

CHAPTER 15

AIRCRAFT WEAPONS SYSTEMS

Modern supersonic fighter and attack aircraft attack a target automatically and accurately. These aircraft are designed and built as a completely integrated weapons system. The weapons subsystems are interconnected and dependent on each other or on other aircraft systems. For example, the bomb release system in some modes of operation depends on the aircraft's flight control system; the missile system is interconnected with the aircraft's radar system for missile guidance. In addition to delivering weapons more accurately, computer-controlled weapons systems provide a higher degree of safety by reducing human error.

The Navy currently uses the F-14 and F/A-18 fighter aircraft, the P-3 and S-3 aircraft, and the SH-3 and SH-60 helicopter antisubmarine warfare weapons systems. The F/A-18 is a dual-mission aircraft (fighter/attack), and is discussed under fighter aircraft. The weapons systems used in modern aircraft are complex. The information on fighter, attack, and antisubmarine warfare weapons systems in this chapter is basic. As you work in your rating, you will learn more about specific systems, and you will be trained in their operation.

FIGHTER AIRCRAFT WEAPONS SYSTEMS

LEARNING OBJECTIVE: *Identify fighter aircraft weapons systems to include those used in the F-14 and F/A-18 aircraft.*

The following text discusses the F-14 and F/A-18 aircraft. You will be introduced to information on the available aircraft armament systems and the basic controls and components common to these systems.

F-14 AIRCRAFT WEAPONS SYSTEMS

The F-14 aircraft is a two-seat (in-line), supersonic, fighter aircraft. It has a servo air fitting and ground cooling air inlet fitting. The servo air fitting provides air to operate servo valves in the environmental control system during built-in-test (BIT) checks and to pressurize the AWG-9 wave guide and gun gas purge valve operation during aircraft ground checks. The ground cooling air inlet fitting provides cooling air to electronic equipment during ground operation.

External power can be applied to all F-14 (series) aircraft. You can use mobile ac power plants, carrier, or hangar ac power cables to apply electrical power to the aircraft when the engines are not operating.

The aircraft armament system consists of a missile control system, multiple weapons release system, M61A1 20-mm automatic gun fire control system, AN/AWW-4 fuze function control system, AN/ALE-39 decoy dispensing system, and jettison system. The F-14 armament system consists of the following basic controls and components common to all systems:

- Air combat maneuver (ACM) panel
- Armament control indicator panel
- Displays control panel
- Control stick
- Master light control panel
- Landing gear handle
- Armament safety override switch

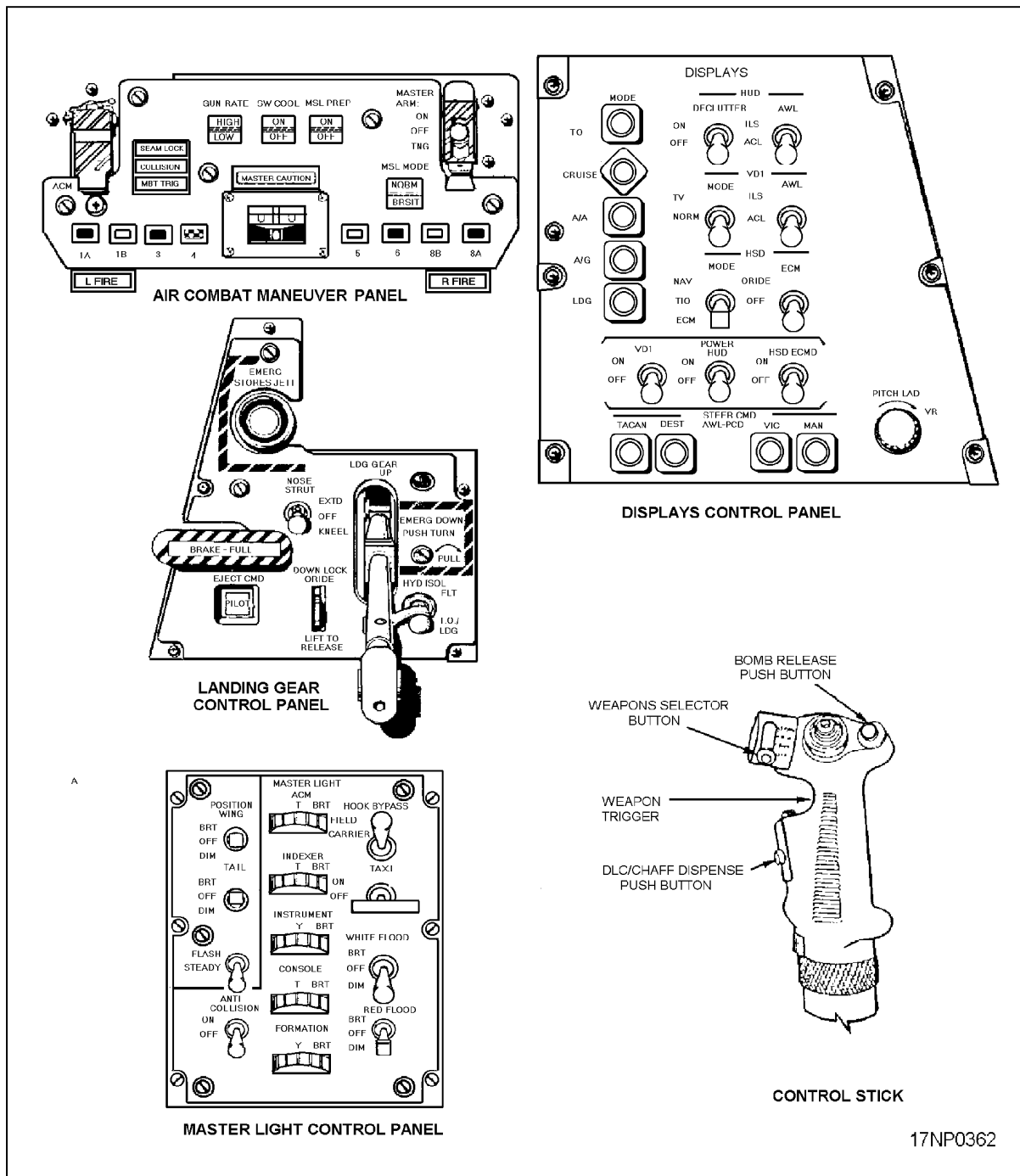


Figure 15-1.—F-14 control panels.

Air Combat Maneuver (ACM) Panel

The ACM panel (fig. 15-1) is located on the forward cockpit center console. It contains switches for missile preparation, missile operating mode selection, and for arming the system. Indicators inform the pilot of weapon status, when the missile is locked on the target, and when the missile is ready to be launched. When the ACM encounter mode is selected, gun high-firing rate and the AIM-9 missile cooling are automatically selected. The ACM panel switches are discussed in the following paragraphs.

Armament Control Indicator Panel

The armament control indicator panel (fig. 15-2) is located in the aft cockpit left vertical console. It contains the attack mode (ATTK MODE) selector switch, weapon-type (WEP TYPE) thumb-wheel switch, electric fuze (ELECT FUZE) selector switch, delivery (DLVY MODE) switches, delivery options (DLVY OPTNS) switches, station set (STA SET) switches, missile option (MSL OPTION) switches, missile speed gate (MSL SPD GATE) selector switch, and select jettison (SEL JETT), tank jettison (TANK

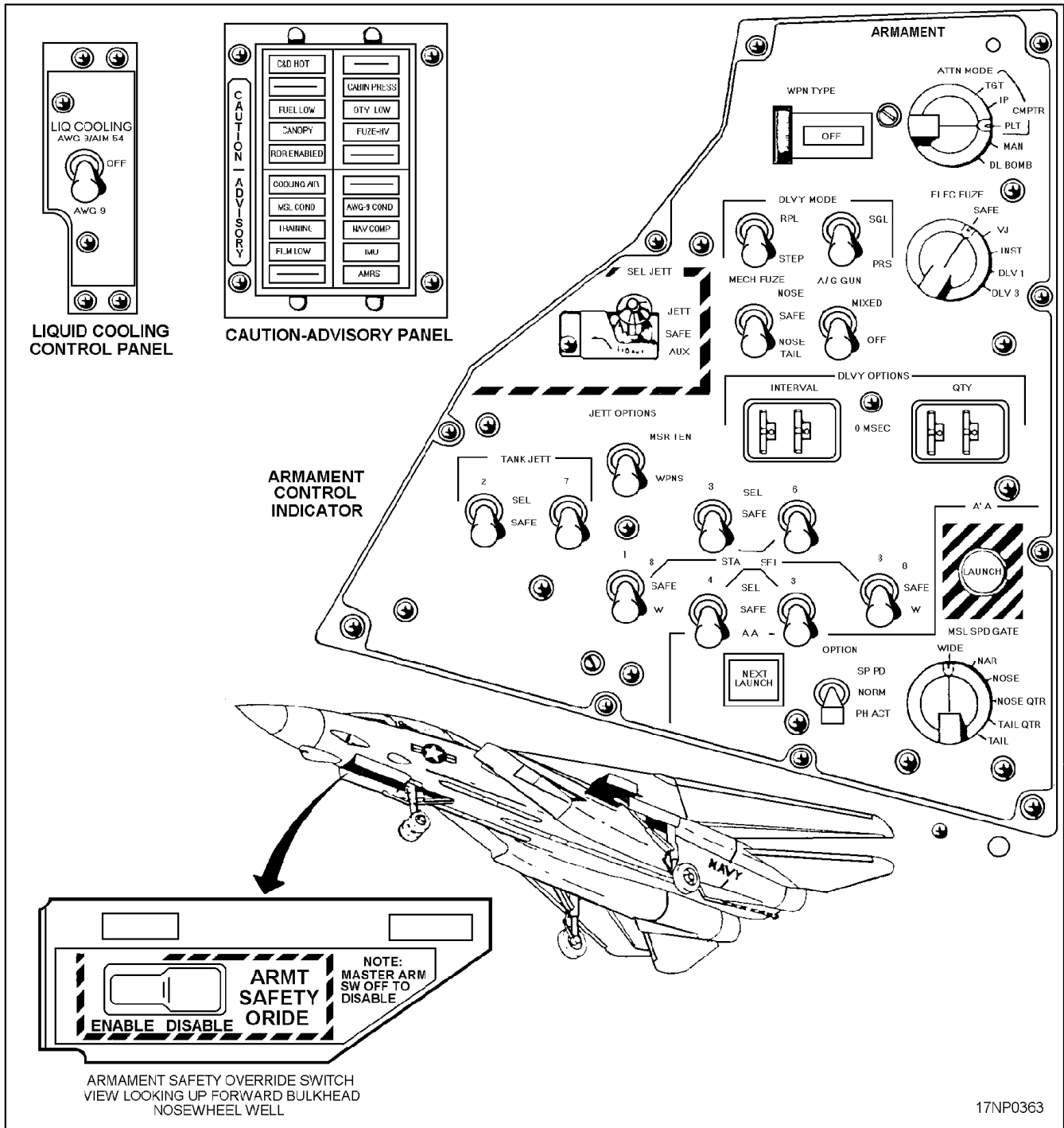


Figure 15-2.—F-14 weapons control panels.

JETT), and jettison options (JETT OPTIONS) switches.

Displays Control Panel

The displays control panel (fig. 15-1) is located on the forward cockpit's right vertical console. It contains the air/ground mode (A/G MODE) push-button switch

for air-to-ground mode selection, the air/air mode (A/A MODE) push-button switch for air-to-air mode selection, and the all-weather landing/precision course direction (AWL/PCD) push-button switch for the all-weather landing or precision course direction mode. The AWL/PCD switch is used when bombs are to be released by using the data link system.

Control Stick

The control stick (fig. 15-1), located in the forward cockpit, contains the weapons selector button, weapon trigger, bomb-release push button, and the DLC/CHAFF DISPENSE push button.

Master Light Control Panel

The master light control panel (fig. 15-1) is located on the right side console of the forward cockpit. It contains the ACM thumb-wheel control, which controls the 26 volts of ac to the ACM panel indicator lights.

Landing Gear Handle

The landing gear handle (LDG GEAR) handle (fig. 15-1) is located on the left vertical console of the forward cockpit. It operates a switch assembly that functions as an armament safety device. As such, it prevents accidental missile launching, bomb release, rocket firing, and ACM encounter jettison of external weapons/stores when the aircraft is on the ground. Master arm power is prevented when the LDG GEAR handle is in the down (DN) position. When the LDG GEAR handle is in the UP position, the fire control system master arm power is available.

Armament Safety Override Switch

The armament safety override (ARM SAFETY OVERRIDE) switch (fig. 15-2) is located in the nosewheel well. It is a magnetically held closed switch. The switch is used as an armament safety override to bypass the open landing gear safety circuit when the LDG GEAR handle is in the DN position. This lets you make functional checks of the system during ground maintenance.

Missile Control System

The missile control system consists of the controls and components you have already read about. It also contains the following missile system controls and components:

- Weapons status indicators
- Liquid (LIQ) cooling control panel
- Aft cockpit caution advisory panel

The AIM-54 and AIM-7 missile fire control systems help to select, prepare, and launch AIM-54 and

AIM-7 missiles. The AIM-54 is a long-range, semiactive, radar midcourse guided and active radar terminal guided missile. It operates in either the normal or boresight mode. The F-14 carries a maximum of six AIM-54 missiles—two are suspended from multipurpose pylons on stations 1B and 8B, and the remaining four at weapons rail stations 3R, 4R, 5R, and 6R. The AIM-7 is a medium-range, semiactive, radar-guided missile. It also operates in either the normal or boresight mode. The F-14 carries a maximum of six AIM-7 missiles—two are suspended from multipurpose pylons on stations 1B and 8B and four at semisubmerged fuselage stations 3, 4, 5, and 6.

The AIM-9 fire control system enables selecting, preparing, and firing of the AIM-9 (series) missiles. The AIM-9 missile is a supersonic, short-range, air-to-air intercept missile that uses passive infrared for target detection and guidance. The F-14 carries a maximum of four AIM-9 missiles—one missile each on stations 1A, 1B, 8A, and 8B.

The weapons status indicators are located on the ACM panel. They notify the pilot of the weapon status of the AIM-9 missiles on stations 1A, 1B, 8A, and 8B.

The Sidewinder cool (SW COOL) switch (fig. 15-1) is a two-position, push-button switch on the ACM panel. This switch is used to generate the AIM-9 missile cool signal to cool the missiles. When in the ACM encounter mode, AIM-9 missile cooling is automatically selected, regardless of the SW COOL switch position.

The throttle quadrant, located on the left side console of the forward cockpit, contains the CAGE/SEAM push-button switch for initiating the Sidewinder expanded acquisition mode (SEAM) lock-on command. The pilot presses the CAGE/SEAM push-button switch when the missile is locked on the target, as indicated by the AIM-9 tone in the pilot headset. The SEAM LOCK advisory indicator, located on the ACM panel, lights to notify the pilot that the AIM-9 missile selected is locked on the target. A tone volume control panel with a SW potentiometer, located on the pilot's left side console, controls the AIM-9 tone to the pilot's headset.

Multiple Weapons Release System

The multiple weapons release system has basic controls and components and multiple weapons system controls and components. They are discussed in the following paragraphs.

The bomb release and rocket control systems enable selecting, preparing, and delivering of the air-to-ground stores. Weapons that can be carried on stations 3R, 4R, 5R, and 6R range from general-purpose bombs of various sizes to CBU, LAU-10, and GBUs.

M61A1 20-MM Automatic Gun Fire Control System

The M61A1 20-mm automatic gunfire control system enables selecting, arming, and firing of the gun. Depending upon the mission objective, the gun fire control system can be operated in an air-to-ground (A/G), air-to-air (A/A), or air combat maneuver (ACM encounter) mode. Two attack modes of operation are available—computer pilot attack mode and manual attack mode. The computer pilot attack mode operates with the weapon control system, command signal decoder system (CSDC), and the vertical display indicator system to display target data. The manual attack mode is used primarily as a backup mode to provide a manually controlled sight reticule if a system malfunction occurs.

GUN RATE SWITCH. The GUN RATE switch (fig. 15-1) is located on the ACM panel. It is a two-position, push-button, indicator switch that selects HIGH (6,000 rounds per minute) or LOW (4,000 rounds per minute) rate of fire. This switch is only active in the A/G and A/A modes.

A/G GUN SWITCH. The A/G GUN switch (fig. 15-2) is located on the armament control indicator panel. It is a two-position toggle switch that enables or inhibits a mixed bomb and gun mode operation. The MIXED position enables bomb and gun mode operation while the OFF position inhibits it.

GUN CONTROL UNIT. The gun control unit, located above the gun barrels, contains the BURST selector switch. This switch limits the number of rounds that can be fired per burst (50, 100, or 200), or it permits unrestricted firing (MAN position).

HOOK/GUN PANEL. The HOOK/GUN panel, located on the forward cockpit vertical console, contains the gun rounds counter. This counter provides digital countdown readout of the rounds remaining.

Decoy Dispensing Systems

The F-14 aircraft uses the AN/ALE-39 decoy dispensing system. The CHAFF/FLARE DISPENSE panel is located on the aft cockpit right side console.

The MANUAL DISPENSE switch on the CHAFF/FLARE DISPENSE panel is used to initiate rounds from the aft cockpit. Rounds can also be initiated from the forward cockpit by the decoy dispense push button on the control stick.

Jettison System

The jettison system allows jettison of certain external stores. There are four jettison modes:

1. Emergency, which is pilot controlled
2. ACM encounter, which is NFO selected and pilot controlled
3. Selective, which is NFO controlled
4. Auxiliary, which is NFO controlled (BRU-32 air-ground weapons)

In all modes, arming and fuzing is disabled during jettison operations. The landing gear handle must be UP for ACM encounter, selective and auxiliary jettison modes.

Aircraft Armament Configuration Capabilities

The basic armament configuration (fig. 15-3) of the F-14 aircraft consists of four fuselage-mounted LAU-92 missile launchers and an internally mounted M61A1 20-mm gun. However, the aircraft has a total of eight weapons stations that hold a variety of missile launchers and weapons rails. Figure 15-4 shows the location of weapons stations 1 through 8. Figures 15-5 through 15-12 show the various station and equipment configurations.

For more information on the authorized configurations of aircraft, you should refer to *F-14 Tactical Manual*, NAVAIR 01-F14AAA-1T. If you want more information on F-14 weapons systems, refer to *Airborne Weapons/Stores Loading Manual*, NAVAIR 01-F14AAA-75.

REVIEW NUMBER 1

- Q1. What naval aircraft is a dual-mission, fighter-bomber?*
- Q2. The F-14 aircraft incorporates the _____ chaff dispensing system.*
- Q3. When the landing gear handle is in the down position on the F-14 aircraft, what switch is used to bypass the open loading gear safety circuit?*

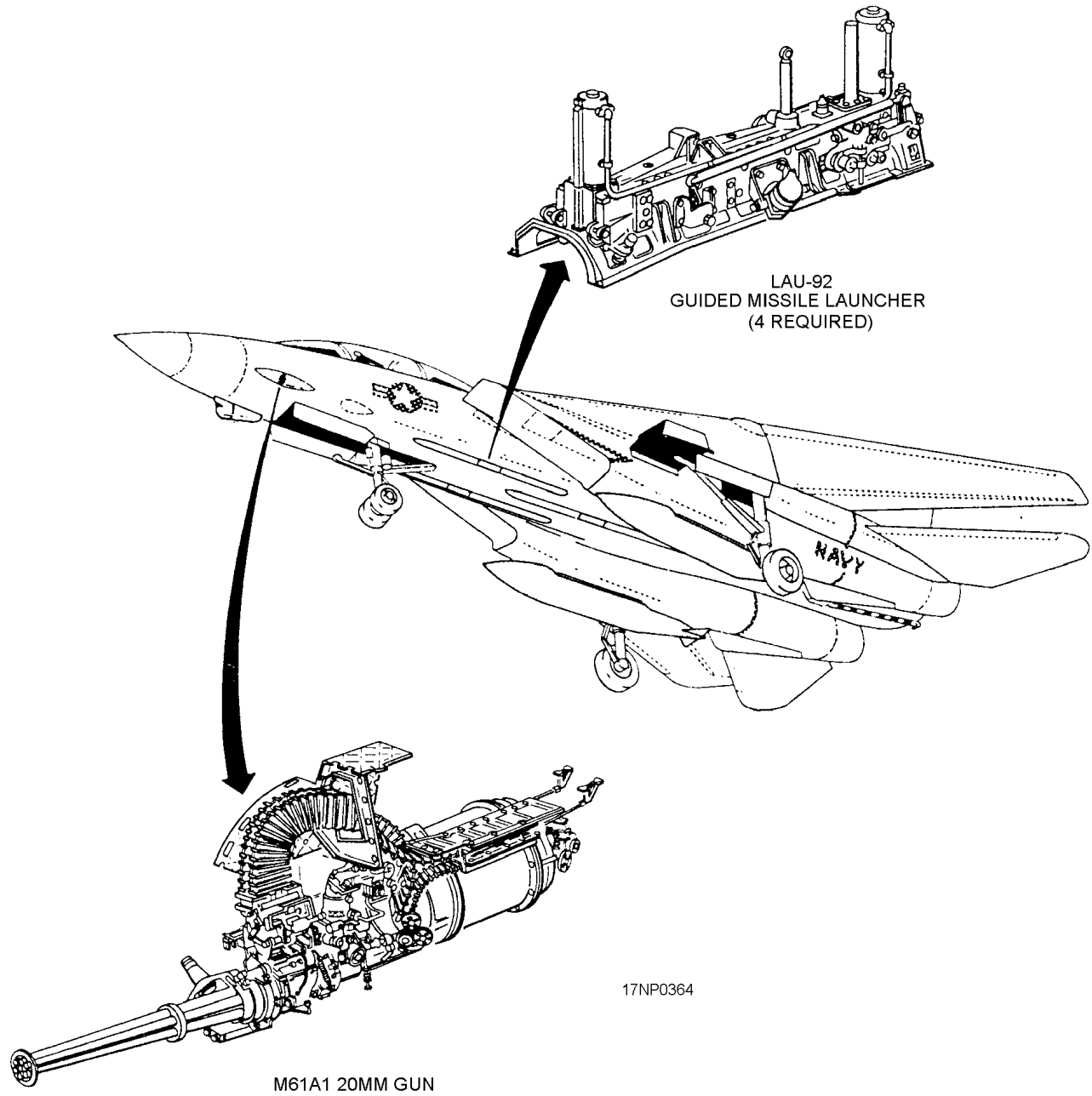
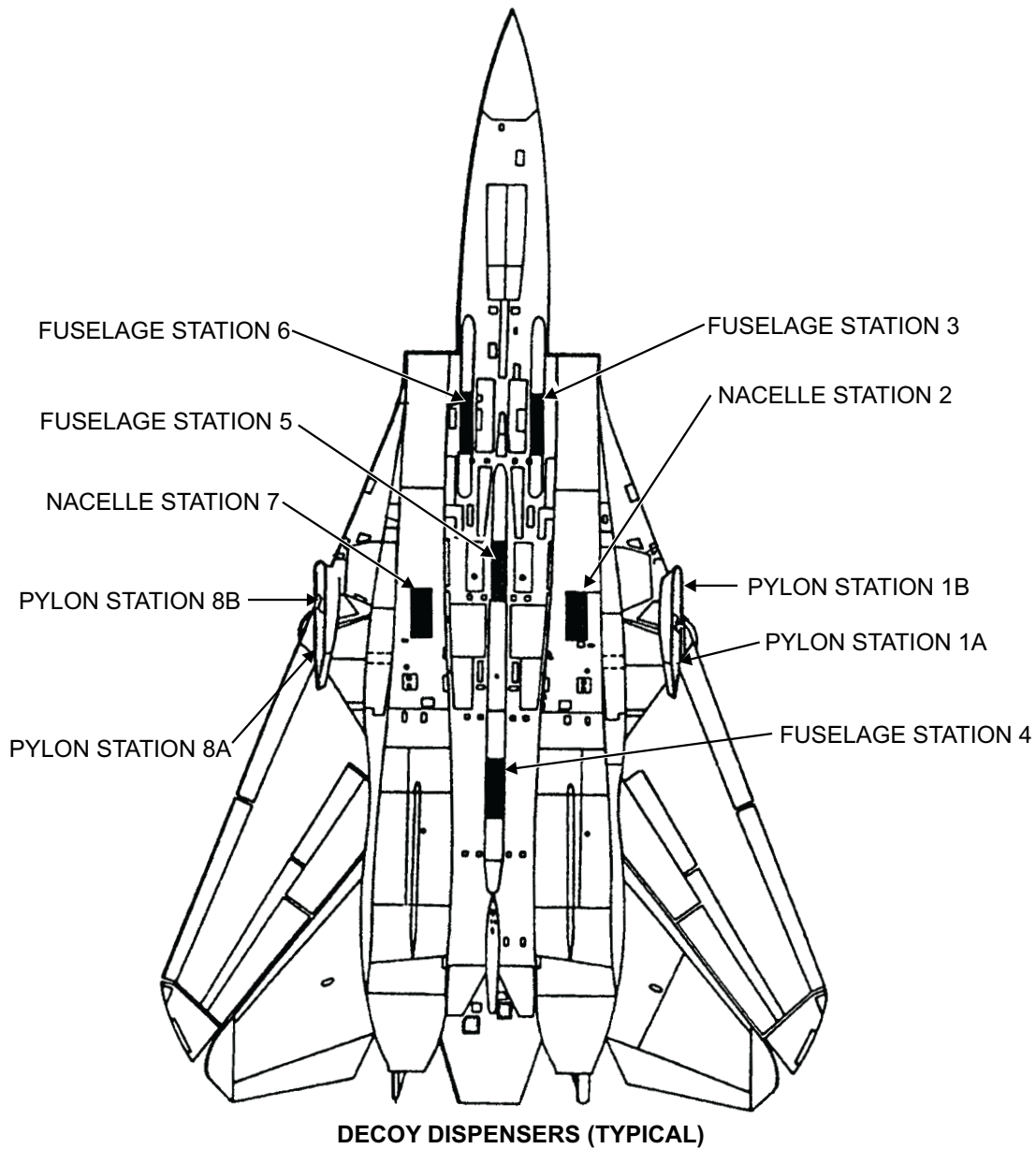


Figure 15-3.—Basic armament configuration.

- Q4. The F-14 aircraft can hold a maximum of _____ AIM-54 missiles.*
- Q5. List the fuselage stations of the F-14 aircraft that are used to suspend AIM-7 missiles.*
- Q6. The F-14 aircraft can hold a maximum of _____ AIM-9 missiles?*
- Q7. List the stations of the F-14 aircraft that are used to carry Sidewinder missiles.*
- Q8. What are the HIGH and LOW rates of fire for the M61A1 gun when it is mounted in the F-14 aircraft?*
- Q9. What switch on the F-14 aircraft limits the number of rounds that are fired per burst?*
- Q10. List the four jettison modes of the F-14 aircraft.*



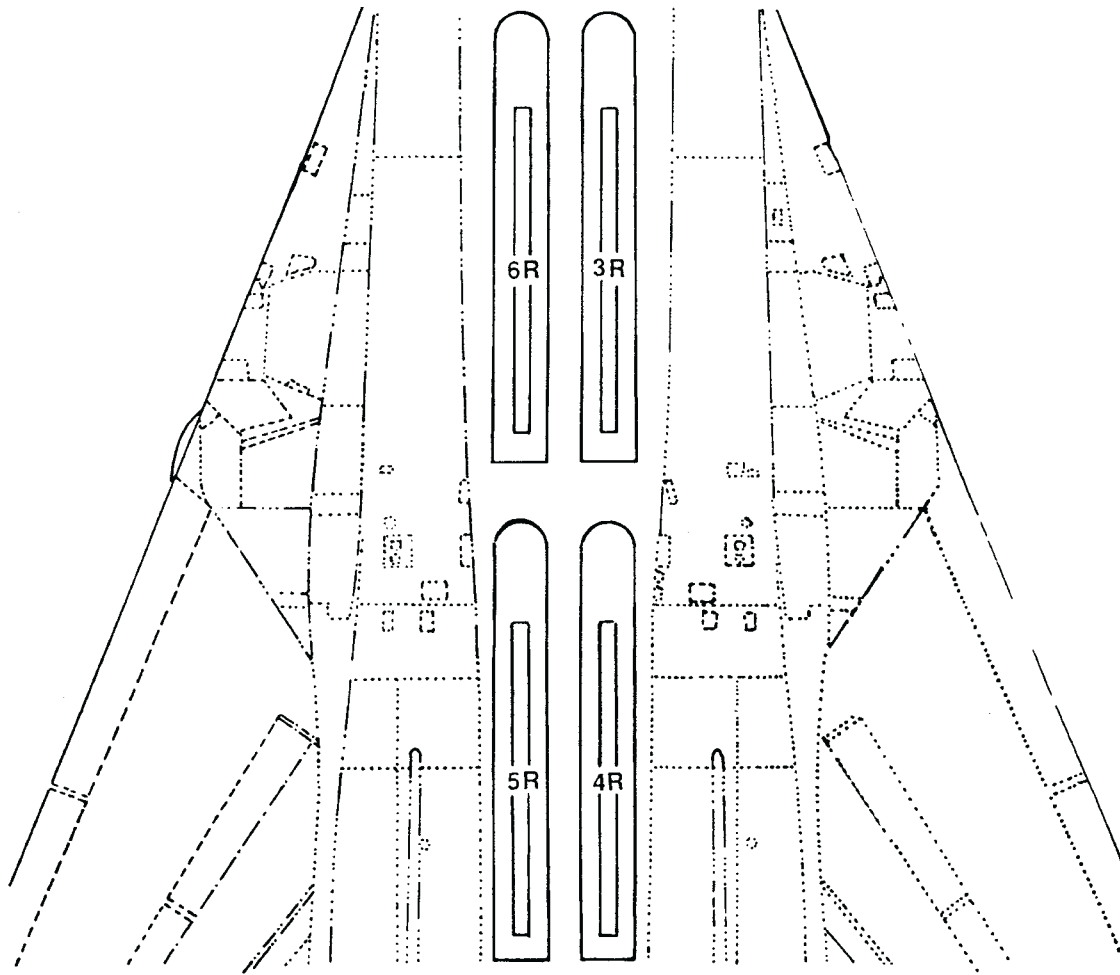
DECOY DISPENSERS (TYPICAL)

VIEW LOOKING UP

EQUIPMENT	FUSELAGE, NACELLE, AND PYLON STATIONS									
	1A	1B	2	3	4	5	6	7	8A	8B
LAU-7/LAU-138 GUIDED MISSILE LAUNCHER	X	X							X	X
LAU-92 GUIDE MISSILE LAUNCHER		X		X	X	X	X			X
LAU-93/LAU-132 GUIDED MISSILE LAUNCHER		X								X
MXU-611/MXU-776/A, 777/A FUEL TANK RELEASE MECHANISM			X					X		

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Figure 15-4.—Location of weapons stations.



VIEW LOOKING UP

EQUIPMENT	WEAPONS RAIL STATION			
	3R	4R	5R	6R
LAU-93/LAU-132 GUIDED MISSILE LAUNCHER	X	X	X	X
BRU-32	X	X	X	X
BUR-42	X	X	X	X
ECA	X			

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Figure 15-5.—Station configuration capabilities.

Q11. What jettison mode is the only one controlled by the pilot?

F/A-18 AIRCRAFT

The F/A-18 aircraft is a single-seat, dual-role (fighter/bomber), and supersonic aircraft. External electrical power can be applied at the external power

receptacle on the left side of the forward fuselage. This is easily accessible from the deck level. The external power connector connects 115/208-volt, three-phase, 400-hertz ac external power to the ac bus. When external power is not available, the aircraft has an auxiliary power unit (APU) to drive either of the aircraft generators for functional checkout of the aircraft system.

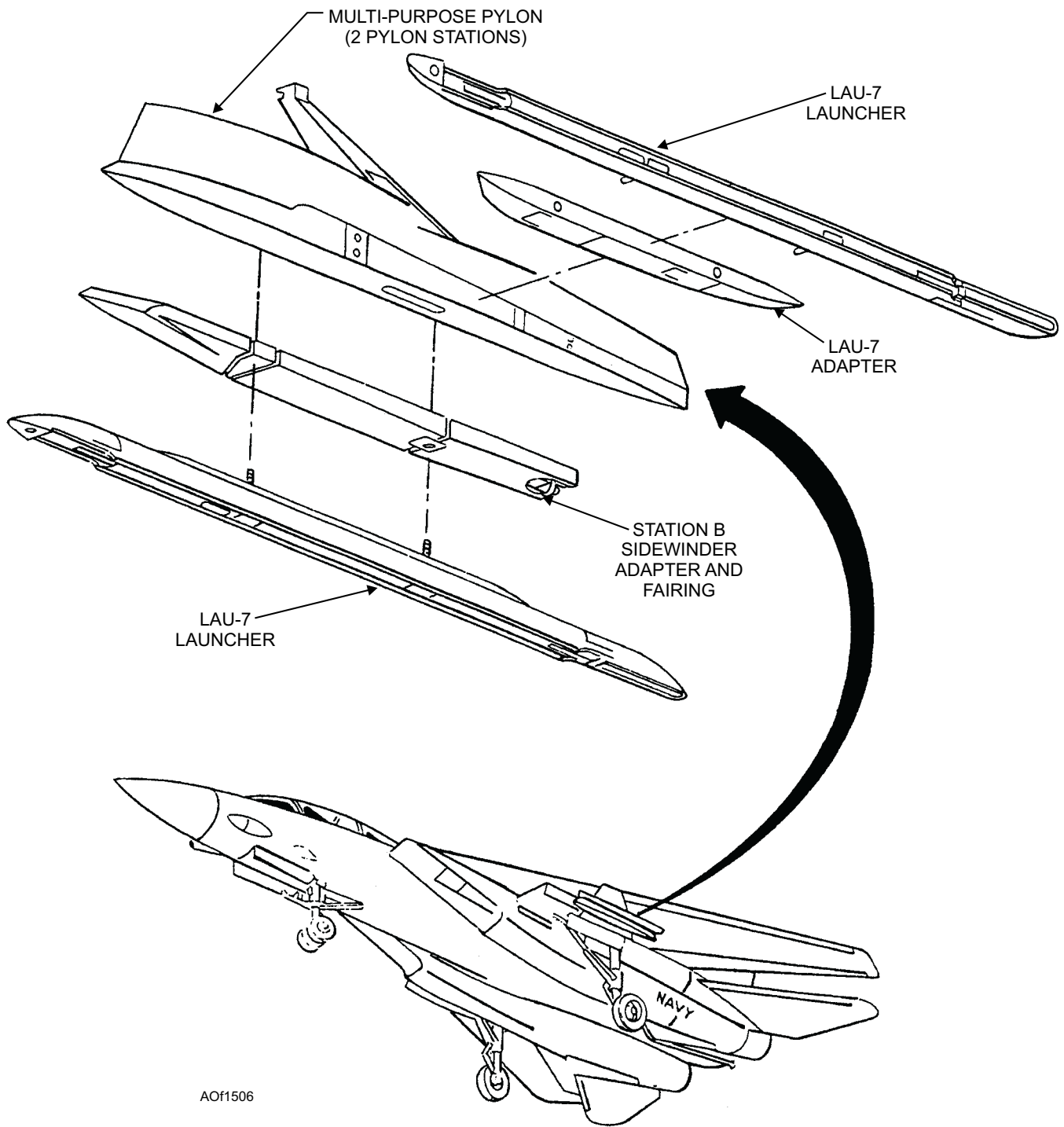


Figure 15-6.—LAU-7 configuration on aircraft.

The systems and subsystems of the F/A-18 aircraft armament system are discussed in the following text. The aircraft armament system, basic controls, and components all function in relation to each other.

Ground Power Control Panel Assembly

The ground power control panel assembly has four toggle switches. Three of these switches control the

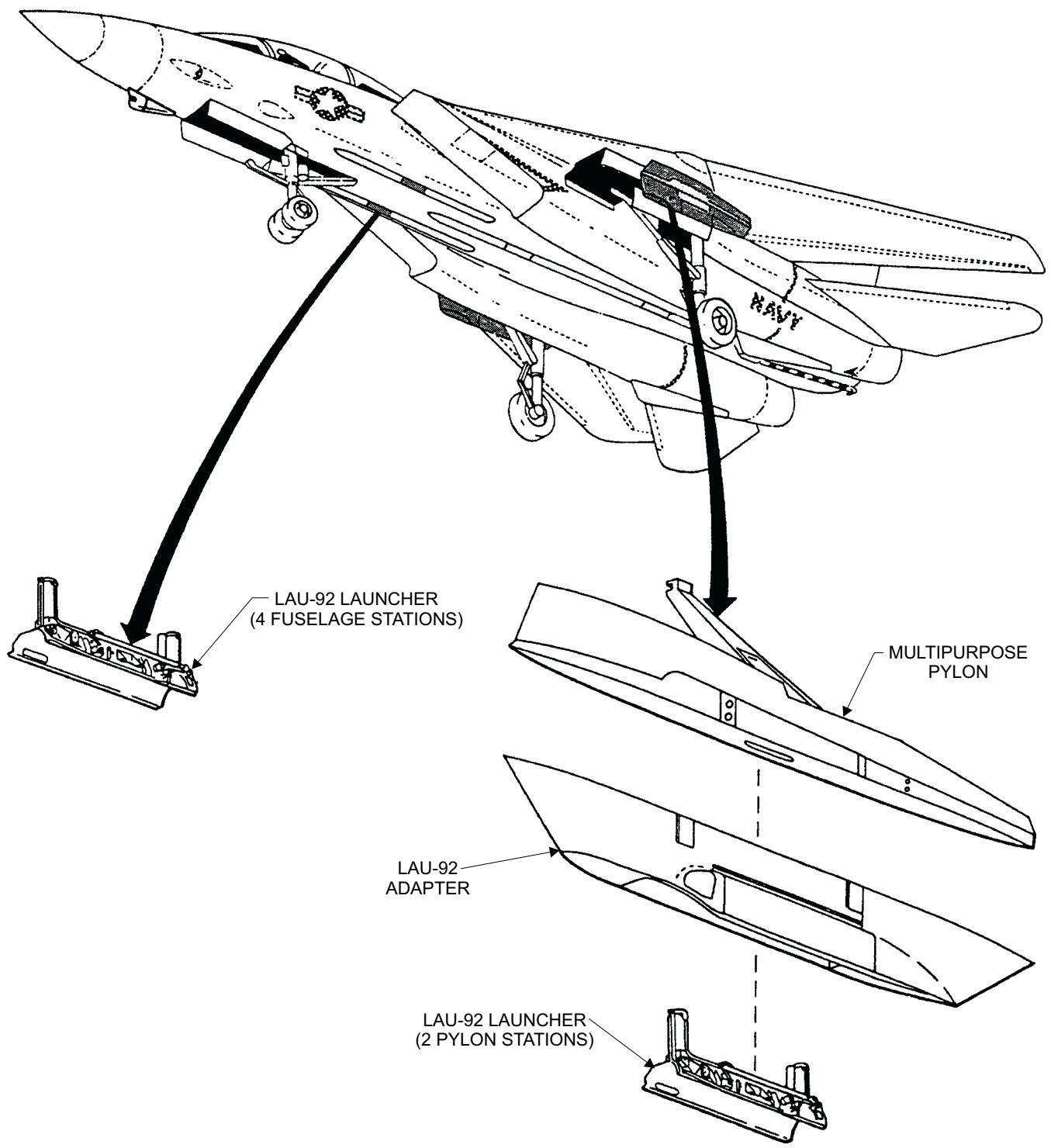


Figure 15-7.—LAU-92 configuration on aircraft.

application of external power to avionics and instrument systems. This prevents excessive equipment operating time because of other unassociated ground operations.

The EXT PWR (external power) switch is a three-position switch used to apply electrical power to the aircraft. In the NORM (normal) position, electrical power is supplied to the aircraft. In the OFF position,

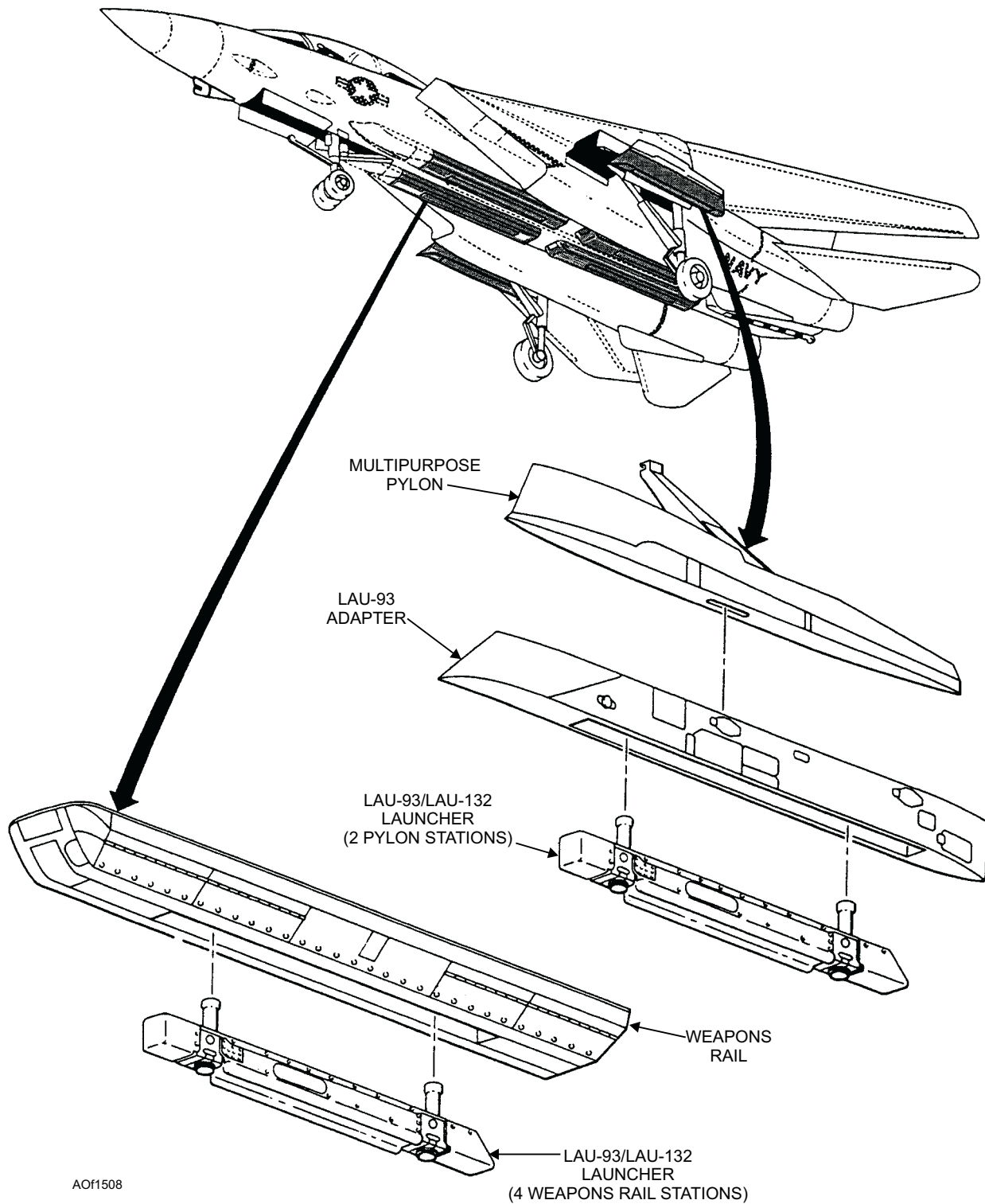


Figure 15-8.—LAU-93/LAU-132 configuration on aircraft.

no power is supplied to the aircraft. The RESET position resets power for the external monitoring circuit when there is a temporary overload. Switch 1 is a three-position switch with B ON to provide enabling power to the mission computers. Switch 2 is a three-position switch with B ON to provide enabling

power to the digital display indicators (DDIs). The B ON switch also enables power to the aircraft radar. Switch 3 is a three-position switch with B ON to provide enabling power to the armament computer stores management panel (SMP), AN/AWW-4 system, HARM system, and the AN/ALE-39 system.

ITER CABLE CONNECTIONS CAN BE PERFORMED WITH ADU-703 INSTALLED IN WEAPONS RAIL

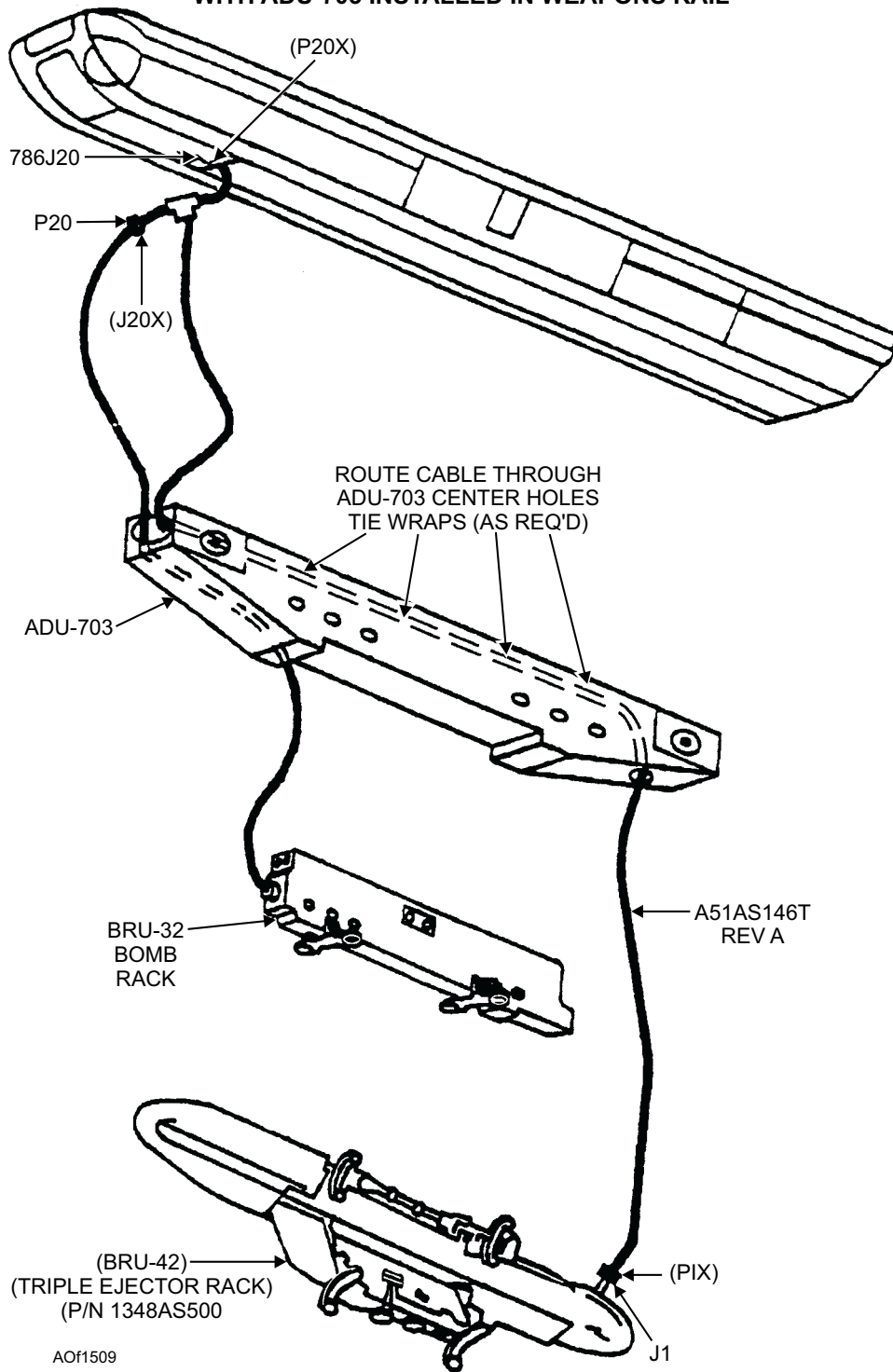
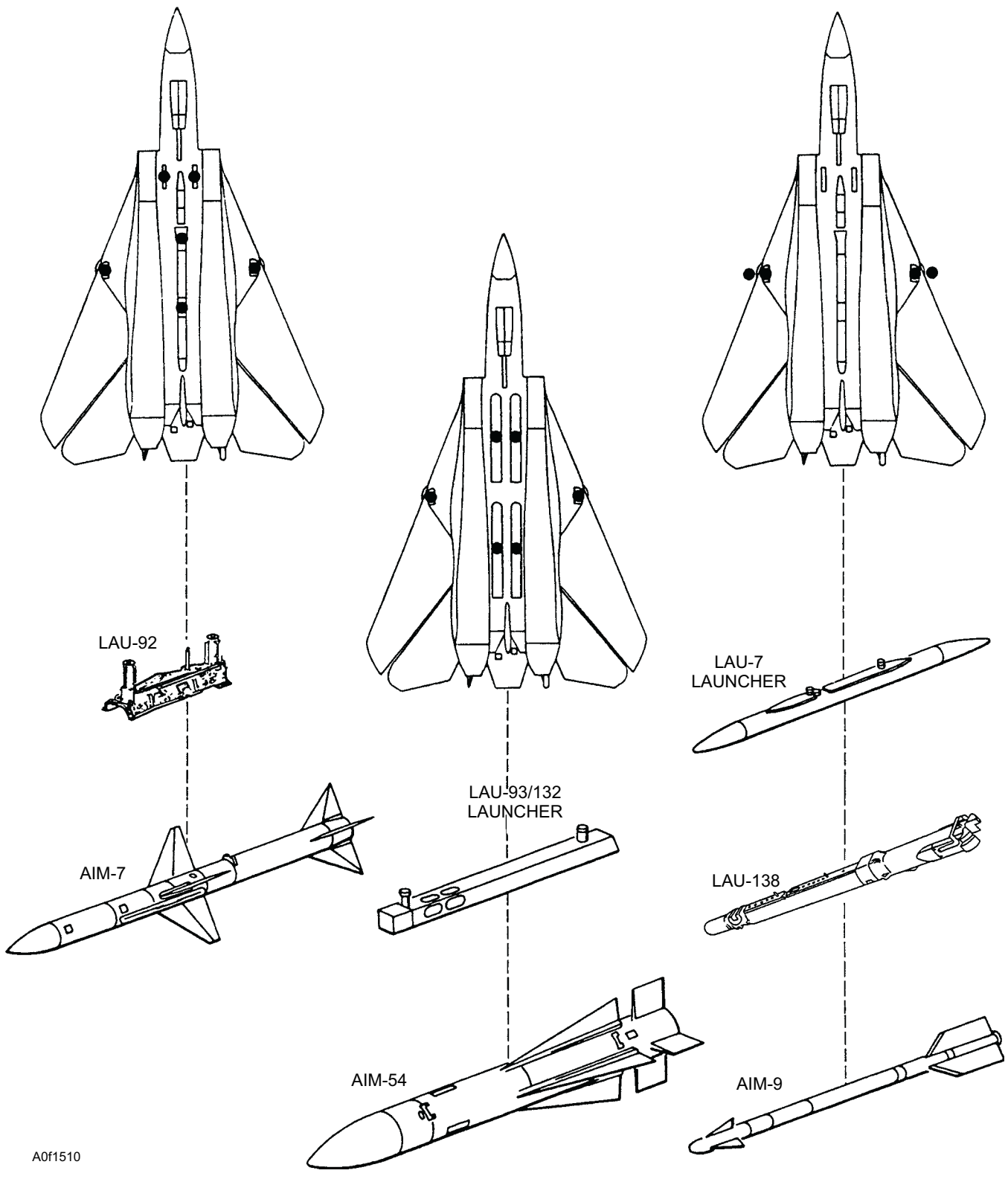


Figure 15-9.—BRU-32/BRU-42 (ITER) configuration.

REVIEW NUMBER 1 ANSWERS

- A1. *The F/A-18 is a dual-mission, fighter-bomber naval aircraft.*
- A2. *The F-14 aircraft incorporates the AN/ALE-39 chaff dispensing system.*

- A3. *When the landing gear handle is in the down position on the F-14 aircraft, the armament safety override switch is used to bypass the open loading gear safety circuit.*
- A4. *The F-14 aircraft can hold a maximum of six AIM-54 missiles.*



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Figure 15-10.—Air intercept missiles configuration on aircraft.

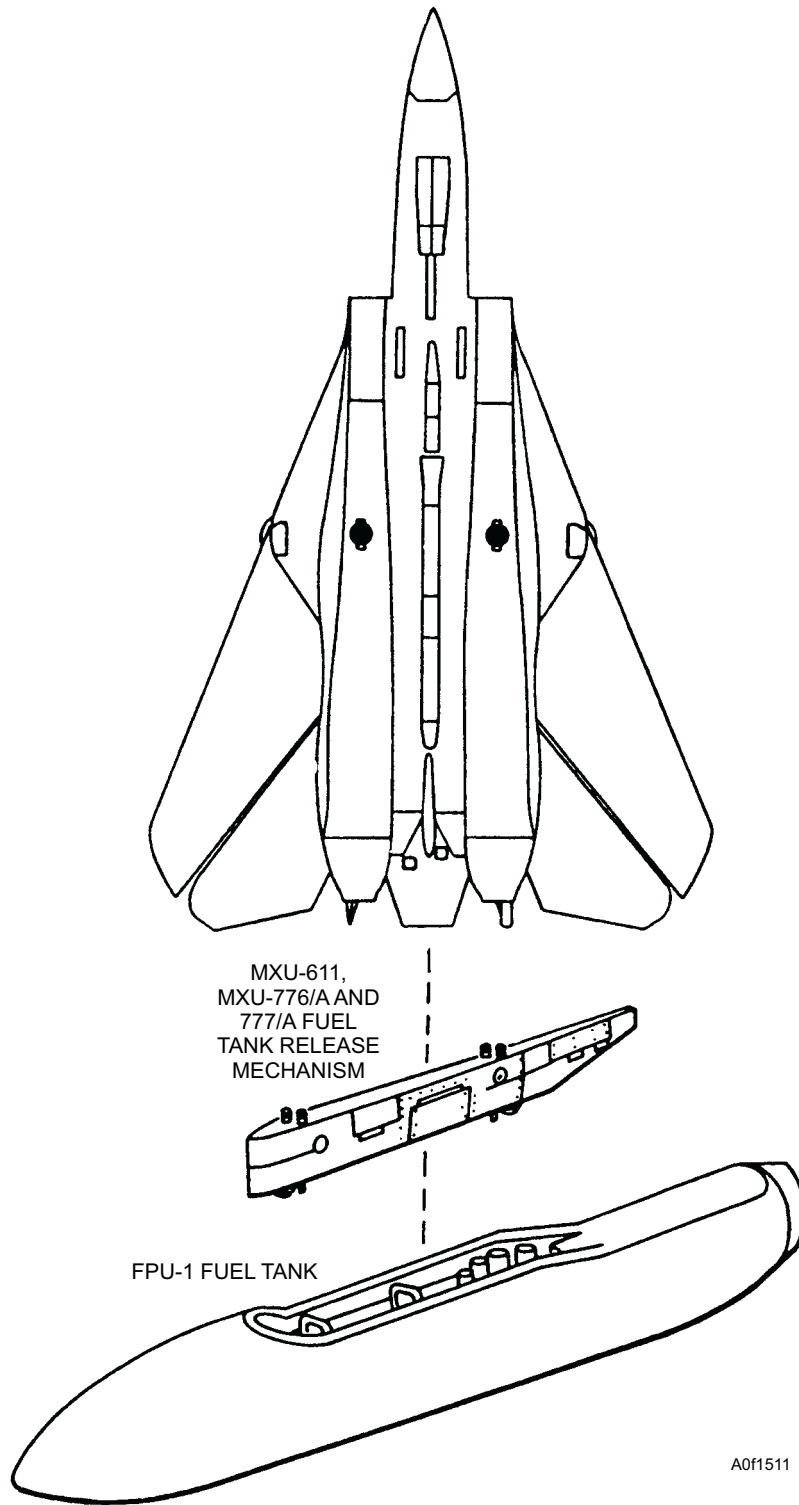


Figure 15-11.—Fuel tank configuration on aircraft.

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|--|--|
| <p>A5. <i>The fuselage stations of the F-14 aircraft used to suspend AIM-7 missiles include stations 3, 4, 5, and 6.</i></p> <p>A6. <i>The F-14 aircraft can hold a maximum of <u>four</u> AIM-9 missiles.</i></p> | <p>A7. <i>The stations of the F-14 aircraft that are used to carry Sidewinder missiles include stations 1A, 1B, 8A, and 8B.</i></p> <p>A8. <i>The HIGH and LOW rates of fire for the M61A1 gun, when it is mounted in the F-14</i></p> |
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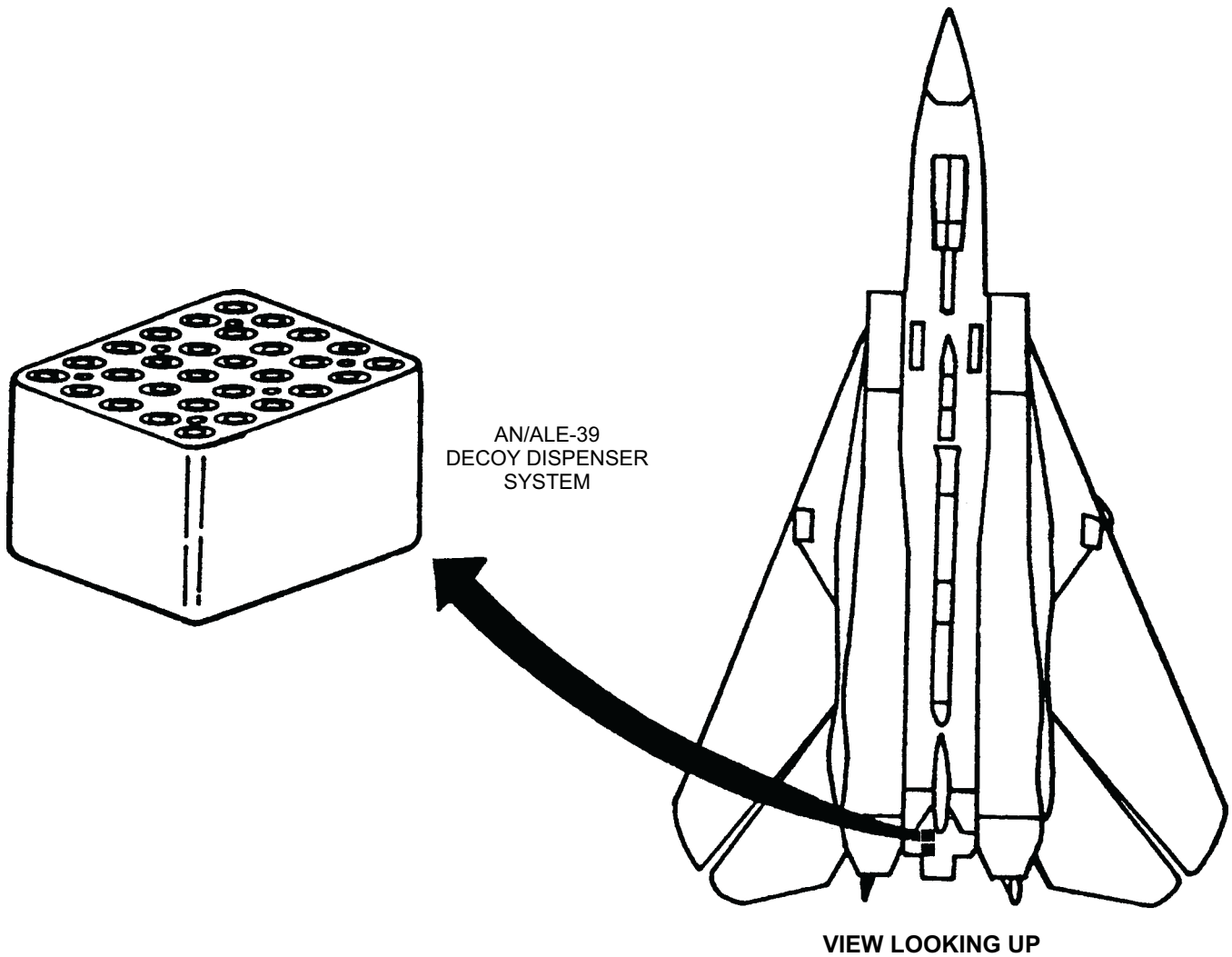


Figure 15-12.—Decoy dispenser configuration on aircraft.

aircraft, are HIGH—6,000 and LOW—4,000 rounds per minute.

- A9. The burst selector switch on the F-14 aircraft limits the number of rounds that are fired per burst.
- A10. The four jettison modes of the F-14 aircraft are as follows: (1) emergency, (2) ACM encounter, (3) selective, and (4) auxiliary.
- A11. The emergency jettison mode is the only one controlled by the pilot.

Landing Gear Control Handle

In the DN position, the LDG GEAR control (fig. 15-13) disables normal weapon release, launch, and fire signals. In the UP position, 28-volt dc power is applied from the main landing gear weight-off-wheels relay to the master arm circuit breaker.

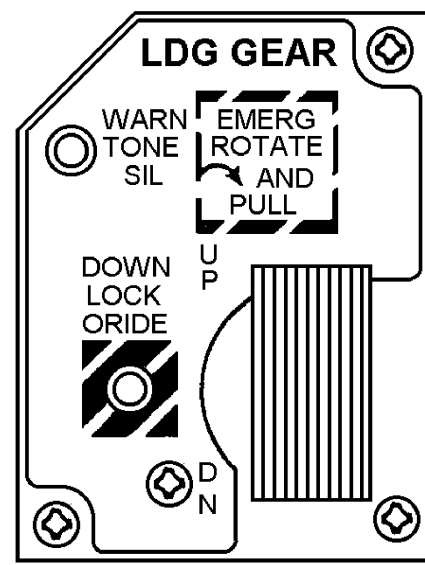


Figure 15-13.—Landing gear control handle.



Figure 15-14.—Armament safety override switch.

Armament Safety Override Switch

The armament safety override switch (fig. 15-14) is in the maintenance panel located in the nosewheel well. In the override position, it overrides the landing gear handle DN position so ground operational maintenance can be pulled on the weapon systems.

Master Arm Control Panel Assembly

The master arm control panel assembly (fig. 15-15) is located in the forward cockpit. It contains the A/A, A/G, and MASTER switches. The A/A and the A/G are

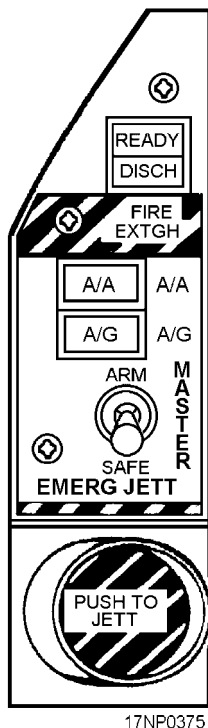


Figure 15-15.—Master arm control panel assembly.

push-button switches that provide a ground to the SMP. They select the air-to-air or air-to-ground computer modes, respectively. The MASTER switch is used with the LDG GEAR handle or the armament safety override switch. In the SAFE position, weapons cannot be released or fired, although emergency jettison can be initiated. The ARM position provides an input to the SMP and power for weapon release, fire, or jettison. The switch position (SAFE/ARM) is displayed on the DDIs in the wing-form display.

Aircraft Controller Grip Assembly

The aircraft controller grip assembly (fig. 15-16) contains the A/G weapons release switch (bomb release switch). The switch is spring-loaded to the OFF position. When the switch is pressed, it completes a circuit from the armament computer and provides an input back to the armament computer. The aircraft grip controller assembly also contains an A/A switch and the trigger switch, which is discussed later in this chapter.

Digital Display Indicators

The digital display indicators (DDIs) (fig. 15-17) are located on the rear cockpit instrument panel vertical consoles. The DDIs on aircraft 161354 through 163778 are connected in parallel with the DDIs in the front cockpit and respond to the last action taken by either pilot. Rear DDIs on F/A-18D 163986 and up have independent displays.

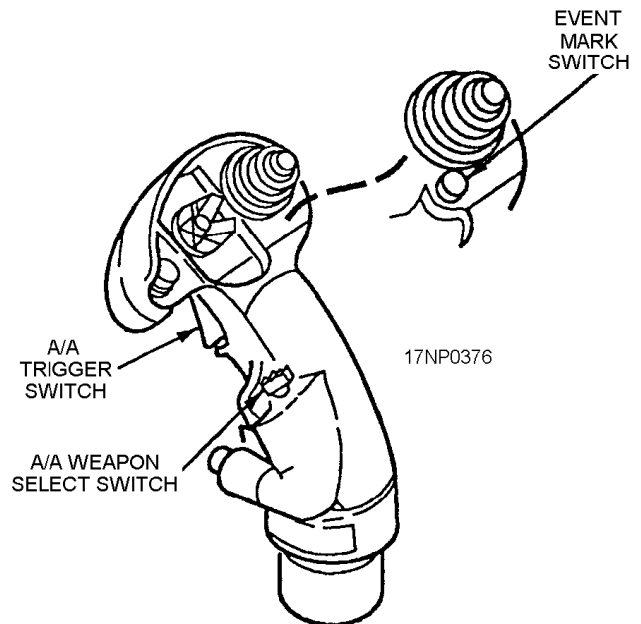
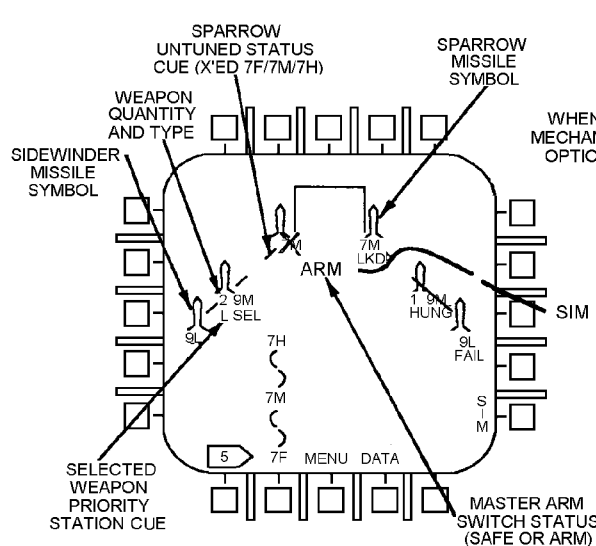
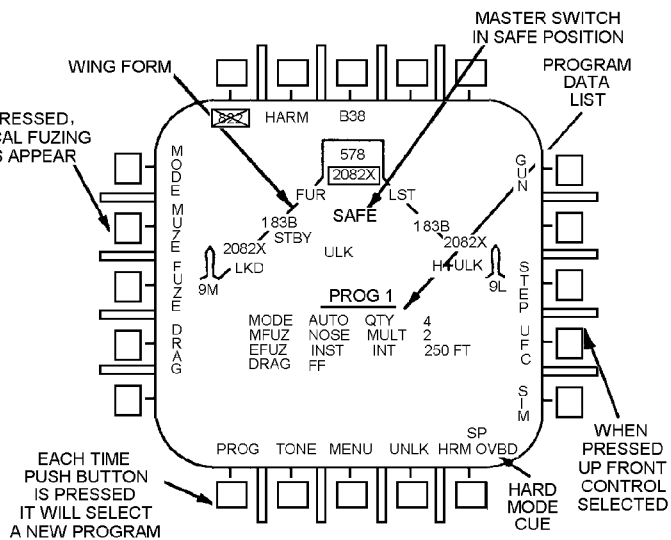


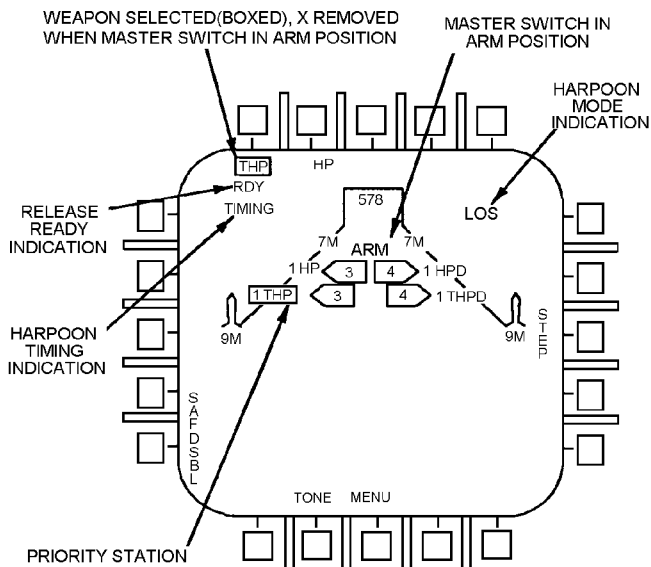
Figure 15-16.—Aircraft controller grip assembly.



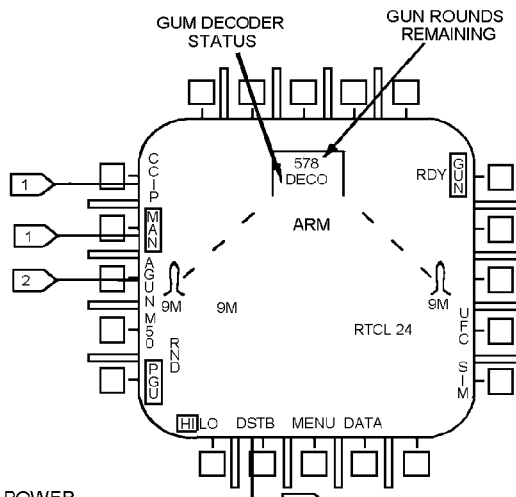
STORES DISPLAY AIR TO AIR



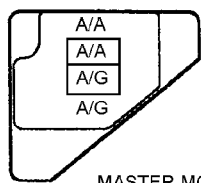
STORES DISPLAY AIR TO GROUND



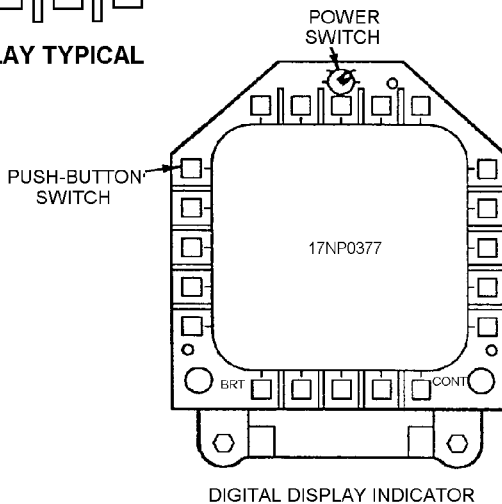
AGM DISPLAY TYPICAL



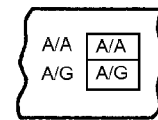
GUN DISPLAY



MASTER MODE SELECT PANEL



DIGITAL DISPLAY INDICATOR



REAR ADVISORY AND THREAT WARNING INDICATOR PANEL

Figure 15-17.—Digital display indicators.

Armament Computer

The armament computer (fig. 15-18) is interfaced with and controlled by the mission computers. The armament computer is also interfaced with and controls the weapon station command encoders-decoders. The armament computer has a weapon insertion panel (fig. 15-19) with code wheels. These code wheels are used to enter the code into the weapon-type (ARMAMENT) and nose or tail fuzes (FUZING). The weapon-type code **must** match the weapon loaded, and the nose fuze or tail fuze code **must be** compatible with the weapon or the armament computer won't allow it to release normally. For weapons without nose or tail fuzes, the codes must still match the weapon loaded.

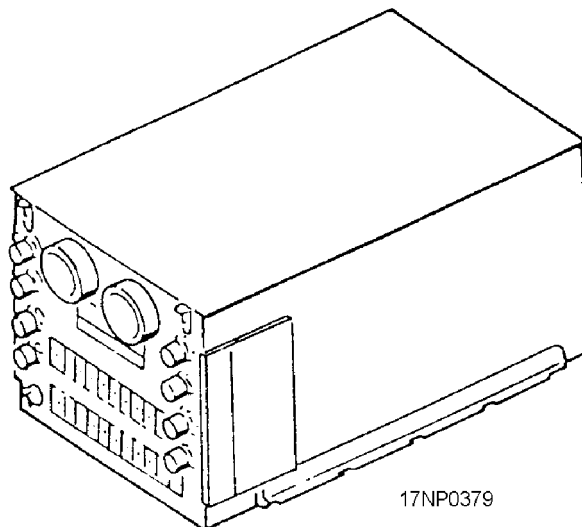


Figure 15-18.—Armament computer.

Digital Computers

Two digital computers make up the mission computer system and control the avionics systems. They interface with the armament computer and allow the armament computer to route power to the encoders-decoders for weapon release. The MC switch on the MC/HYD ISOL panel controls the digital computers.

Jettison System

The jettison system gives the pilot or crew a way to jettison weapons, stores, launchers, and fuel tanks. The jettison system has three modes of release—emergency jettison, selective jettison, and auxiliary jettison.

The emergency jettison mode jettisons all weapons from the five pylon stations.

The selective jettison mode individually jettisons the left fuselage missile, the right fuselage missile, racks, launchers, and stores.

The auxiliary jettison mode is a gravity mode to jettison the five pylon stations when emergency and/or selective jettison fails.

Bomb Release System

The bomb release system provides the aircraft with capabilities for release of conventional weapons. The

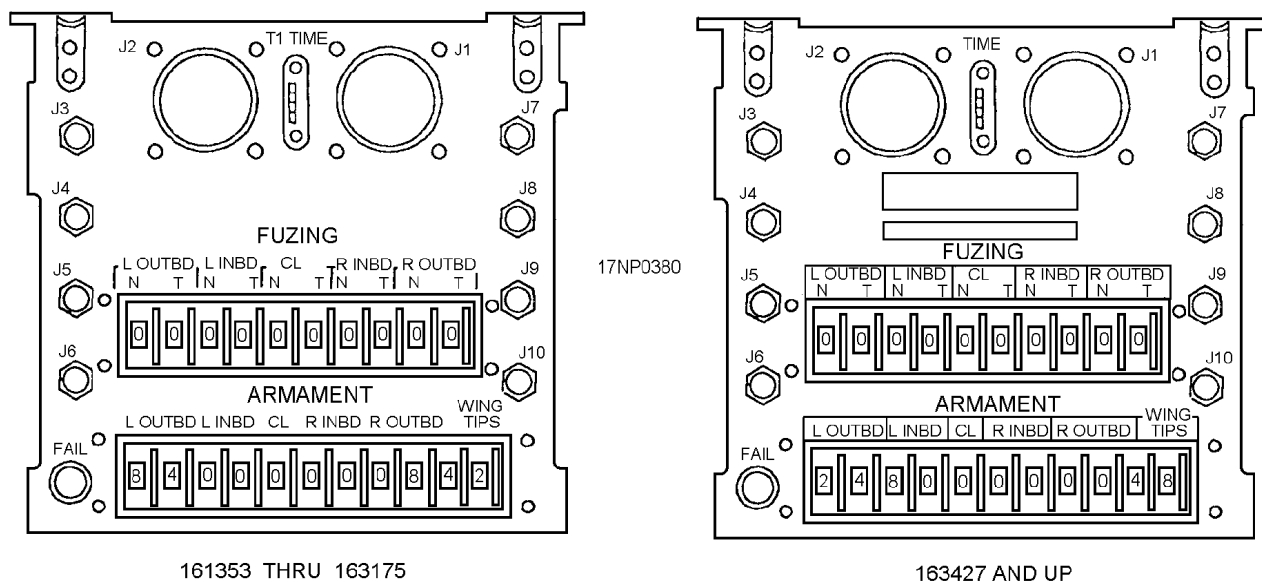


Figure 15-19.—Weapon insertion panel.

system uses the BRU-32, BRU-33, BRU-41, and BRU-42 gas ejector bomb racks for suspension and release of weapons. Normal release is provided in four electrically controlled modes of operation. The system consists of the A/G weapon release switch and weapon control system's basic controls and components.

AN/AWW-4 Fuze Function Control System

The AN/AWW-4 fuze function control system gives the aircraft the capability of using electric fuzes. The system uses the Mk 39 bomb arming unit in the BRU-32/A and BRU-33/A bomb racks. The Mk 39 bomb-arming unit denies all voltage to the weapon until it has actually separated from the bomb rack. Voltage is supplied by the PP-6419 power supply to the bomb-arming unit through the aircraft wiring. There are four voltages selected on the DDIs. When release is initiated, voltage is supplied through an inter-connecting cable to the weapon during the first few inches of fall of the weapon. No voltage is supplied to the bomb rack until the bomb release switch is pressed. The system consists of the PP-6419 power supply and the armament system's basic controls and components.

Rocket Firing System

The rocket firing system gives the aircraft the capability to fire rockets. The system uses the BRU-32/A and BRU-33/A bomb racks for suspension of the rocket launchers. When the bomb release switch is pressed, voltage is supplied through aircraft wiring to the vertical ejector rack (VER). Wiring within the VER allows the rocket to fire. The system consists of the armament system's basic controls and components.

Walleye Guided Weapon System

The Walleye guided weapon system gives the aircraft the capability for release and guidance of a Walleye weapon. The system uses the BRU-32/A bomb rack, bomb release system, and the AN/AWW-4 fuze function control system for fuzing. Video is supplied from the weapon through the aircraft wiring to the DDIs. No voltage is supplied to the bomb rack until the bomb release switch is pressed. The system consists of the CAGE/UNCAGE switch and the armament system's basic controls and components. The CAGE/UNCAGE switch is on the throttle. When the switch is pressed, it cages/uncages the weapon selected.

The AN/AWW-9B, AN/AWW-12A, and AN/AWW-13 data link systems are used with the Mk 21 and

Mk 27 Walleye weapons and with the Walleye guided weapon system. The data link systems provide control and guidance to these weapons by using a data pod that is externally mounted to the aircraft. The systems use the BRU-32/A bomb rack. Video is supplied from the weapons and pod to the DDIs through the aircraft wiring. The systems consist of the armament system's basic controls and components.

AGM-65 Maverick System

The AGM-65 Maverick system gives the aircraft the capability to fire a Maverick missile. The system uses the BRU-32/A bomb rack and the LAU-117/A launcher for suspension and firing of the Maverick missile.

AGM-84 Harpoon/SLAM/SLAM ER

The AGM-84 Harpoon/SLAM/SLAM ER system gives the aircraft the capability to fire an AGM-84 missile. The system incorporates the BRU-32 bomb rack for suspension.

AGM-88 HARM System

The AGM-88 HARM system gives an aircraft the capability to fire a HARM missile. The system incorporates the BRU-32/A bomb rack and the LAU-118/A launcher for suspension and firing. Control of the missile is supplied through the armament computer.

AGM-154 (JSOW)

The AGM-154 (JSOW) system gives the aircraft the capability to fire an AGM-154 (JSOW). The system incorporates the BRU-32 bomb rack for suspension.

AIM-7 Sparrow Fire Control System

The AIM-7 Sparrow fire control system gives the aircraft the capability to fire an AIM-7 missile. The system incorporates the LAU-116/A launcher for fuselage stations and the BRU-32/A bomb rack with the LAU-115C/A launcher on wing pylon stations for suspension and firing. Control of the missile is supplied through the armament computer and the radar system.

AIM-9 Sidewinder Fire Control System

The Sidewinder fire control system gives an aircraft the capability for firing an AIM-9 missile. The

system uses the LAU-7 launcher for wing tip stations and the BRU-32/A bomb rack with an LAU-115C/A launcher configured with the LAU-7 launcher on wing pylon stations for suspension and firing. Control of the missile is supplied through the armament computer.

AIM-120 (AMRAAM) Fire Control System

The AIM-120 AMRAAM fire control system incorporates the LAU-116A/A launcher for fuselage stations and the BRU-32 bomb rack with a LAU-115C/A launcher configured with LAU-127A/A launchers on wing pylon station for suspension.

M61A1 20-MM Gun System

The M61A1 20-mm gun system gives an aircraft the capability to fire this gun. The system enables selecting, arming, and firing. Depending on the mission objective, the gun can be operated in the air-to-air (A/A) or air-to-ground (A/G) computer mode. There are two A/G modes—continuously computed impact point (CCIP) and manual (MAN). There are three A/A modes—director, disturbed, and cage. Control of the gun is supplied through the SMP. No voltage is supplied to fire the gun until the trigger switch is pulled and all landing gear is up and locked. The gun fire control system consists of four subsystems—the gun and associated ammunition feed, hydraulics, gun gas purging and ammunition cooling, and gun electronics.

AN/ALE-39 Decoy Dispensing System

The AN/ALE-39 decoy dispensing system gives an aircraft the capability to dispense chaff or flares. The decoy rounds are contained in two dispensers at the fuselage underside area. Control is supplied through the SMP. The system consists of the dispenser/ECM control panel, engine throttle lever grip assembly, left console DISP switch, AN/ALE-39 programmer, two AN/ALE-29A dispensers, MX-7721/ALE-29A dispenser housings, two 1874/ALE-39 sequencer switches, and the armament system's basic controls and components.

Aircraft Armament Configuration Capabilities

The basic armament configuration of the F/A-18 aircraft consists of LAU-116/A missile launchers, LAU-7 missile launchers, SUU-63/A pylons, SUU-62/A pylon, BRU-32/A bomb racks, and an M61A1 20-mm gun.

The F/A-18 basic armament configuration can be reconfigured to accommodate a variety of weapons. Figure 15-20 shows the station configuration capabilities.

If you want more information about authorized aircraft configurations and weapons loading, refer to *A1-F18AA-TAC-000*, volume 1, and *A1-F18AA-TAC-100*, volume 2, *NATOPS Tactical Manual*. A general description of the F/A-18 armament systems and suspension or releasing equipment is contained in the *Airborne Weapons/Stores Loading Manual*, A1-F18AAA-LWS-000.

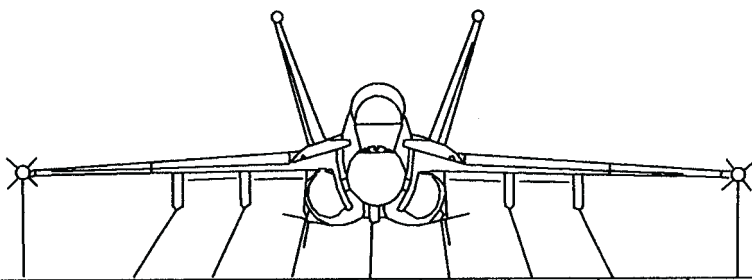
REVIEW NUMBER 2

- Q1. In the F/A-18 aircraft, the armament safety override switch is located on the _____.*
- Q2. List the jettison modes of the F/A-18 aircraft.*
- Q3. If the emergency jettison is selected on the F/A-18 aircraft, what weapons are released?*
- Q4. Under what condition would the auxiliary jettison mode be used in the F/A-18 aircraft?*
- Q5. What fuze function control system gives the F/A-18 aircraft the capability of using electric fuzes?*
- Q6. To suspend and fire the Maverick missile from the F/A-18 aircraft, you should use what bomb rack and launcher combination?*
- Q7. What missile launcher should you use to suspend the AGM-88 HARM missile on the F/A-18 aircraft?*
- Q8. What missile launcher is used on the wing pylon stations of the F/A-18 aircraft to suspend and launch an AIM-7 Sparrow missile?*

ANTISUBMARINE WARFARE WEAPONS SYSTEMS

LEARNING OBJECTIVE: *Identify anti-submarine warfare weapons systems to include the basic system, the kill store system, the release and control system, the release and control systems checks, and weapons system maintenance.*

Antisubmarine warfare (ASW) is becoming a broad field. New developments are being made in submarine detection as well as in the tactical deployment of the equipment. The search stores



EQUIPMENT	9	8	7	6	5	4	3	2	1
SUU-62 PYLON					X				
LAU-116 SERIES LAUNCHER				X		X			
MER/BRU-41/BRU-42		X	X				X	X	
BRU-33 (VER)		X	X		X		X	X	
BRU-32 BOMB RACK		X	X		X		X	X	
SUU-63 PYLON		X	X				X	X	
LAU-117 LAUNCHER		X	X				X	X	
LAU-118 LAUNCHER		X	X				X	X	
LAU-115 SERIES LAUNCHER		X	X				X	X	
LAU-115 SERIES LAUNCHER WITH TWO LAU-7 OR LAU-127 LAUNCHERS		X						X	
LAU-115C/A WITH TWO LAU-127 LAUNCHERS		X	X				X	X	
LAU-7 LAUNCHER	X								X

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Figure 15-20.—F/A-18 aircraft station configuration capabilities.

(primarily sonobuoys), launched at precise intervals and locations and with the airborne electronics equipment, give accurate information in the detection of submarines. The kill stores consist of torpedoes,

mines, bombs, rockets, and guided missiles. The basic ASW search and kill store system and its associated equipment are currently used in the P-3 and S-3 fixed-wing aircraft and the SH-60 rotary-wing aircraft.

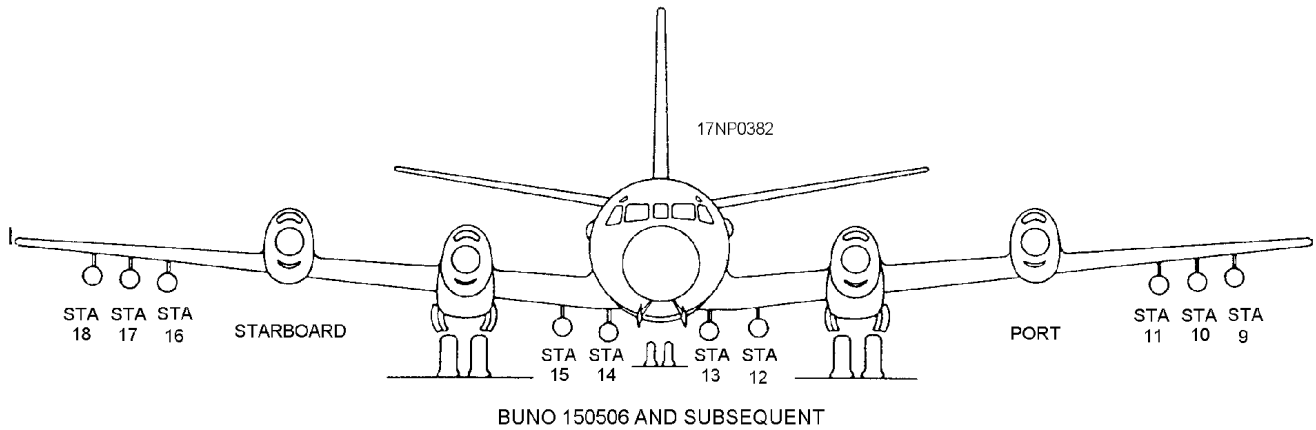


Figure 15-21.—P-3 ordnance stations.

P-3 AIRCRAFT

The basic P-3 (fig. 15-21) ASW weapons system consists of the equipment and accessories necessary for carrying and releasing kill stores and search stores. The system's equipment and accessories are discussed in the following text.

Pilots Armament Control Panel

The armament control panel provides the pilot with control of all kill and search stores.

Pilots Search Stores Control Panel

The pilots search stores control panel provides the pilot with operational control of the search stores system and provides a visual indication of the stores that are loaded and are available for release.

TORP Presetter Panel

This panel provides the controls and indicators for manual or automatic preset of Mk 46 or Mk 50 torpedoes.

Weapon Release Switches

The pilot and copilot have two switches for release of weapons other than missiles. Release of kill stores by the tactical coordinator is limited to bombs and torpedoes.

Harpoon Aircraft Command Launch Control (Missile Control Panel)

The missile control panel provides power application, controls, and displays for the Harpoon

missile. The controls and displays are used for manually defining missile selection or deselecting, warhead fusing, target range and relative bearing, attack and seeker modes, and aircraft true airspeed and altitude inputs.

Data Processor Computer (DPC)

The data processor is a digital computer that provides the digital communications link between the Harpoon Aircraft Command Launch Control System (HACLCS) and the Harpoon missile.

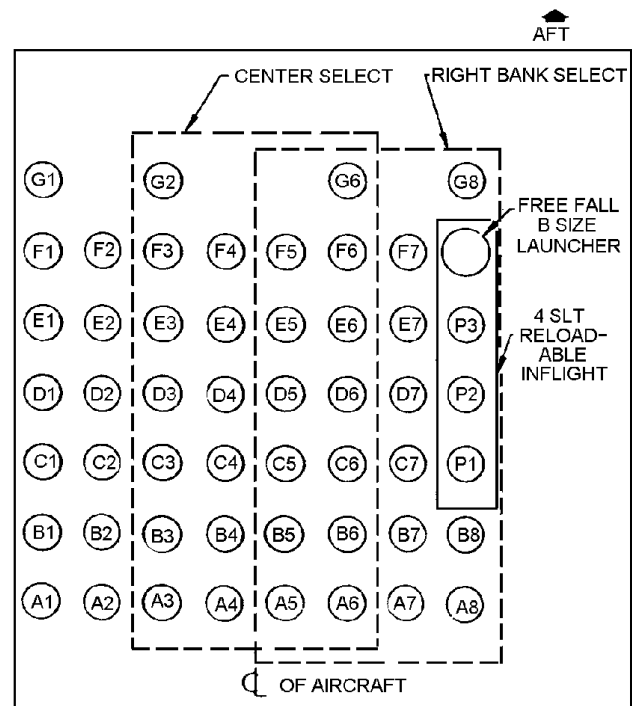


Figure 15-22.—P-3 sonobuoy launch tube arrangement.

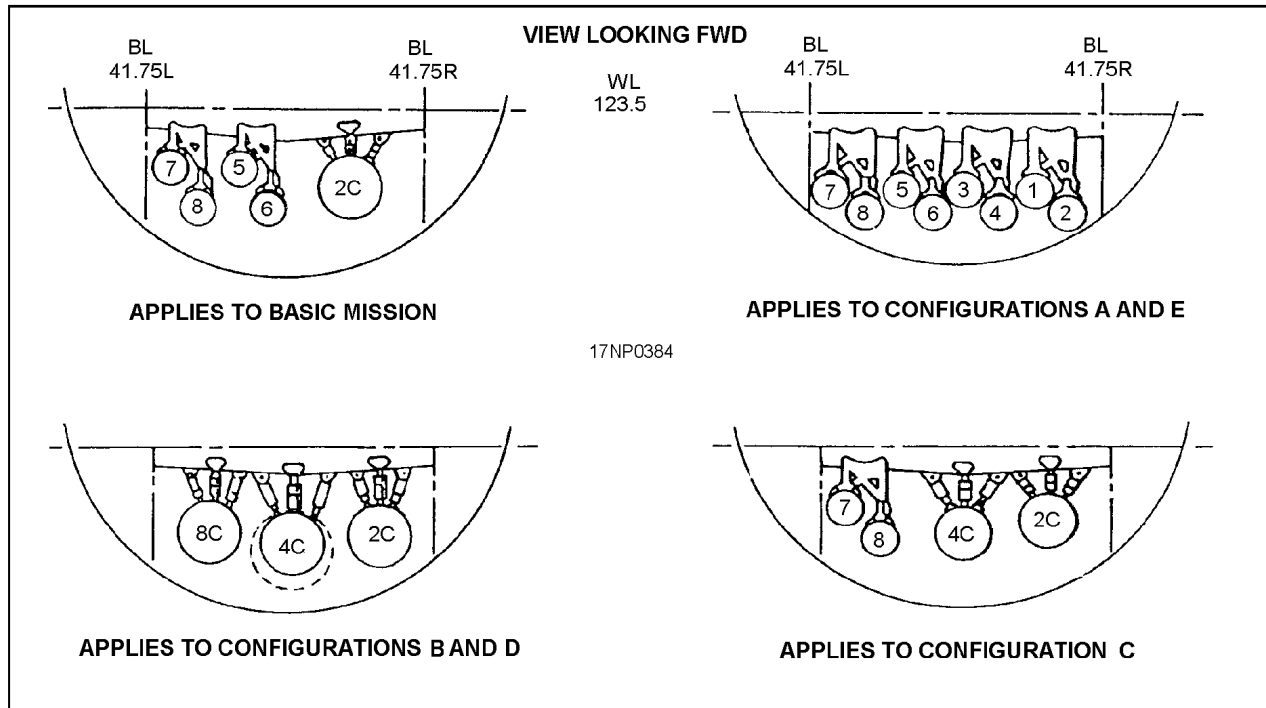


Figure 15-23.—Bomb bay weapons stations.

Armament Subsystems

The following text provides general information on the aircraft armament subsystems and components.

WEAPON SYSTEM.—The weapon system consists of the equipment and accessories necessary for loading, carrying, and releasing of kill and search stores. There are two subsystems, the armament (kill store) subsystem and the ordnance (search store) subsystem. The armament system refers to carriage and delivery of weapons or stores from the wing and bomb bay stations. The ordnance system refers to equipment used for carriage and delivery of search stores. A maximum of 8 bomb bay stations and 10 wing stations are available for carriage of weapons. There are 48 unpressurized sonobuoy launch tubes (SLT), 3 pressurized SLT, and 1 free-fall chute used with the search store system (fig. 15-22).

BOMB BAY SYSTEM.—The bomb bay has a maximum of eight stations available at one time. The eight basic stations are arranged in two layers; odd numbered stations in the upper layer and even numbered stations in the lower layer. This configuration limits the release of weapons from the

upper layer until the interfering weapon on the lower level has been released. Bomb racks are attached to removable pylons with two types of pylons (primary pylon and 1,000- to 2,000-pound class store pylon). Bomb rack installations are assigned a number or a number followed by a letter (fig. 15-23).

BOMB BAY CONFIGURATION.—There are four primary pylon assemblies (fig. 15-24) provided for carrying a maximum of eight bomb bay stores. The pylon consists of two BRU-12/A bomb racks (fig. 15-25) mounted between two pylon ends. There are three 1,000- or 2,000-pound class store pylon assemblies (fig. 15-26) provided for carrying a maximum of three 1,000- or one 2,000-pound class weapon. The pylon assembly consists of a BRU-14/A bomb rack with mounting adapters on station 4C. The Aero 1A adapters provide the BRU-14/A bomb rack with 30-inch suspension and load capabilities. Figures 15-27 through 15-32 show the various wing stations and bomb bay equipment configurations.

For more information on the P-3 aircraft, refer to *Airborne Weapons/Stores Loading Manual*, NAVAIR 01-75PA-75.

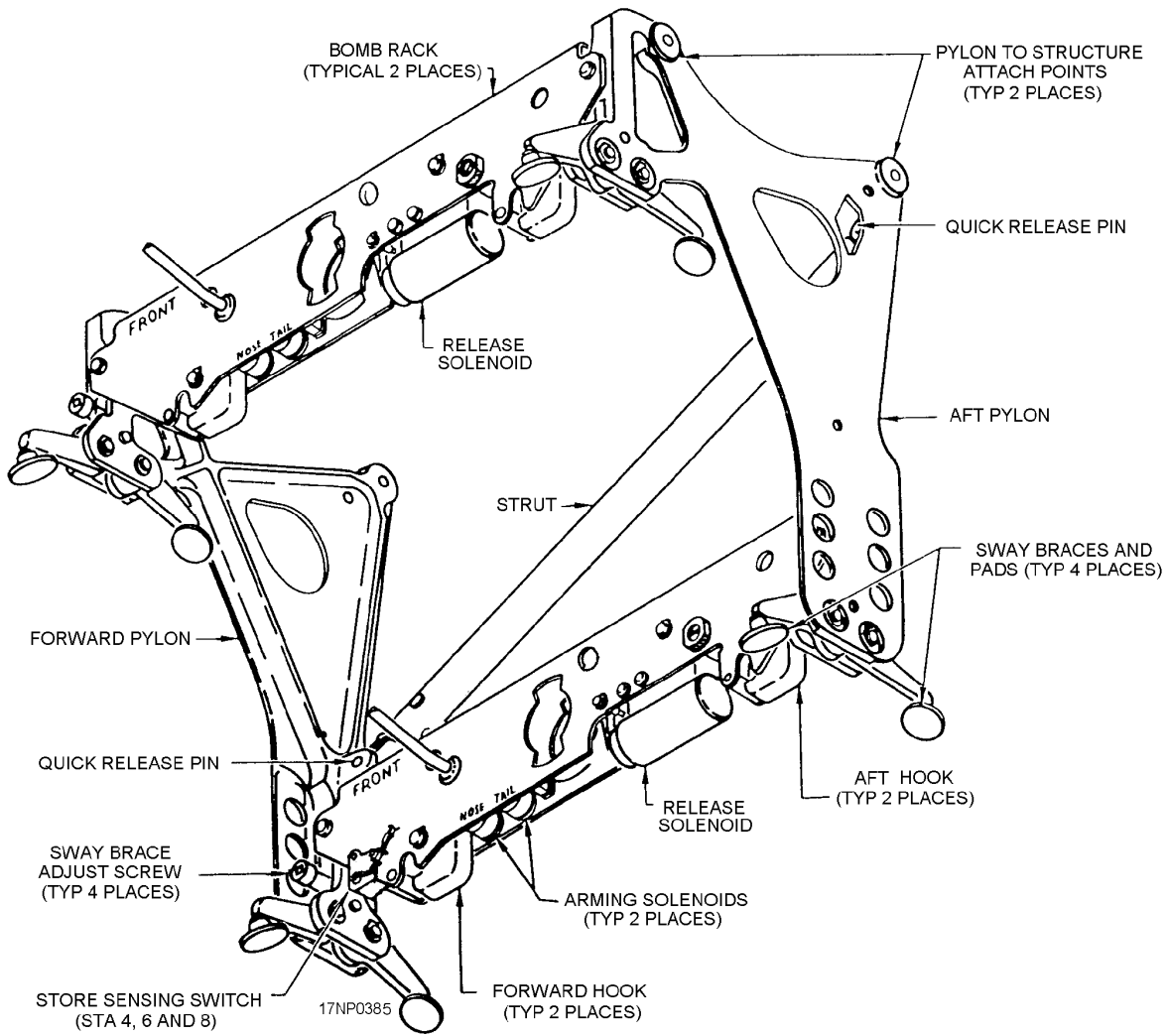


Figure 15-24.—Primary pylon assembly.

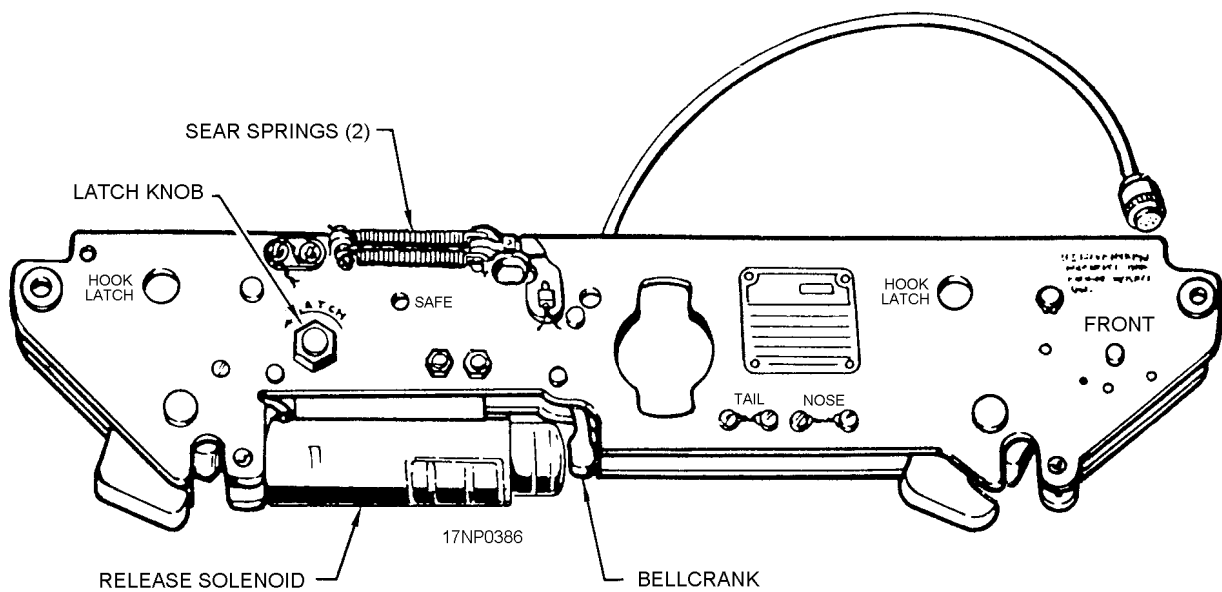


Figure 15-25.—BRU-12/A bomb rack.

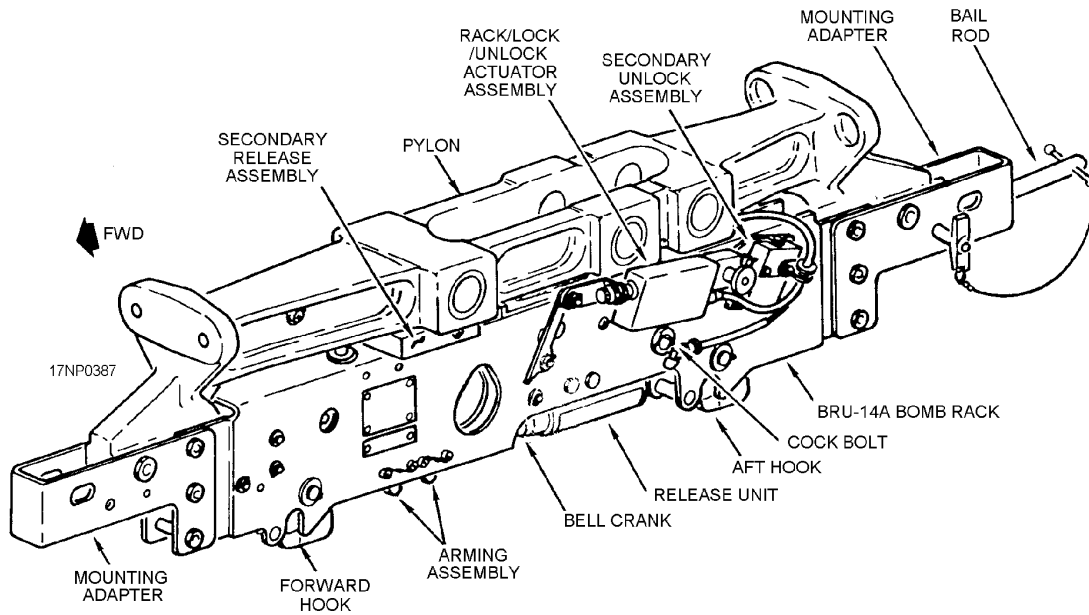


Figure 15-26.—P-3 1,000- or 2,000-pound class store pylon assembly with BRU-14/A bomb rack.

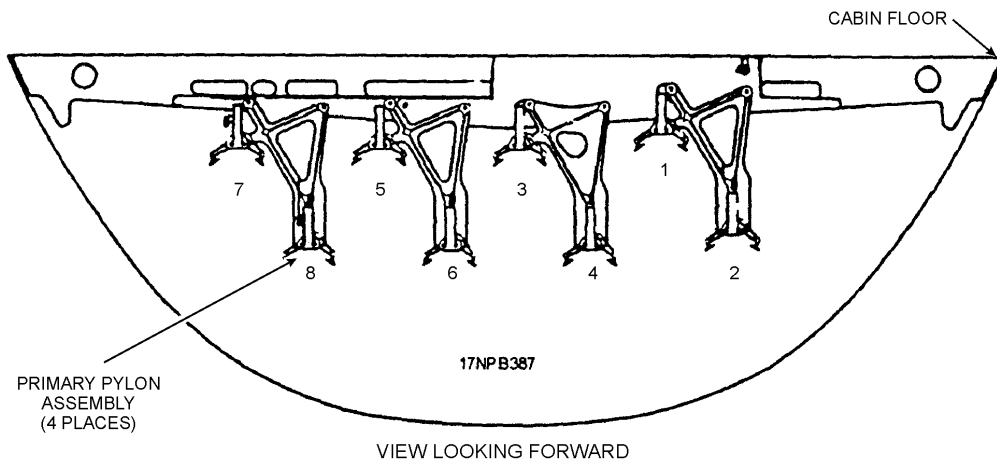


Figure 15-27—Bomb bay configuration with four primary pylons.

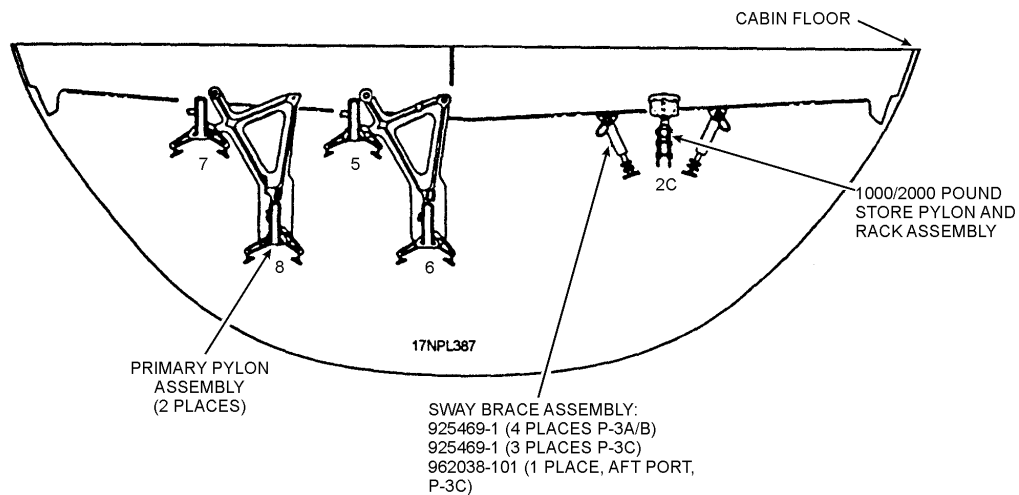


Figure 15-28.—Bomb bay configuration with two primary pylons and one 1,000- or 2,000-pound store pylon.

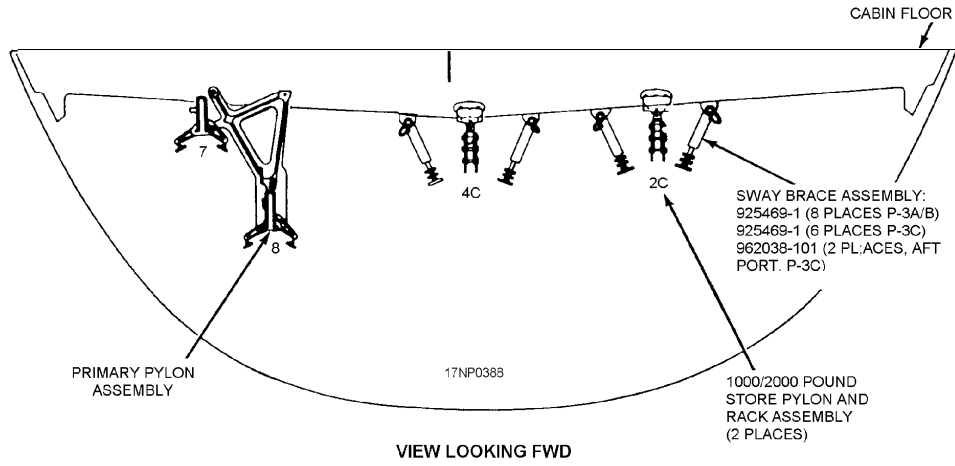


Figure 15-29.—Bomb bay configuration with one primary pylon and two 1,000- or 2,000-pound store pylons.

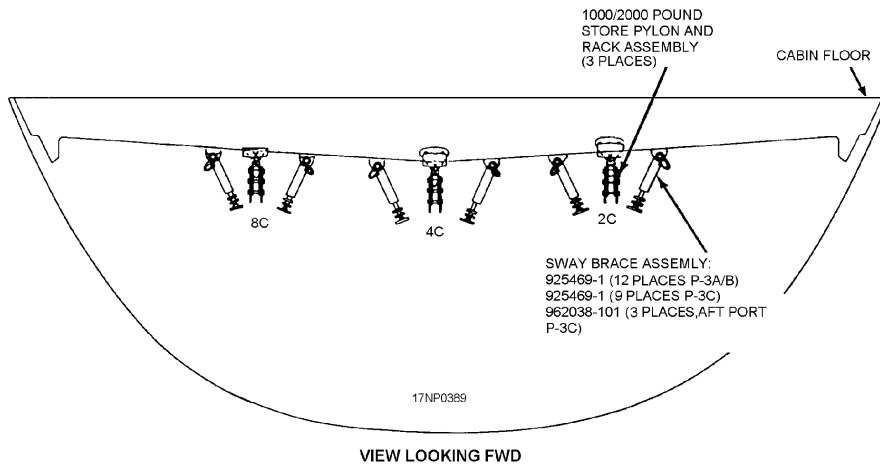


Figure 15-30.—Bomb bay configuration with three 1,000- or 2,000-pound store pylons.

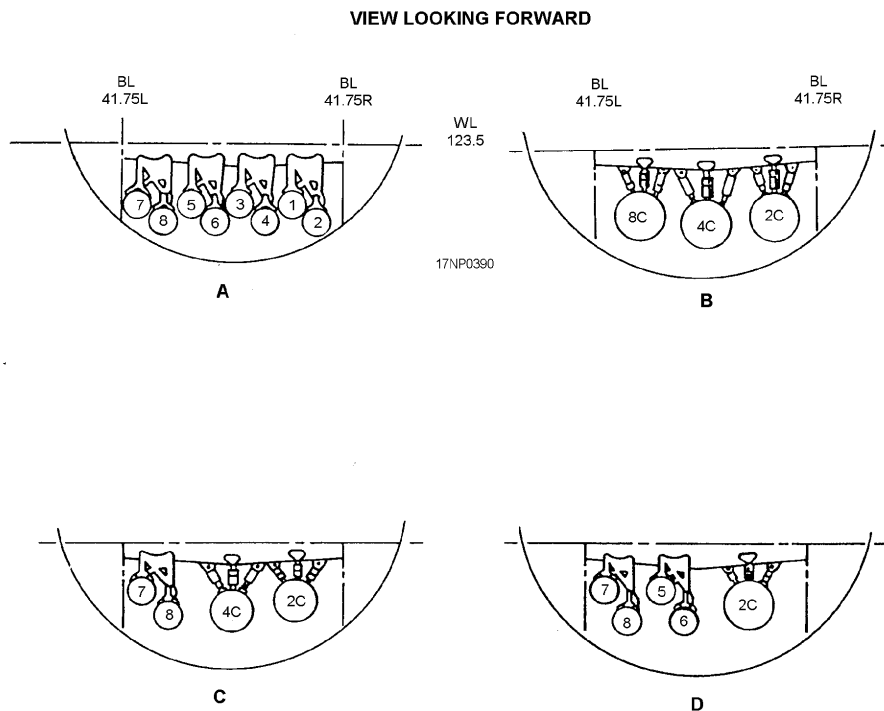
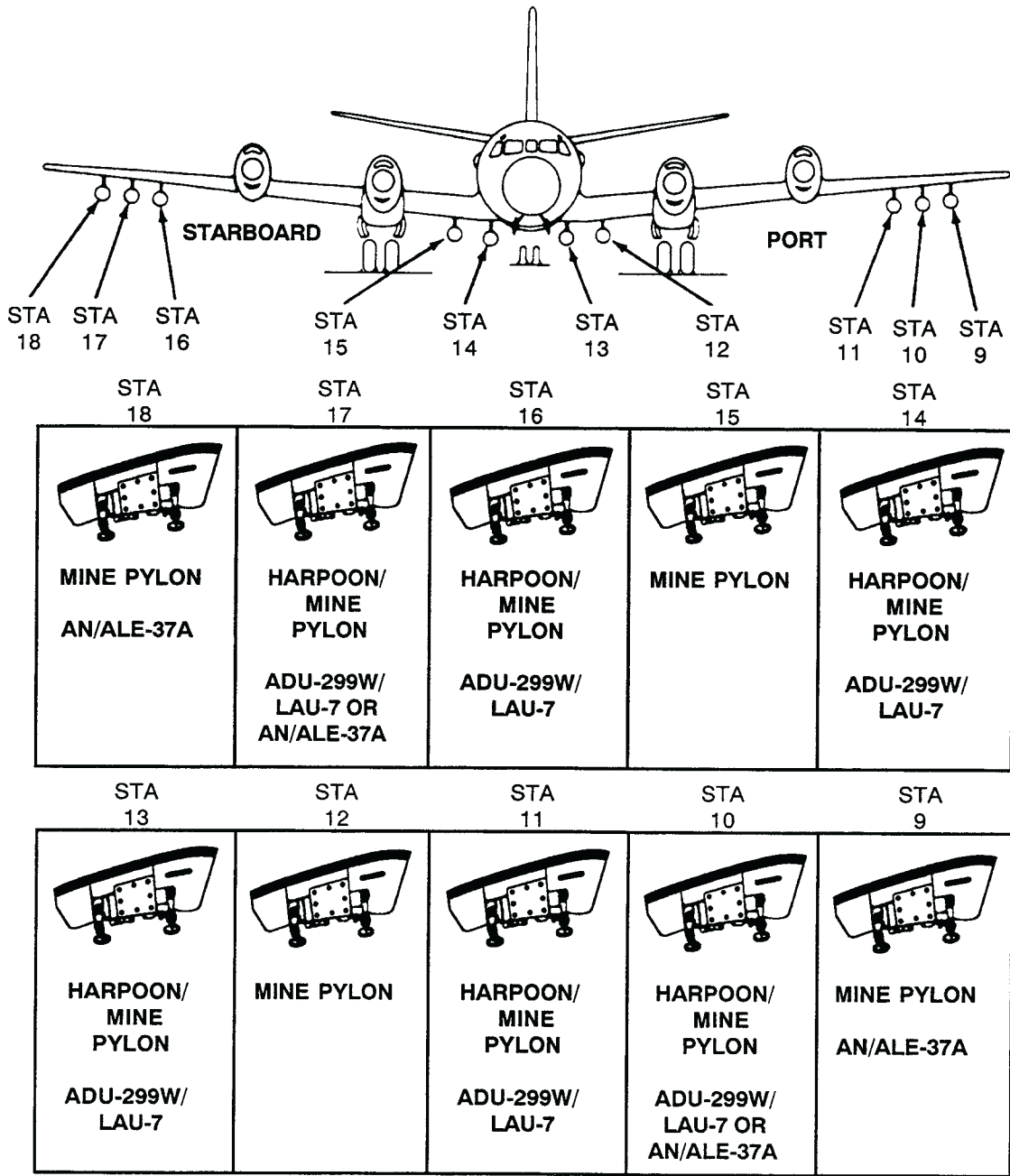


Figure 15-31.—Various bomb bay configurations.



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Figure 15-32.—Wing station configurations.

S-3 AIRCRAFT

The S-3 (fig. 15-33) weapon control system has the units, panels, switches, logic circuits, interfaces, computer, and controls necessary for selecting, arming, and releasing the kill or search stores. Status lights indicate store selection errors and stores go or no-go status. Electrical jettison release systems are used to release or eject all the wing stores and all search stores of the S-3 aircraft.

REVIEW NUMBER 2 ANSWERS

- A1. *In the F/A-18 aircraft, the armament safety override switch is located on the maintenance panel in the nosewheel well.*
- A2. *The jettison modes of the F/A-18 aircraft include (1) emergency, (2) selective, and (3) auxiliary.*
- A3. *If the emergency jettison is selected on the F/A-18 aircraft, all weapons from the five pylon stations are released.*
- A4. *The auxiliary jettison mode is used in the F/A-18 aircraft when emergency and/or selective jettison fails. It is a gravity jettison mode.*

- A5. *The AN/AWW-4 fuze function control system gives the F/A-18 aircraft the capability of using electric fuzes.*
- A6. *To suspend and fire the Maverick missile from the F/A-18 aircraft, you should use the BRU-32A and the LAU-117/A combination.*
- A7. *You should use the LAU-118/A to suspend the AGM-88 HARM missile on the F/A-18 aircraft.*
- A8. *The LAU-115C/A missile launcher is used on the wing pylon stations of the F/A-18 aircraft to suspend and launch an AIM-7 Sparrow missile.*

Armament Control Panel

The armament control panel (ACP) provides the pilot with control for the manual delivery of forward-firing weapons, droppable stores, and the release of the SAR sonobuoy.

AN/ALE-39 Countermeasures Dispensing System

The system dispenses expendable payloads that consist of chaff, flares, or RF jammers, either individually or in-groups. Three dispensers are

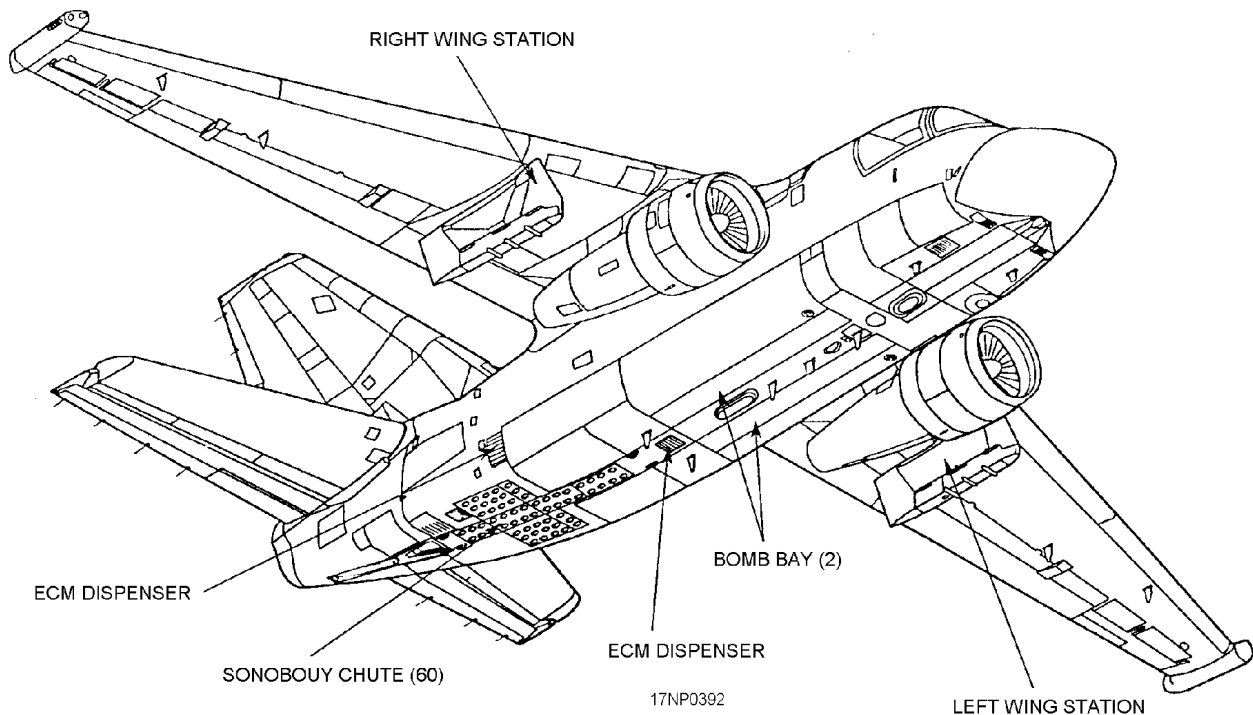


Figure 15-33.—S-3 aircraft configuration.

installed in the aircraft, one on each side of the fuselage and one on the centerline on the fuselage bottom.

Search Store System

The search store system has the necessary equipment and accessories to carry and release sonobuoys. Also, the sono system can carry and release several other search-related stores.

Part of the search store system consists of unpressurized size A sonobuoy launch tubes (SLTs). These are installed in the underside of the aircraft fuselage. There are 60 SLTs. The SLTs are not accessible from the pressurized aircraft cabin (flight station); therefore, the designation "unpressurized." The SLTs may be reloaded only from the outside of the aircraft. Look at figure 15-34. It shows the arrangement of the SLTs as you look up at the lower fuselage.

Bomb Bay System

The bomb bay system consists of the units and components needed to carry, arm, and release stores. The bomb racks are attached to brackets mounted to the aircraft in a cruciform pattern. Each of these basic installations is assigned a station number. Numbers followed by a letter (such as A or B) designate these stations for special capacities or types of stores. These stations are arranged in pairs, such as stations 1 and 2, 3 and 4, etc.

For ground maintenance without power on the S-3, you need to use a 3/8-inch drive crank to open or close the doors. Both aircraft have a ground safety pin to disable the door mechanism in the open position. **The door safety pin must be inserted when you are working in the bomb bays.**

The release of bomb bay stores is normally accomplished by the computer, as programmed by the TACO and controlled by the TACO with copilot backup. The pilots have final control because they must activate the master arm switch.

S-3 Configurations

The S-3 bomb bay suspension has two BRU-14/A bomb racks. The racks are suspended from the bomb bay overhead support braces. Arranging the racks in various locations on the support braces makes different configurations. Figure 15-35 shows the configurations available for each bomb bay.

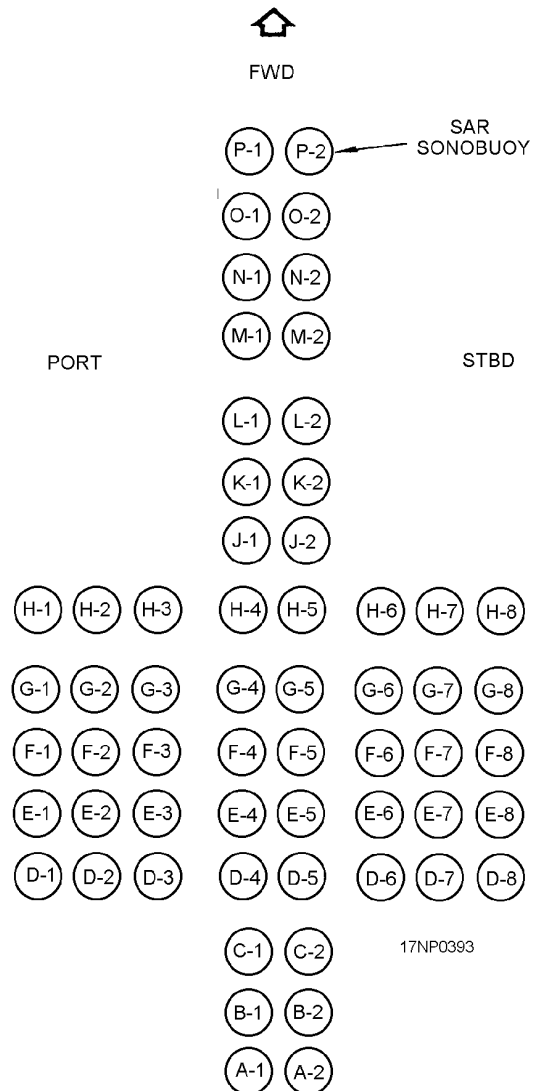


Figure 15-34.—S-3 sonobuoy launch tube arrangement.

The basic configuration of the S-3 consists of dual stations—stations 1 and 2 and stations 3 and 4 across the bays. The station A configuration consists of dual tandem stations in each bay—1A and 2A, 3A and 4A. These two configurations are used, as necessary, to provide store clearance, depending on the shape and size of the store. The single store configuration consists of one station per bay—1B and 4B. This configuration is used for special purposes, such as special weapons.

The BRU-14/A rack is held in position by two mounting bolts through the forward mount. Mounting pins secured to the aircraft braces restrain the rear of the rack assembly. Electrical receptacles at each mounting position provide connection for the rack to the aircraft circuits.

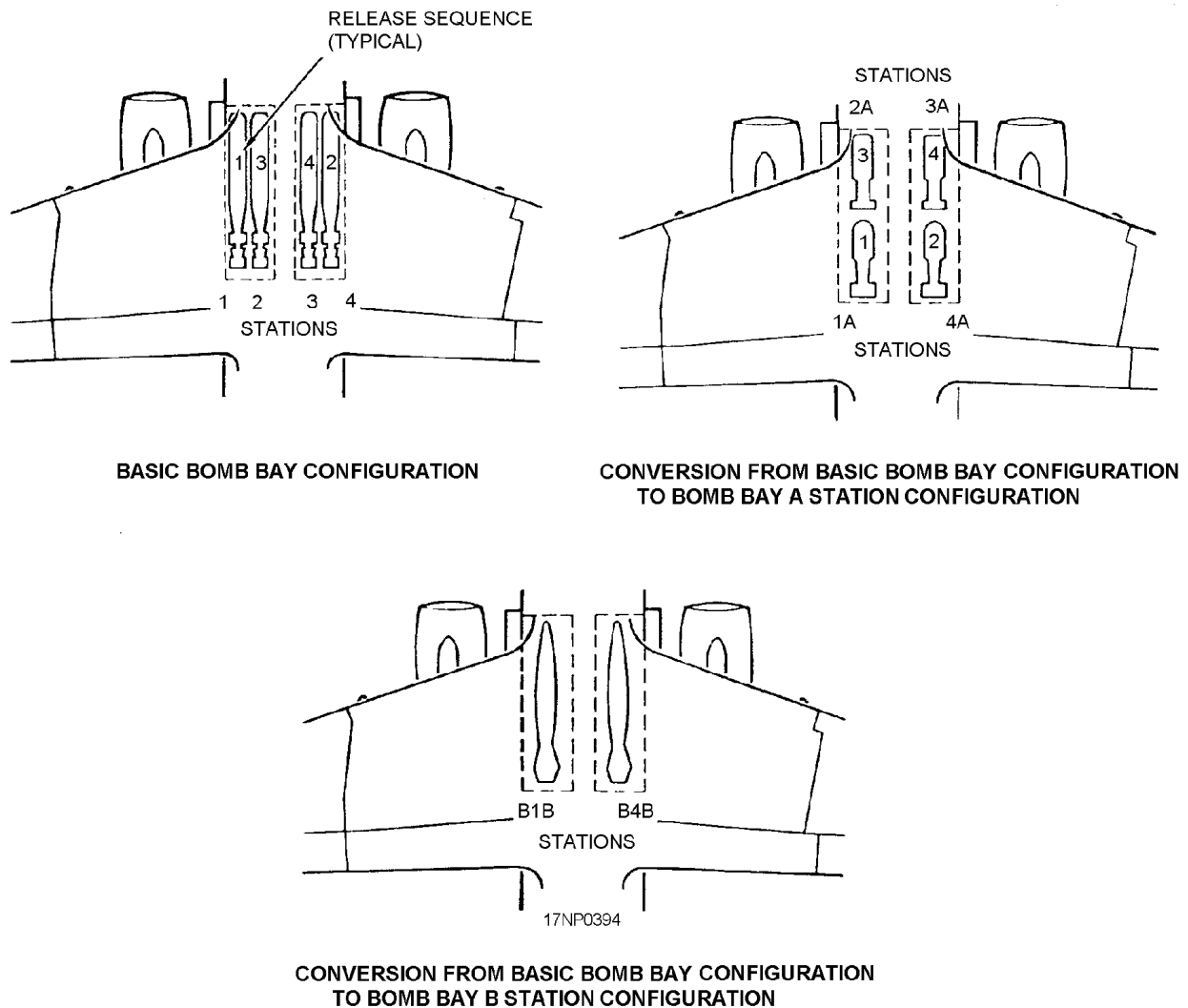


Figure 15-35.—S-3 bomb bay configurations.

Foldable scrub rails, or guides, secured to the bomb bay centerline bulkhead, are used with some stores to prevent damage to the aircraft structure as the store falls away.

The distribution box provides the necessary interface between the decoder and the bomb racks in both auto (computer) and manual modes. The decoder contains the necessary electronics for receiving commands from the armament control panel for arming and releasing bomb bay stations and transmitting station status information.

Wing Store System

The wing store system consists of the units and components necessary for carrying, arming, and

releasing external stores. The stores are suspended from two wing stations (fig. 15-36)—W5 (left) and W6 (right).

S-3 Pylon and Rack Assembly

The S-3 pylon and rack assembly consists of a pylon supporting a BRU-11A/A ejector rack. The rack is a self-contained unit that performs all the functions of carrying, arming, and releasing the stores. The aircraft armament circuits control it. The pylon provides structural attachment between the aircraft wing and the rack. It also contains the necessary wiring and components to connect the rack to release and status indicating circuits.

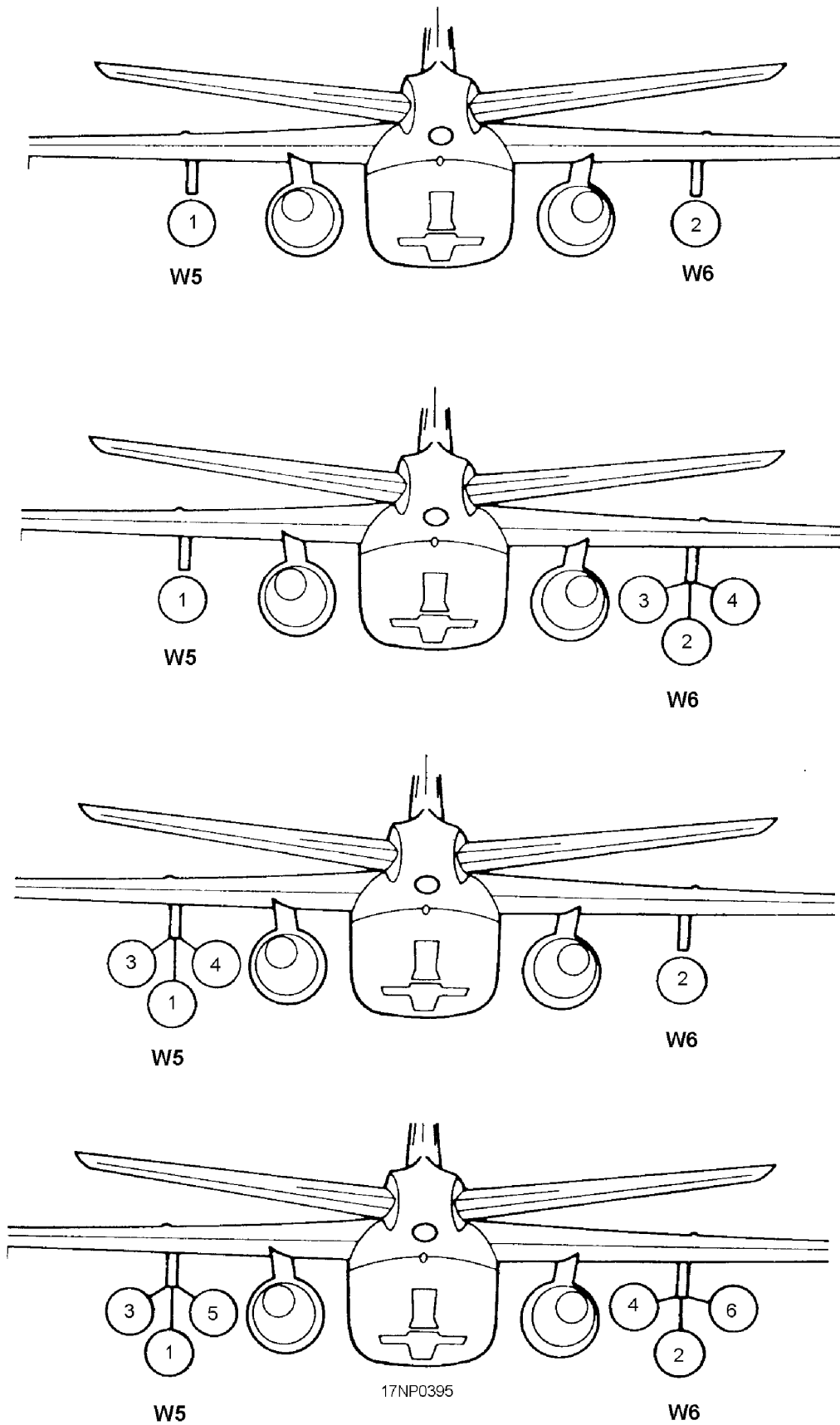


Figure 15-36.—Wing station configuration.

SH-60B/F Helicopter

The search store system of SH-60 helicopters is less complex than that of the P-3 and S-3 aircraft's, but it serves the same purpose. The SH-60 has all weather capabilities. The SH-60B is designed to operate off frigates, destroyers, and cruisers. Its primary missions are detection, classification, localization, and interdiction of surface ships and submarines. Its secondary missions include communications relay, vertical replenishment, search and rescue (SAR), medavac, and fleet support. The SH-60F is designed to replace the SH-3, and it operates off aircraft carriers. The primary mission is close-in ASW protection for the carrier battle group, and secondary missions include SAR and plane guard. Both the SH-60B and SH-60F are equipped with 25 sonobuoy launch tubes, BRU-14/A bomb racks (2 on the SH-60B and 3 on the SH-60F) for carriage of torpedoes. The SH-60F also has air-to-surface missile capabilities. The various models of the SH-60 helicopter (B, F) have different configurations and capabilities.

REVIEW NUMBER 3

- Q1. List the three basic aircraft used by the Navy for ASW operations.
- Q2. The P-3 aircraft has _____ bomb bay stations.
- Q3. What is the total number of unpressurized sonobuoy launch chutes in a P-3 aircraft?
- Q4. Three pressurize SLTs are used in P-3 aircraft. What size SLTs are used?
- Q5. Describe the numbering system of the P-3 bomb bay stations.
- Q6. You can mount _____ BRU-12/A racks on the primary pylon assembly of a P-3 aircraft.
- Q7. What bomb rack or release unit is used with the SH-60 helicopter?

SAFETY PRECAUTIONS

LEARNING OBJECTIVE: Recognize safety precautions to follow when handling aircraft weapons systems.

The safety precautions you should follow when dealing with aircraft, systems, and their maintenance are outlined in various publications. The repetition of safety precautions in the manuals makes sure they are

widely distributed and read. A few of the safety precautions applicable to the aircraft discussed in this chapter are listed below.

- Do not open or close the bomb bay doors when personnel or equipment are in the vicinity of the bomb bay. Also, do not enter the bomb bay until the door safety pin is installed.
- Beware of APU noise. It can cause permanent ear damage to the unprotected ear. Wear ear protection devices when working in the vicinity of an operating APU.
- Provide adequate interphone communications between personnel inside and outside the aircraft to ensure safety between personnel and to compensate for the size of the aircraft.
- Before you apply external power to the aircraft, make sure that personnel are not performing maintenance on electrical or electronic systems.
- Make sure that personnel working with or near high voltage are familiar with modern methods of resuscitation.
- Observe the aircraft external danger areas shown in the particular loading manual.
- Be extremely careful near breakaway suspension bands. They can release with enough force to cause serious injury.

REVIEW NUMBER 3 ANSWERS

- A1. The three basic aircraft used by the Navy for ASW operations include the P-3 and S-3 aircraft and SH-3 helicopter.
- A2. The P-3 aircraft has eight bomb bay stations.
- A3. There are 48 unpressurized sonobuoy launch chutes in a P-3 aircraft.
- A4. Three pressurized size A SLTs are used in P-3 aircraft.
- A5. P-3 bomb bay stations are numbered as follows: odd-numbered stations in the upper level and even-numbered stations on the lower level.
- A6. You can mount two BRU-12/A racks on the primary pylon assembly of a P-3 aircraft.
- A7. The BRU-14/A bomb rack is used with the SH-60 helicopter.

CHAPTER 16

AIRCRAFT WEAPONS SYSTEMS TEST EQUIPMENT

Aviation ordnancemen use test equipment in all phases of electrical testing of weapons systems. The testing procedures you use are required at specific maintenance levels, such as depot, intermediate, or organizational. Test equipment varies in complexity, from a small pocket tester to a very large and complex unit. No matter the size or complexity, the purpose of the test equipment is to make sure that the weapon and the launching platform (aircraft) function correctly.

TEST EQUIPMENT

LEARNING OBJECTIVE: *Identify the test equipment used with aircraft weapons systems. Recognize the purpose and use of each.*

All the test equipment you will use isn't described in this chapter. Also, the step-by-step procedures

required to operate the test equipment aren't listed. To do your job, you need to be able to identify the equipment, know what it is used for, and how it is used. The specific step-by-step procedures that you should follow when you use test equipment can be found in applicable publications.

MULTIMETERS

The AN/PSM-4 and 77/AN multimeters (figs. 16-1 and 16-2) are used to measure resistance (ohms) and voltage (ac or dc) in an electrical circuit. You use them to test aircraft circuits when no special test equipment is available, or when reasonably accurate measurements are required.

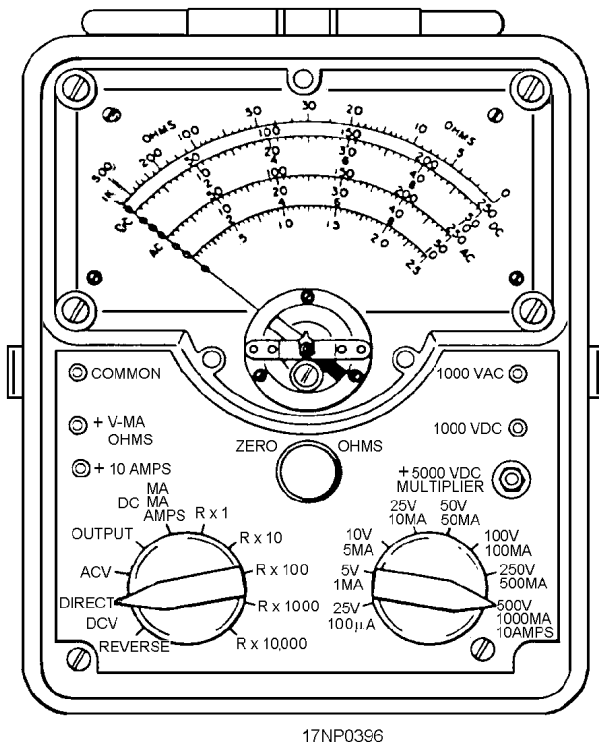


Figure 16-1.—AN/PSM-4 multimeter.

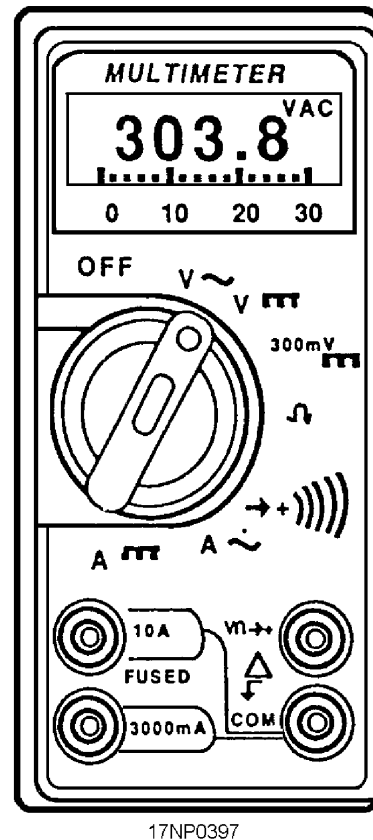


Figure 16-2.—77/AN multimeter.