CHAPTER 7

WEAPONS SYSTEMS

As a result of major developments in current aircraft design and computer technology, modern aircraft are able to deliver sophisticated weapons to a target automatically and with unprecedented accuracy. These aircraft are designed and built as a completely integrated weapons system. The weapons subsystems are interconnected and dependent, to some extent, on each other or on other aircraft systems. For example, the bomb release system in some modes of operation is dependent upon the aircraft's flight control system. In another example, the missile system is interconnected with the aircraft's radar system for missile guidance. In addition to delivering weapons more accurately, the computer-controlled weapons systems provide a higher degree of safety by significantly reducing the degree of human error.

When avionics technicians are testing, trouble-shooting, or performing maintenance on an avionics system, they must be aware of the effects the system can have on ordnance, either loaded or to be loaded on the aircraft. To complicate matters, most aircraft in the Navy's inventory are multimission aircraft. The F/A-18 is used as a fighter and an attack aircraft. The P-3C is an antisubmarine warfare (ASW) and a patrol aircraft. The aircraft discussed in this chapter are the fighter, fighter/attack, and the ASW aircraft.

FIGHTER AIRCRAFT WEAPONS SYSTEMS

Learning Objective: *Recognize various fighter aircraft weapons systems and their operating functions.*

The following discussion of the F-14 and the F/A- 18 aircraft will provide you with information on the available aircraft armament systems and the basic controls and components for both the fighter and the fighter/attack aircraft.

F-14 AIRCRAFT WEAPONS SYSTEMS

The F-14 aircraft is a two seat, supersonic fighter aircraft. The aircraft's armament system consists of the following systems and subsystems: armament basic controls and components, missile control system, multiple weapons release system, M61A1 20-mm automatic gunfire control system, AN/AWW-4 fuze function control system, AN/ALE-29A or AN/ALE-39 decoy dispensing system, and a jettison system.

Armament Basic Controls and Components

The F-14 armament system consists of the following basic controls and components that are common to all systems: the air combat maneuver (ACM) panel, the armament control panel, the display control panel, the control stick, the master light control panel, the landing gear handle, and the armament safety override switch.

AIR COMBAT MANEUVER (ACM) PANEL.— The ACM panel (fig. 7-1) is located on the forward cockpit center console. It contains switches for missile preparation, missile operating mode selection, and for arming the systems. Indicators are provided to inform the pilot of weapon status, when the missile is locked on to the target, and when the missile is ready to be launched. The ACM panel switches are discussed in the following paragraphs.

Master Arm Switch.— This switch is important to the avionics technician who must be aware that when the guard switch is raised and the switch is set to ON, a master arm signal is sent to the armament panel to enable the master arm logic circuitry.

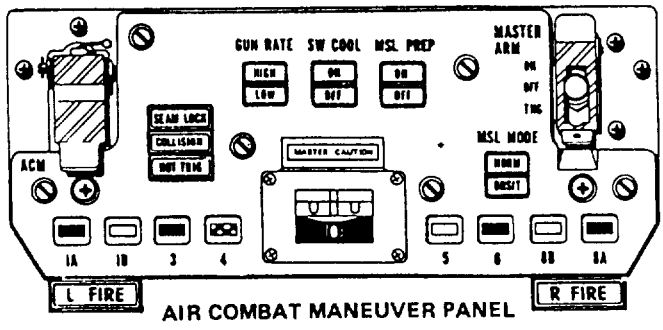

Figure 7-1.-Air combat maneuver (ACM) panel.

CAUTION

Before applying external power, the technician must ensure that all armament switches are in their proper position. If they are not, the technician must notify the appropriate person(s). Failure to do so could result in injury or death to personnel or damage to the aircraft/weapon systems.

ACM Switch.— This switch is a cam-type switch that is activated when the switch guard is moved up to select the ACM encounter mode. The normal missile mode is automatically selected.

ACM JETT Switch.— This switch is a push-button switch located under the ACM switch guard. When the switch is pressed, the stores on the stations that are selected on the armament panel are jettisoned.

HOT TRIG (Trigger) Warning Indicator Light.— This warning indicator lamp lights to notify the pilot that missiles are ready for launching, the gun is ready to fire, or the weapons selected are ready for release or firing.

Weapon Status Indicators.— These indicators indicate weapon status when the landing gear handle is in the UP position. These indicators are labeled 1A, 1B, 3, 4, 5, 6, 8B, and 8A. They correspond to the weapon stations on the aircraft. There are three indications possible:

1. White indication—Weapon station is ready and weapon is loaded.

2. Checkerboard indication—Weapon station is loaded, ready, and selected. Only one weapon status indicator is checkerboard at any one time.

3. Black indication—Weapon station has no weapon loaded, or the weapon is not ready.

ARMAMENT CONTROL INDICATOR PANEL.— The armament control indicator panel (fig. 7-2) is located in the aft cockpit console and contains the following selector switches: attack mode; weapon type; electric fuze; delivery mode and options; station select; missile options; missile speed gate; and select jettison, tank jettison, and jettison options.

DISPLAYS CONTROL PANEL.— The displays control panel (fig. 7-3) is located in the forward cockpit right vertical console. This panel contains

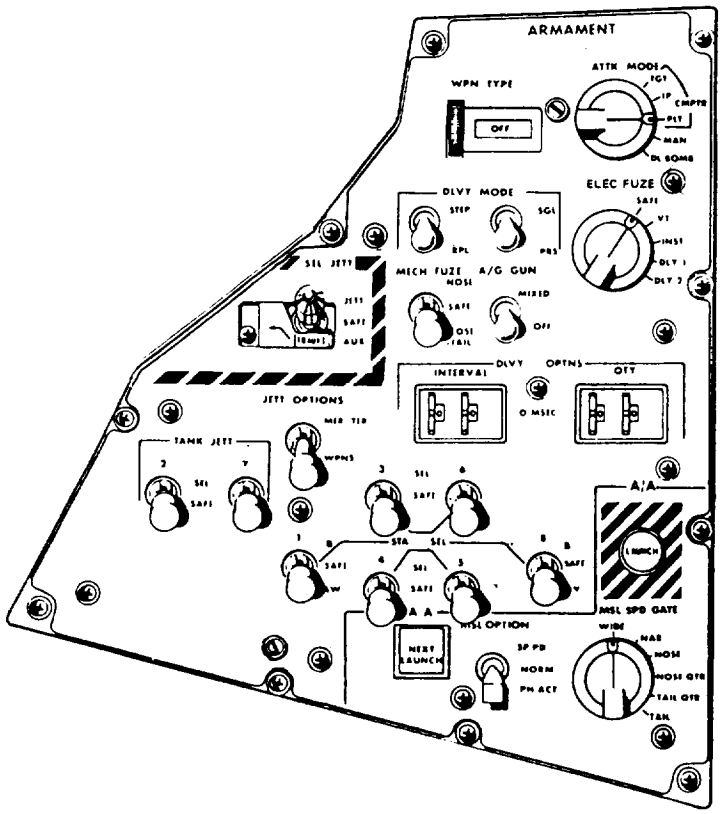

Figure 7-2.-Armament control indicator panel.

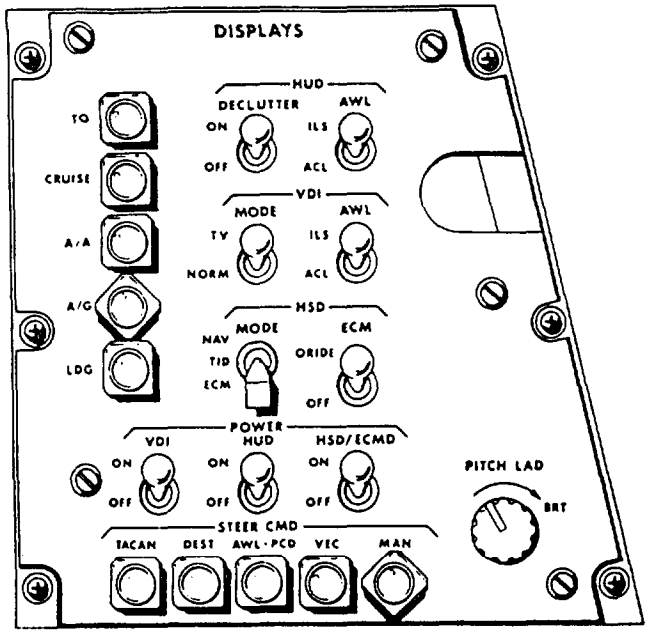

Figure 7-3.-Displays control panel.

push-button mode selection switches for air-to-ground or air-to-air selection. The panel also contains the all-weather landing/precision course direction push-button switch for air-to-air mode selection. The all-weather landing/precision course direction switch is used when weapons are to be released using the data link system.

CONTROL STICK.— The control stick (fig. 7-4) is located in the forward cockpit and contains the weapons selector button, weapon trigger, bomb release push button, and the DLC/CHAFF DISPENSE push button.

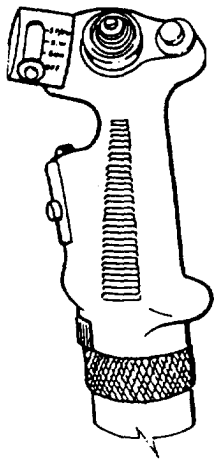

Figure 7-4.-Control stick.

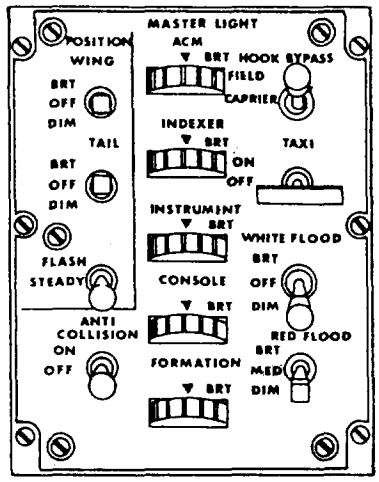

Figure 7-5.-Master light control pannel.

MASTER LIGHT CONTROL PANEL.— The master light control panel (fig. 7-5) is located on the right side console of the forward cockpit and contains the ACM thumb-wheel control. This thumb-wheel controls the 26-volt ac to the ACM panel indicator lights.

LANDING GEAR HANDLE.— The landing gear (LDG GEAR) handle (fig. 7-6) is located on the left vertical console of the forward cockpit. Movement of the LDG GEAR handle operates a switch assembly that functions as an armament safety device. This assembly prevents inadvertent missile launching, bomb release, rocket firing, and ACM encounter jettison of external weapons/stores when the aircraft

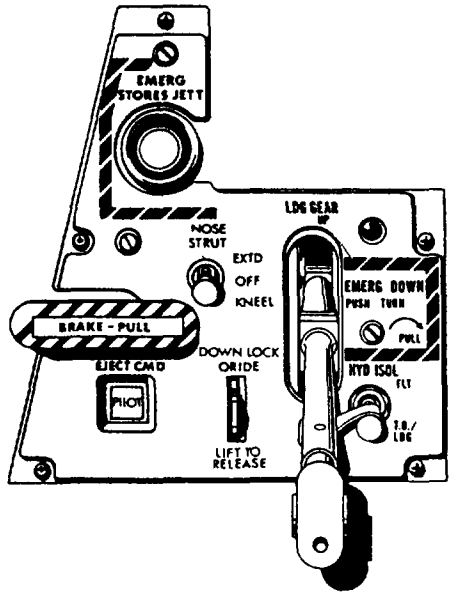

Figure 7-6.-Landing gear handle.

is on the ground. Master arm power is removed when the handle is in the DOWN position, but is available when the handle is in the UP position.

ARMAMENT SAFETY OVERRIDE SWITCH.— The armament safety override (ARMT SAFETY ORIDE) switch (fig. 7-7) is located in the nosewheel well. This switch 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 DOWN position. This switch enables technicians to perform functional checks while the aircraft is on the ground.

Missile Control System

The missile control system consists of the basic controls and components previously discussed, and the following controls and components: the weapons status indicators, the liquid (LIQ) cooling control panel, and the aft cockpit caution advisory panel.

Multiple Weapons Release System

The multiple weapons release system comprises the basic controls and components, as well as the multiple weapons systems controls and components.

M61A1 20-mm Automatic Gunfire Control system

The M61A1 20-mm automatic gunfire control system enables selecting, arming, and firing of the gun. Depending upon the mission objective, the gunfire control system can be operated in an air-to-air (A/A), air-to-ground (A/G), or air-combat maneuver (ACM encounter) mode.

AN/AWW-4 Fuze Function Control System

This system is used to provide a high dc voltage for the charging and arming of electrical bomb fuzes. It also provides voltage for the electrical initiation of the VT or proximity fuze. The faze is called a VT fuze because the original device contained vacuum tubes.

Decoy Dispensing Systems

The F-14 aircraft uses the AN/ALE-29A or the AN/ALE-39 decoy dispensing system to eject decoy rounds into the air. These rounds consist of chaff packages or flares. Releasing these rounds allows the aircraft to evade air-to-air and surface-to-air attacks. The location of the decoy dispenser is shown in figure 7-8.

Jettison System

The jettison system enables the jettisoning of certain external stores. There are four jettison modes:

1. Emergency—Pilot controlled.
2. ACM encounter—NFO selected, pilot controlled.
3. Selective—NFO controlled.
4. Auxiliary—NFO controlled.

The NFO is the person in the back seat of the aircraft. The NFO selects and controls the jettison by using the armament control indicator located in the aft cockpit (fig. 7-2). In all modes, arming and fuzing are

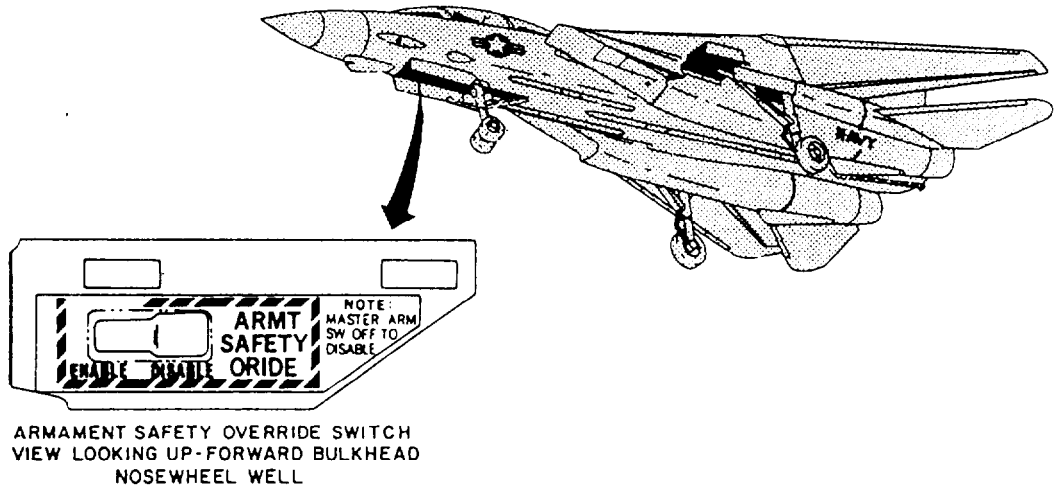

Figure 7-7.-Armament safety override switch.

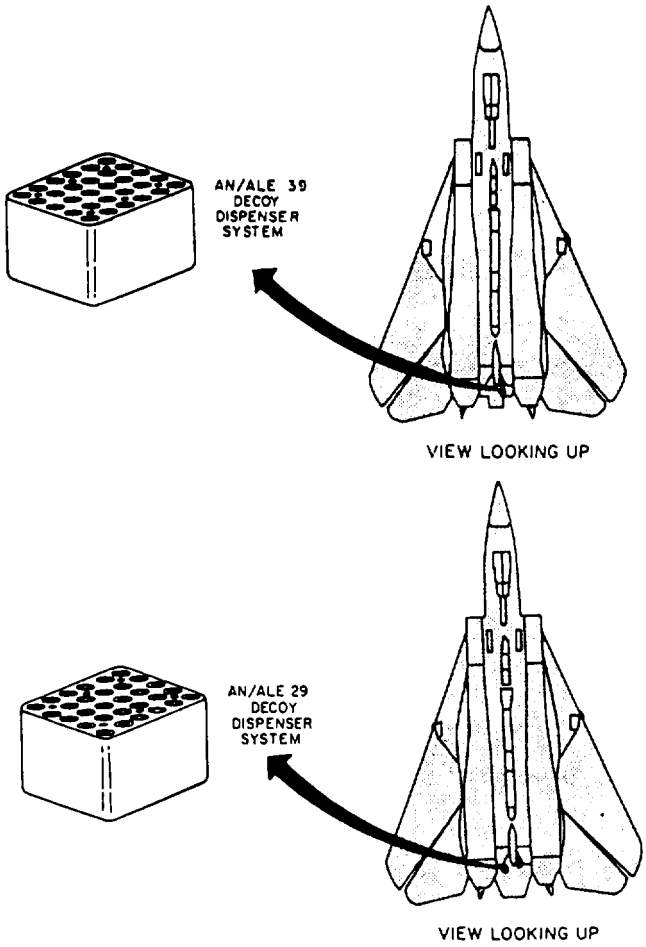

Figure 7-8.-Decoy dispenser configuration on aircraft.

disabled during jettisoning. The landing gear handle must be in the UP position for all modes except emergency.

F/A-18 AIRCRAFT WEAPONS SYSTEMS

The F/A-18 aircraft is a single seat, dual role (fighter/bomber), supersonic aircraft. Provisions are available in the aircraft for the application of external power. The external power connector connects 115/200 volt, three-phase, 400-Hz ac power to the ac bus. When external power is not available, there is an auxiliary power unit (APU) to drive either of the aircraft generators for functional checkout of the aircraft systems.

The F/A-18 armament system consists of the following systems and subsystems:

- F/A-18 armament basic controls and components
- AN/AWW-4 fuze function control system
- Rocket firing system
- Walleye system
- AN/AWW-7 data link system
- AGM-65 Maverick fire control system
- AGM-88 HARM fire control system
- AIM-7 Sparrow fire control system
- AIM-9 Sidewinder fire control system
- M61A1 20-mm gun system
- AN/ALE-39A decoy dispensing system

F/A-18 Armament Basic Controls and Components

The F/A-18 armament system consists of the following basic controls and components that are common to all systems: the ground power control panel assembly, the landing gear control handle, the armament safety override switch, the master arm control panel assembly, the aircraft controller grip assembly, and the two digital display indicators.

GROUND POWER CONTROL PANEL ASSEMBLY.— A ground power control panel assembly provides four toggle switches, three of which control the application of external power to avionic and instrument systems. This prevents excessive equipment operation time because of other unassociated ground operations.

The EXT PWR switch is a three-position switch that applies electrical power to the aircraft. In the NORM position, electrical power is supplied to the aircraft. In the OFF position, 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) and the radar. Switch 3 is three-position switch with B ON to provide enabling power to the armament computer, the AN/AWW-4 system, the HARM system, and the AN/ALE-39A system.

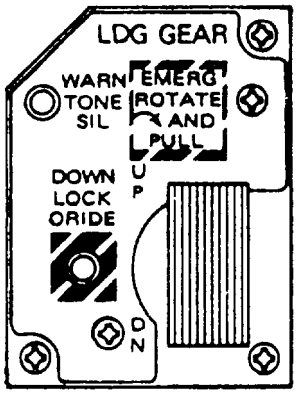

Figure 7-9.-Landing gear control handle.

LANDING GEAR CONTROL HANDLE.— The LDG GEAR control (fig. 7-9) in the DN position 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.

ARMAMENT SAFETY OVERRIDE SWITCH.— The armament safety override switch (fig. 7-10) is on the maintenance panel that is located in the nosewheel well. In the override position, it overrides the landing gear handle DN position to enable weapons systems for ground operational maintenance.

MASTER ARM CONTROL PANEL ASSEMBLY.— The master arm control panel assembly (fig. 7-11) is located in the cockpit. It contains the A/A, A/G, and the MASTER switches. The A/A and A/G switches are push-button switches that provide a ground to the stores management processor (SMP). They select the air-to-air or air-to-ground computer modes, respectively. The MASTER switch is used in conjunction with the LDG GEAR handle or the armament safety override switch. In the SAFE position, weapons cannot be released or fired. Emergency jettison can be initiated while this switch is in the SAFE position. The ARM position provides an input to the SMP and power for weapns release, fire, or jettison. The switch position (SAFE/ARM) will be displayed on the DDIs in the wing-form display.

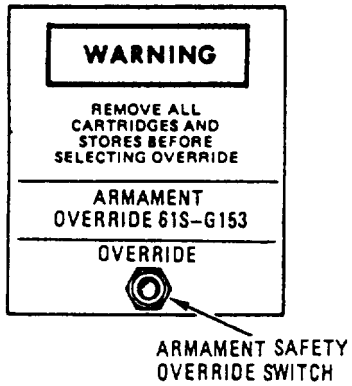

Figure 7-10.-Armament safety override switch.

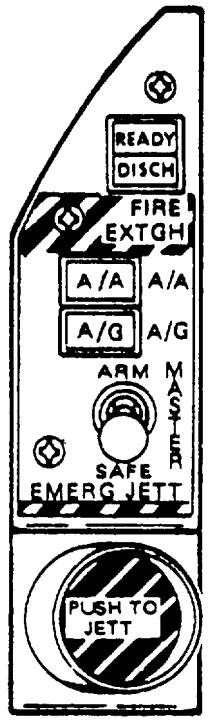

Figure 7-11.-Master arm control panel assembly.

AIRCRAFT CONTROLLER GRIP ASSEMBLY.— The aircraft controller grip assembly (fig. 7-12) 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 SMP and provides an input back to the SMP. The aircraft controller grip assembly also contains an A/A switch and the trigger switch.

DIGITAL DISPLAY INDICATORS DDIs).— The digital display indicators (fig. 7-13) are located on the main instrument panel vertical consoles. The DDIs monitor the SMP and display that information. The DDIs always have a wing-form display, and when in the air-to-ground mode, a program list. The wing-form display, program list, and switches/controls on the DDIs are discussed in the following paragraphs.

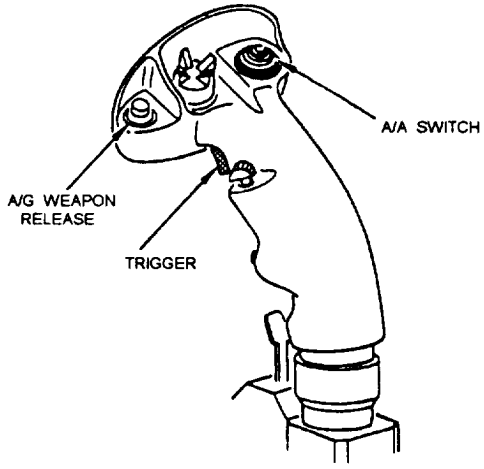

Figure 7-12.-Aircraft controller grip assembly.

The wing-form display is displayed in the air-to-air and the air-to-ground computer modes. It identifies what is loaded on all stations except the wing tip AIM-9 stations, which are always displayed. The weapon loaded is displayed on the DDI by the appropriate acronym. When weapons are loaded on the stations, the type of weapon is coded into the SMP during loading procedures. Thus, when selected, the DDIs display the appropriate acronym. An acronym is an abbreviated number and letter, such as 1 82B, which indicates that one Mk 82 blunt-nose bomb is loaded.

The push-button switches around the DDIs are used to select weapons, various functions, and mode options of a function (if any). For example, mechanical fuzing (MFUZ) is one function and nose

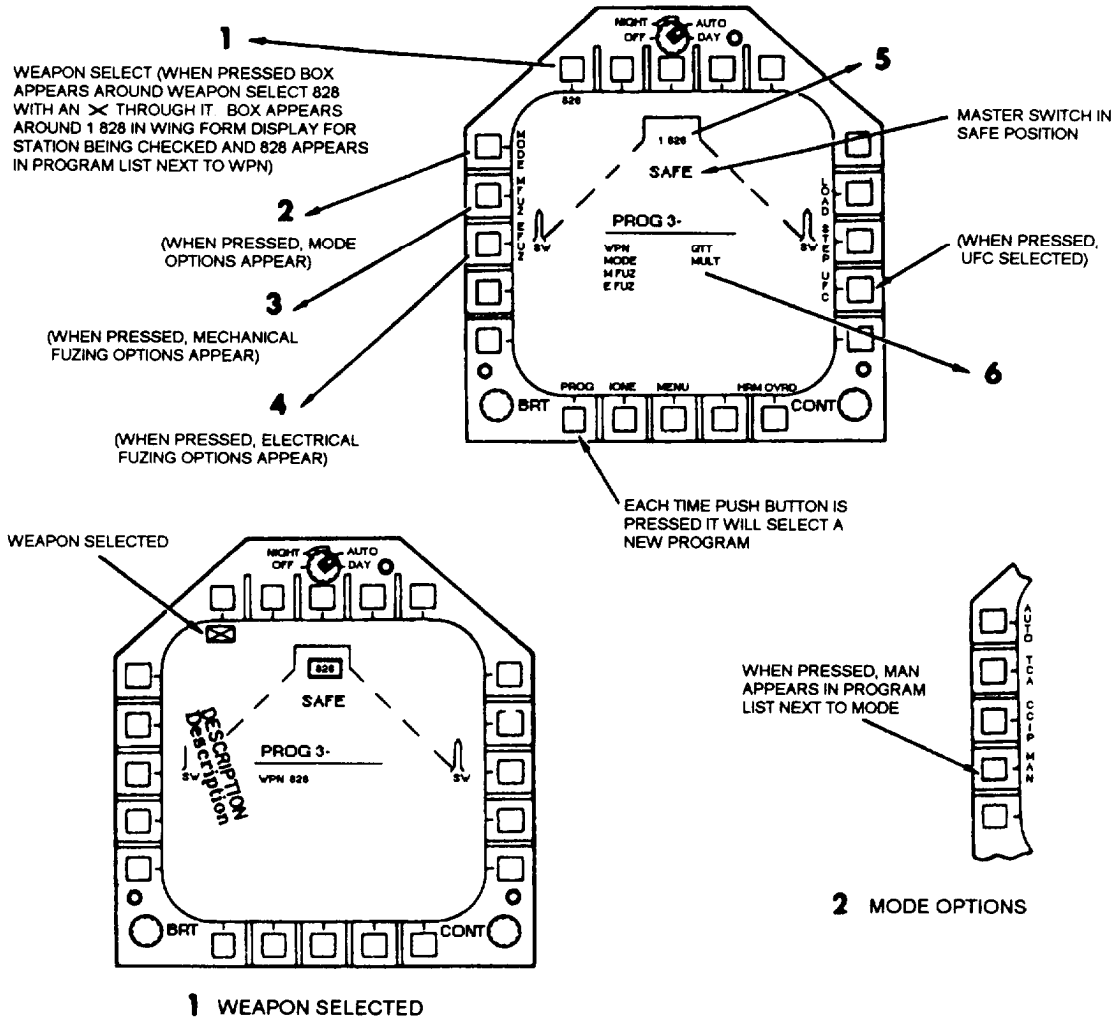

Figure 7-13.-Digital display indicators.

(NOSE), nose/tail fuzing (N/T), and long-delay fuzing (LDLY) are the selectable options.

Weapon selection for air-to-ground weapons is accomplished by pressing the push-button switch located next to the acronym of the weapon desired. When the weapon is selected, a box lights around the acronym. When the MASTER switch is in the SAFE position, an X appears superimposed through the acronym. When the MASTER switch is in the ARM position, the X is removed and RDY is displayed under the box light around the acronym. A box also appears around the acronym of the weapon in the wing-form display for the first priority (first station in firing sequence) station that has this particular weapon loaded. Also, this weapon acronym is displayed next to WPN in the program list.

Armament Computer

The armament computer (SMP) is shown in figure 7-14. The computer is interfaced with and controlled by the digital computers in the aircraft. The SNIP is also interfaced with and controls the weapons station command encoders/decoders. The SMP has a weapon insertion panel with code wheels. These code wheels are used to enter the code into the weapon-type (ARMAMENT) and nose/tail fuzes (FUZING). The weapon-type code must match the weapon loaded. The nose/tail fuze codes must be compatible with the weapon, or the SMP will not

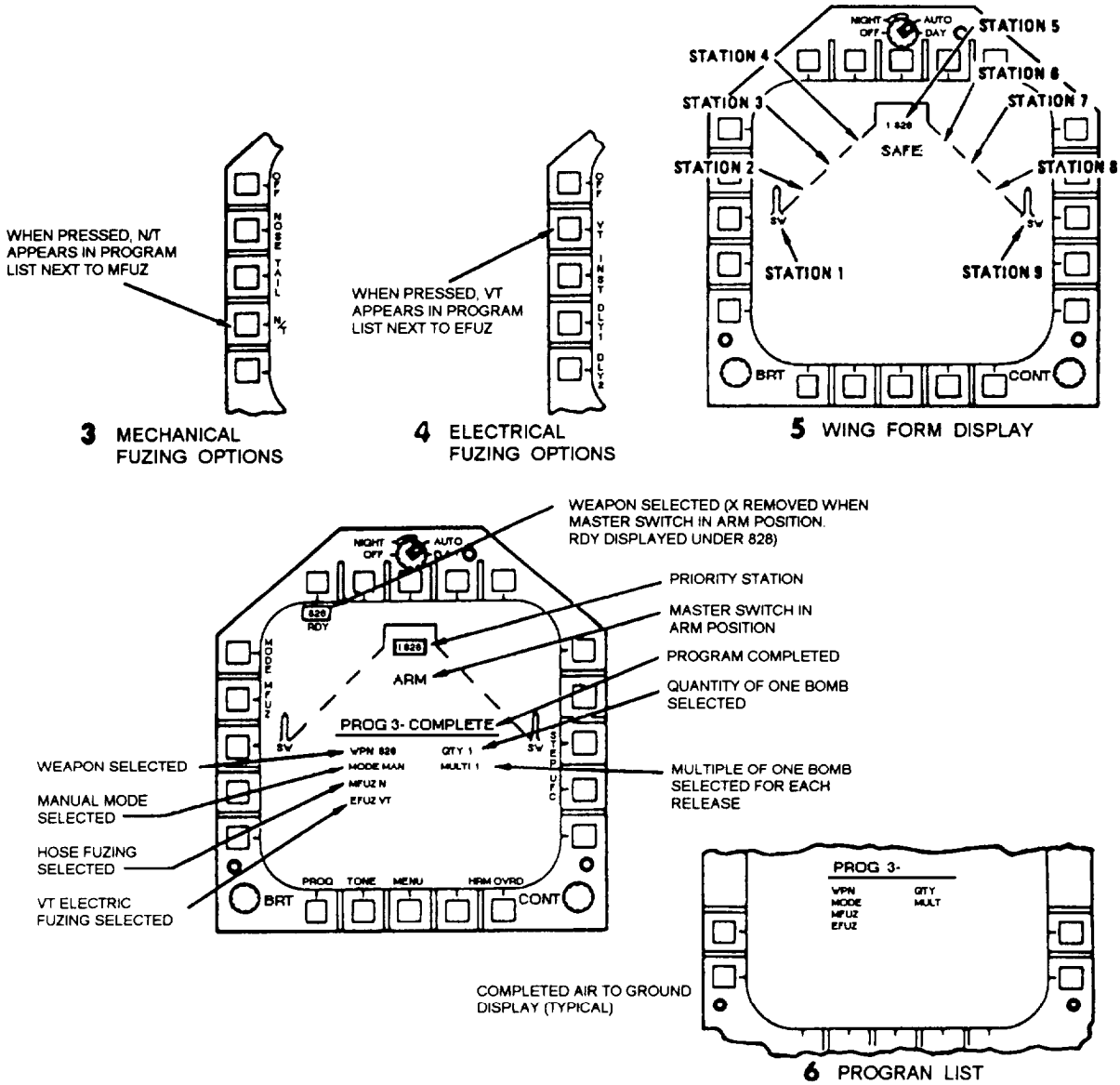

Figure 7-13.-Digital display indicators—Continued.

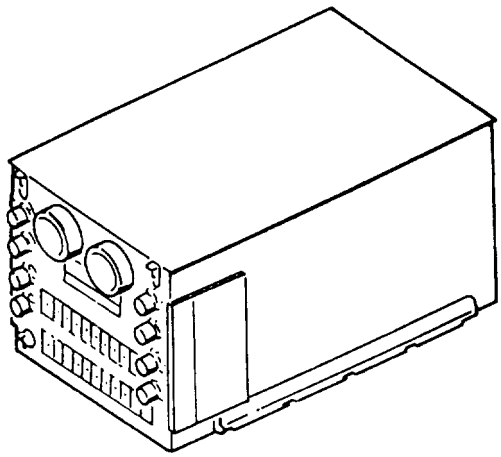

Figure 7-14.-Armament computer (stores management processor) (SMP).

allow it to release normally. For weapons without nose/tail fuzes, the codes must still match the weapon loaded. AIM-7 missiles loaded on fuselage stations 4 and 6 do not require a weapon code.

Digital Computers

Digital computers make up the mission computer system and control the avionics systems. The y interface with the SMP and allow the SMP to route power to the encoders/decoders for weapons release. The digital computers are controlled by the MC switch on the MC/HYD ISOL panel. When the MC switch is in the 1 OFF position, power is removed from mission computer No. 1. When in the NORM position, power is applied to mission computers Nos. 1 and 2. When in the 2 OFF position, power is removed from mission computer No. 2.

The command encoders/decoders provide an interface with the SMP and the weapons loaded. When the SMP supplies power to the encoders/ decoders, they allow the weapon release.

Jettison System

The jettison system provides a method of jettisoning weapons, stores, launchers, and fuel tanks. The jettison system has three modes of release—emergency, selective, and auxiliary.

The emergency jettison mode jettisons all weapons from the five pylon stations. Conditions for jettisoning are weight-off-wheels or landing gear control handle in the UP position and the EMERG JETT PUSH TO JETT switch pressed. The PUSH TO

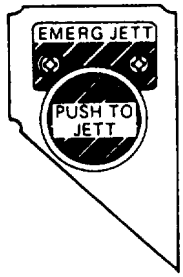

Figure 7-15.-Emergency jettison control panel assembly.

JETT switch (fig. 7-15) is on the emergency jettison control panel assembly.

The JETT STATION SELECT switches (fig. 7-16) are on the flaps, landing gear, and stores indicator panel. When the switches are pressed, a ground is provided to the SMP and the station is selected. The SELECT JETT switch is located on the left-hand vertical control panel assembly. The rotary portion of the switch selects the fuselage missile stations (L FUS MSL/ R FUS MSL/ RACK LCHR/ STORES) to be jettisoned.

The auxiliary jettison is a gravity mode of jettisoning used on the five pylon stations when emergency and selective jettison fails. Conditions for jettisoning are as follows: the landing gear handle in the UP position, all gear up and locked, MASTER switch to ARM, stations selected by the JETT STATION SELECT switches, AUX REL switch to ENABLE, and the bomb-release switch pressed. The AUX REL switch is located on the ECM control panel assembly. When it is positioned to ENABLE, it provides a ground to the SMP and allows the auxiliary cartridge to fire when the bomb-release switch is pressed.

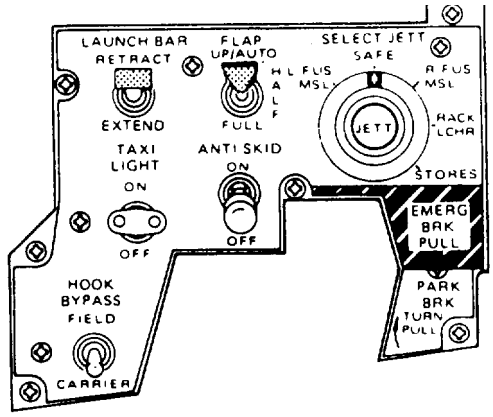

Figure 7-16.-Jettison station select stitches.

Bomb Release System

The bomb release system provides the aircraft with capabilities for release of conventional weapons. Normal release is provided in four electrically controlled modes of operation. Release is accomplished by electrically firing two gas-generating cartridges in the breech housing unit in the bomb rack. The system consists of the armament basic controls and components.

AN/AWW-4 Fuze Function Control System

The AN/AWW-4 fuze function control system provides the aircraft with capabilities for the use of electric fuzes. 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, a voltage is supplied through an interconnecting 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 power supply and the armament basic controls and components.

Rocket Firing System

The rocket firing system provides the aircraft with the capability for firing rockets. When the bomb release switch is pressed, voltage is supplied through the aircraft wiring to the vertical ejector rack (VER). Wiring within the VER allows the rocket to fire. The system consists of the armament basic controls and components.

Walleye Guided Weapon System

The Walleye guided weapon system provides the aircraft with the capability for the release and guidance of a Walleye weapon. 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 is pressed. The system consists of the CAGE/UNCAGE switch and the armament basic controls and components. The CAGE/UNCAGE switch is located on the throttle. When the switch is pressed, the selected weapon is either caged or uncaged.

AN/AWW-7B Data Link System

The AN/AWW-7B data link system is used with the Mk 21 and Mk 27 Walleye weapons. The data link system provides control and guidance to these weapons with a data pod externally mounted to the aircraft. The system consists of the armament basic controls and components.

AGM-65 Maverick System

The AGM-65 Maverick system provides the aircraft with the capability for firing the Maverick missile. Control of the missile is supplied through the missile control system while the AN/AWW-4 fuze function control provides fuze arming. Video is supplied from the weapon to the DDIs. No voltage is supplied to the missile until the trigger switch is pulled. The system consists of the trigger switch and the armament basic controls and components. The trigger switch is located on the aircraft controller grip assembly. The switch is a two-position detent switch, with the first detent initiating the camera operation and the second initiating missile launch.

AGM-88 HARM System

The AGM-88 HARM system provides the aircraft with the capability for firing a HARM missile. Control of the missile is provide through the SMP. No voltage is supplied to fire the missile until the trigger switch is pulled. The system consists of the trigger switch and the armament basic controls and components.

AIM-7 Sparrow Fire Control System

The AIM-7 Sparrow fire control system provides the aircraft with the capability for firing an AIM-7 missile. Control of the missile is supplied through the SMP and the radar system. No voltage is supplied to fire the missile until the trigger switch is pulled. Weapon selection is accomplished by the A/A weapon select switch on the aircraft controller grip assembly. The system consists of the RADAR switch, CAGE/UNCAGE switch, and the armament basic controls and components.

The A/A weapon select switch selects the Sparrow missile on the priority station when the switch is in the FWD position. Each time the switch is depressed, the priority station changes. SEL is displayed on the DDI underneath the SP acronym of the station selected. An X is superimposed through the SP when the missile is not tuned. The X disappears when the missile tunes. The RADAR switch is located on the sensor control panel.

AIM-9 Sidewinder Fire Control System

The Sidewinder fire control system provides the aircraft with the capability for firing a Sidewinder missile. Control of the missile is provided through the SMP. No voltage is supplied to fire the missile until the trigger switch is pulled. Weapon selection is made by the A/A weapon select switch on the aircraft controller grip assembly. Tone volume is controlled by the WPN VOL switch. The system consists of the IR COOL switch, trigger switch, and the armament basic controls and components.

The A/A weapon select switch selects the Sidewinder missile on the priority station when the switch is in the DOWN position. Each time the switch is depressed, the priority station changes. SEL is displayed on the DDI underneath the SW acronym of the station selected. The WPN VOL switch is on the intercommunication amplifier control panel assembly.

The IR COOL switch is a three-position switch on the map gain control panel assembly. When the switch is in the OFF position, coolant is disabled to the seeker heads unless weight is off the wheels, the MASTER switch is in the ARM position, and the station is selected. In the NORM position, coolant is enabled to all seeker heads when the weight is off the wheels. In the ORIDE position, coolant is enabled to all seeker heads when power is applied to the aircraft.

M61A1 20-mm Gun System

The M61A1 20-mm gun system provides the aircraft with the capability for firing the gun. The system enables selecting, arming, and firing. Depending upon the mission objective, the gun can be operated in the A/A or the A/G computer modes. In the A/G mode there are two submodes. The two submodes are the continuously computer impact point (CCIP) and the manual (MAN) modes. There are three A/A modes. These are the director, disturbed, and the cage modes. Control of the gun is supplied through the SMP. No voltage is supplied to the gun until the trigger switch is pulled.

AN/ALE-39 Decoy Dispensing System

The AN/ALE-39 decoy dispensing system provides the aircraft with the capability for dispensing chaff and 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, the ALE-39 programmer, two AN/ALE-29A dispensers, and the armament system basic controls and components.

ANTISUBMARINE WARFARE WEAPONS SYSTEMS

Learning Objective: *Recognize various weapons systems on ASW type aircraft.*

Antisubmarine warfare (ASW) is becoming an ever broadening field. Our ASW capabilities have been improving constantly. As a senior avionics technician, you must play the key role in maintaining the ASW platform used for in-flight launching of search and kill stores. When launched at precise intervals and locations and in conjunction with the aircraft's electronic data processing equipment, these stores provide accurate information for detecting enemy submarines. The kill stores consist mainly of torpedoes, mines, bombs, rockets, and guided missiles.

The remainder of this chapter discusses the basic ASW system, the P-3C and S-3A search store systems, the helicopter search store systems, the P-3C and S-3A kill store systems, and the helicopter kill store systems. Finally, the control systems for release and control of search and kill stores are discussed.

BASIC ASW WEAPONS SYSTEMS

The basic ASW weapons systems consist of the equipment and accessories necessary for carrying and releasing the search and kill stores.

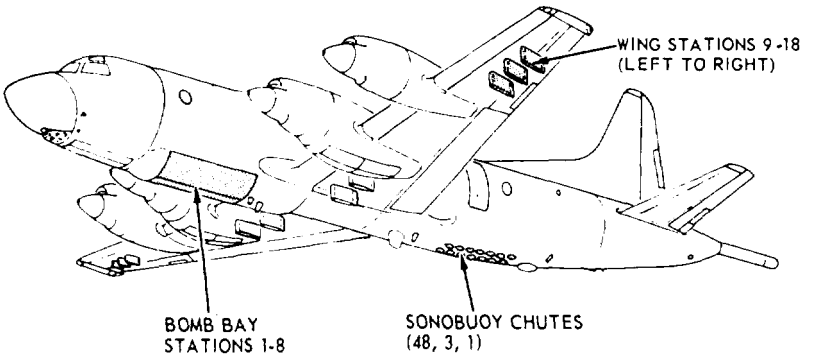

Figure 7-17.-P-3C ordnance stations.

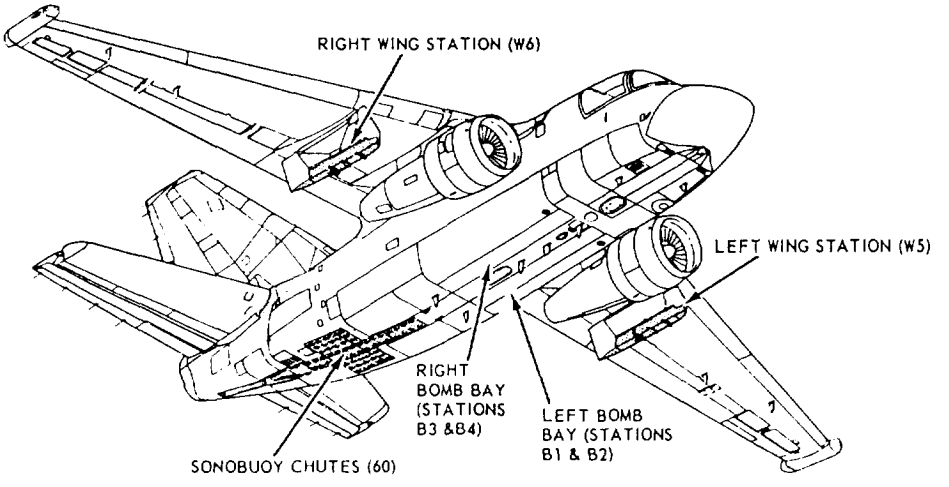

Figure 7-18.-S-3A ordnance stations.

In the P-3C, in addition to the eight bomb bay stations, ten wing stations are available for the carriage of a variety of stores. Forty-eight unpressurized, three pressurized, and one free-fall launch chutes are used in the search store system (fig. 7-17).

In the S-3A, two bomb bays with two stations each and two wing stations are available for store carriage. Sixty unpressurized launch chutes are used in the search store system (fig. 7-18).

The weapons control system of each aircraft has the units, panels, switches, logic circuits, interfaces, computer, and controls necessary for selecting, arming, and releasing the kill or search stores. Additionally, status lights indicate store selection errors and store go or no-go status. Electrical jettison release systems are incorporated to release or eject all kill stores of the P-3C aircraft, and the wing stations and all search stores of the S-3A aircraft.

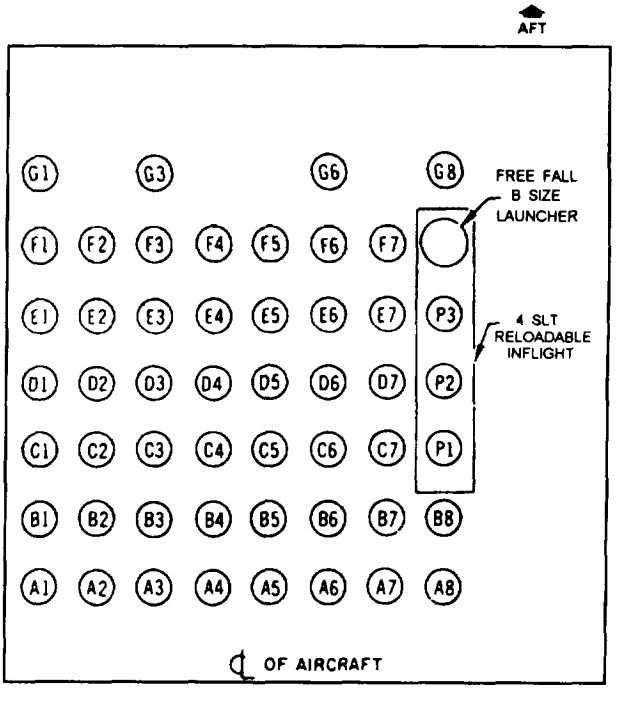

Figure 7-19.-P-3C SLT arrangement.

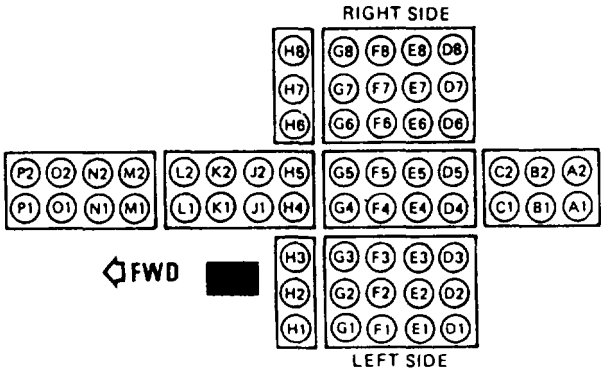

Figure 7-20.-S-3A SLT arrangement.

FIXED-WING SEARCH STORE SYSTEMS

The search store systems of the P-3C and the S-3A aircraft consist mainly of the equipment and accessories necessary to carry and release sonobuoys. The sono systems also have the capability for carriage and release of several other search related stores.

Part of the system consists of unpressurized, size A sonobuoy launch tubes (SLTs) installed in the underside of the aircraft fuselage. Forty-eight of the SLTs on the P-3C and all of the S-3A SLTs (60) are of this type. These SLTs are not accessible from inside the pressurized aircraft. Figure 7-19 shows the arrangement of the P-3C SLTs (as you lookup at the lower fuselage), while figure 7-20 shows the S-3A arrangement.

The P-3C also has three pressurized size A SLTs (fig. 7-21) and one unpressurized size B free-fall chute. These are accessible from inside the aircraft, and are reloadable in flight. Size A chutes are approximately 5 inches in diameter, and the size B chute is approximately 7 inches in diameter.

The size B chute is a tube with a pressure-sealing cover at the top end. If it is pressurized, the cabin of the aircraft must be depressurized before you open the

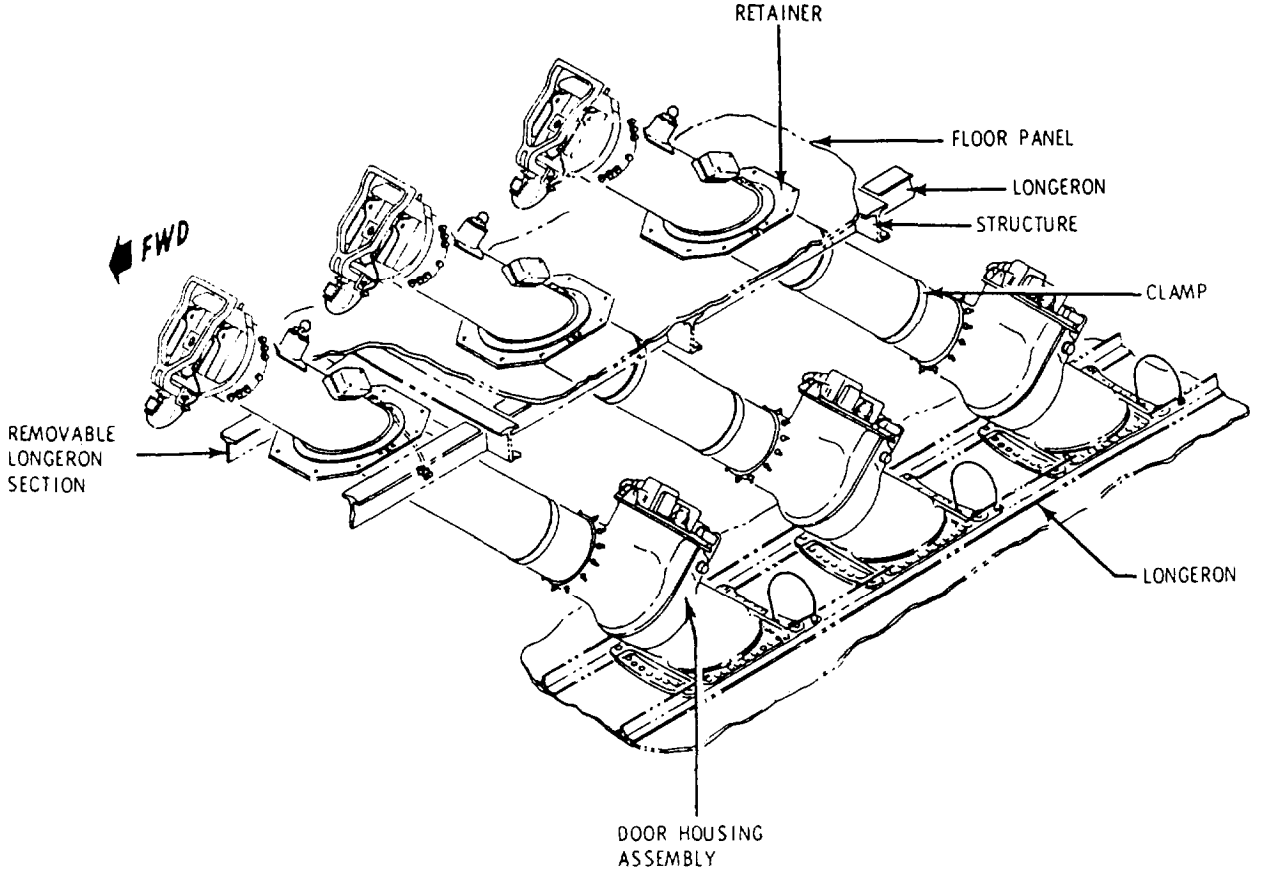

Figure 7-21.-Pressxurized size A sonobuoy launch tubes.

sealing door of the chute. The chute may then be used for manually expending miscellaneous items less than 7 inches in diameter. The size B chute has no connecting electrical circuits.

All of the size A SLTs in both aircraft have electrical connections that interface with the aircraft computer. There are also connections for the manual mode control circuits for sono inventory and launching.

Sonobuoys, Mk 58 and/or Mk 25 marine location markers (MLMs), and signal underwater sounds (SUSs) can be loaded into sonobuoy launch containers (SLCs). The Mk 25 MLMs and SUSs may be dropped from the size B chute of the P-3C. After a store is loaded into the SLC, with the appropriate pads and spacers, an end cap is installed at the open end and marked with information of the enclosed store. The end cap has two protruding pin lugs, which mate with slots on the SLC to Iock the store in place. The lugs shear when the cartridge-activated device (CAD) is fired. When the CAD fires, everything in the SLC is ejected.

NOTE: Some sonobuoys may be received prepackaged in disposable SLCs. This deletes the need for loading SLCs at the organizational maintenance level.

Before you load the SLCs into the SLTs, you should perform a no-voltage and stray-voltage check on the sono circuits at the sonobuoy safety switch for the S-3A, and on the sono launch circuit tester in the P-3C. The safety switch on both aircraft is located adjacent to the SLTs and is actuated to the safe position when the switch access door is open.

CAUTION

When either type of aircraft is on the deck, the switch access door should be open to prevent inadvertent firing of the SLT stores. Inadvertent firing may cause injury or death to personnel, and will cause damage to the equipment.

The SLC, with CAD installed, is loaded into a designated SLT according to the load plan. The locking lugs at the CAD cap mate with the locking lugs of the SLT. The CAD is pressed against the electrical firing pin in the SLT breech assembly. In the S-3A, tube P2 is always loaded with an SLC containing a search and rescue (S AR) sonobuoy. The P-3C also has a stowage rack inside the aircraft for 36 SLCs for use in the four SLTs inside the cabin.

When the SLCs are loaded, the area beneath the loaded SLTs is cleared, and the safety switch door is closed. When the door is closed, the cockpit sono disabled indication will be extinguished. A continuity check is performed by the aircraft circuits on the CADs, and the load status verified by using the sono select switches of the particular aircraft. The switch door is opened again, and the system is disabled until just before takeoff. The load plan is given to the tactical coordinator (TACCO) for computer programming of the specific store in each SLT, and in the case of the P-3C, the stowage rack.

Release of the SLT stores in flight is normally activated by the aircraft computer. The computer is programmed by the TACCO and controlled by the pilot's or TACCO's keyset in the P-3C. In the S-3A, the TACCO's keyset programs and controls the computer. The manual release mode is normally used only during maintenance testing and system checks, and as an emergency backup for the auto mode. Emergency jettison of the SLTs is not included in the P-3C system. In the S-3A, it is part of the jettison circuit, and when activated, will jettison 59 of the 60 SLCs in less than 10 seconds. Until the pilot initiates circuit activation, the SAR buoy will remain in the P2 chute.

HELICOPTER SEARCH STORE SYSTEM

The search store system of helicopters is less complex than that of the fixed-wing aircraft just discussed, but it serves the same purpose. Figure 7-22 shows some of the basic search store equipments

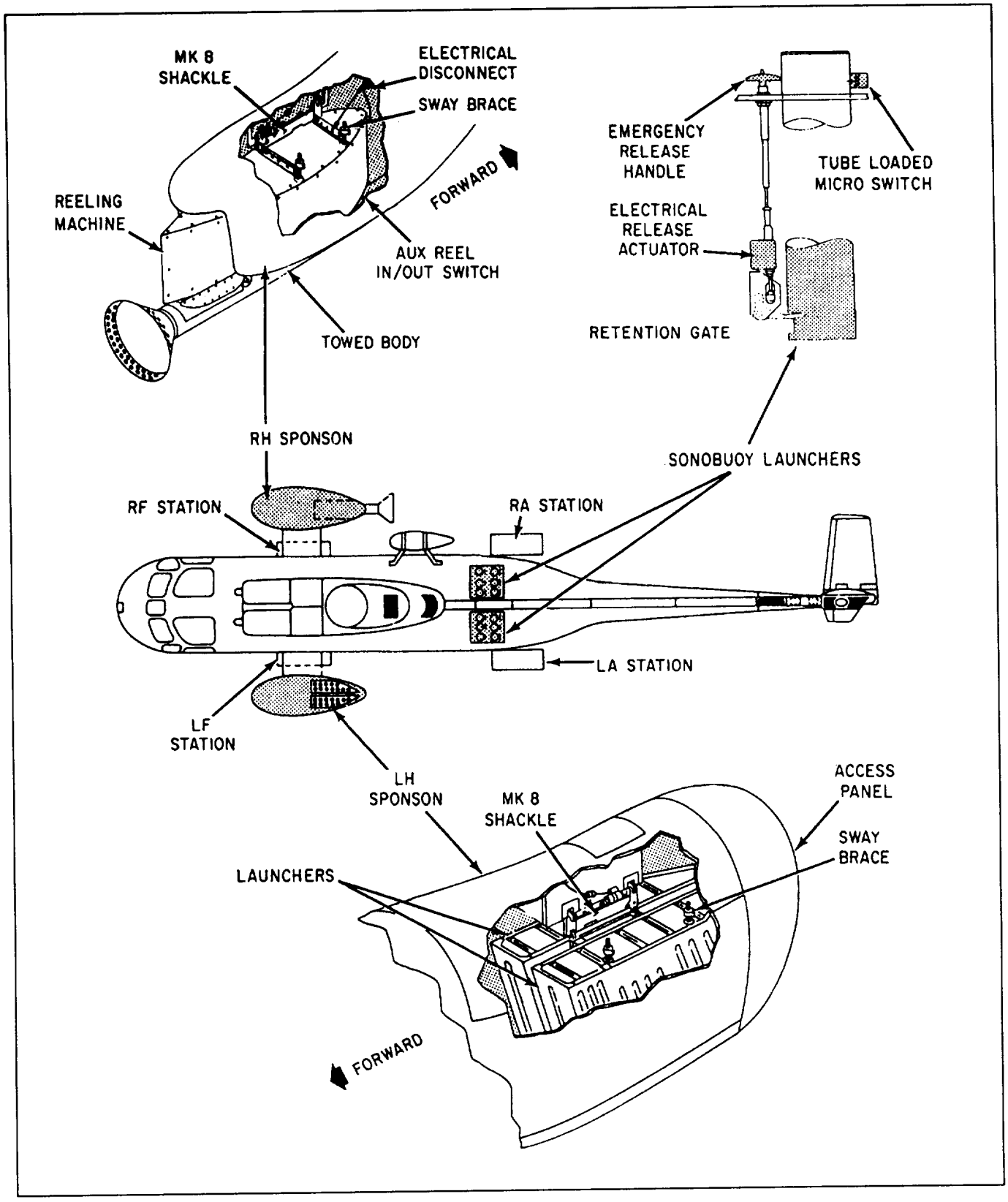

Figure 7-22.-SH-3 (series) search and kill stores.

of the SH-3 series helicopter, and figure 7-23 shows the basic equipments of the SH-60 series helicopter. Both types of helicopters have various models with different configurations. In this chapter, no specific model is discussed.

SH-3 Series Helicopter Sonobuoy Launcher

The launcher used in the SH-3 series helicopter provides a means for free-fall launching of sonobuoys. The system consists of a control panel and 12 launcher tubes (size A), which are incorporated as an integral part of the airframe. Each tube contains a retention gate that can be electrically or manually released to launch the individual sonobuoy. A tube-loaded microswitch operates a panel light when the selected tube is loaded.

SH-60 Series Helicopter Sonobuoy Launcher

The SH-60 series sonobuoy launcher is designed to pneumatically launch up to 25 sonobuoys. The buoys exit from the launcher on the left-hand side of the aircraft. The system consists of a launcher assembly, a distributor valve, a high-pressure air bottle, and an electrical control unit (ECU). The air

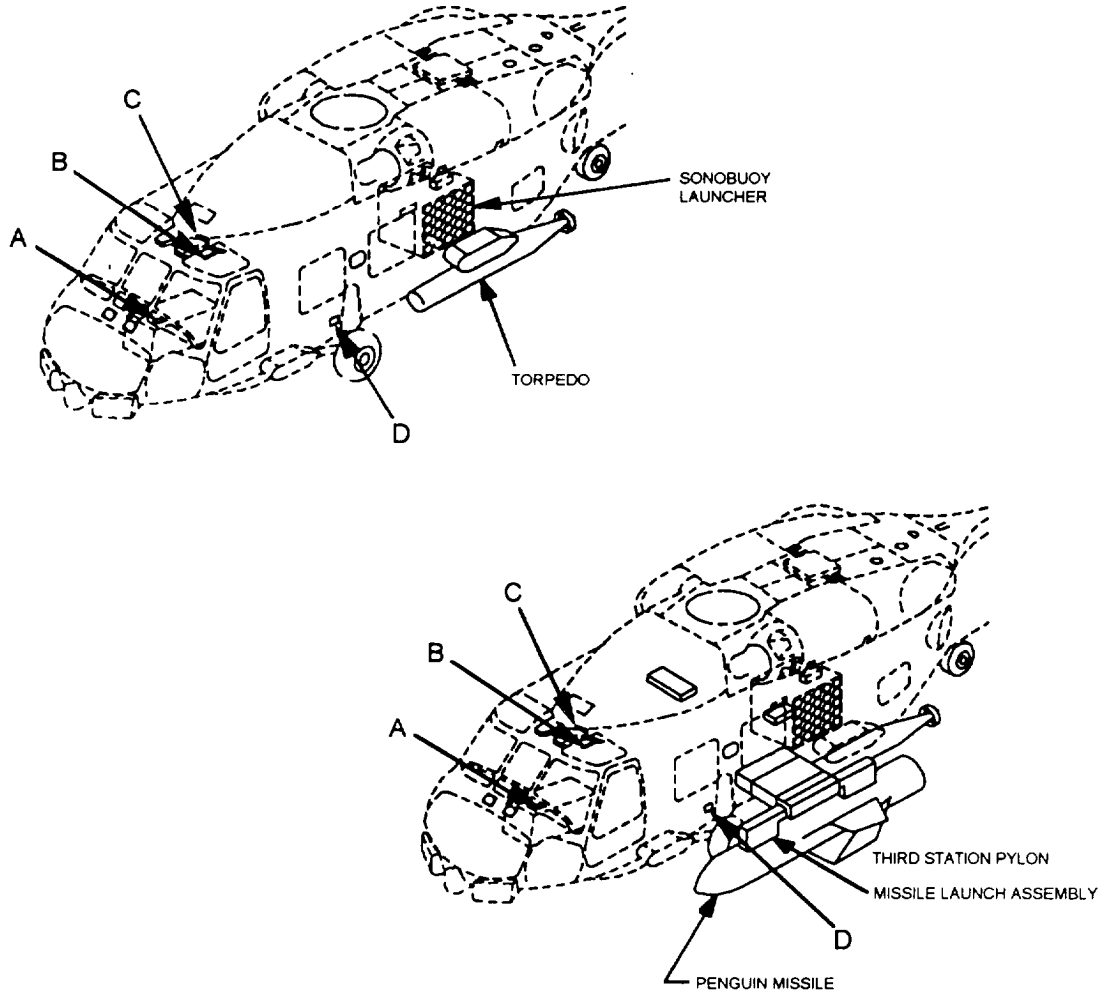

Figure 7-23.-SH-60 (series) search and kill stores.

bottle and the ECU are mounted on top of the launcher assembly. A servicing valve is provided, on the left-hand side of the helicopter, for servicing the air bottle. The air bottle should be serviced to 1200-1250 psi. This ensures that the system will be able to launch all 25 sonobuoys.

The distributor valve assembly uses a stepping motor to route air pressure to the selected launch tube. A manual selection knob, distribution lock, and tube-selected indicator window are located on the valve. The manual selection knob can be hand rotated to move the rotary valve to vent or to any desired launcher tube position. The valve lock allows the rotary valve to be manually secured to any desired launcher tube position or vent. The tube-selected indicator window displays the position of the rotary valve at any one of 25 tubes or vent.

The ECU front panel contains three controls and one indicator. The controls are a AUTO/MANUAL switch, a SELF TEST switch, and a SAFE switch. The indicator is a STATUS display. When the AUTO/MANUAL switch is in the AUTO position, the ECU controls the rotary valve. In the MANUAL position, the rotary valve is controlled by manually turning the manual selection knob. Depressing the SELF TEST switch initiates the BITE testing for the ECU and the launcher. The STATUS indicator displays any faults found during self-test. If more than one fault is found, the failure codes will cycle at 3-second intervals. The SAFE switch causes the rotary valve to move to the vent position.

FIXED-WING KILL STORE SYSTEMS

The kill store system consists of all equipment necessary to select, arm, and release weapons from the bomb bay(s) and wing stations of the aircraft. The system is divided into two subsystems—the bomb bay and the wing store systems.

Bomb Bay System

The bomb bay system consists of the units and components necessary for the carrying, arming, and releasing of stores. On the P-3C, these stores are installed on bomb racks suspended from removable pylon assemblies, which are mounted across the center of the bomb bay. On the S-3A, the 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 letters (such as A or B) designate these stations for special capacities or types of stores. In addition, these stations are arranged in pairs: stations 1 and 2, stations 3 and 4, etc. As a further identification feature on the P-3C, the stations are grouped into two layers. Odd numbered stations in the upper layer and even numbered stations in the lower layer. When the bomb bay is loaded with mixed stores, each pair of stations must be loaded with the same type of store to ensure proper clearance between the stores. The S-3A has only one layer of stations because of its much smaller bomb bays.

The bomb bay doors are electrically controlled and hydraulically operated. For ground maintenance without power, the doors may be opened or closed internally on the P-3C by a manual control valve and hand pump. On the S-3A, the doors can be operated externally with a 3/8-inch drive crank. Both aircraft have a ground safety pin that is used to disable the door mechanism in the open position. The door safety pin must be inserted when personnel are working in the bays.

The release of bomb bay stores is normally accomplished by the computer. In the P-3C, the TACCO performs programming, and the pilot or TACCO controls the release. In the S-3A, the TACCO does both, with the copilot acting as backup. The pilots in both aircraft have final control because they must activate the master arm switch.

Wing Store System

The wing store system consists of the units and components necessary for carrying, arming, and releasing external stores. On the P-3C, these stores are suspended from 10 wing stations, numbered 9 through 18. On the S-3A, the stores are suspended from two wing stations, W5 (left) and W6 (right).

P-3C WING LAUNCHER ASSEMBLY.— The P-3C wing launcher assembly universal pylon is shown in figure 7-24. It consists of a pylon assembly supporting an Aero 65A-1 bomb rack with two Aero 1A adapters, four sway braces, and an emergency release jettison mechanism. Three hoist positions are identified by decals, and are labeled A, B, and C. Their use is determined by the relationship of the store suspension lugs to the center of gravity (CG) of the weapon. The rear sway braces are positioned at a forward or aft mounting position, depending upon weapon length and contour. The forward position is used with 500- and 1,000-pound mines, and the aft position is used with the 2,000-pound mines. The wing launcher fairing is trimmed to fit the wing contour at one station, and is not interchangeable between stations after trimming. Jettison operation of weapons occurs when the jettison solenoid in the wing launcher is energized. The solenoid-actuated linkage connects to the Aero 65A-1 manual release cable. The jettison solenoid and linkage must be cocked before loading.

S-3A PYLON/RACK ASSEMBLY.— The S-3A pylon/rack assembly (fig. 7-25) 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. It is controlled by the aircraft armament circuits. The pylon provides structural attachment between the aircraft wing and rack. It also contains the necessary wiring and components to connect the rack to release and status indicating circuits.

HELICOPTER KILL STORE SYSTEM

The kill store system of the SH-3 series helicopter consists of control panels, interconnecting electrical units, and four launchers. The SH-60 series helicopter has either two or three launchers. On the SH-3 series helicopter, the launcher consists of an Mk 8 Mod bomb shackle, an Aero 7 series release unit, mechanical arming units, and accessories varied by location for a particular model. The SH-60 series helicopter uses the BRU-14/A bomb rack attached to the pylons. Each type of helicopter is designed to release and jettison electrically through normal and jettison-release circuits.

FIXED-WING RELEASE AND CONTROL SYSTEM

The functions of the fixed-wing release and control systems are to provide necessary controls and

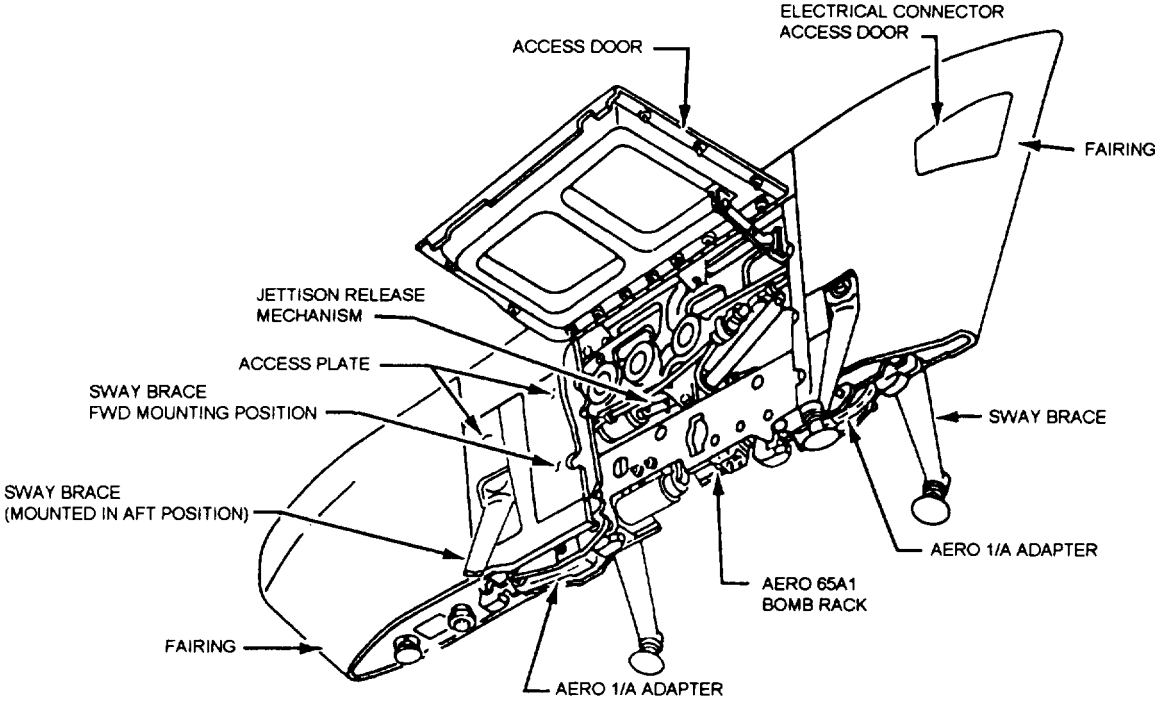

Figure 7-24.-Wing launcher assembly universal pylon.

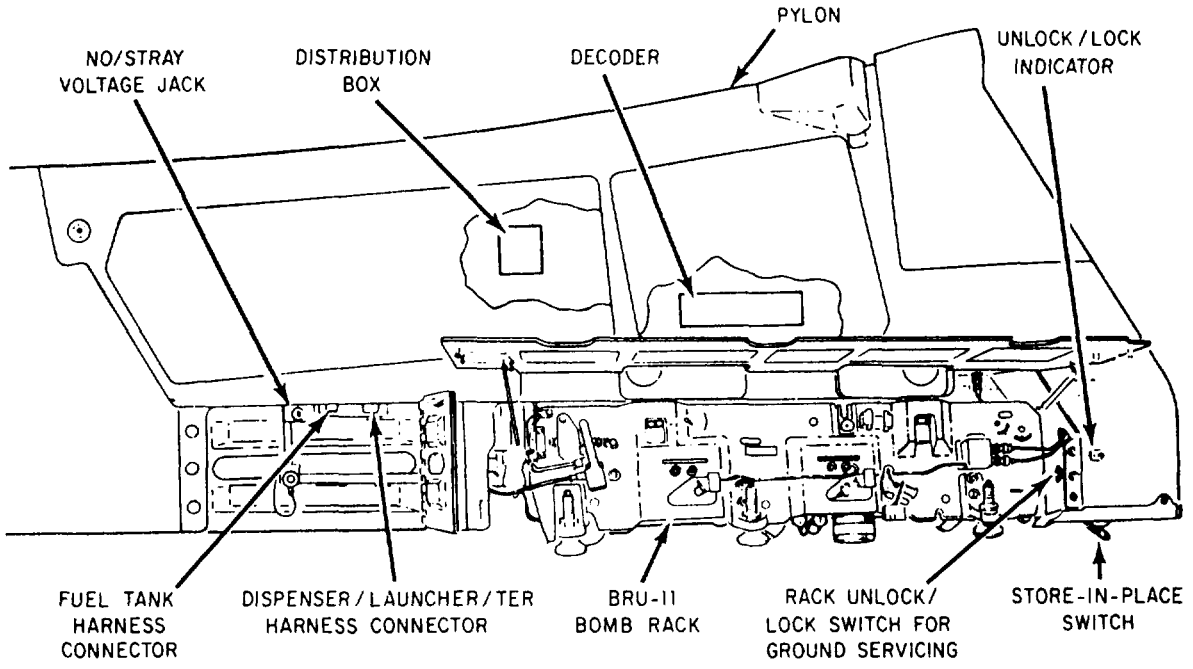

Figure 7-25.-Pylon/rack assembly.

circuitry for control and release of search and kill stores from the aircraft.

In the P-3C aircraft, system control is concentrated between the pilot and TACCO, with the copilot and other crew members having minor control functions. In the S-3A aircraft, the control is concentrated between the TACCO and copilot. The pilot and SENSO also have control functions available. In both aircraft, the pilot has final control over the release of stores through the master arm and search power switches.

The basic operation of the release and control systems of both aircraft are discussed in the following text. Remember, this information is of a general nature. For more detailed information, refer to the aircraft's MIMs.

Operation

The system's primary mode of operation is the automatic (on-line) mode. This mode uses the computer, logic units, crew member's keysets, bomb bay rack lock panel (P-3C), multipurpose data displays, pilot's armament control panel (ACP), and other displays and panels to control and monitor the system. The manual mode uses the same components, less the computer and logic units, through the TACCO's manual weapon control box (P-3C) and the main auto key select on the pilot's ACP (S-3A).

AUTOMATIC MODE.— The automatic mode permits a method of search and kill store management that allows maximum flexibility and control of the system while minimizing the amount of necessary manual action required by the aircrew. In the automatic mode, the system is designed to have the computer and its subsystems perform the following functions:

1. Maintain an up-to-date inventory of all stores on the aircraft and provide weapon inventory that can be called up for display on the TACCO's auxiliary readout (P-3C) or any crew member's MPD (S-3A).

2. Determine the availability of a selected weapon and select the weapon station from which the weapon is to be released (station priority).

3. Energize the armament system relays at the proper time, in the proper sequence, and for the proper time duration to accomplish a store release under joint computer and operator control.

4. Instruct the operator, by cuing via a light display or readout on the MPD, to perform a manual

operation. For example, the computer may cue the operator to turn on the bomb bay door switch and the master arm switch. The P-C3 computer also uses the ordnance panel to instruct the ordnance crew member on how to perform certain pressurized SLT loading or unloading operations (exchange between storage rack and SLTs). This enables the ordnance crew member to make available the search store requested by the TACCO.

5. Present the operator with alternatives for which decisions are required; for example, arming has three selections (nose, tail, or both). The computer also furnishes alerts, such as components or circuit failures and selections errors, to bring important developments to the operator's attention.

6. Calculate and initiate fly-to-point store releases, intervals between releases for train releases, and furnish system release commands in response to crew member release commands.

7. Secure the system following each weapon release, check store-in-place status, update the inventory, and prepare the system for the next store selection.

MANUAL MODE.— In the P-C3, the manual mode provides the TACCO with management control of all kill and search stores. In the S-3A, each crew member controls kill and search stores under the management of the pilot and TACCO conjunctival y.

In the manual mode, the P-C3 TACCO/S-3A pilot selects the bomb bay or wing station for release, along with the arming and release mode of the selected store. These actions are executed by the control on the weapons control panel. If required, the pilot is cued to turn on the master arm switch and open the bomb bay doors.

When the station, arming, and release modes in the P-C3 have been selected, the master arm power will be on, the bomb bay doors will open (if required), and the kill ready lights on the ACP and TACCO manual weapons control panel will illuminate. If the selected station is loaded, the station select keys on the ACP will light amber (S-3A). The store may then be released by the pilot, copilot, or TACCO (also the SENSO in the S-3A) by use of their release switches.

The P-C3 search store release and control in the manual mode is completed by the ordnance crew member using the controls on the search stores interconnection box. The desired SLT is selected by using the letter and number switches. This cues the pilot to turn on the search power switch. When the SLT has been selected and search power is on, a launch is effected by actuating the sono launch switch on the search stores interconnection box.

Jettison

Store jettison of both aircraft is somewhat similar in operation and control. Manual actuation of the jettison or the external jettison switch by the pilot disables the arming circuit and initiates jettison.

In the P-C3, the jettison programmer is energized and sends sequential release and bomb bay door open/close signals. Wing stations are released in pairs (one from each wing) from outboard stations to inboard stations at 2-second intervals. At this same time, the bomb bay doors are opening. Then, the lower stations are released, the upper stations release after the lower stations, and then the doors are closed.

A separate switch on the pilot's console initiates the jettison function for wing stations only. Selective jettison from any station may be accomplished through normal manual release with the arming select (TACCO weapons panel) set on safe.

In the S-3A, the wings and SLTs receive jettison commands from the wing and search store decoders to release all wing stores and 59 SLTs. The SAR chute remains loaded.

Bomb bay stores, wing stores only, and wing stores from auxiliary devices (such as flare launchers) are released by using the ACP AUX rotary switch. This is done according to the load to be jettisoned. In this situation, the mechanical arm thumb-wheel selector must be set to safe, and the arm set switch depressed. Armed store releases may also be initiated in the above reamer.

When the aircraft is on the ground, the jettison circuits of both aircraft are disabled by the weight-on-wheels switches. These switches are located on the right and left main landing gear (main mounts).

REVIEW QUESTIONS

Q1. True or False. The weapons systems in modern aircraft are completely independent of any other systems.

Q2. What should an avionics technician do if the armament switches are in the wrong position?

Q3. What does the checkerboard symbolize on the weapon status indicators?

Q4. What switch is used to enable ground technicians to perform functional checks while the aircraft is on the ground?

Q5. What weapon does not require a weapon code when loaded on stations 4 and 6 on the F-18 aircraft?

Q6. How many bomb bay stations are available on the P-C3 aircraft?

Q7. How many launch chutes are available on the P-C3 aircraft? (Include all pressurized, unpressurized and free-fall chutes.)

Q8. How many sonobuoys can the SH-60 helicopter launch?