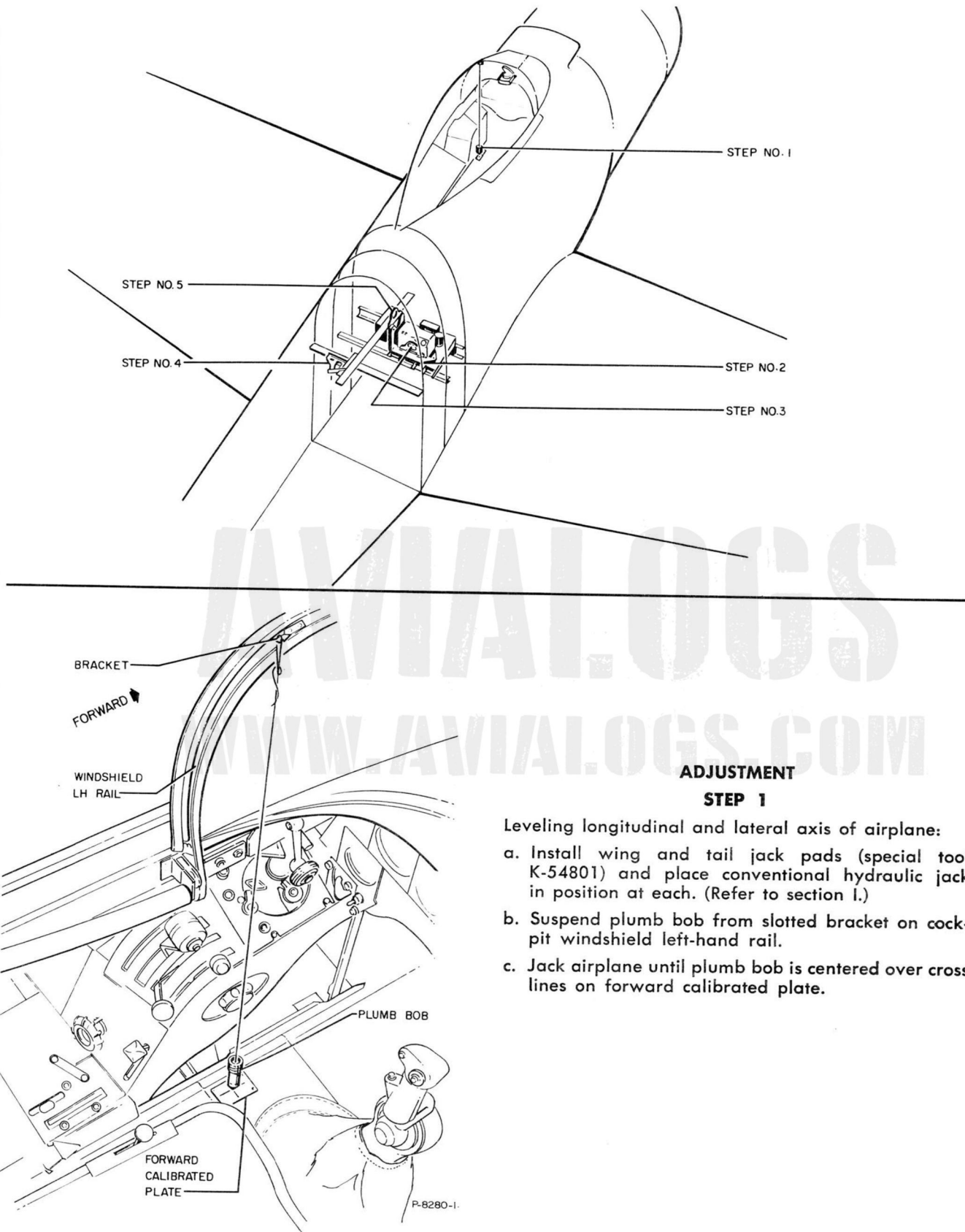


ACCELEROMETER, CALIBRATOR, AND RELAY

EFFECTIVITY-BUNO.  
 FACTORY: 142010-142081  
 SERV CHG: NONE

P-8811-1B

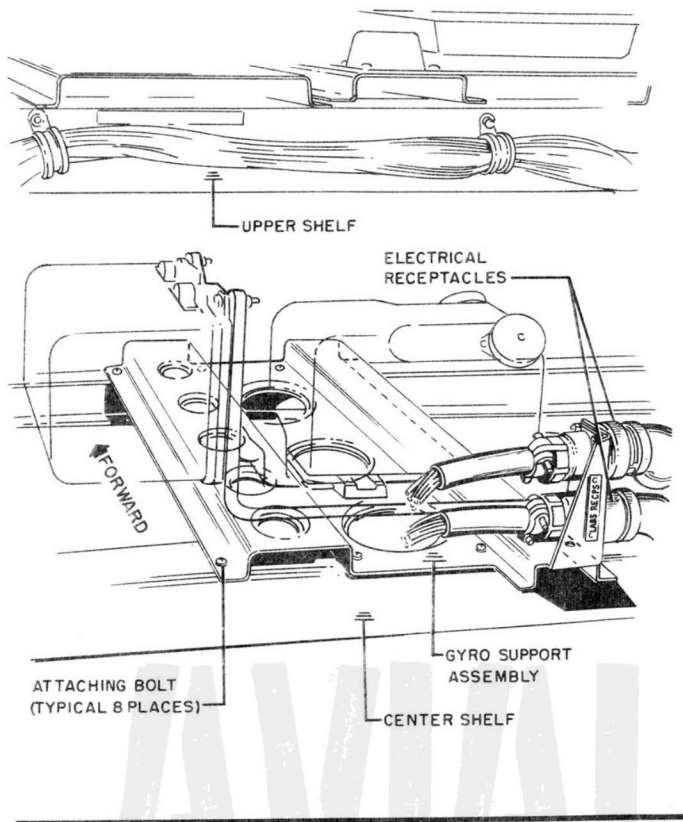
Figure 9-22A. Aero 18C Armament Control System



**ADJUSTMENT  
STEP 1**

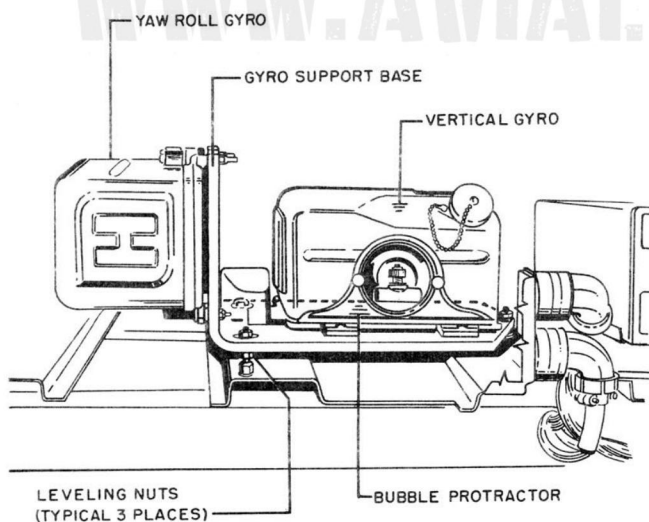
- Leveling longitudinal and lateral axis of airplane:
- Install wing and tail jack pads (special tool K-54801) and place conventional hydraulic jack in position at each. (Refer to section I.)
  - Suspend plumb bob from slotted bracket on cockpit windshield left-hand rail.
  - Jack airplane until plumb bob is centered over cross lines on forward calibrated plate.

Figure 9-23. Aero 18A & 18C Armament Control Systems Adjustment (Sheet 1)

**STEP 2**

Installing gyro assembly:

- a. Remove radio compartment access door.
- b. Place gyro assembly in position on center shelf at forward end of radio compartment.
- c. Bolt gyro support assembly to center shelf structure.
- d. Apply anti-seize compound (specification JAN-A-669) sparingly to threads of electrical plugs and connect each to applicable receptacle on gyro assembly bracket identified as LABS RECPS.

**STEP 3**

Horizontal leveling of gyro support base:

- a. On upper surface of gyro support base loosen three nuts attaching base to studs on gyro support assembly.
- b. Place bubble protractor on leveling lugs of vertical gyro (on aft side of gyro case near base).
- c. Adjust leveling nut on lower right-hand side of gyro support base until bubble protractor indicates base is level horizontally.

**Note**

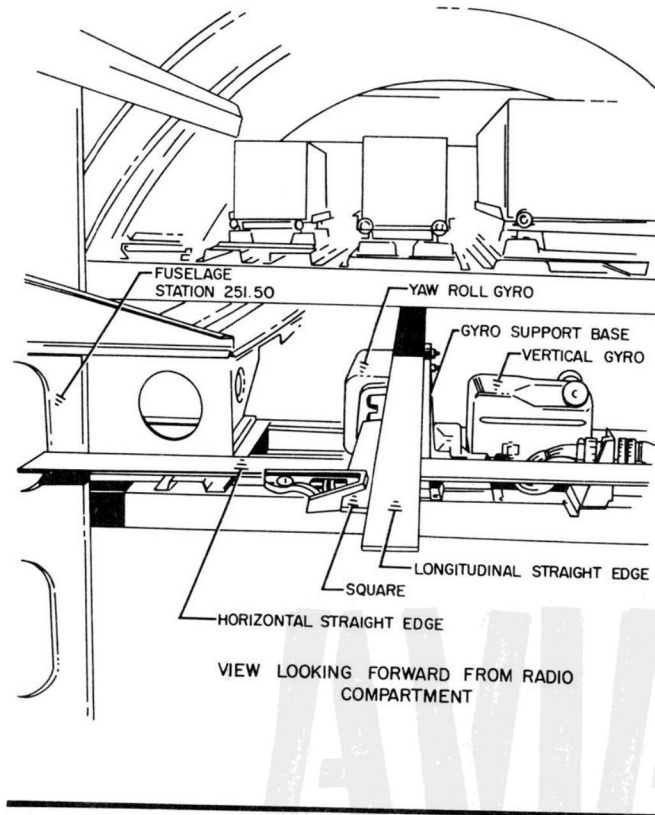
The gyro support base is precision formed with the vertical and horizontal projections perpendicular to each other, and with the gyro mounting holes jig drilled for accurate alignment with the vertical and horizontal surfaces.

VIEW LOOKING FORWARD FROM RADIO COMPARTMENT

NOTE: ELECTRICAL RECEPTACLE BRACKET CUT AWAY FOR CLARITY.

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Figure 9-23. Aero 18A & 18C Armament Control Systems Adjustment (Sheet 2)

**STEP 4**

Aligning yaw roll axis:

- Aft of former at fuselage station 251.500 place suitable straight edge horizontally across radio compartment. Hold straight edge firmly against aft side of former to establish reference line perpendicular to longitudinal axis of airplane.
- Extend another straight edge longitudinally across top of horizontal straight edge and upper surface of yaw gyro case. Hold forward end of straight edge against yaw roll gyro leveling lugs.
- Place suitable square on horizontal straight edge and move gyro support base fore or aft until square indicates longitudinal straight edge is perpendicular to horizontal straight edge.
- On upper surface of gyro support base, tighten right-hand stud attaching nut.

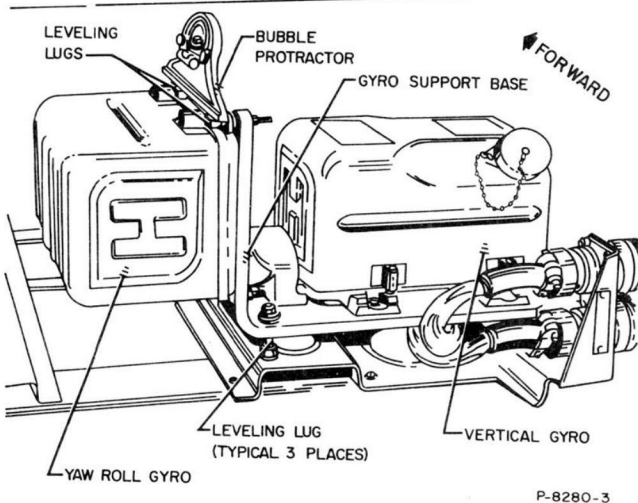
**STEP 5**

Aligning vertical gyro:

- Determine airplane gross weight and "run-in" speed to be utilized for the particular tactical problem. Refer to AN 01-40ALF-1A, flight handbook for AD-6 aircraft, and note angle of attack for specific speed and load conditions.
- Place bubble protractor on yaw roll gyro leveling lugs.
- Adjust leveling nuts on left-hand side of gyro support base until bubble protractor indicates longitudinal axis of gyro is parallel to line of flight.

**Note**

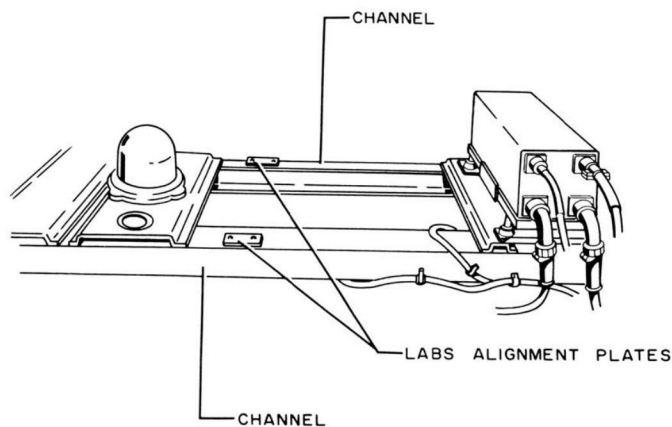
The angle-of-attack determined in step a is the angular difference between the fuselage reference line and the line of flight, therefore adjusting the gyro support base until the protractor indicates an angle corresponding to the angle-of-attack will properly align the vertical gyro with the airplane flight path.



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- On upper surface of gyro support base, tighten remaining stud attaching nuts.
- Perform final check to insure alignments specified in preceding steps were accurately maintained.

Figure 9-23. Aero 18A & 18C Armament Control Systems Adjustment (Sheet 3)

**STEP 6**

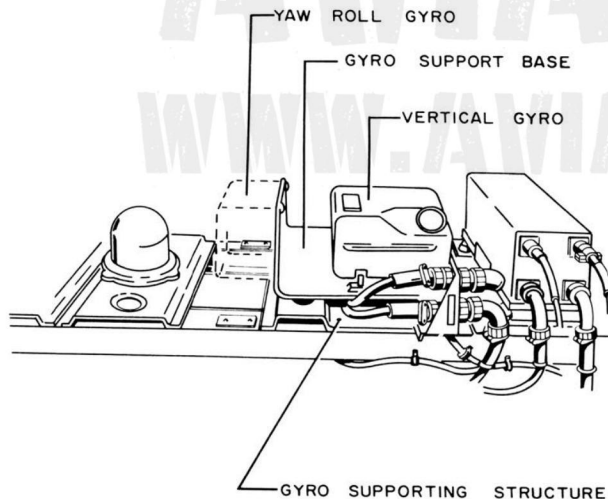
(To be accomplished prior to installation of gyro supporting structure in airplane.)

- a. Place gyro supporting structure on two blocks large enough to support base structure and provide clearance for relay box.
- b. Apply shims to blocks, as required, until base of gyro supporting structure is level.

**Note**

Insert shims under blocks to preclude distortion by establishing level and support conditions similar to those existing when structure is installed in the airplane.

- c. Loosen all three mounting nuts.
- d. Using UG-241A-1 lead table, adjust gyro support base until vertical gyro is level. Do not tighten top nuts.
- e. Adjust gyro support base until surface (1) is parallel to edge (2) of base structure. Tighten right-hand top nut as viewed from disconnect receptacles.
- f. Refer to step 5 for leveling of remaining axis of gyro support base.
- g. Adjust equipment settings. Test system in accordance with Confidential Handbook of Operation and Service Instructions, Aero 18A ACS NAVAER 11-5MD-501, or AERO 18B and 18C ACS NAVAER 11-70HE-501.
- h. Install gyro supporting structure in airplane and verify that it is resting firmly against the LABS alignment plates.



VIEW LOOKING FORWARD FROM RADIO COMPARTMENT

PB280-4

**Figure 9-23. Aero 18A & 18C Armament Control Systems Adjustment (Sheet 4)**

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