AIRCREW WEAPONS DELIVERY MANUAL (NONNUCLEAR) B-52/AGM-84D

USAF SERIES B-52/AGM-84D AIRCRAFT MISSILES

THE BOEING COMPANY
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This Revision rescinds TO 1B-52G-34-2-2 dated 30 August 1986 with Change 2 dated 15 September 1993.

Refer to Technical Order Index T.O. 0-1-1-2 for current status of Flight Manuals, Safety and Operational Supplements, and Flight Crew Checklists.

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Flyleaf 1	0	1-11 – 1-59	0	5-1	0	7-5 – 7-22	0
Flyleaf 2 Blank	0	1-60 Blank	0	5-2 Blank	0	Glossary 1	0
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1-1	0	3-1 – 3-7	0	6-2 Blank	0	Index 1 - Index 4	0
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CURRENT ABBREVIATED CHECKLIST

AGM-84 HARPOON MISSILE
Abbreviated Flight Crew Checklist T.O. 1B-52H-34-2-2CL-1 1 Apr 97

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STATUS OF SAFETY AND OPERATIONAL SUPPLEMENTS

This supplement status page is based on information available to the manual editor as of the date of this publication. The information may not be current as it must be updated by any subsequent supplement status pages and by reference to T.O. 0-1-1-2.

SUPPLEMENTS IN THIS CHANGE

Number	Date	Short Title	Section Affected

OUTSTANDING SUPPLEMENTS

Number	Date	Short Title	Section Affected

Table of Contents

INTRODUCTION

SCOPE. This manual provides aircrews with descriptive and procedural information required for delivery of AGM-84 Harpoon Missiles from B-52 CS aircraft (modified by TCTO 1B-52H-756 Integrated Conventional Stores Management System).

CHECKLISTS. Abbreviated checklists for the procedures given in this manual have been integrated with the affected flightcrew checklists. These checklists are identified by a T.O. number that is identical to that of the applicable flight manual except for the addition of the letters CL (checklist) and a suffix number indicating the crewmember to which it applies.

ARRANGEMENT. This manual is divided into seven sections as follows:

Section I, DESCRIPTION - Locates, identifies, and functionally describes the missile and aircraft components including controls and displays and the Harpoon Stores Management Overlay (SMO) which directly concern the aircrew in the delivery of an AGM-84 missile.

Section II, NORMAL AIRCREW PROCEDURES - Contains amplified checklists for performance of normal aircrew missile delivery procedures from preflight through after landing and procedures applicable in the event a mission is aborted. No attempt is made to regulate or define conditions under which the mission will be aborted. Procedures and techniques can be accomplished on any CS aircraft.

Section III, EMERGENCY AIRCREW PROCEDURES - Contains missile fire and jettison procedures.

Section IV, SUPPLEMENTARY DATA - Contains information on operational test launch and launch systems.

Section V, OPERATING LIMITATIONS - Contains important missile and weapon system limitations that must be taken into account during planning and accomplishment of a mission.

Section VI, MISSION PLANNING - Contains information on transportation of dangerous material, inflight emergency notification and inflight mission data changes that can be accomplished by the flightcrew.

Section VII, SYSTEMS OPERATION - Contains additional material regarding the operation of the aircraft systems related to the AGM-84 missile. Theory of guidance system operation, guidance performance, and malfunction analysis are included.

SAFETY AND OPERATIONAL SUPPLEMENTS. Information involving flightcrew safety and directly pertaining to the information contained herein will be promptly forwarded to you by Safety Supplements issued against this manual. Safety Supplements covering loss of life will get to you in 48 hours by TWX (called Interim Safety Supplements) and those concerning serious damage to equipment within 15 days by mail (in a formal printed form). Operational information not involving safety but of an urgent nature will be forwarded to you by Operational Supplements issued against this manual. These will be forwarded by TWX (interim) or by mail (formal), depending on the urgency of the information. Interim supplements are normally replaced by formal printed supplements at an early date. Formal printed supplements are identified by red letters “SS” for safety supplements and black letters “OS” for operational supplements printed around the borders of the pages. The currency of safety and operational supplements affecting your manual can be determined by referring to the Weekly Index of Bomber Aircraft Safety Supplements (T.O. 0-1-1-2). The title block of each supplement and the title page of this manual

WARNINGS, CAUTIONS, AND NOTES. The following definitions apply to "Warnings," "Cautions," and "Notes" found throughout the manual.

WARNING

Operating procedures, techniques, etc, which could result in personal injury or loss of life if not carefully followed.

CAUTION

Operating procedures, techniques, etc, which could result in damage to equipment if not carefully followed.

NOTE

An operating procedure, technique, etc, which is considered essential to emphasize.

SHALL, WILL, SHOULD, and MAY. The following definitions apply to the words:

SHALL or WILL	The instructions or procedures prefaced by "shall" or "will" are mandatory.
SHOULD	Normally used to indicate a preferred but nonmandatory method of accomplishment.
MAY	An acceptable or suggested means of accomplishment.

CHANGE SYMBOLS. Changes to existing material and addition of new material are indicated by one of three types of symbols determined by the nature of the material affected. Text material utilizes a vertical line in the margin adjacent to the affected area. New illustrations (figures) utilize a vertical line in the outer margin of the page. Line drawings use a miniature pointing hand to highlight the affected area. Change symbols are not used for blank space resulting from deletions, indexes, and tabular data where changes cannot be identified, relocation of material, or correction of minor inaccuracies unless such correction changes the meaning.

RESPONSIBLE AGENCY. Every effort is made to keep this manual current. Review conferences with operating personnel and a constant review of reports assure inclusion of the latest data in this manual. Comments, corrections, and questions regarding this manual should be submitted on AF Form 847 through the local standardization/evaluation unit and routed to Oklahoma City ALC/LHRH, 3001 Staff Drive Suite 2AD292, Tinker AFB, Oklahoma 73145-3021.

This T.O. applies to the following CS B-52 aircraft which have been modified by TCTO 1B-52H-756 (Integrated Conventional Stores Management System):

60-0004	60-0025	60-0049	61-0003
60-0007	60-0026	60-0050	61-0004
60-0009	60-0031	60-0051	61-0006
60-0010	60-0032	60-0052	61-0007
60-0011	60-0033	60-0055	61-0010
60-0014	60-0034	60-0056	61-0011
60-0015	60-0035	60-0057	61-0016
60-0016	60-0037	60-0058	61-0020
60-0018	60-0038	60-0059	61-0023
60-0020	60-0043	60-0060	61-0027
60-0022	60-0044	60-0062	61-0031
60-0023	60-0046	61-0002	61-0039

AIRCRAFT GROUP CODING. Certain modifications which have been completed do not include all serialized aircraft in the models affected. Information pertaining to these aircraft is identified by aircraft group coding symbols such as CS . Specific aircraft serialization within these groups is identified in the appropriate flight manual under a like coding in the "Aircraft Coding" pages.

Description

section I

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PART 1 - GENERAL SYSTEM DESCRIPTION

B-52/AGM-84 (HARPOON) WEAPON SYSTEM

The B-52/AGM-84 weapon system consists of a Surface Attack Guided Missile, Air AGM-84D-1 (tactical missile) and the B-52 OAS System. The B-52 aircraft has the capability of launching eight AGM-84 missiles from two Heavy Stores Adapter Beams (HSAB), one on each wing, four missiles per HSAB. The AGM-84 can be fired singularly or in salvo, one from each wing.

B-52 CARRIER AIRCRAFT

The offensive avionics system (OAS) controls power application, programming, and launching of missiles. The OAS also provides signal processing, storage avionics, control and display panels, missile supervision, regulated dc power conversion, and monitors environmental control equipment in the aircraft. The OAS interfaces with the carrier electrical sources, and panel lighting. Primary missile control and monitor is provided through the weapon control panel (WCP) and the multifunction displays (MFD).

AGM-84 MISSILE (AGM-84)

The AGM-84 missile (figure 1-1) is an all weather, anti-ship attack weapon capable of airborne launch from various platforms including B-52 aircraft. It incorporates the All-Up-Round (AUR) concept and requires no assembly other than installation of missile wings BSU-42/B and BSU-43/B and missile control fins BSU-44/B at the organizational level. See figure 1-2 for missile identification and usage.

MISSILE CHARACTERISTICS

Length	12 feet 7 inches
Diameter	
Missile body	13.5 inches
Control fin span	36 inches
Wing span	36 inches
Gross weight	1165 lbs (JP10 fuel)
Center-of-gravity (Nominal from nose)	84.26 inches (With JP10 fuel)
Range	Over-the-horizon
Propulsion	J402 Jet engine
Guidance section	Self-contained active radar, Midcourse Guidance Unit (MGU) and radar altimeter
Warhead section	Class A high explosive penetration blast. Safe/arm device and fuze

AGM-84 Major Components

The major components of the tactical missile are described in the following paragraphs. See figure 1-1 for component locations.

GUIDANCE SECTION

The guidance section accomplishes the navigational computations, arming, and flight control of the missile. It contains the Midcourse Guidance Unit (MGU), Radar Altimeter, Radar Seeker, and Radome.

The MGU consists of a digital computer and an attitude reference assembly. It initiates all free-flight control functions. After launch, the MGU uses data transferred from the OAS loaded with the Harpoon SMO prior to launch and inputs from other guidance section units to direct the missile's flight profile.

The Radar Altimeter provides altitude data to the MGU when the missile is inflight at altitudes between 10 and 5000 feet. The Radar Altimeter consists of a transmitter, a receiver, a transmitting antenna (mounted on the underside of the Guidance Section), and a receiving antenna (mounted on the underside of the Warhead Section).

The Radar Seeker provides terminal guidance data to the MGU for flight control maneuvering and computations. The seeker search is initiated by the MGU when the missile reaches a programmed distance from the target. The seeker will then search, evaluate, and lock-on to the target. The lock-on will be maintained until impact with the target.

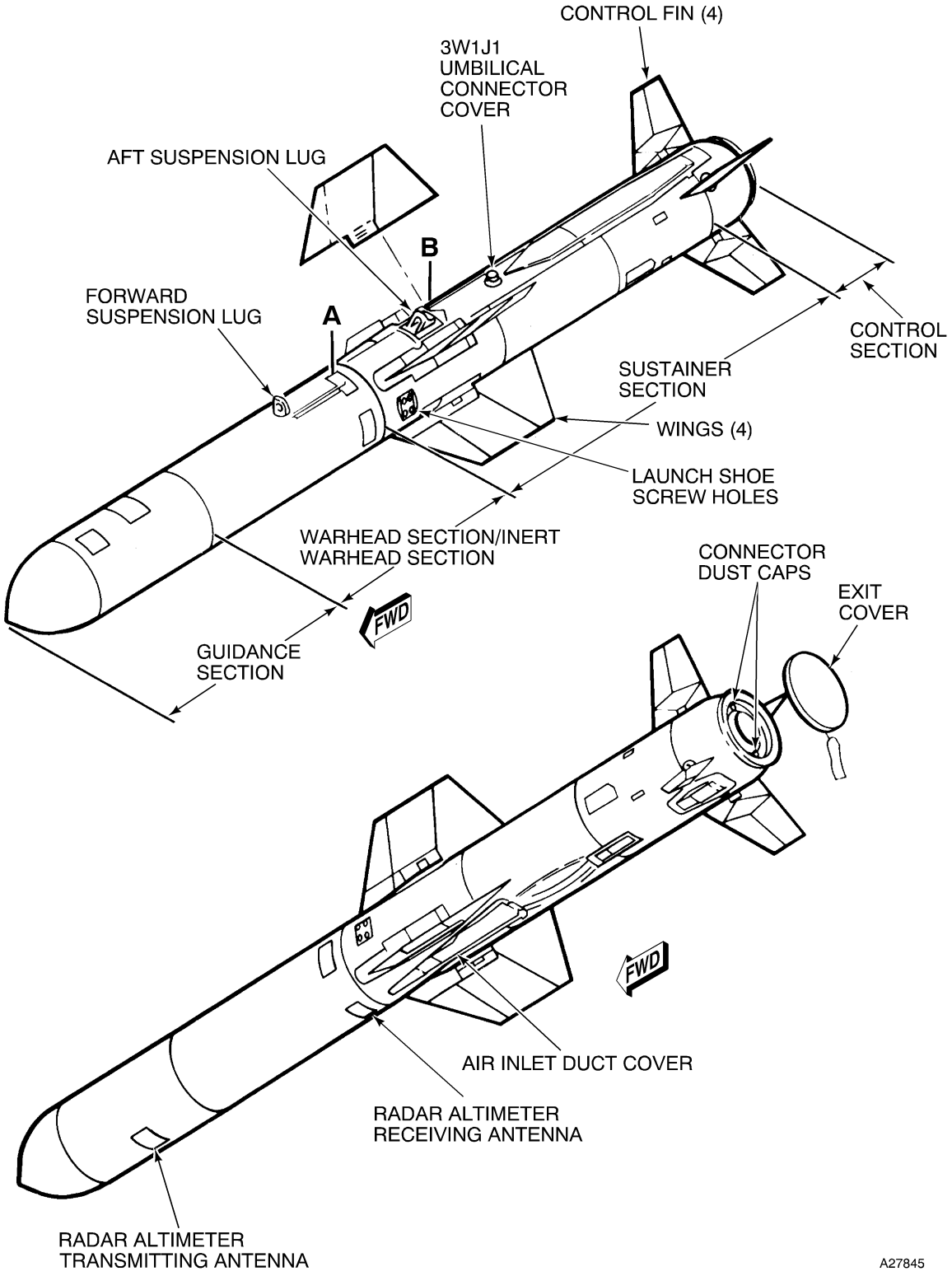


Figure 1-1. Tactical/Inert Warhead Airlaunch Missile (Sheet 1 of 2)

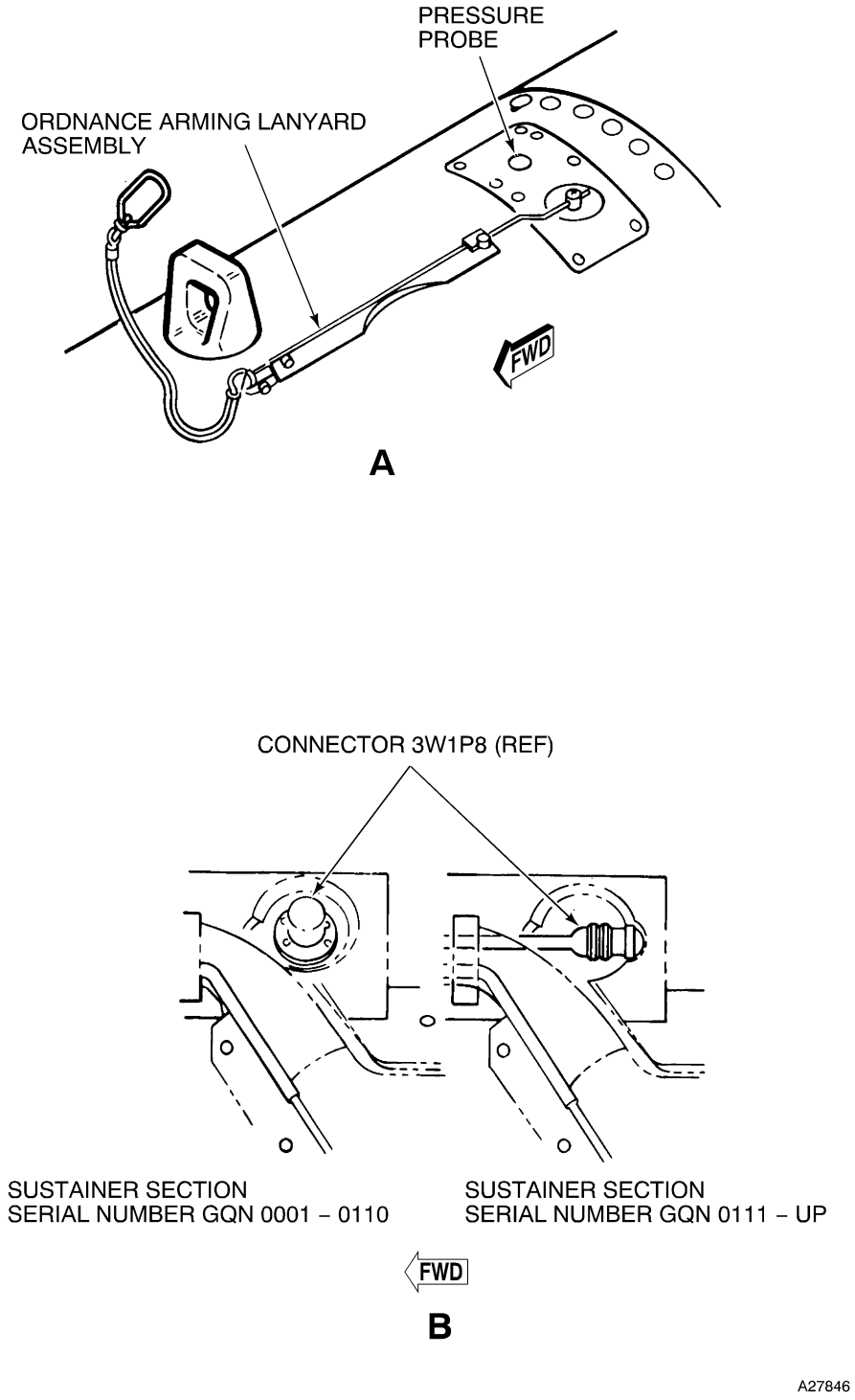


Figure 1-1. Tactical/Inert Warhead Airlaunch Missile (Sheet 2 of 2)

DESIGNATION	NOMENCLATURE	USE	COLOR
AGM-84D-1	Surface Attack Guided Missile, Air	Tactical antiship weapon	White with yellow band around warhead section. Brown band around sustainer section
ATM-84D-1	Exercise Training Missile, Air	Training, test, and evaluation	White with blue band around exercise section. Brown band around sustainer section
ATM-84A-1B	Training Missile, Inert, Air	Handling, training	White with blue band around guidance section
ATM-84A-1C (Captive)	Ballistic Air Test Vehicle, Air	Handling, training captive carry	White with blue bands around the guidance, warhead, and sustainer sections

Figure 1-2. Missile Identification and Usage

WARHEAD SECTION

The warhead section contains a penetration blast type explosive, contact fuze, crush sensors, and pressure probe assembly. It provides for internal routing of the interconnecting cables from the guidance section to other parts of the missile. The forward launch lug, signal reception antenna, and arming lanyard are mounted on the warhead section.

SUSTAINER SECTION

The sustainer section consists of five major components: the fuel tank, electronic control amplifier, battery, pyrotechnic relay panel, and the engine. The inlet duct for the engine has a pyrotechnic activated inlet duct cover which is ejected just prior to engine start during the missile engine start sequence. The umbilical connector, four wings, and the aft launch lug are mounted on the sustainer section. The sustainer section provides approximately 8 minutes of propulsive thrust for the missile and can obtain maximum thrust in 7 seconds. The fuel tank contains approximately 108 pounds of JP-10 fuel which is sealed into the tank during missile assembly. The LCE Fire Warning System monitors only the sustainer section of the selected missile. The Fire Warning indicator is located on FRMT 7.

CONTROL SECTION

The control section consists of the four missile fins and the four electro-mechanical actuators. When directed by the MGU, the actuators position the missile fins to the desired setting for missile altitude and course control.

The control fins are one-piece aluminum castings containing a special torque-limiting bolt, used to fasten the control fin securely to the control actuators.

SUSPENSION LUGS

Two suspension lugs are provided for attachment of the missile to the B-52 aircraft HSAB. The forward launch lug is mounted on the upper surface of the warhead section and the aft launch lug is mounted on the upper surface of the sustainer section.

PROTECTIVE DEVICES

The covers and protective devices shown in figure 1-1 are described in the following paragraphs.

- The arming wire installed in the pressure probe switch prevents switch actuation until launch of the missile.
- A dust cover is installed on umbilical connector 3W1J1 and wing root connector 3W1P8 (Detail B, figure 1-1) to protect the pins from damage, dirt, and moisture and reduce the possibility of a static discharge from being induced into the missile wiring.
- Two snap-on type dust caps are installed over two unused electrical connectors on the aft end of the control section to keep out dirt and moisture, prevent damage to pins, and reduce the possibility of a static discharge from being induced into the missile wiring. The exit cover completes protective closure of the aft end of the control section.
- Unused launch shoe screw holes have either a cover or nylon setscrews installed for aerodynamic considerations and to keep out dirt.

MISSILE SUSPENSION SYSTEM

B-52 AGM-84 missiles are carried externally on modified wing pylon weapon suspension assemblies which are attached to the wing pylon adapter. The aircraft is certified to carry/launch missiles from stations 1, 2, 3, and 7 on both left and right heavy stores adapter beams (HSAB), for a total of eight missiles. Each suspension assembly consists of the following:

- Stub Pylon (Modified Wing Pylons)
- Heavy Stores Adapter Beam (HSAB)
- MAU-12 Ejector Rack

AGM-84 missile system wire harnesses are routed inside the stub pylon to the HSAB. The Weapon Personality Adapter (WPA) is located at the front end of each stub pylon under the fairing (figure 1-3).

The HSAB is attached to the stub pylon on each wing and houses the wire harnesses for missile control and release. The adapter beam has provisions for carrying up to four AGM-84 missiles on MAU-12 ejector racks. The aft station missiles of the HSABs are required to be launched prior to launching the forward station missiles when the missile engine is to be started before launch. The navigator can select a forward station missile, but the OAS will inhibit launch until the aft station missile on the same HSAB is launched or jettisoned.

NOTE

Center station missiles (stations 2 and 7) must be launched prior to the shoulder-station missiles under all conditions.

The MAU-12 ejector rack is used to suspend and release missiles. Each rack is equipped with two hooks and four sway braces which hold and support the missile. A spacer is used to ensure the fins of one missile are separated from the fins of an adjacent missile. Two ejector feet, one near each hook between each pair of sway braces, ejects the missile when release is commanded. The rack has provisions for a ground safety lockpin and an inflight safety lock. A bolt with nut is installed in the inflight safety lockout pin hole of each MAU-12 rack. The ground safety lockpin is used to lock the racks while on the ground.

The MAU-12 ejector rack initiates or inhibits the AGM-84 missile warhead arming sequence at release using the ordnance arming lanyard. The arming lanyard is retained or released by an arming solenoid in each rack. During launch, the OAS provides an electrical signal to the arming solenoid in the selected MAU-12 ejector rack. The arming solenoid then retains the missile ordnance arming lanyard when the missile is launched. Retention of the ordnance arming lanyard by the solenoid activates the missile arming circuits. The arming solenoids are not energized during missile jettison because the missile ordnance arming lanyard is released with the weapon.

When the missile umbilical connector is properly connected and locked, a small pin projects from the front of the connector barrel approximately 1/16 inch. The missile free-flight sequence is initiated when the umbilical cable "Quick-Disconnect" connector is disconnected by the pull of the connector bail wire as the missile is ejected from the rack.

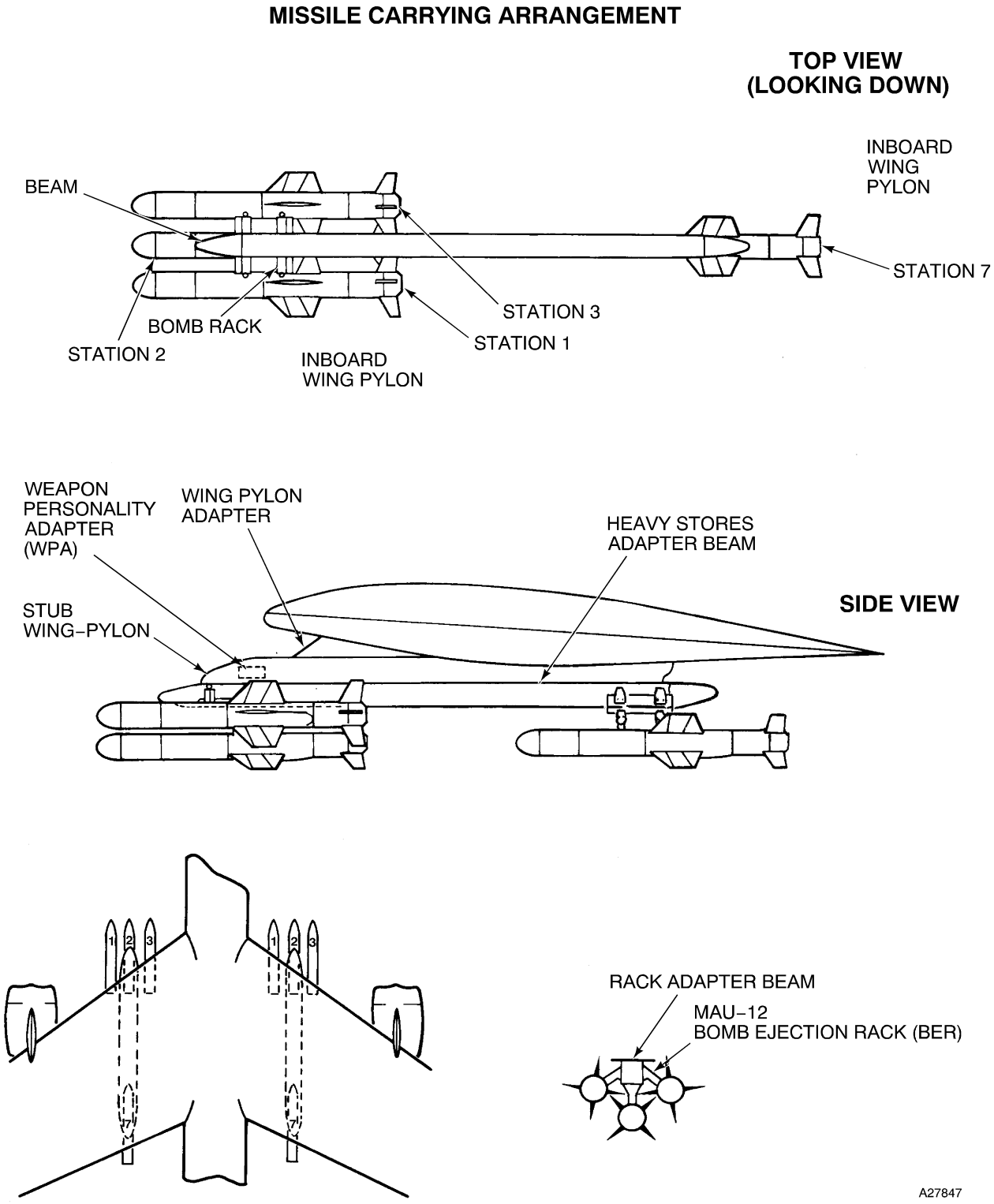


Figure 1-3. Pylon/Missile Configuration

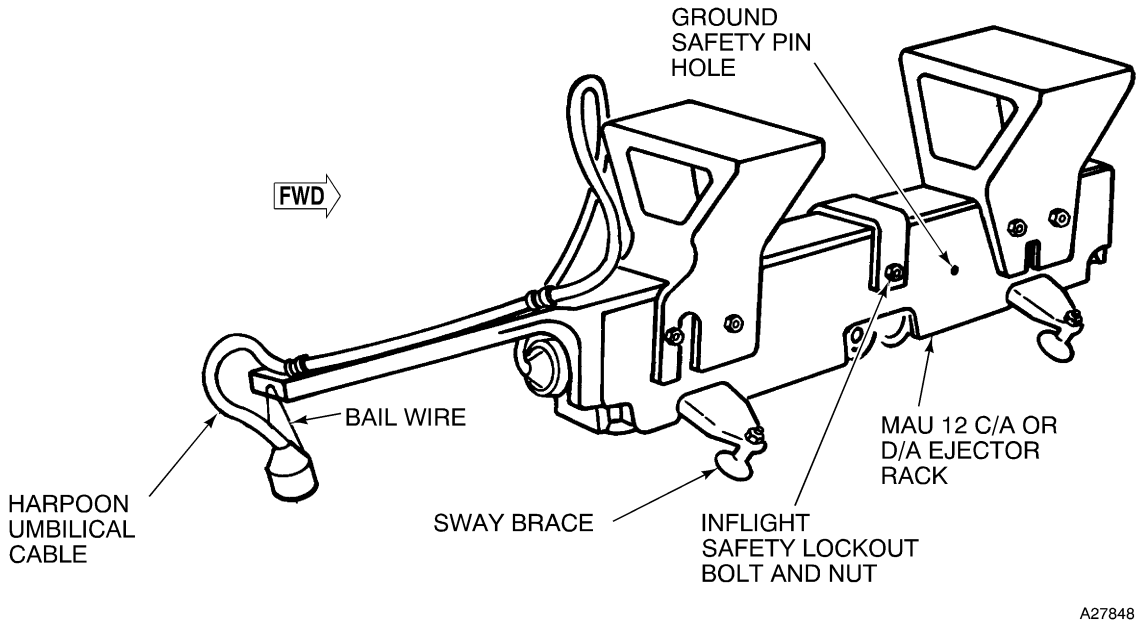


Figure 1-4. MAU-12 Ejector Rack

PART 2 – SYSTEM FUNCTIONAL DESCRIPTION

AIRCRAFT MISSILE CONTROLS AND DISPLAYS

Operator controls and displays for missile system control are located at the pilots' and navigators' stations. The munitions consent panel is located at the pilots' station. The WCP, OAS power control panel, keyboards, MFD, and computer control panel are located at the navigators' station. See figure 1-5 for OAS/missile data flow.

PILOT'S MUNITIONS CONSENT PANEL

The pilot's munitions consent panel (figure 1-6) (here after called the pilot's consent panel), contains the PREARM-OFF and LOCK-UNLOCK switches. The panel provides unlock consent for powering the missile ejectors. The PREARM function of the pilot's switch is not used with AGM-84 missile. The LOCK-UNLOCK switch is guarded in the LOCK position.

WEAPON CONTROL PANEL

The weapon control panel (figure 1-7), located on the navigator's front panel, provides controls for prearming (Intent To Launch), launch, and jettison of missiles. Missiles are selected with the LOCATION and STATION switches. With a single location selected, individual missiles or groups of missiles may be selected at that location. If more than one location is selected, the OAS will allow only the ALL station switch to be selected. For example, left pylon (LP) stations 1, 3, 7 may be selected, but, if both left and right pylons are selected, only the ALL station can be selected.

Weapon Control Panel Abnormal Procedures

An advisory "WCP" on the MFD indicates malfunction on the WCP. The operator will use CF-E (figure 1-18) to back up actions accomplished on the WCP. This will allow the operator to work around certain failures of the WCP and OAS power control panel.

NOTE

With a total WCP failure prior to accomplishing hardwired functions, missile launch is not possible.

CF-E may be used in conjunction with an operational WCP and OAS power panel to operate the system. The operators may use keyboard entries to perform functions mechanized on these panels at any time regardless of the panels go/no-go status. The OAS will treat the keyboard command as if it had originated from the WCP or OAS power panel. The lock-unlock function is not available on the CF-E backup. The display is laid out in basically the same arrangement as the panel. To accomplish a backup action for the malfunctioning panel switch, the operator enters CF-E and the symbols associated with the switch on the keyboard in the same sequence that normal switch operation would occur. See CF-E this section for further discussion of the CF-E functions.

OAS POWER CONTROL PANEL

The OAS power control panel (figure 1-8) located on the navigators' front panel provides power control for the OAS and the WIU (Weapon Interface Unit). All legends are backlighted green when power is on. The MIU switches which command power to the WIU and the WPA (Weapon Personality Adapter), are alternate action pushbuttons and will remain latched if the WIU loses power or is shut down by the OAS. The light in the switch is software controlled and will go out when WIU power is removed regardless of switch position. To reapply power to the WIU/WPA when they have been shut down by other than the operator, the switch must be pressed and released to reset the switch and then pressed a second time to reapply WIU/WPA power.

KEYBOARD

The keyboards (figure 1-9) located at the navigator's and radar navigator's stations, provide interface with the control of the OAS and missile system. The keyboard and MFD provide operator interface with the missiles through the selection of format (FRMT), control function (CF), program (PRGM), and modify (MDFY) commands. The selection of FRMT results in the display of a specific OAS and missile data presentation on the selected MFD. Control function selection results in display of a specific OAS data display or initiates the entry into a specific operating mode. If WCP switches malfunction, the navigator or radar navigator can select CF-E which provides a display of the WCP switches and the MIU power switches.

MULTIFUNCTION DISPLAYS

The multifunction display (MFD) (figure 1-10) is a CRT display unit. The MFD displays scan converted radar video, electro-optical viewing system (EVS) video, and alphanumeric mission data. Two MFD are located at the navigator's station and two at the radar navigator's station.

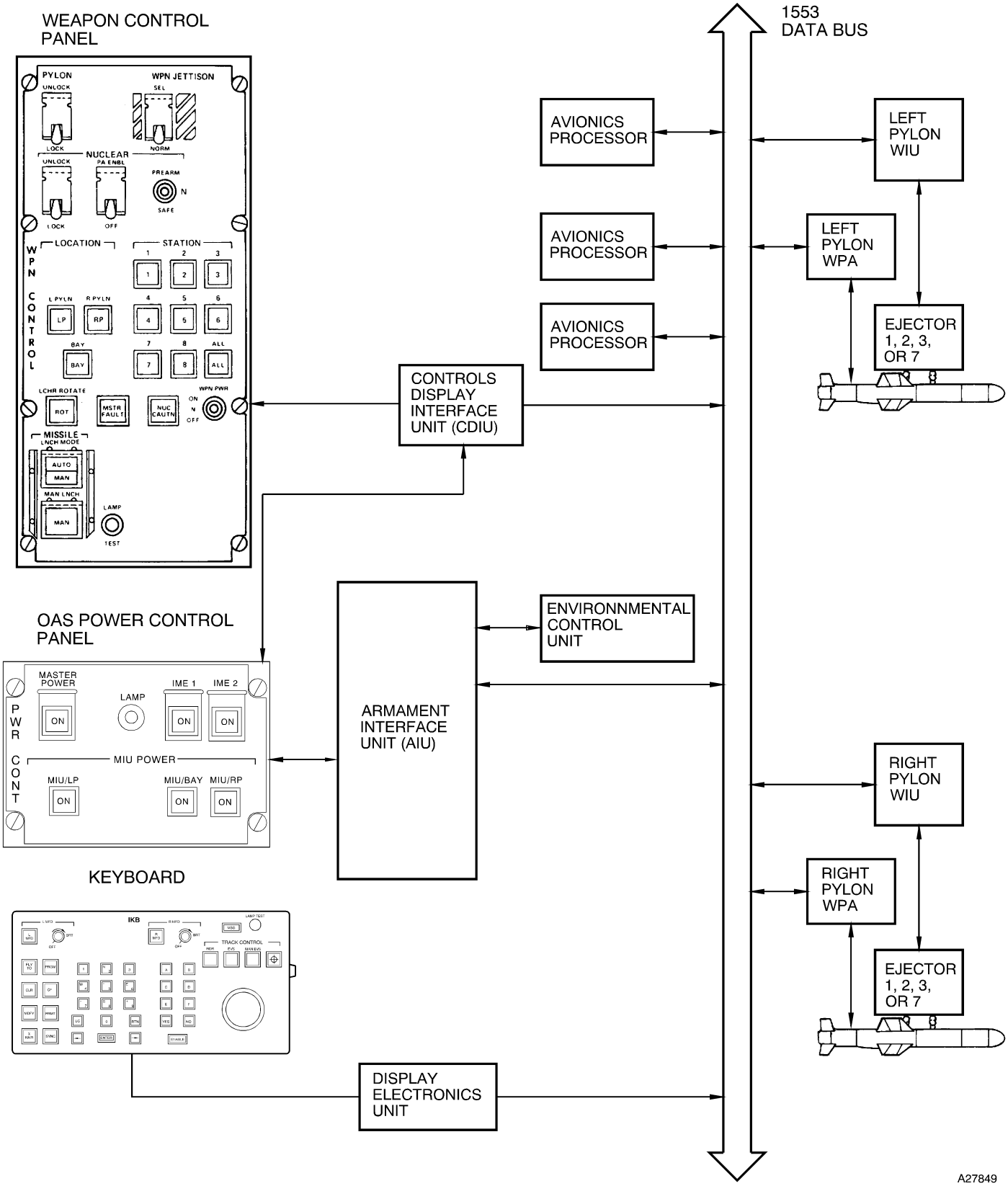


Figure 1-5. Missile Data Flow

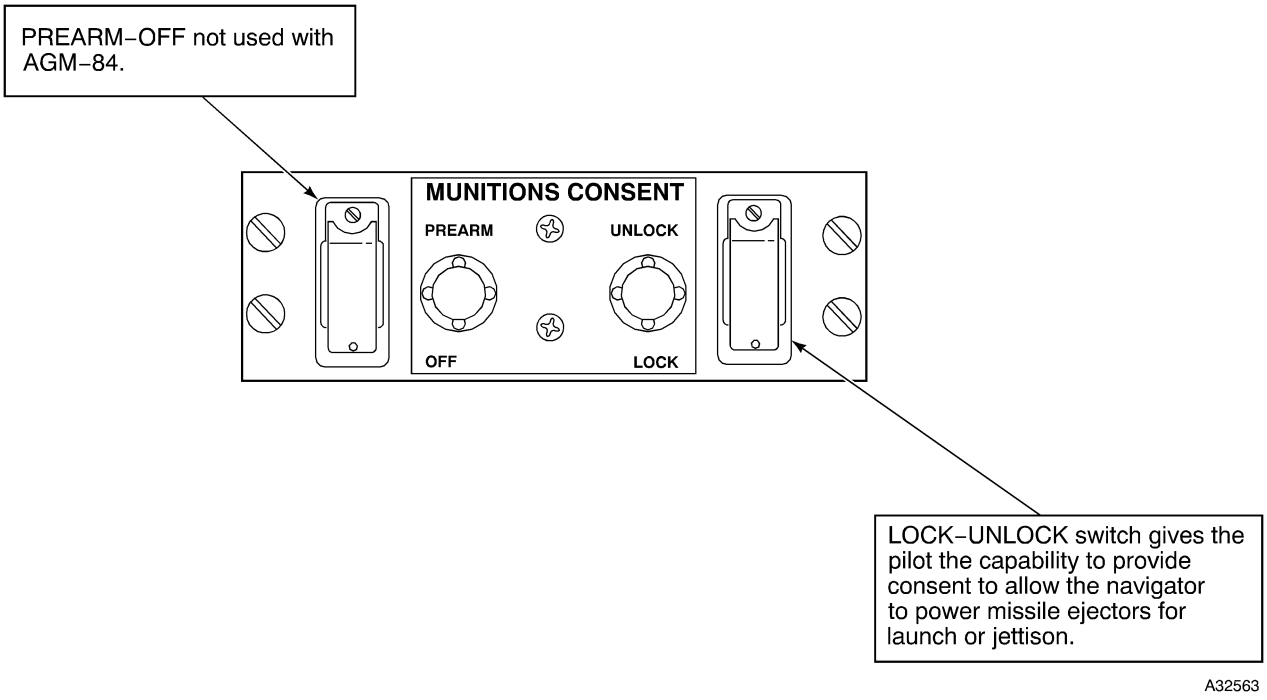
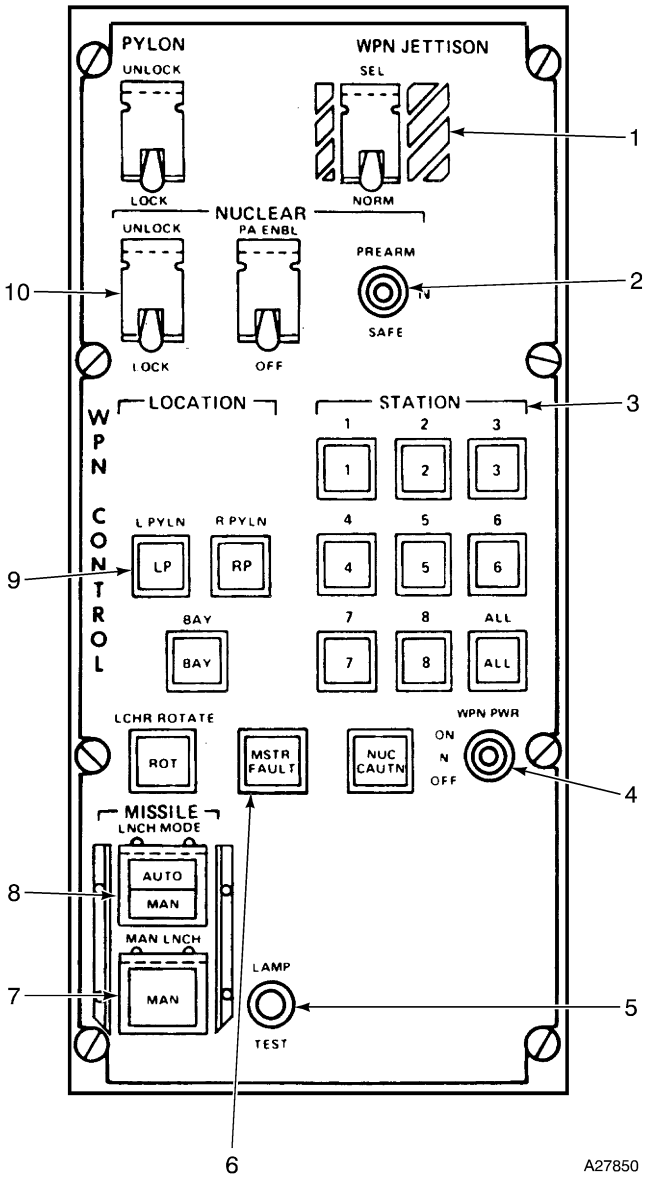


Figure 1-6. Pilot's Munitions Consent Panel

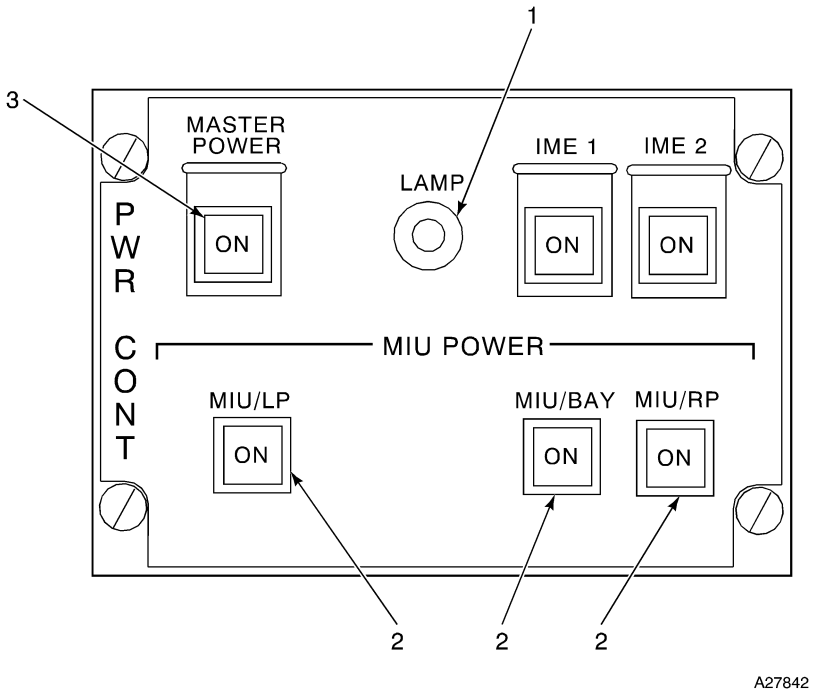


NAVIGATOR'S FRONT PANEL

Figure 1-7. Weapon Control Panel (Sheet 1 of 2)

NO.	CONTROL/INDICATOR	FUNCTION
1	WEAPON JETTISON SELECT (SEL) Switch	Spring-loaded to NORM (off) position. Used with unlock consent from pilot's missile consent panel and WCP nuclear lock-unlock switch. SEL – Jettisons missiles selected on location and station switches.
2	NUCLEAR PREARM SAFE Switch	Three position, spring-loaded to neutral (N). PREARM – When momentarily placed to PREARM, Intent to Launch (ITL) is transmitted to the missiles. Only one PREARM command is required per target regardless of the number of missiles to be launched against that target. SAFE – When momentarily placed to SAFE, with a LOCATION and STATION selected, sends an abort command to the selected missiles.
3	STATION Switches	Used with location switches to select individual pylon missile stations (1, 2, 3, and 7) or all (ALL) stations at the selected location for missile operational functions
4	WEAPON POWER (WPN PWR) Switch	Three position, spring-loaded to neutral (N). ON – Commands power be applied to the missiles selected by the location and station switches on the WCP. OFF – Commands power be removed from the missiles selected by the WCP.
5	LAMP TEST Switch	When pressed all panel lights will come on.
6	MASTER (MSTR) FAULT Light	Indicates a fault has occurred and more information is available on the MFD. Pressing acknowledges receipt of message, turns light off, and erases message.
7	MISSILE MANUAL LAUNCH Switch	Pressing the switch commands missile launch against a selected target. Only one launch command is required per selected target regardless of the number of missiles to be launched against that target.
8	MISSILE LAUNCH MODE Switch	Missile launch mode selections are ignored by the Harpoon SMO, and the system is always in MAN.
9	LOCATION Switches	Used with station select switches to select missiles for missile operation functions Left Pylon – (LP) selects left pylon missiles. Right Pylon – (RP) selects right pylon missiles. Bay – (BAY) Non functional with Harpoon missiles.
10	NUCLEAR LOCK-UNLOCK Switch	Guarded two position switch used with pilot's consent to apply power to missile ejectors for launch or jettison.

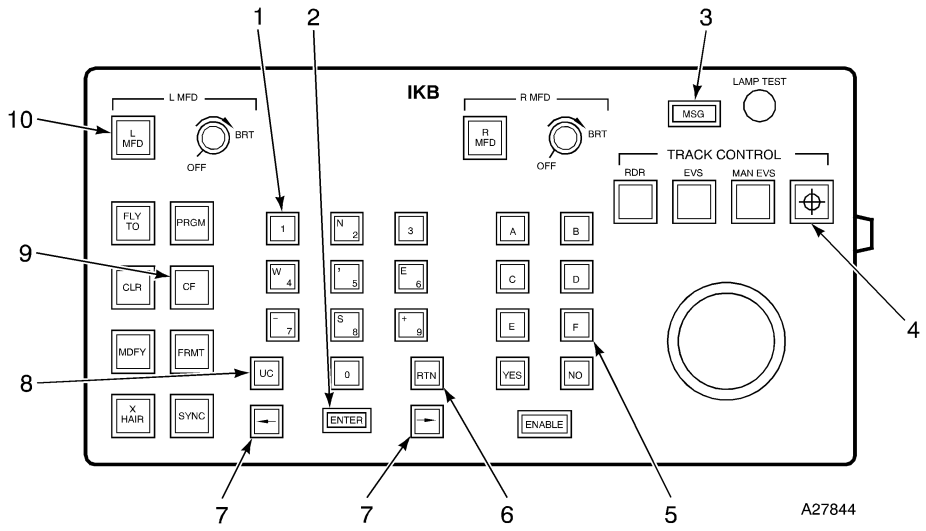
Figure 1-7. Weapon Control Panel (Sheet 2 of 2)



NAVIGATOR'S FRONT PANEL

NO.	CONTROL/INDICATOR	FUNCTION
1	LAMP TEST Switch	Tests all lights on the Power Control Panel.
2	MISSILE INTERFACE UNIT Switches	MIU/LP – Commands power to the left pylon weapon interface unit and weapon personality adaptor. MIU/BAY – Not used for AGM-84 MIU/RP – Commands power to the right pylon weapon interface unit and weapon personality adaptor.
3	MASTER POWER Switch	ON (light on) sends master power to: • OAS • WEAPON CONTROL PANEL • ARMAMENT INTERFACE UNIT (AIU) • Enable MIU POWER switches For all other functions, refer to the applicable flight manual.

Figure 1-8. OAS Power Control Panel



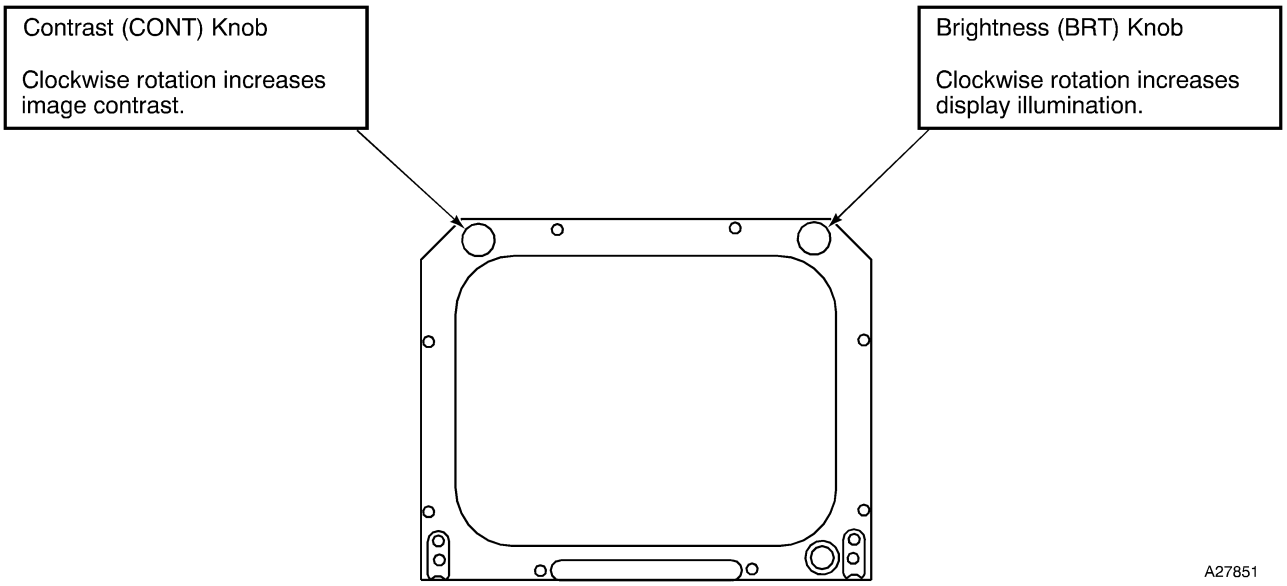
MISSILE RELATED KEYS AND SWITCHES

NO.	CONTROL/INDICATOR	FUNCTION
1	0 – 9 Keys	Enter the respective number in the data/command to be transferred. When used in conjunction with upper corner key, gives N, S, E, W, +, –, and comma (,).
2	ENTER Key	Completes the operator sequence. When pressed, data/commands will be transferred to OAS and displayed on MFD.
3	Message (MSG) Switch	Acknowledges an existing message after being displayed on all four MFDs.
4	Crosshair On Target Key	Used with CF-573 to designate the crosshair position as a target/waypoint.
5	A – F Keys	Enter respective letter in data/command to be transferred.
6	Return (RTN) Key	Places the MFD cursor to the first operator-changeable position in the row designated.

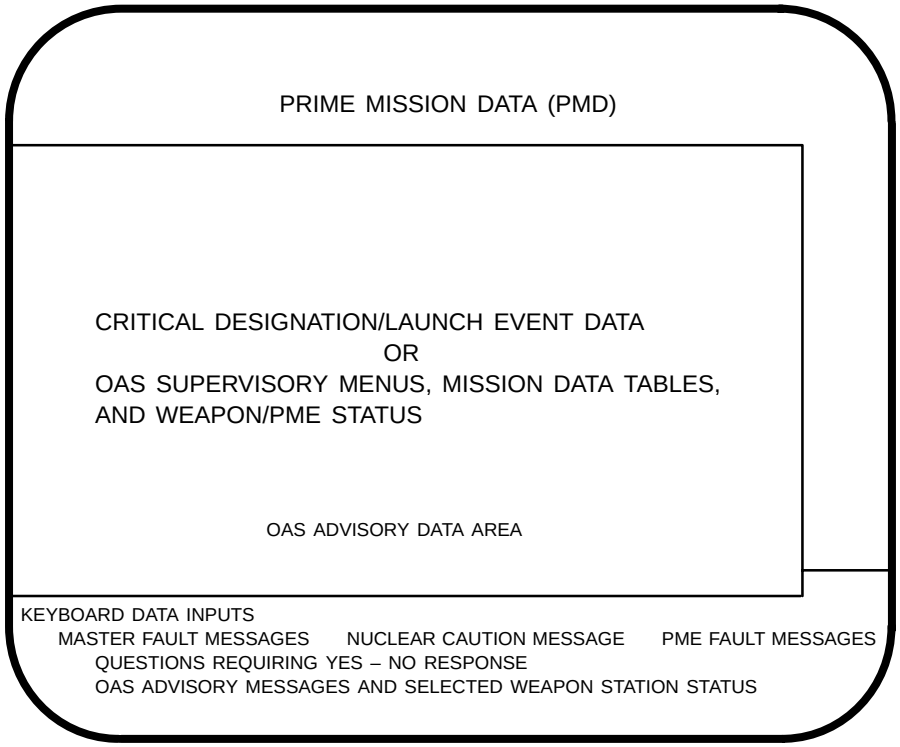
Figure 1-9. Integrated Keyboard (IKB) (Sheet 1 of 2)

NO.	CONTROL/INDICATOR	FUNCTION
7	Backspace (←) and Advance (→) Keys	Keys move the cursor on the MFD to the left and right respectively.
8	Upper Corner (UC) Key	When pressed, the number keys enter the symbols in the upper left corner of the key.
9	Display Select Keys (4)	PRGM displays current event program or selected event program. CF displays OAS mode supervision menu or initiates entry into specific OAS mode. MDFY initiates operator changes to MFD displayed data. FRMT displays video and/or data
10	L MFD and R MFD Selection Switches	Select either MFD for display of data inputs from the keyboard

Figure 1-9. Integrated Keyboard (IKB) (Sheet 2 of 2)



TYPICAL MFD RADAR NAVIGATOR'S AND NAVIGATOR'S FRONT PANELS



GENERAL DISPLAY ARRANGEMENT

Figure 1-10. Multifunction Displays

AGM-84 OAS SOFTWARE

The OAS controls the programming and launch or release of AGM-84 missiles using the flight computer program (FCP). The FCP consists of the flight management system (FMS) and stores management overlay (SMO). The FMS controls navigation, radar, controls and displays, and supports the SMO. The SMO contains all weapon control delivery functions. The SMO menu can be displayed to allow the operator to select the appropriate SMO. Up to 10 SMOs can be listed on CF-62, the SMO Load Menu (figure 1-17).

Functions performed by the SMO include weapon control processing, simulation processing, and controls and displays processing. To perform its required functions, the SMO interfaces with existing aircraft weapon system components, the OAS sources of navigation, steering, controls and displays processing, mission data, and with the global positioning system (GPS) hardware.

SMO MFD DISPLAYS

Sixteen MFD displays are used to interface with the operator for AGM-84 operations. Several of the displays are standard OAS displays which are modified by the AGM-84 SMO to provide additional data. Some of the displays are AGM-84 unique and only available through the AGM-84 SMO.

- CF — Control Function
- CF-5 — Weapon Supervision Menu
- CF-57 — AGM-84 Supervision Menu
- CF-573, N — Target/Waypoint Designate display
- CF-574, N — Target/Waypoint Locate display
- CF-6 — FCP Supervision Menu
- CF-E — Weapon Control Panel Backup display
- FRMT- — Format Menu
- FRMT-6 — PME Status Display
- FRMT-7 — AGM-84 Status and Inventory display
- FRMT-11,N — Target/Waypoint Input display
- FRMT-12 — Target Location Summary display
- FRMT-13,N — RBL Mission Parameter Input display
- PRGM-DO — BOL launch Data display
- PRGM-DN — RBL Launch Data display
- AGM-84 Release Advisory display

CONTROL FUNCTION (CF) DISPLAYS

Pressing the CF key on the IKB will display the CF MENU display (figure 1-11). The AGM-84 related selections form this menu are; CF-5 which commands display the AGM-84 weapon supervision menu, CF-6 which commands display of the FCP supervision display, and CF-E which commands display of the weapon control panel backup display.

Weapon Supervision Menu (CF-5)

The weapon supervision menu, commanded by CF-5, is shown in figure 1-12. CF-5 displays the current mode status (strike or simulation) and lists the commands for mode selection, AGM-84D unique menu, and the command to open and close the bomb bay doors (not used with AGM-84). The mode (strike or simulation) cannot be changed if a target is selected in the current mode.

AGM-84 Supervision Menu (CF-57)

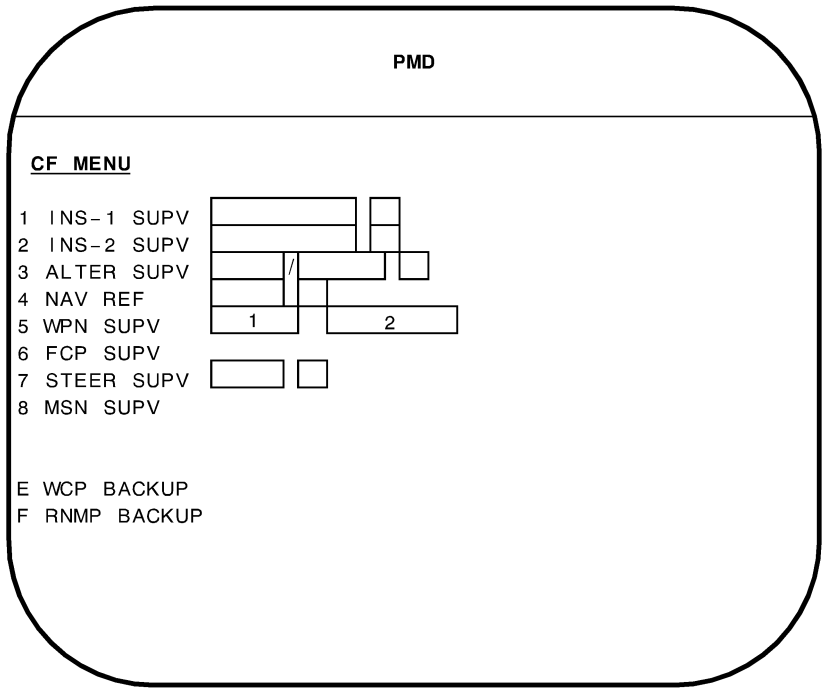
The AGM-84 Supervision menu, commanded by CF-57, is shown in figure 1-13. CF-57 displays the current SMO status and lists both CF and PRGM commands associated with AGM-84 operations.

Target/Waypoint Designate Display (CF-573)

The Target/Waypoint Designate display, figure 1-14 is commanded by CF-573,N. This display allows the operator to designate either a target or waypoint using the X-Hair control on either FRMT-1 or FRMT-2 displays. The desired point to be designated (i.e. target or waypoint) can be changed by either a 0 for target or 1 for waypoint next to the CF-573,N command line. The location can then be defined by rolling the X-Hairs to the desired position and pressing the X-HAIR ON TGT button on the IKB. Subsequently, the latitude and longitude of the Target/Waypoint will be displayed at the bottom of the display.

Target/Waypoint Locate Display (CF-574)

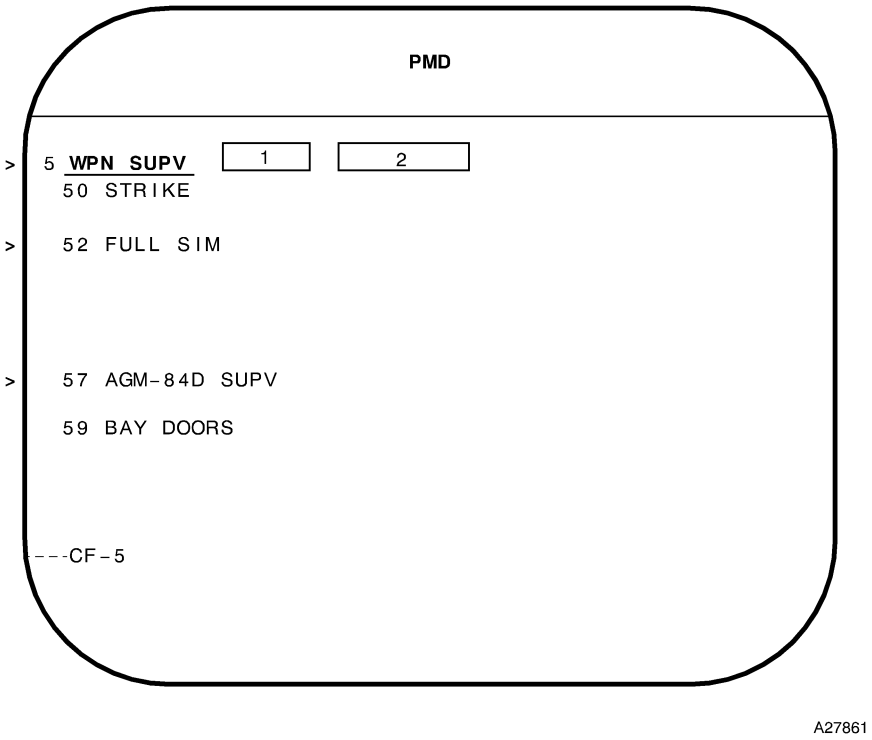
The Target/Waypoint Locate display, figure 1-15 is commanded by CF-574,N. The display is similar to CF-573, except that CF-574 cannot be modified. This display allows the operator to graphically locate targets or waypoints using either FRMT-1 or FRMT-2 displays. A T and/or a W will be displayed on the Target/Waypoint Locate display as applicable, indicating the general range and bearing to the designated Target and/or waypoint position(s). The latitude and longitude of the Target/Waypoint will be displayed, as applicable, at the bottom of the display.



> INDICATES TEXT OVERLAYED BY THE AGM-84 SMO.

1	STRIKE	OPERATIONAL MODE IS STRIKE	2	TEST MSL	TEST MISSILE IS COMMANDED
	SIM	OPERATIONAL MODE IS SIMULATION		Blank	TEST MISSILE IS NOT COMMANDED

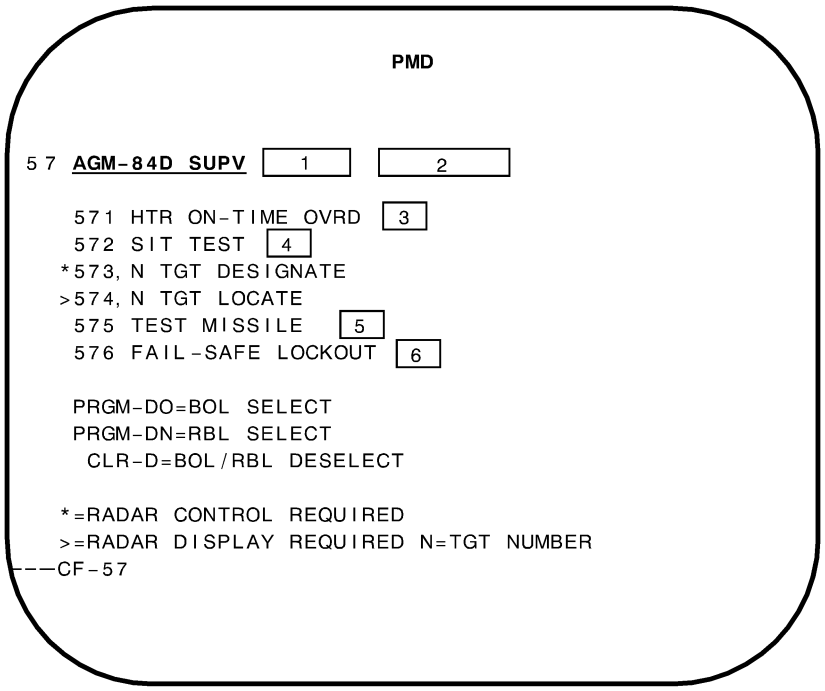
Figure 1-11. Control Function (CF) Menu



> INDICATES TEXT OVERLAYED BY THE AGM-84 SMO.

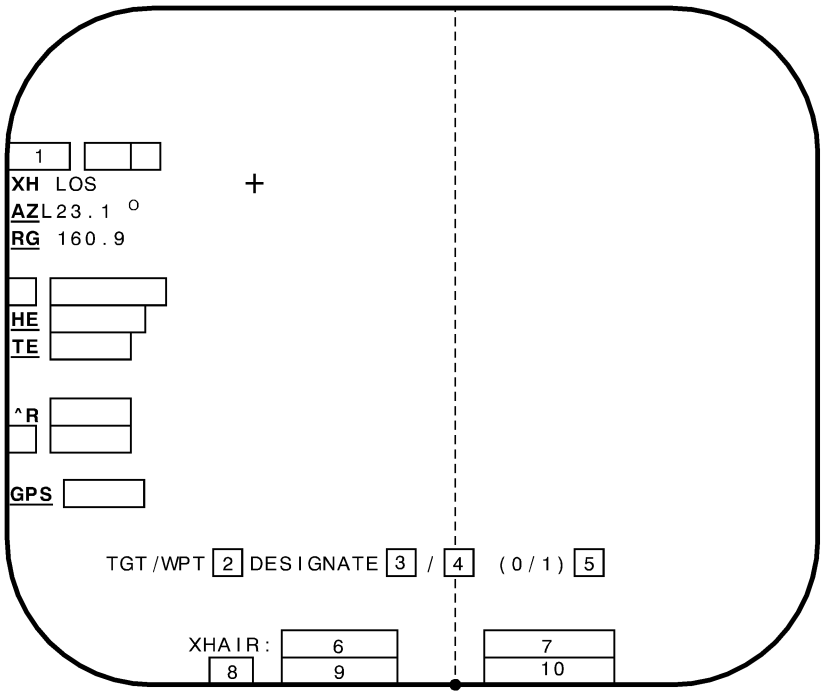
1	STRIKE	OPERATIONAL MODE IS STRIKE	2	TEST MSL	TEST MISSILE IS COMMANDED
	SIM	OPERATIONAL MODE IS SIMULATION		Blank	TEST MISSILE IS NOT COMMANDED

Figure 1-12. CF-5 Weapon Supervision Menu



1	STRIKE	OPERATIONAL MODE IS STRIKE
	SIM	OPERATIONAL MODE IS SIMULATION
2	TEST MSL	TEST MISSILE IS COMMANDED
	Blank	TEST MISSILE IS NOT COMMANDED
3	ON	HEATER ON TIME OVERRIDE IS COMMANDED
	OFF	HEATER ON TIME OVERRIDE IS NOT COMMANDED
4	YES	SIT TEST IS COMMANDED AND IN PROGRESS
	YES	SIT TEST WAS IN PROGRESS, BUT WAS TERMINATED DUE TO INVALID CONDITIONS
	NO	SIT TEST IS NOT COMMANDED
5	YES	TEST MISSILE COMMANDED
	NO	TEST MISSILE NOT COMMANDED
6	YES	FAIL-SAFE LOCKOUT IS COMMANDED BY THE OPERATOR
	NO	FAIL-SAFE LOCKOUT IS NOT COMMANDED

Figure 1-13. CF-57 AGM-84 Supervision Menu



1 TGT — THE X-HAIR SIGHTING POINT IS A TARGET
WPT — THE X-HAIR SIGHTING POINT IS A WAYPOINT

2 1 - 8 — TGT/WPT NUMBER

3 **TGT** — THE X-HAIR SIGHTING POINT IS A TARGET
TGT — THE X-HAIR SIGHTING POINT IS A WAYPOINT

4 **WPT** — ATTEMPT TO ENTER ASSIGN MODE FOR A WAYPOINT BEFORE THE ASSOCIATED TARGET HAS BEEN DESIGNATED OR ATTEMPT TO LOCATE A WAYPOINT THAT HAS NOT BEEN DESIGNATED
WPT — THE X-HAIR SIGHTING POINT IS A WAYPOINT
WPT — THE X-HAIR SIGHTING POINT IS A TARGET

5 X-HAIR SIGHTING POINT INDICATOR
0 — TARGET
1 — WAYPOINT

6 X-HAIR LATITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

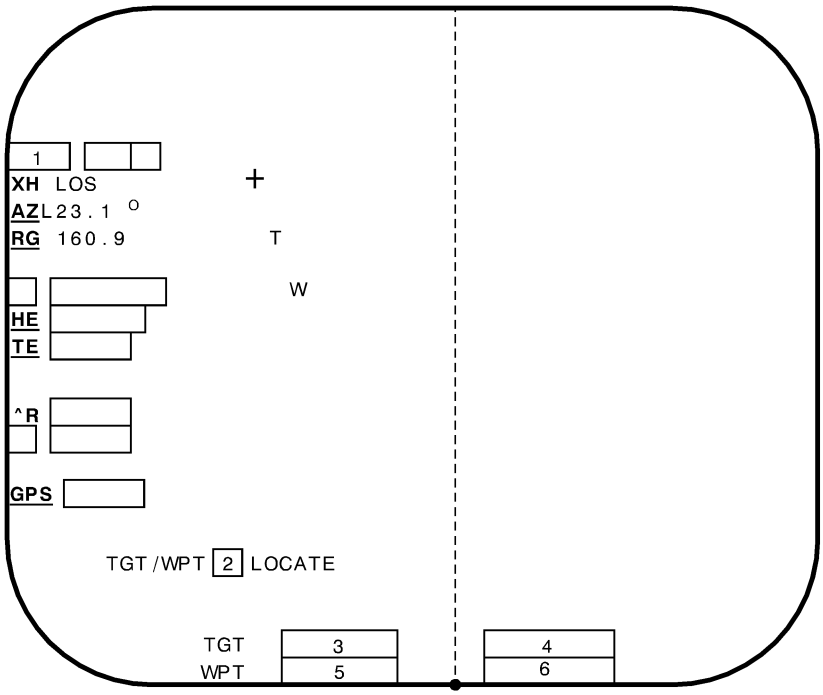
7 X-HAIR LONGITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

8 TGT — X-HAIR SIGHTING POINT IS A TARGET
WPT — X-HAIR SIGHTING POINT IS A WAYPOINT

9 CURRENT LATITUDE OF SELECTED POINT IN DEGREES, MINUTES, AND TENTHS OF MINUTES

10 CURRENT LONGITUDE OF SELECTED POINT IN DEGREES, MINUTES, AND TENTHS OF MINUTES

Figure 1-14. CF-573 Target/Waypoint Designate Display



1 TGT THE X-HAIR SIGHTING POINT IS A TARGET
WPT THE X-HAIR SIGHTING POINT IS A WAYPOINT

2 1 - 8 TGT/WPT NUMBER

3 CURRENT LATITUDE OF THE TARGET IN DEGREES, MINUTES, AND TENTHS OF MINUTES

4 CURRENT LONGITUDE OF THE TARGET IN DEGREES, MINUTES, AND TENTHS OF MINUTES

5 CURRENT LATITUDE OF THE WAYPOINT IN DEGREES, MINUTES, AND TENTHS OF MINUTES
Blank NO WAYPOINT DEFINED FOR SELECTED TARGET

6 CURRENT LONGITUDE OF THE WAYPOINT IN DEGREES, MINUTES, AND TENTHS OF MINUTES
Blank NO WAYPOINT DEFINED FOR SELECTED TARGET

Figure 1-15. CF-574 Target/Waypoint Locate Display

FCP Supervision Menu (CF-6)

The FCP Supervision Menu is commanded by CF-6, shown in figure 1-16, lists FCP function commands. The commands which apply to AGM-84 operations are; CF-62 SMO menu, CF-67 Shutdown, and CF-68 ECU Power Override.

SMO Load Menu (CF-62)

Figure 1-17 shows the SMO Menu, CF-62. It displays the SMOs available on the OCP DTUC. The procedure for loading the AGM-84 SMO is the same as for loading any other SMO and is contained in T.O. 1B-52H-1-12.

OAS Shutdown (CF-67)

CF-67 commands OAS shutdown. The procedure for shuting down the OAS with the AGM-84 SMO loaded is the same as for any other shutdown and is contained in T.O. 1B-52H-1-12.

ECU Power Override (CF-68)

CF-68 command (ECU PWR ORIDE) can be used to override faults associated with unavailability of ECU power.

Weapon Control Panel Backup Display (CF-E)

CF-E, shown in figure 1-18, can be used by the operator to enter weapon commands in lieu of entering the commands via the WCP.

FORMAT (FRMT) DISPLAYS

The FRMT display displays the format menu shown in figure 1-19. FRMT 6 PME Status, FRMT 7 Weapon Data, FRMT 11,N TGT/WPT Input, FRMT 12 TGT Locations, and FRMT 13,N MSN Parameters are applicable to AGM-84 operations.

PME Status Display (FRMT-6)

Figure 1-20 shows FRMT-6, the PME Status display. The AGM-84 SMO adds WIU and WPA status for the left and right pylons to the standard PME status display.

AGM-84 Status and Inventory Display (FRMT-7)

The AGM-84 Status and inventory display, FRMT 7, figure 1-21 displays the following items:

- AIU fault indication
- ECU fault indication
- Left and right WIU fault indication
- Left and right WPA fault indication
- Weapon identification
- Weapon power state
- Weapon status
- Weapon faults
- Ejector status
- Missile heater power on time override status

Target/Waypoint Input Display (FRMT-11,N)

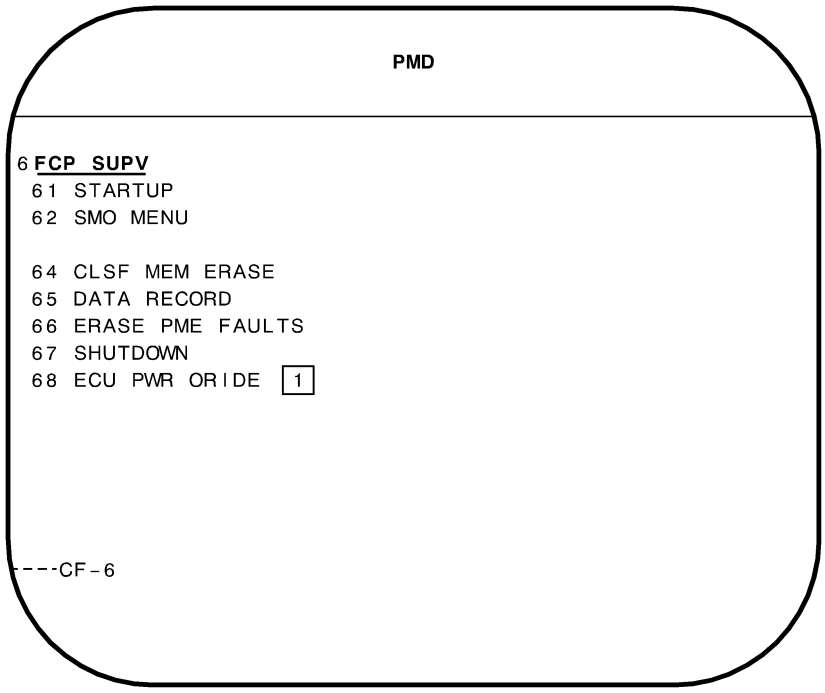
The Target/Waypoint Input display FRMT-11,N, figure 1-22, can be used for input of the following parameters:

- Target latitude and longitude
- Target range and bearing from a reference point
- Target reference point (aircraft or other defined target)
- Waypoint latitude and longitude
- Waypoint range and bearing

Target Location Summary Display (FRMT-12)

The Target/Location Summary display FRMT-12, shown in figure 1-23, displays up to eight targets, and displays the following for each target:

- Target bearing and range
- Target latitude and longitude
- Time of last target or waypoint position update



1	YES	ECU POWER OVERRIDE IS COMMANDED
	NO	ECU POWER OVERRIDE IS NOT COMMANDED

Figure 1-16. CF-6 FCP Supervision Menu

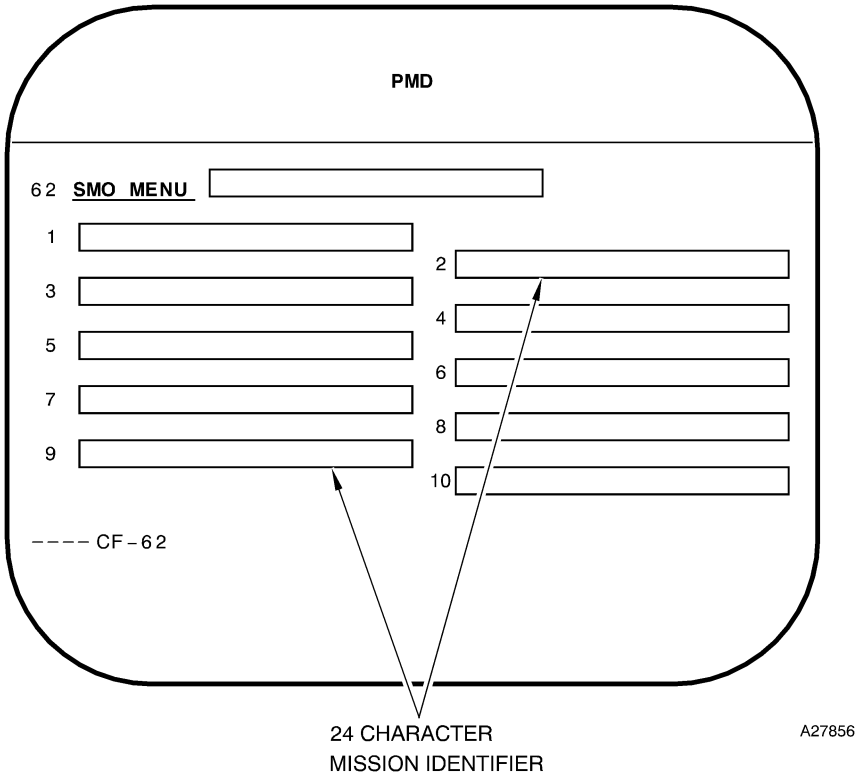
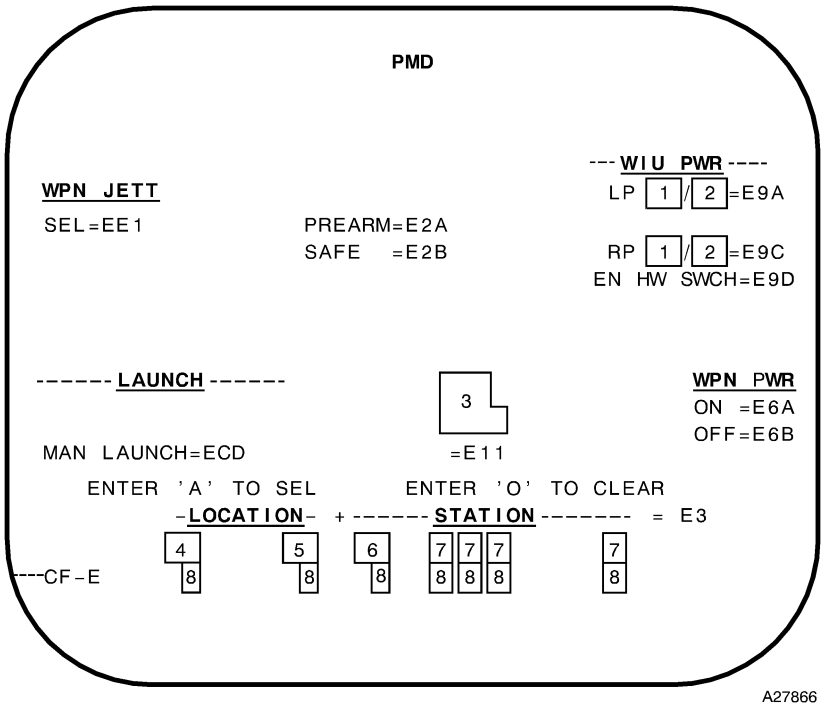


Figure 1-17. CF-62 SMO Load Menu



WHEN SELECTED BOXED ITEMS ARE DISPLAYED IN BRIGHT UNDERLINED VIDEO.

1 ON — WIU/WPA POWER IS OFF
ON — WIU/WPA POWER IS ON

2 **OFF** — WIU/WPA POWER IS OFF
OFF — WIU/WPA POWER IS ON

3 MSTR FAULT — NO MASTER FAULT DISPLAYED
MSTR FAULT — MASTER FAULT DISPLAYED

4 **LP** — LEFT PYLON SELECTED
LP — LEFT PYLON NOT SELECTED

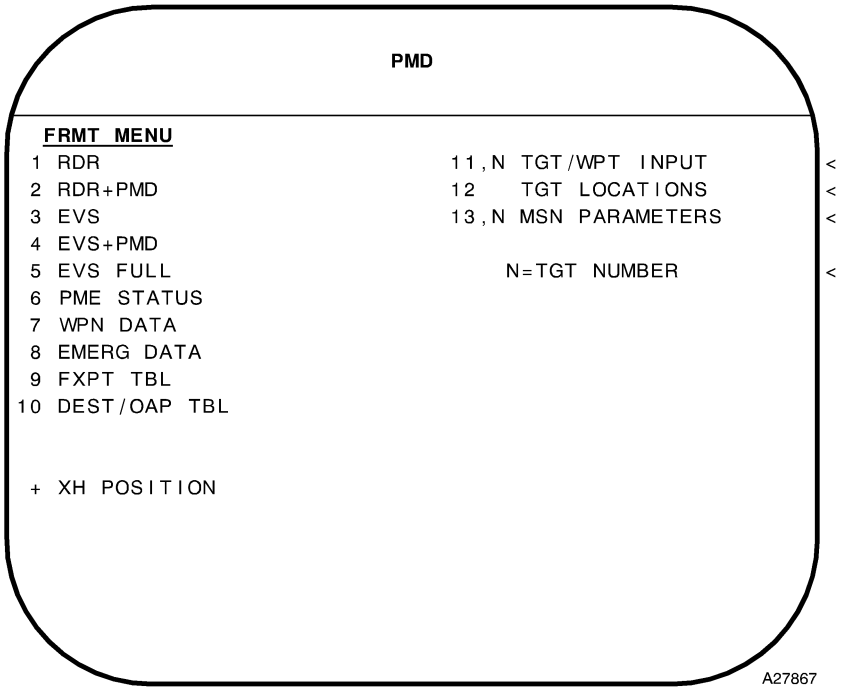
5 **RP** — RIGHT PYLON SELECTED
RP — RIGHT PYLON NOT SELECTED

6 **ALL** — ALL STATIONS SELECTED
ALL — ALL STATIONS NOT SELECTED

7 STATION SWITCHES (1, 2, 3, 7) — BRIGHT UNDERLINED VIDEO WHEN SELECTED

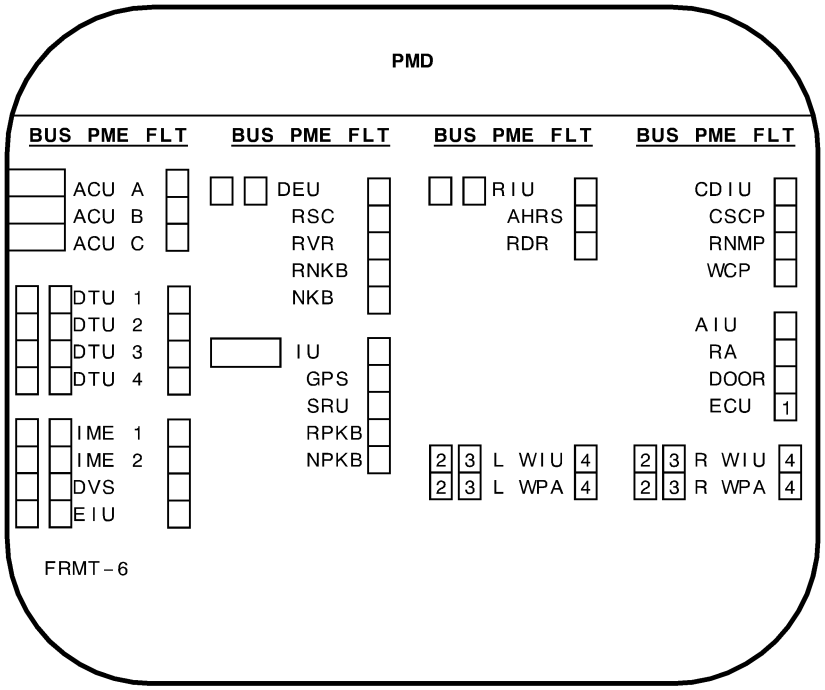
8 A — CORRESPONDING LOCATION OR STATION IS SELECTED. WHEN A IS DISPLAYED THE LOCATION/STATION ABOVE IT IS DISPLAYED IN BRIGHT UNDERLINE VIDEO

Figure 1-18. CF-E Weapon Control Panel Backup Display



> AND < INDICATE TEXT OVERLAYED BY THE AGM-84 SMO.

Figure 1-19. FRMT Format Menu



1 **X** LAST STATUS RECEIVED FROM THE AIU INDICATES AN ECU FAILURE

X THE LAST STATUS RECEIVED FROM THE AIU DOES NOT INDICATE AN ECU FAILURE, BUT A STATUS HAS BEEN RECEIVED FROM THE AIU THAT INDICATED AN ECU FAILURE SINCE THE LAST FAULT RESET COMMAND

Blank NEITHER CONDITION IS TRUE

2 **A** COMMUNICATION WITH THE LRU CANNOT BE ESTABLISHED ON THE A BUS

A COMMUNICATION WITH THE LRU IS POSSIBLE ON THE A BUS, BUT COMMUNICATION WITH THE LRU HAS FAILED ON THE A BUS SINCE THE LAST FAULT RESET COMMAND

Blank NEITHER CONDITION IS TRUE

3 **C** COMMUNICATION WITH THE WIU CANNOT BE ESTABLISHED ON THE C BUS

C COMMUNICATION WITH THE WIU IS POSSIBLE ON THE C BUS, BUT COMMUNICATION WITH THE WIU HAS FAILED ON THE C BUS SINCE THE LAST FAULT RESET COMMAND

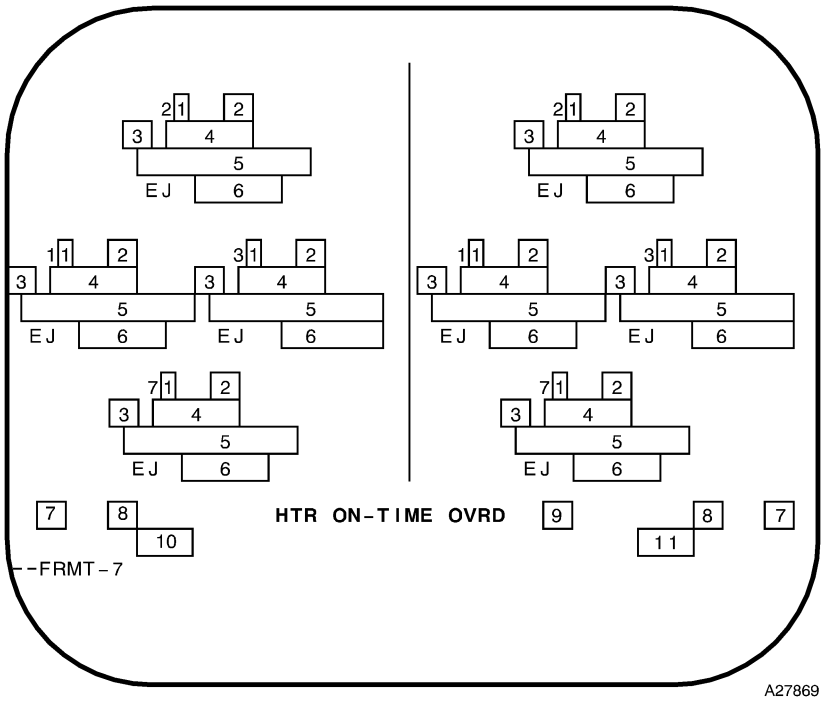
Blank NEITHER CONDITION IS TRUE

4 **X** COMMUNICATION WITH THE LRU CANNOT BE ESTABLISHED ON EITHER BUS OR THE LRU IS REPORTING A FAULT

X COMMUNICATION WITH THE LRU IS POSSIBLE ON AT LEAST ONE BUS, BUT COMMUNICATION WITH THE LRU HAS FAILED ON BOTH BUSES SINCE THE LAST FAULT RESET COMMAND OR THE LRU HAS REPORTED A FAULT SINCE THE LAST FAULT RESET COMMAND

Blank NEITHER CONDITION IS TRUE

Figure 1-20. FRMT-6 PME Status Display



1	P	STORE PRESENT INDICATED BY EJECTOR OR WPA MISSILE PRESENT STATUS
	H	PRESENT WEAPON IS STATUSED AS AN AGM-84
	S	TEST SET PRESENT STATUS
	X	NO STORE PRESENT
	Blank	WIU/WPA OFF OR NO STATUS RECEIVED
2	OF	WIU/WPA POWER FOR PYLON IS ON AND MISSILE POWER IS OFF
	ON	MISSILE POWER IS ON
	GO	MISSILE AVAILABLE FOR LAUNCH SELECTION
	NG	PERMANENT FATAL FAULT HAS OCCURRED FOR THIS MISSILE OR AN ABORT HAS BEEN COMMANDED PRIOR TO RELEASE ATTEMPT
	HG	THE MISSILE IS HUNG AFTER AN ATTEMPTED RELEASE
	Blank	MISSILE IS NOT PRESENT OR WIU/WPA POWER FOR THIS PYLON IS OFF
3	NO	THE MISSILE DID NOT RESPOND WITH AN ABORT DISCRETE IN RESPONSE TO AN ABORT COMMAND
	Blank	AN ABORT COMMAND HAS NOT BEEN SENT TO THE MISSILE OR THE MISSILE RESPONDED WITH AN ABORT DISCRETE IN RESPONSE TO AN ABORT COMMAND.

Figure 1-21. FRMT-7 AGM-84 Status and Inventory Display (Sheet 1 of 3)

4	mm:ss	REMAINING DESIRED HEATER POWER ON TIME WHEN OPERATE POWER IS OFF OR THE DESIRED HEATER POWER ON TIME HAS NOT ELAPSED SINCE THE WIU/WPA POWER APPLICATION AND HEATER ON TIME OVERRIDE HAS NOT BEEN COMMANDED OR ACCUMULATED OPERATE POWER ON TIME WHEN OPERATE POWER IS ON AND THE MAXIMUM POWER ON TIME HAS NOT BEEN EXCEEDED
	mm:ss	ACCUMULATED OPERATE POWER ON TIME WHEN OPERATE POWER IS ON AND THE MAXIMUM POWER ON TIME OF 10 MINUTES HAS BEEN EXCEEDED
	WARM	DESIRED HEATER POWER ON TIME HAS ELAPSED OR HEATER ON TIME OVERRIDE HAS BEEN COMMANDED
	SLCTD	THE MISSILE IS SELECTED FOR LAUNCH AND HAS NOT RECEIVED AN ITL COMMAND
	ITL	THE ITL COMMAND HAS BEEN SENT TO THE MISSILE
	STG	ENGINE START COMMAND HAS BEEN SENT TO THE MISSILE
	READY	MISSILE READY FOR LAUNCH AND CAN BE LAUNCHED
	BLKD	MISSILE BLOCKED BY ANOTHER MISSILE NOT AVAILABLE FOR LAUNCH
	ABORT	AN ABORT COMMAND HAS BEEN SENT TO THE MISSILE
	HOLD	THE MISSILE IS READY TO BE LAUNCHED BUT CANNOT BE LAUNCHED BECAUSE LAUNCH PREREQUISITE CONDITIONS ARE NOT MET
	HOLD	MISSILE IS READY FOR ITL BUT ITL PREREQUISITES ARE NOT MET

OPERATOR ITL COMMANDS WILL BE INHIBITED WHEN ITL PREREQUISITE CONDITIONS HAVE NOT BEEN MET. IF THE PREREQUISITE CONDITIONS ARE MET WHEN THE OPERATOR COMMANDS ITL, THE FIRST MISSILE TO BE LAUNCHED FROM EACH PYLON WILL RECEIVE AN ITL COMMAND, THEREFORE, ITL HOLD IS NOT APPLICABLE TO THE FIRST MISSILE ON EACH PYLON RECEIVING AN ITL COMMAND IN RESPONSE TO EACH OPERATOR ITL COMMAND.

Blank	MISSILE IS NOT PRESENT OR WIU/WPA POWER FOR THIS PYLON IS OFF OR A PERMANENT FATAL FAULT HAS OCCURRED FOR THE MISSILE BUT NO ABORT COMMAND WAS SENT

5	**WPN PRESENT**	AGM-84 PRESENT STATUS DISCREPANCY
	UNSAFE	UNSAFE STATUS FOLLOWING A SAFE COMMAND
	UNCMD ENABLE	ENABLE IS PRESENT BUT NOT COMMANDED
	NO ENABLE	ENABLE NOT PRESENT AFTER ITL
	NO READY	MISSILE IS NOT READY AFTER ENGINE START
	UNCMD READY	READY IS PRESENT BUT NOT COMMANDED
	UNCMD ABORT	UNCOMMANDED MISSILE ABORT
	NO ABORT	ABORT UNCOMMANDED FALSE
	FIRE WARN	MISSILE FIRE WARNING
	BATT EXP	MISSILE BATTERY TIMER HAS EXPIRED
	COMM FAIL	COMMUNICATIONS FAILURE HAS OCCURRED
	ICMP CONFIG	INCOMPATIBLE MISSILE CONFIGURATION
	NO GYROS	MISSILE GYROS ARE NOT UP TO SPEED
	BIT FAILED	MISSILE BIT HAS FAILED
	NOT LOCKD	ILLEGAL EJECTOR STATUS
	UNCMD LK	UNCOMMANDED EJECTOR LOCKED
	FAIL SAFE ??	FAIL SAFE LOCKOUT DISCREPANCY FOR TEST MISSILE
	STBY PWR	STANDBY POWER DISCREPANCY
	HTR PWR	HEATER POWER DISCREPANCY
	UCMD OPR PWR	UNCOMMANDED OPERATE POWER
	NO OPR PWR	UNCOMMANDED NO OPERATE POWER
	UNCMD ITL	UNCOMMANDED INTENT TO LAUNCH
	NO ITL	UNCOMMANDED NO INTENT TO LAUNCH
	UCMD ENG STR	UNCOMMANDED ENGINE START

Figure 1-21. FRMT-7 AGM-84 Status and Inventory Display (Sheet 2 of 3)

5. (CONT)

NO ENG STR	UNCOMMANDED NO ENGINE START
UCMD ABRT DR	UNCOMMANDED ABORT DRIVER
NO ABRT DR	UNCOMMANDED NO ABORT DRIVER
UNCMD DESLCT	UNCOMMANDED DESELECT
NO DESLCT	UNCOMMANDED NO DESELECT
ARM SOL	EJECTOR ARM SOLENOID NO-GO
UNCMD RLS	UNCOMMANDED MISSILE RELEASE
Blank	MISSILE IS NOT PRESENT OR NO FAULT EXISTS FOR THIS MISSILE OR WIU/WPA POWER TO THIS PYLON IS OFF

6

LOCKD	EJECTOR IS LOCKED
UNLOCKD	EJECTOR IS UNLOCKED
NOT LOCKD	EJECTOR STATUS IS NOT KNOWN
Blank	MISSILE IS NOT PRESENT OR WIU/WPA POWER TO THIS PYLON IS OFF

7

WIU	A WIU FAULT INDICATION HAS BEEN RECEIVED WHICH PRECLUDES LAUNCH FROM THIS PYLON
Blank	NO WIU FAULTS PRECLUDING LAUNCH ARE PRESENT FOR THIS PYLON

8

WPA	A WPA FAULT INDICATION HAS BEEN RECEIVED WHICH PRECLUDES LAUNCH FROM THIS PYLON
Blank	NO WPA FAULTS PRECLUDING LAUNCH ARE PRESENT FOR THIS PYLON

9

ON	HEATER ON TIME OVERRIDE IS COMMANDED
OFF	HEATER ON TIME OVERRIDE IS NOT COMMANDED

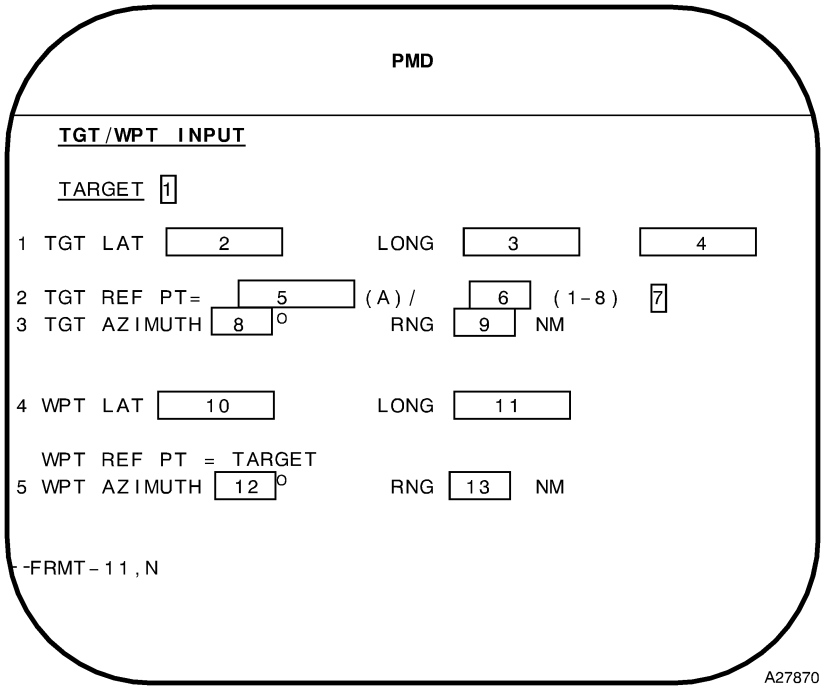
10

AIU	AN AIU FAULT HAS BEEN RECEIVED WHICH PRECLUDES MISSILE LAUNCH OR COMMUNICATION WITH THE FAILED AIU
Blank	NO FAULT

11

ECU	AN ECU FAULT HAS BEEN RECEIVED FROM THE AIU
Blank	NO ECU FAULT IS PRESENT

Figure 1-21. FRMT-7 AGM-84 Status and Inventory Display (Sheet 3 of 3)



1 1 - 8 TGT/WPT NUMBER

2 TARGET LATITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

3 TARGET LONGITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

4 LAST TIME OF POSITION UPDATE FROM THE IKB OR RADAR OF THIS TARGET POSITION DISPLAYED AS HOURS:MINUTES:SECONDS

5 **AIRCRAFT** THE AIRCRAFT IS THE RANGE AND BEARING REFERENCE POINT FOR THIS TARGET
AIRCRAFT ANOTHER TARGET IS THE RANGE AND BEARING REFERENCE POINT FOR THIS TARGET

6 **TARGET** ANOTHER TARGET IS THE RANGE AND BEARING REFERENCE POINT FOR THIS TARGET
TARGET THE AIRCRAFT IS THE RANGE AND BEARING REFERENCE POINT FOR THIS TARGET

7 A THE AIRCRAFT IS THE RANGE AND BEARING REFERENCE POINT FOR THIS TARGET
N TARGET NUMBER N (1-8) IS A DESIGNATED TARGET THAT IS THE RANGE AND BEARING REFERENCE POINT FOR THIS TARGET. THIS CANNOT BE THE NUMBER OF THE REFERENCED TARGET

8 TARGET BEARING IN DEGREES FROM THE REFERENCE POINT FOR THIS TARGET RELATIVE TO TRUE NORTH

9 TARGET RANGE IN NM FROM THE REFERENCE POINT FOR THIS TARGET

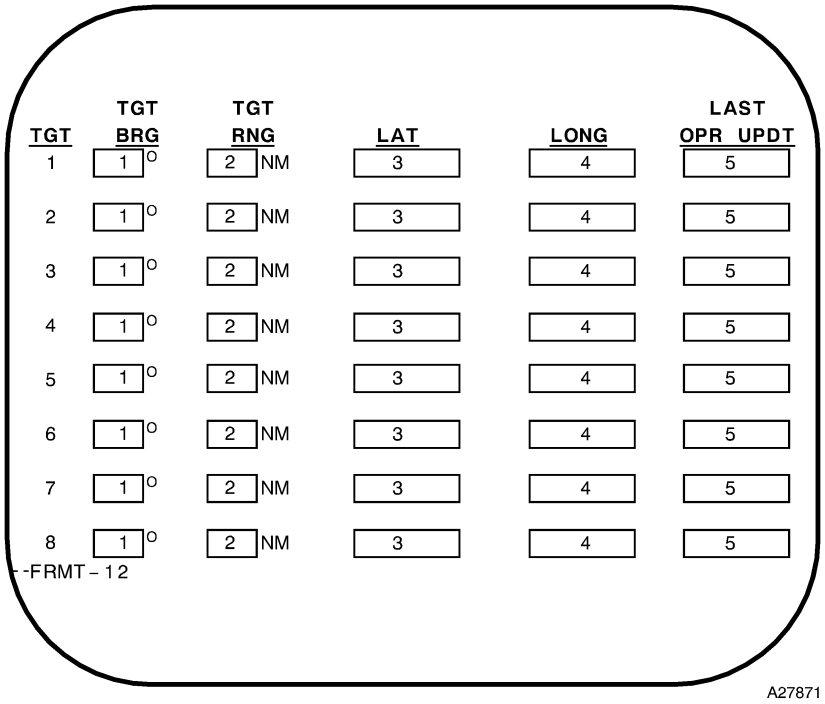
10 WAYPOINT LATITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

11 WAYPOINT LONGITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

12 WAYPOINT BEARING IN DEGREES FROM THE REFERENCE POINT FOR THIS TARGET RELATIVE TO TRUE NORTH

13 WAYPOINT RANGE IN NM FROM THE REFERENCE POINT FOR THIS TARGET

Figure 1-22. FRMT-11,N Target/Waypoint Input Display



1 TARGET BEARING IN DEGREES LEFT OR RIGHT RELATIVE TO THE AIRCRAFT BEARING, BLANK WHEN THE TARGET HAS NOT BEEN DESIGNATED

2 RANGE IN NM FROM THE CURRENT AIRCRAFT TO THE TARGET, BLANK WHEN THE TARGET HAS NOT BEEN DESIGNATED

3 TARGET LATITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

4 TARGET LONGITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

5 LAST TIME OF POSITION UPDATE FROM THE IKB OR RADAR OF THIS TARGET POSITION DISPLAYED AS HOURS:MINUTES:SECONDS

Figure 1-23. FRMT-12 Target Location Summary Display

RBL Elliptical Pattern Mission Parameter Input display (FRMT-13,N)

A RBL mission with an elliptical search pattern will result in the display shown in figure 1-24 when FRMT-13,N is selected. The display can be used to input, modify and or review the following mission items:

- Number of missiles to be launched at the target
- Seeker search pattern
- Planned launch range from target via missile route
- Seeker search priority
- Terminal maneuver
- High fly-out command
- Range to descent if high fly-out is commanded
- Target number

NOTE

Changing the seeker search pattern from elliptical (ELP) to rectangular (RECT) or from RECT to ELP will change the FRMT-13,N display to match the pattern selected.

RBL Rectangular Pattern Mission Parameter Input display (FRMT-13,N)

A RBL mission with an rectangular search pattern will result in the display shown in figure 1-25 when FRMT-13,N is selected. The display can be used to input, modify and or review the following mission items:

- Number of missiles to be launched at the target
- Seeker search pattern
- Planned launch range from target via missile route
- Seeker search range before target location
- Seeker search range beyond target location
- Terminal maneuver
- High fly-out command
- Range to descent if high fly-out is commanded

NOTE

Changing the seeker search pattern from elliptical (ELP) to rectangular (RECT) or from RECT to ELP will change the FRMT-13,N display to match the pattern selected.

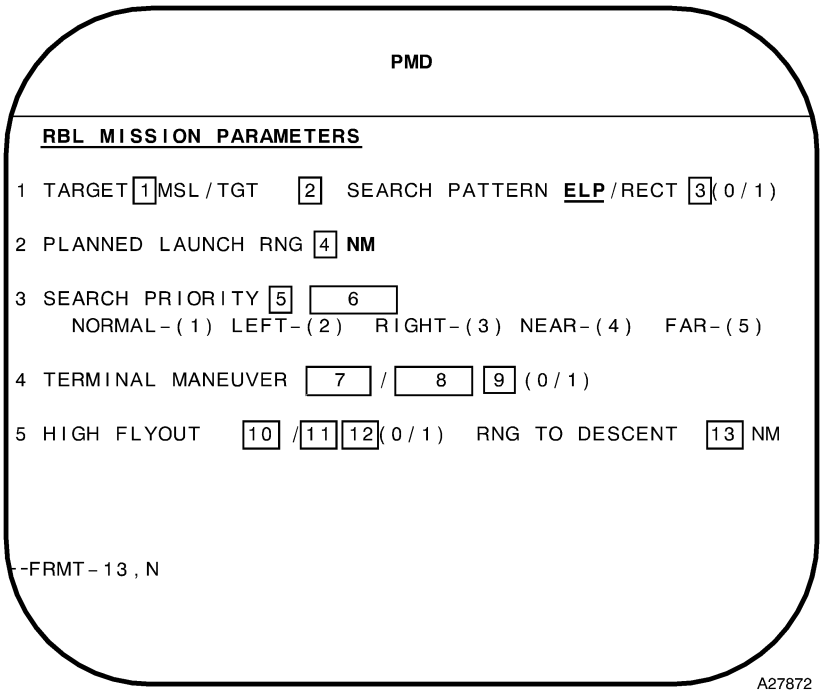
PROGRAM (PRGM) DISPLAYS

The normal PRGM display contains no AGM-84 specific display items. PRGM-DN RBL Launch Data display and PRGM-DO BOL Launch Data display are the only AGM-84 SMO generated PRGM displays.

RBL Launch Data Display (PRGM-DN)

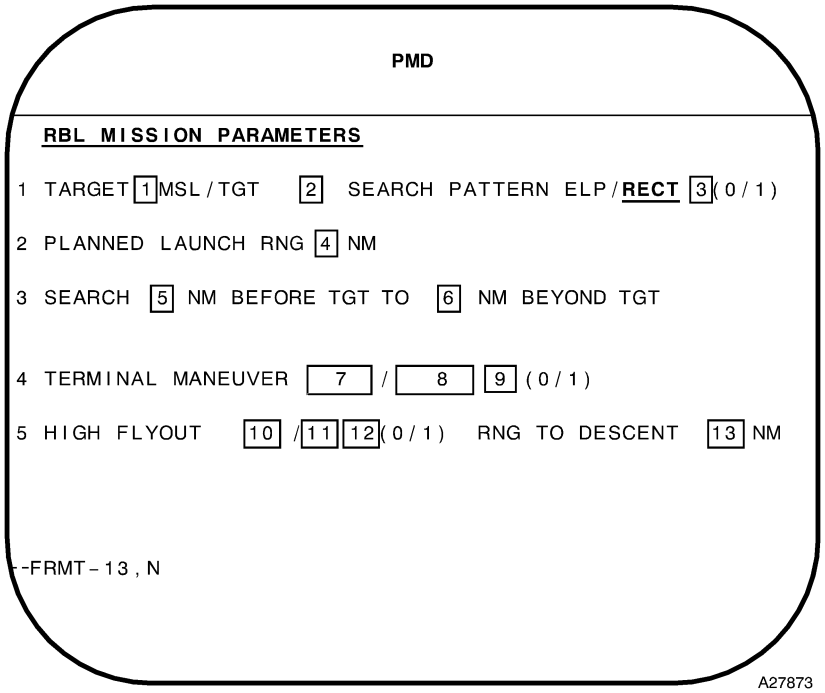
The RBL Launch Data display, PRGM-DN, figure 1-26, is used to select the RBL mission in preparation for launch and displays pertinent status data in preparation for launch. The following items can be input or reviewed using the RBL Launch Data display:

- Target number
- Number of missiles to be launched at the target
- Azimuth and range to the target
- Target latitude and longitude
- Planned launch range from the target via the missile route
- Time of last target or waypoint position update
- Current TEST MISSILE mode option status
- Current Fail Safe Lock-Out status
- Current Engine Start Before Launch (ESBL)/ Engine Start After Launch (ESAL) status
- Current high fly-out status
- Defined range to descent if high fly-out is commanded
- Defined seeker search priority
- Defined terminal maneuver
- Current TEST MISSILE mode option status
- Current Fail Safe Lock-Out status
- Defined seeker search range before target location
- Defined seeker search range beyond target location
- Current Safe and In-Range (SAIR) status
- Current calculated time to SAIR
- Current SAIR faults
- Identification of aimpoint as waypoint or target
- Current range and bearing to aimpoint
- Current missile bearing change to be performed at the waypoint, if waypoint defined.
- Identity and status of missiles currently available for launch
- Current range from aircraft to the closest point within the planned launch range
- Current calculated time to travel to the closest point within the planned launch range
- Current Estimated Time of Arrival (ETA) to the closest point within the planned launch range



1	1 - 8	TGT/WPT NUMBER
2	N	NUMBER OF MISSILES TO BE LAUNCHED AT THE TARGET
	0	AFTER LAUNCH PROCESSING IS COMPLETE AND AFTER A CLR-DN COMMAND IS ENTERED BY THE OPERATOR FOR THE SELECTED TARGET
3	0	ELLIPTICAL SEEKER SEARCH MODE
	1	RECTANGULAR SEEKER SEARCH MODE
4	NN	DESIRED MISSILE FLIGHT RANGE AT LAUNCH (0 THROUGH 99 NM)
5	1	NORMAL SEARCH PRIORITY
	2	LEFT SEARCH PRIORITY
	3	RIGHT SEARCH PRIORITY
	4	NEAR SEARCH PRIORITY
	5	FAR SEARCH PRIORITY
6	**NORMAL**	NORMAL SEARCH PRIORITY IS SELECTED
	LEFT	LEFT SEARCH PRIORITY IS SELECTED
	RIGHT	RIGHT SEARCH PRIORITY IS SELECTED
	NEAR	NEAR SEARCH PRIORITY IS SELECTED
	FAR	FAR SEARCH PRIORITY IS SELECTED
7	**SKIM**	SEA SKIM TERMINAL MANEUVER SELECTED
	SKIM	SEA SKIM TERMINAL MANEUVER NOT SELECTED
8	**POP-UP**	POP-UP TERMINAL MANEUVER SELECTED
	POP-UP	POP-UP TERMINAL MANEUVER NOT SELECTED
9	0	SEA SKIM TERMINAL MANEUVER SELECTED
	1	POP-UP TERMINAL MANEUVER SELECTED
10	**YES**	HIGH FLY-OUT IS SELECTED
	YES	HIGH FLY-OUT IS NOT SELECTED
11	**NO**	HIGH FLY-OUT IS NOT SELECTED
	NO	HIGH FLY-OUT IS SELECTED
12	0	HIGH FLY-OUT IS SELECTED
	1	HIGH FLY-OUT IS NOT SELECTED
13	NN	RANGE TO DESCENT IN NM WHEN HIGH FLY-OUT IS SELECTED, BLANK WHEN HIGH FLY-OUT IS NOT SELECTED

Figure 1-24. FRMT-13,N RBL Elliptical Pattern Mission Parameter Input Display



1 1 - 8 TGT/WPT NUMBER

2 N NUMBER OF MISSILES TO BE LAUNCHED AT THE TARGET
0 AFTER LAUNCH PROCESSING IS COMPLETE AND AFTER A CLR-DN COMMAND IS ENTERED BY THE OPERATOR FOR THE SELECTED TARGET

3 0 ELLIPTICAL SEEKER SEARCH MODE
1 RECTANGULAR SEEKER SEARCH MODE

4 NN PLANNED MISSILE FLIGHT PATH RANGE (0 THROUGH 99 NM)

5 RANGE IN NM BEFORE TARGET WHERE SEARCH IS TO BEGIN (0 TO 99 NM), BLANK PRIOR TO INPUT OF DISTANCE

6 RANGE IN NM BEYOND TARGET WHERE SEARCH IS TO END (0 TO 99 NM), BLANK PRIOR TO INPUT OF DISTANCE

7 **SKIM** SEA SKIM TERMINAL MANEUVER SELECTED
SKIM SEA SKIM TERMINAL MANEUVER NOT SELECTED

8 **POP-UP** POP-UP TERMINAL MANEUVER SELECTED
POP-UP POP-UP TERMINAL MANEUVER NOT SELECTED

9 0 SEA SKIM TERMINAL MANEUVER SELECTED
1 POP-UP TERMINAL MANEUVER SELECTED

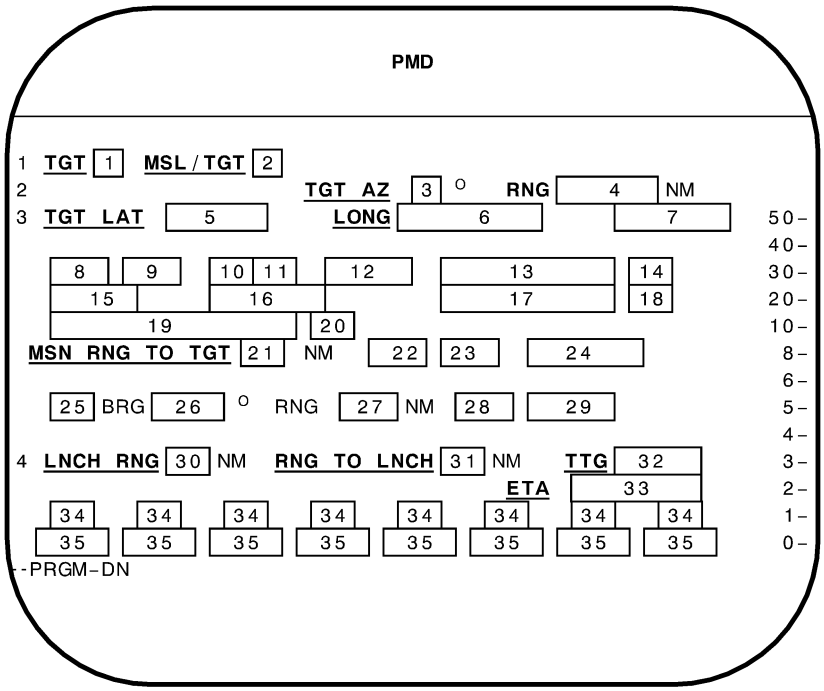
10 **YES** HIGH FLY-OUT IS SELECTED
YES HIGH FLY-OUT IS NOT SELECTED

11 **NO** HIGH FLY-OUT IS NOT SELECTED
NO HIGH FLY-OUT IS SELECTED

12 0 HIGH FLY-OUT IS SELECTED
1 HIGH FLY-OUT IS NOT SELECTED

13 NN RANGE TO DESCENT IN NM WHEN HIGH FLY-OUT IS SELECTED, BLANK WHEN HIGH FLY-OUT IS NOT SELECTED

Figure 1-25. FRMT-13,N RBL Rectangular Pattern Mission Parameter Input Display



1 1 - 8 TGT/WPT NUMBER

2 N NUMBER OF MISSILES TO BE LAUNCHED AT THE TARGET

0 AFTER LAUNCH PROCESSING IS COMPLETE AND AFTER A CLR-DN COMMAND IS ENTERED BY THE OPERATOR FOR THE SELECTED TARGET

3 TARGET AZIMUTH IN DEGREES RELATIVE TO THE AIRCRAFT. MODIFICATION OF THIS DATA WILL CAUSE THE TARGET TO BE DESIGNATED RELATIVE TO THE AIRCRAFT.

4 RANGE IN NM FROM THE AIRCRAFT

5 TARGET LATITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

6 TARGET LONGITUDE IN DEGREES, MINUTES, AND TENTHS OF MINUTES

7 LAST TIME OF POSITION UPDATE FROM THE IKB OR RADAR OF THIS TARGET POSITION DISPLAYED AS HOURS:MINUTES:SECONDS

8 ELP ELLIPTICAL SEARCH PATTERN SELECTED

RECT RECTANGULAR SEARCH PATTERN SELECTED

9 ESBL ENGINE WILL START BEFORE LAUNCH

ESAL ENGINE WILL START AFTER LAUNCH

Blank A TARGET IS NOT SELECTED (AFTER LAUNCH PROCESSING IS COMPLETE FOR A TARGET)

10 HI HIGH FLY-OUT HAS BEEN COMMANDED

LOW HIGH FLY-OUT HAS NOT BEEN COMMANDED

11 NN RANGE TO DESCENT IN NM WHEN HIGH FLY-OUT IS SELECTED, BLANK WHEN HIGH FLY-OUT IS NOT SELECTED

12 **NORMAL** NORMAL SEARCH PRIORITY IS SELECTED

LEFT LEFT SEARCH PRIORITY IS SELECTED

RIGHT RIGHT SEARCH PRIORITY IS SELECTED

NEAR NEAR SEARCH PRIORITY IS SELECTED

FAR FAR SEARCH PRIORITY IS SELECTED

Figure 1-26. PRGM-DN RBL Launch Data Display (Sheet 1 of 3)

13 SEARCH BEFORE DISPLAYED FOR RECTANGULAR SEEKER PATTERN

14 RANGE IN NM BEFORE TARGET WHERE SEARCH IS TO BEGIN (0 TO 99 NM), PRIOR TO INPUT OF DISTANCE OR IF ELLIPTICAL SEEKER SEARCH PATTERN IS SELECTED

15 SKIM — SEA SKIM TERMINAL MANEUVER SELECTED
POP-UP — POP-UP TERMINAL MANEUVER SELECTED

16 TEST MSL — TEST MISSILE COMMANDED

17 SEARCH BEYOND DISPLAYED FOR RECTANGULAR SEEKER PATTERN

18 RANGE IN NM BEYOND TARGET WHERE SEARCH IS TO END (0 TO 99 NM), BLANK PRIOR TO INPUT OF DISTANCE OR IF ELLIPTICAL SEEKER SEARCH PATTERN IS SELECTED

19 FAIL-SAFE LOCKOUT WHEN TEST MISSILE CONFIGURATION HAS BEEN COMMANDED

20 YES — TEST MISSILE CONFIGURATION AND FAIL-SAFE LOCKOUT HAS BEEN COMMANDED
NO — TEST MISSILE CONFIGURATION AND FAIL-SAFE LOCKOUT HAS NOT BEEN COMMANDED

21 RANGE IN NM BEFORE THAT THE MISSILE MUST FLY TO REACH THE TARGET BY FLYING TO THE WAYPOINT (IF DEFINED FOR THE TARGET SELECTED) THE VALUE IS DISPLAYED IN REVERSE VIDEO IF THE RANGE IS GREATER THAN THE MAXIMUM RANGE OF THE MISSILE

22 **SAIR** — ONE OR MORE LAUNCH RESTRICTIONS EXIST AND A TARGET IS SELECTED
SAIR — MISSILE FLIGHT RANGE TO THE TARGET IS GREATER THAN THE MAXIMUM RANGE OF THE MISSILE AND A TARGET IS SELECTED WITH NO LAUNCH RESTRICTIONS

SAIR — MISSILE FLIGHT RANGE TO THE TARGET IS WITHIN THE MAXIMUM RANGE OF THE MISSILE AND A TARGET IS SELECTED WITH NO LAUNCH RESTRICTIONS
Blank — A TARGET IS NOT SELECTED (AFTER LAUNCH PROCESSING IS COMPLETE FOR A TARGET)

23 WHEN A TARGET IS SELECTED AND THE MISSILE FLIGHT RANGE IS GREATER THAN THE MAXIMUM RANGE OF THE MISSILE, THE TIME FOR THE AIRCRAFT TO REACH A POINT IN RANGE OF THE TARGET IS DISPLAYED IN MINUTES AND SECONDS. (BASED ON THE AIRCRAFT FLYING TOWARDS THE AIMPOINT AT THE CURRENT GROUND SPEED.) THE FIELD IS BLANK WHEN THE MISSILE FLIGHT RANGE TO THE TARGET IS WITHIN THE MAXIMUM RANGE OF THE MISSILE OR A TARGET IS NOT SELECTED (AFTER LAUNCH PROCESSING IS COMPLETE FOR A TARGET)

24
CLIMB — BELOW MINIMUM ALTITUDE
DIVE — ABOVE MAXIMUM ALTITUDE
ACCEL — BELOW MINIMUM MACH OR DYNAMIC PRESSURE TOO LOW OR AIR SPEED TOO LOW
DCLR — AIRCRAFT SPEED ABOVE MAXIMUM MACH
LVL OFF — MAXIMUM OR MINIMUM FLIGHT PATH ANGLE EXCEEDED
BRG CHG — WAYPOINT TURN TOO GREAT
LNCH BRG — MAXIMUM BEARING EXCEEDED
A/C –> WPT — AIRCRAFT TOO CLOSE TO WAYPOINT FOR LAUNCH
A/C –> TGT — AIRCRAFT TOO CLOSE TO TARGET FOR LAUNCH
WPT –>TGT — WAYPOINT TOO CLOSE TO TARGET FOR LAUNCH
DCNT RNG — HIGH FLY-OUT IS SELECTED AND RANGE TO DESCENT IS TOO SMALL
SRCH BFR — RBL SEEKER SEARCH MODE IS RECTANGULAR AND RANGE BEFORE IS TOO SMALL
SRCH BYN — RBL SEEKER SEARCH MODE IS RECTANGULAR AND RANGE BEYOND IS TOO SMALL
ENBL RNG — BOL ENABLE RANGE IS TOO LARGE OR TOO SMALL

25 TGT — THE AIMPOINT IS A TARGET
WPT — THE AIMPOINT IS A WAYPOINT

26 CHANGE IN MISSILE HEADING AFTER LAUNCH IN DEGREES LEFT OR RIGHT DISPLAYED IN REVERSE VIDEO WHEN THE HEADING CHANGE IS GREATER THAN 90 DEGREES

Figure 1-26. PRGM-DN RBL Launch Data Display (Sheet 2 of 3)

27. RANGE FROM THE AIRCRAFT TO THE TARGET IN NM WHEN A TARGET IS SELECTED DISPLAYED IN REVERSE VIDEO WHEN THE RANGE TO THE AIMPOINT IS LESS THAN THE MINIMUM RANGE ALLOWED

28 ΔBRG — DISPLAYED WHEN A WAYPOINT IS DEFINED FOR THE SELECTED TARGET

29 REQUIRED CHANGE IN MISSILE HEADING IN DEGREES LEFT OR RIGHT AT THE WAYPOINT DISPLAYED IN REVERSE VIDEO WHEN THE HEADING CHANGE IS GREATER THAN THE MISSILE CAN ACCOMPLISH

30 PLANNED MISSILE FLIGHT PATH RANGE

31 nnn — RANGE FROM CURRENT AIRCRAFT POSITION TO THE FIRST POINT WHEN THE AIRCRAFT WOULD BE WITHIN THE PLANNED MISSILE FLIGHT PATH RANGE TO THE TARGET

000 — DISPLAYED WHEN THE AIRCRAFT IS WITHIN THE PLANNED MISSILE FLIGHT PATH RANGE TO THE SELECTED TARGET

Blank — A TARGET IS NOT SELECTED (AFTER LAUNCH PROCESSING IS COMPLETE FOR A TARGET).

32 mm:ss — TIME REQUIRED FROM CURRENT AIRCRAFT POSITION TO THE FIRST POINT WHEN THE AIRCRAFT WOULD BE WITHIN THE PLANNED MISSILE FLIGHT PATH RANGE TO THE TARGET FLYING AT THE CURRENT GROUND SPEED

00:00 — DISPLAYED WHEN THE AIRCRAFT IS WITHIN THE PLANNED MISSILE FLIGHT PATH RANGE TO THE SELECTED TARGET

Blank — A TARGET IS NOT SELECTED (AFTER LAUNCH PROCESSING IS COMPLETE FOR A TARGET).

33 ESTIMATED TIME OF ARRIVAL AT A POINT AT THE PLANNED LAUNCH RANGE FOR THE SELECTED TARGET ASSUMING THE AIRCRAFT FLYS DIRECTLY TO THE AIMPOINT AT THE CURRENT GROUND SPEED AS LONG AS THE CURRENT RANGE TO THE TARGET IS GREATER THAN THE PLANNED LAUNCH RANGE

34 xy — LOCATION AND STATION FOR EACH OF EACH MISSILE SELECTED AND AVAILABLE FOR LAUNCH AT THE SELECTED TARGET. THE MISSILES WILL BE DISPLAYED FROM LEFT TO RIGHT IN ACTUAL LAUNCH SEQUENCE

xy — LOCATION AND STATION OF EACH MISSILE SELECTED AND AVAILABLE FOR LAUNCH WHEN ITL WAS COMMANDED BUT CANNOT BE LAUNCHED AT THE CURRENT TIME

■ — REVERSE BOX IS DISPLAYED WHEN THE NUMBER OF MISSILES REQUESTED FOR THE SELECTED TARGET IS GREATER THAN THE THE NUMBER OF MISSILES AVAILABLE FOR LAUNCH

35 mm:ss — ACCUMULATED POWER ON TIME WHEN OPERATE POWER IS ON AND THE MAXIMUM POWER ON TIME HAS NOT BEEN EXCEEDED

mm:ss — ACCUMULATED OPERATE POWER ON TIME WHEN OPERATE POWER IS ON AND THE MAXIMUM POWER ON TIME HAS BEEN EXCEEDED

ITL — THE ITL COMMAND HAS BEEN SENT TO THE MISSILE

STG — ENGINE START COMMAND HAS BEEN SENT TO THE MISSILE

READY — MISSILE READY FOR LAUNCH AND CAN BE LAUNCHED

BLKD — MISSILE BLOCKED BY ANOTHER MISSILE NOT AVAILABLE FOR LAUNCH

ABORT — AN ABORT COMMAND HAS BEEN SENT TO THE MISSILE

HOLD — THE MISSILE IS READY TO BE LAUNCHED BUT CANNOT BE LAUNCHED BECAUSE LAUNCH PREREQUISITE CONDITIONS ARE NOT MET

HOLD — MISSILE IS READY FOR ITL BUT ITL PREREQUISITES ARE NOT MET

OPERATOR ITL COMMANDS WILL BE INHIBITED WHEN ITL PREREQUISITE CONDITIONS HAVE NOT BEEN MET. IF THE PREREQUISITE CONDITIONS ARE MET WHEN THE OPERATOR COMMANDS ITL, THE FIRST MISSILE TO BE LAUNCHED FROM EACH PYLON WILL RECEIVE AN ITL COMMAND, THEREFORE, ITL HOLD IS NOT APPLICABLE TO THE FIRST MISSILE ON EACH PYLON RECEIVING AN ITL COMMAND IN RESPONSE TO EACH OPERATOR ITL COMMAND.

OFF — THE MISSILE WAS SELECTED FOR LAUNCH WHEN THE OPERATOR COMMANDED ITL, BUT POWER HAS BEEN REMOVED AFTER ITL WAS COMMANDED

Figure 1-26. PRGM-DN RBL Launch Data Display (Sheet 3 of 3)

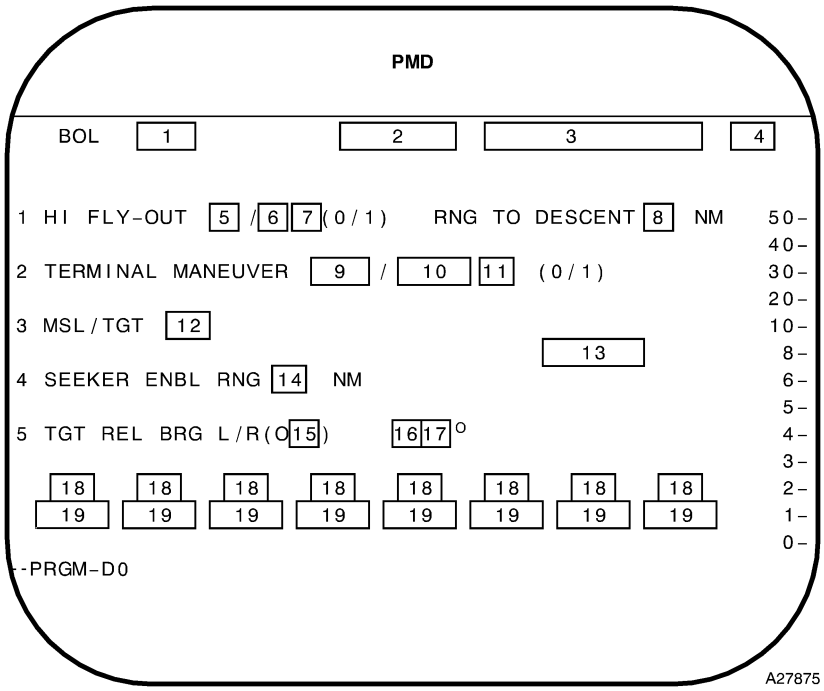
BOL Launch Data display (PRGM-D0)

The BOL Launch Data display, PRGM-D0, figure 1-27, is used to input all target position and optional parameters for a BOL mission. In addition PRGM-D0 also selects the BOL mission in preparation for launch and displays pertinent status data in preparation for launch. The following items can be input or reviewed using the BOL Launch Data display:

- High fly-out command
- Range to descent if high fly-out is commanded
- Terminal maneuver
- Number of missiles to be launched at the target
- Missile range to begin seeker search after launch
- Relative bearing to target
- Current Engine Start Before Launch (ESBL)/ Engine Start After Launch (ESAL) status
- Current TEST MISSILE mode option status
- Current Fail Safe Lock-Out status

AGM-84 RELEASE ADVISORY DISPLAY

When AGM-84 missiles are launched, jettisoned, aborted or hung, the location/station number and the appropriate status will be shown on the AGM-84 Release Advisory, figure 1-28, at the bottom of the display on all MFD displays. Once displayed the data will remain on the MFD for approximately five seconds and then will automatically clear.



1	ESAL	ENGINE WILL START AFTER LAUNCH
	ESBL	ENGINE WILL START BEFORE LAUNCH
2	TEST MSL	TEST MISSILE COMMANDED
3	FAIL-SAFE LOCKOUT	TEST MISSILE CONFIGURATION HAS BEEN COMMANDED
	Blank	TEST MISSILE CONFIGURATION HAS NOT BEEN COMMANDED
4	YES	TEST MISSILE CONFIGURATION AND FAIL-SAFE LOCKOUT HAS BEEN COMMANDED
	NO	TEST MISSILE CONFIGURATION AND FAIL-SAFE LOCKOUT HAS NOT BEEN COMMANDED
5	**YES**	HIGH FLY-OUT IS SELECTED
	YES	HIGH FLY-OUT IS NOT SELECTED
6	**NO**	HIGH FLY-OUT IS NOT SELECTED
	NO	HIGH FLY-OUT IS SELECTED
7	0	HIGH FLY-OUT IS SELECTED
	1	HIGH FLY-OUT IS NOT SELECTED
8	NN	RANGE TO DESCENT IN NM WHEN HIGH FLY-OUT IS SELECTED,
		BLANK WHEN HIGH FLY-OUT IS NOT SELECTED
9	**SKIM**	SEA SKIM TERMINAL MANEUVER SELECTED
	SKIM	SEA SKIM TERMINAL MANEUVER NOT SELECTED
10	**POP-UP**	POP-UP TERMINAL MANEUVER SELECTED
	POP-UP	POP-UP TERMINAL MANEUVER NOT SELECTED
11	0	SEA SKIM TERMINAL MANEUVER SELECTED
	1	POP-UP TERMINAL MANEUVER SELECTED
12	N	NUMBER OF MISSILES TO BE LAUNCHED AT THE TARGET
	0	AFTER LAUNCH PROCESSING IS COMPLETE AND AFTER A CLR-DN COMMAND IS ENTERED BY THE OPERATOR FOR THE SELECTED TARGET

Figure 1-27. PRGM-D0 BOL Launch Data Display (Sheet 1 of 2)

13 **CLIMB** BELOW MINIMUM ALTITUDE
DIVE ABOVE MAXIMUM ALTITUDE
ACCEL BELOW MINIMUM MACH OR DYNAMIC PRESSURE TOO LOW OR AIR SPEED TOO LOW
DCLR AIRCRAFT SPEED ABOVE MAXIMUM MACH
LVL OFF MAXIMUM OR MINIMUM FLIGHT PATH ANGLE EXCEEDED
BRG CHG WAYPOINT TURN TOO GREAT
LNCH BRG MAXIMUM BEARING EXCEEDED
A/C –> WPT AIRCRAFT TOO CLOSE TO WAYPOINT FOR LAUNCH
A/C –> TGT AIRCRAFT TOO CLOSE TO TARGET FOR LAUNCH
WPT –>TGT WAYPOINT TOO CLOSE TO TARGET FOR LAUNCH
DCNT RNG HIGH FLY-OUT IS SELECTED AND RANGE TO DESCENT IS TOO SMALL
SRCH BFR RBL SEEKER SEARCH MODE IS RECTANGULAR AND RANGE BEFORE IS TOO SMALL
SRCH BYN RBL SEEKER SEARCH MODE IS RECTANGULAR AND RANGE BEYOND IS TOO SMALL
ENBL RNG BOL ENABLE RANGE IS TOO LARGE OR TOO SMALL

14 DISTANCE IN NM THE MISSILE IS COMMANDED TO FLY BEFORE TURNING THE SEEKER ON

15 0 LEFT TURN
1 RIGHT TURN
[redacted] LAUNCH BEARING TURN DIRECTION HAS NOT BEEN INPUT

16 L LEFT TURN
R RIGHT TURN

17 NN DEGREES OF BOL LAUNCH BEARING (0 THROUGH 90)
[redacted] LAUNCH BEARING HAS NOT BEEN INPUT

18 xy LOCATION AND STATION FOR EACH MISSILE SELECTED AND AVAILABLE FOR LAUNCH TO THE SELECTED TARGET. THE MISSILES WILL BE DISPLAYED FROM LEFT TO RIGHT IN ACTUAL LAUNCH SEQUENCE

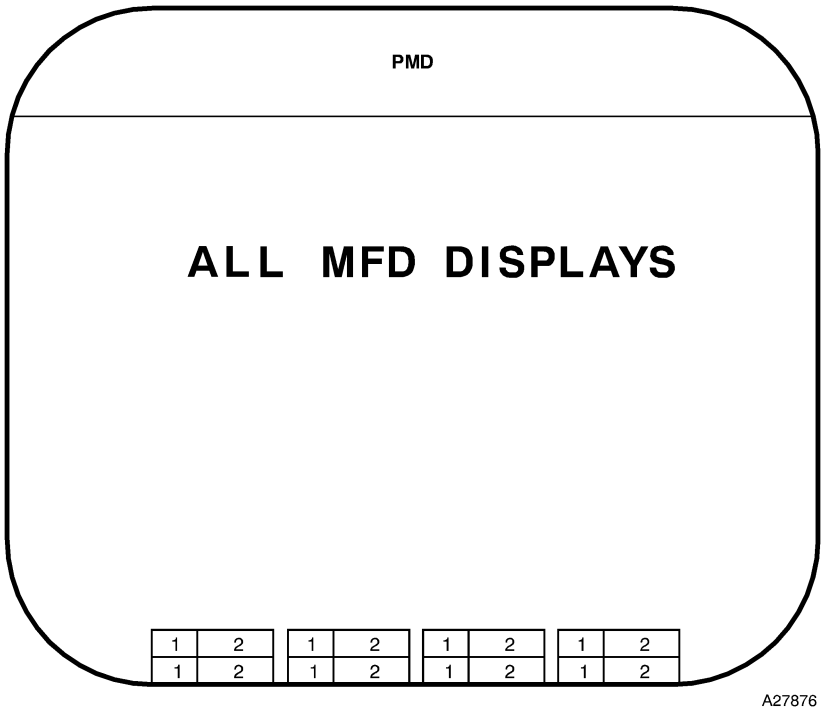
xy LOCATION AND STATION OF EACH MISSILE SELECTED AND AVAILABLE FOR LAUNCH WHEN ITL WAS COMMANDED BUT CANNOT BE LAUNCHED AT THE CURRENT TIME
[redacted] REVERSE BOX IS DISPLAYED WHEN THE NUMBER OF MISSILES REQUESTED FOR THE SELECTED TARGET IS GREATER THAN THE THE NUMBER OF MISSILES AVAILABLE FOR LAUNCH

19 mm:ss ACCUMULATED POWER ON TIME WHEN OPERATE POWER IS ON AND THE MAXIMUM POWER ON TIME HAS NOT BEEN EXCEEDED
mm:ss ACCUMULATED OPERATE POWER ON TIME WHEN OPERATE POWER IS ON AND THE MAXIMUM POWER ON TIME HAS BEEN EXCEEDED
ITL THE ITL COMMAND HAS BEEN SENT TO THE MISSILE
STG ENGINE START COMMAND HAS BEEN SENT TO THE MISSILE
READY MISSILE READY FOR LAUNCH AND CAN BE LAUNCHED
BLKD MISSILE BLOCKED BY ANOTHER MISSILE NOT AVAILABLE FOR LAUNCH
ABORT AN ABORT COMMAND HAS BEEN SENT TO THE MISSILE
HOLD THE MISSILE IS READY TO BE LAUNCHED BUT CANNOT BE LAUNCHED BECAUSE LAUNCH PREREQUISITE CONDITIONS ARE NOT MET
HOLD MISSILE IS READY FOR ITL BUT ITL PREREQUISITES ARE NOT MET

OPERATOR ITL COMMANDS WILL BE INHIBITED WHEN ITL PREREQUISITE CONDITIONS HAVE NOT BEEN MET. IF THE PREREQUISITE CONDITIONS ARE MET WHEN THE OPERATOR COMMANDS ITL, THE FIRST MISSILE TO BE LAUNCHED FROM EACH PYLON WILL RECEIVE AN ITL COMMAND, THEREFORE, ITL HOLD IS NOT APPLICABLE TO THE FIRST MISSILE ON EACH PYLON RECEIVING AN ITL COMMAND IN RESPONSE TO EACH OPERATOR ITL COMMAND.

OFF THE MISSILE WAS SELECTED FOR LAUNCH WHEN THE OPERATOR COMMANDED ITL, BUT POWER HAS BEEN REMOVED AFTER ITL WAS COMMANDED

Figure 1-27. PRGM-D0 BOL Launch Data Display (Sheet 2 of 2)



1	XY	LOCATION AND STATION OF EACH MISSILE LAUNCHED DISPLAYED LEFT TO RIGHT IN THE LAUNCH SEQUENCE	2	AWAY	MISSILE HAS SUCCESSFULLY LAUNCHED
				HUNG	MISSILE UMBILICAL AND/OR EJECTOR STATUS INDICATE THE MISSILE DID NOT RELEASE
				ABORT	MISSILE ABORT WAS COMMANDED FOR LOCATION/STATION
				JETT	MISSILE WAS SUCCESSFULLY JETTISONED

Figure 1-28. AGM-84 Release Advisory Display

MISSILE MISSION DATA ITEMS

The following mission data items are used to define a particular AGM-84 mission:

- Target Location
- Waypoint Location
- Missiles per Target
- Search Pattern
- Search Priority
- Terminal Maneuver
- High Fly-Out
- Range to Descent
- Search Range Before Target
- Search Range Beyond Target
- Seeker Enable Range
- Target Relative Bearing
- Planned Launch Range

The Mission types and parameters for each are listed in figure 1-29.

Target Location

The target location is the geographic position of the area containing the missile target. The target location can be defined by the operator using one of the following four methods:

- Latitude and longitude
- Range and Azimuth from current aircraft position
- Range and Azimuth from another defined target
- Radar X-Hair location

Waypoint Location

The waypoint location is the geographic position, defined by the operator, where the missile may be programmed to alter its course. After launch, the missile will make its initial turn and can be programmed to fly to this optional waypoint. Upon reaching the waypoint, the missile will make a another turn and continue to the target location. The waypoint can be defined by the operator in one of the following methods:

- Latitude and longitude
- Range and Azimuth from the defined target for that mission
- Radar X-Hair location

NOTE

If a waypoint is defined as coordinates, it will remain fixed at that point even if the target position is moved. If a way point is defined as a bearing and range to the target, that relationship will remain constant even if the target position is moved.

Missiles Per Target

Missiles Per Target is the number of missiles which are to be launched against a specific target. Missiles per target can range from one to eight.

Search Pattern

Search patterns are used only with RBL missions with a defined target location. The Search Pattern option allows the operator to command either an elliptical or a rectangular seeker search pattern.

When the elliptical search pattern option is used, the missile seeker will initiate its search at a location relative to the target, based on the defined search priority. The seeker will gradually begin searching a larger area around the initial search position until the maximum search area is obtained or a target is located. The maximum search area is an ellipse around the target location.

When a rectangular search pattern is selected, the seeker will initiate its search at a specified range prior to the target location, as entered by the operator as the search range before target. The seeker will initially search a narrow field of view (FOV) and gradually begin expanding the FOV until the maximum is reached or a target is detected. Once the maximum FOV is reached and a target has not been found, the seeker will continue searching the area defined by a rectangle centered around the missile flight path. The seeker will suspend its search at a range past the target location. This range is entered by the operator as the search range beyond target.

Search Priority

If an elliptical search pattern has been selected, the search priority allows the operator to command the position relative to the target location where the seeker is to initiate its search pattern. NORMAL priority commands the seeker to initiate search at the target location. LEFT or RIGHT priority commands the seeker to initiate search to the left or right side of the target location. NEAR will command initiation of the search on the near side of the target location, and FAR will command search far side of the target location.

Terminal Maneuver

The missile has two options for its terminal maneuver, SEA-SKIM or POP-UP. The SEA-SKIM maneuver commands the missile to remain at low altitude as it approaches the target, causing it to impact the side of the target. The POP-UP maneuver commands the missile to pop-up and descend impacting the target from above.

High Fly-Out

The HIGH FLY-OUT option commands the missile to fly at a higher altitude after launch, before descending to its low mission altitude. The missile remains at the higher altitude until it reaches the RANGE TO DESCENT distance, at which time the missile descends to its lower mission altitude. If the HIGH FLY-OUT is not selected, the missile will descend to its low mission altitude after completing its initial turn towards the waypoint or target location.

Range to Descent

The RANGE TO DESCENT defines the point at which the missile descends from its HIGH FLY-OUT altitude to the low mission altitude.

Search Range Before Target

The SEARCH RANGE BEFORE TARGET is the distance, for rectangular search missions, before the target location at which the seeker initiates search.

Search Range Beyond Target

The SEARCH RANGE BEYOND TARGET is the distance, for rectangular search missions, past the target location at which the seeker terminates search.

Seeker Enable Range

The SEEKER ENABLE RANGE is used with BOL missions to define the distance from the launch point where the seeker will initiate search.

Target Relative Bearing

The TARGET RELATIVE BEARING is used with BOL missions to define the bearing relative to the aircraft heading the missile will fly after being launched.

Planned Launch Range

The PLANNED LAUNCH RANGE option allows the operator to enter the desired missile flight distance from launch to the target location via the waypoint.

MISSILE MISSION DATA ENTRY

RBL Missions

DEFINING MISSION PARAMETERS

Mission Parameters are defined using the FRMT-13 display. The parameters differ based on seeker search pattern. Changing the search pattern on the FRMT-13 display changes the display options to align with the selected search pattern. The following parameters are contained on FRMT-13 for both types of search pattern missions:

- Missiles per target
- Search Pattern
- Planned launch range
- Terminal maneuver
- High fly-out
- Range to descent

Elliptical pattern missions have the following additional parameter:

- Search priority

Rectangular pattern missions have the following two additional parameters:

- Search range before target
- Search range beyond target

MODIFYING MISSION DATA

Once defined RBL target mission data can be modified any time up to the targets selection for launch. The procedures for modification of data are the same as for initial entry.

After a target has been selected for launch using PRGM-DN, only the following can be modified:

- Missiles per target
- Azimuth and range from aircraft to the target
- Target latitude and longitude
- Planned launch range

DEFINING TARGET LOCATIONS

A target location is required to be entered for each missile mission prior to launch. The target location can be entered using one of the following four methods:

a. Entering target latitude and longitude

b. Entering range and azimuth from current aircraft position to target location

c. Entering range and azimuth from another defined target position (1-8) to target location

d. Defining target location using radar X-Hairs

When designating target locations per a., b., or c., the data is entered using the IKB and FRMT-11. When designating target locations with the radar X-Hairs, the data is entered on the CF-573 display by selecting the crosshair on target switch.

If a target is defined relative to another target, values must be entered on FRMT 11,N line 3, even if the desired values are zeros, or the OAS will not recognize the designation of the target.

If a waypoint is designated relative to the target being modified, the waypoint coordinates will be modified when the associated target location is moved such that the range and azimuth from the target to the waypoint remains constant. If a waypoint is designated for the target being modified, but is designated relative to the Earth, the waypoint latitude and longitude will not change and the range and azimuth from the waypoint to the target will be modified to show the new range and azimuth from the target to the waypoint when the associated target location is moved. It is possible to input an azimuth and range which are each within acceptable limits, but, together from the location of the reference point will produce a target latitude of greater than 90 degrees. Since the SMO has no way of knowing which input is correct, the resulting latitude will be accepted, but the azimuth, range, and the out-of-range latitude will all be displayed in reverse video on FRMT-11 and on the RBL Launch Data display (PRGM-DN). The out-of-range latitude will also be displayed on the Target Summary display (FRMT-12). It is also possible to place the crosshair in a position where the crosshair latitude, computed by FMS, is greater than 90 degrees. If a target is designated with the crosshair and the latitude is greater than 90 degrees, the azimuth, range, and latitude will be displayed in reverse video on FRMT-11, FRMT-12, and PRGM-DN.

DEFINING WAYPOINT LOCATIONS

A waypoint location may be entered for each missile mission prior to launch. The waypoint location can be entered using one of the following three methods:

- Entering waypoint latitude and longitude
- Entering range and azimuth to the waypoint from its defined target location
- Defining target location using radar X-Hairs

BOL Missions

When a BOL target is selected for launch using PRGM-D0, the BOL mission parameters and default values are displayed. The following parameters, contained on PRGM-D0 can be modified before intent to launch (ITL):

- High fly-out
- Range to descent
- Terminal maneuver
- Seeker enable range
- Target relative bearing

Only Missiles per Target can be modified after ITL.

MISSION ITEM	DEFAULT VALUE	RBL ELLIPTICAL	RBL RECTANGULAR	BOL
TARGET LOCATION	None	**R**	**R**	N/A
WAYPOINT LOCATION	None	O	O	N/A
MISSILES PER TARGET	1	R	R	R
SEARCH PATTERN ELLIPTICAL/RECTANGULAR	Elliptical	R	R	N/A
SEARCH PRIORITY NORMAL/LEFT/RIGHT/NEAR/FAR	Normal	R	N/A	N/A
TERMINAL MANEUVER SEA-SKIM/POP-UP	Sea-Skim	R	R	R
HIGH FLY-OUT YES/NO	No	R	R	R
RANGE TO DESCENT	None	R if HIGH FLY-OUT is YES Otherwise N/A	R if HIGH FLY-OUT is YES Otherwise N/A	R if HIGH FLY-OUT is YES Otherwise N/A
SEARCH RANGE BEFORE TARGET	None	N/A	**R**	N/A
SEARCH RANGE BEYOND TARGET	None	N/A	**R**	N/A
SEEKER ENABLE RANGE	0 NM	N/A	N/A	R
TARGET RELATIVE BEARING	None	N/A	N/A	**R**
PLANNED LAUNCH RANGE	None	O	O	N/A

R = Required, must be input by operator
R = Required, default value supplied
O = Optional
N/A = Not Applicable

Figure 1-29. Mission Types and Applicable Parameters

VIEWING TARGET LOCATIONS

The currently defined target locations can be viewed using the Target Location Summary display (FRMT-12) and the Target/Waypoint Locate display (CF-574). The FRMT-12 display allows the operator to view all current target locations simultaneously. The CF-574 display allows the operator to review individual target positions graphically using either the FRMT-1 or FRMT-2 displays.

Target/Waypoint Locate

The Target /Waypoint display is commanded by entering CF-574,N where N is a defined target location 1 thru 8. Once the CF-574 display is active, the target location number can be changed without having to reenter CF-574,N by overwriting the currently selected target location number with a new one. If the target is on the radar display, a T will be displayed on the target. If a waypoint has been defined and is on the radar display, a W will be displayed on the waypoint.

SELECTING TARGETS FOR LAUNCH

Targets for launch are selected by entering PRGM-DN (N = Target 1-8) for RBL missions or PRGM-D0 for BOL missions. After selection the SMO will begin ranging calculations for the specified target, select missiles available, and display pertinent information in preparation for missile launch.

When a RBL launch has been selected, some mission data can be updated by the operator prior to ITL. The following conditions must be satisfied in order to select a RBL target for launch:

- The target number must be 1 thru 8
- If the RBL is an elliptical target, the target location must be defined
- If the RBL target is a rectangular target, the target location, the search range before target, and the search range beyond target must be defined
- Another target for which ITL has been commanded cannot be selected

DESELECTING TARGETS FOR LAUNCH

A target can be deselected by selecting another target location for launch (PRGM-D0 or PRGM-DN) or by entering the Target Deselect command (CLR-D). If ITL has been commanded, and the launch sequence for the current target has not completed, selecting another target will be inhibited. Therefore, after ITL, a target can only be deselected by entering CLR-D.

Pre-ITL Deselection

If CLR-D is selected before operator command of ITL the SMO will:

- Stop all target ranging calculations
- Stop performing missile selection
- Remove all ranging and data values derived from ranging data from the launch data display (PRGM-DN or PRGM-D0) for the selected target.
- Display no missiles selected on the launch data display (PRGM-DN or PRGM-D0).

Post-ITL Deselection

If CLR-D is selected after operator command of ITL the SMO will:

- Complete launch processing for any missile which has received an ITL command
- Not command ITL to any additional missiles after the target deselect command has been entered.
- The MSL/TGT window on the launch data display (PRGM-DN or PRGM-D0) will show the number of missiles which have received ITL, but have not been launched (i.e. the number of missiles yet to be launched).
- The location/station and missile status display windows at the bottom of the launch data display (PRGM-DN or PRGM-D0) will show the location/station and missile state of each missile remaining to be launched. The data is displayed left to right in expected order of launch starting with the left most pair of windows. Data will be displayed for no more than two missiles (one on each pylon).
- When all missiles which have received ITL have been launched, the launch sequence will be terminated normally and the target will be deselected. The SMO will stop performing all target ranging calculations, and all missile selection processing. The launch data display (PRGM-DN or PRGM-D0) will show that no missiles are selected.
- If any missile which has received an ITL command prior to the target deselect command fails to launch, the launch sequence will be terminated in the same manner as a fatal fault.

TARGET RANGING

Once a target has been selected for launch by entering PRGM-DN or PRGM-D0, the SMO will begin ranging calculations for the selected target and display the ranging data on the launch data display until deselected.

RBL Target Ranging

RBL ranging data includes the groups of data shown in figure 1-30.

DATA DESCRIPTION	MODIFIABLE	RANGE/UNITS
ESAL/ESBL INDICATION	NO	ESAL/ESBL
SAIR INDICATION	NO	*
TIME TO GO TO SAIR	NO	00:01 - 59:59 Minutes:Seconds
SAFE LAUNCH RESTRICTIONS	NO	**
AIMPOINT IDENTIFICATION (TARGET OR WAYPOINT)	NO	TGT/WPT
AIRCRAFT RELATIVE BEARING TO THE AIMPOINT	NO	L 180° - R 180°
RANGE FROM AIRCRAFT TO AIMPOINT	NO	0 - 9999 NM
MISSILE FLIGHT RANGE	NO	0 - 999 NM
RANGE FROM AIRCRAFT TO PLANNED LAUNCH RANGE	NO	0 - 999 NM
TIME TO GO TO PLANNED LAUNCH RANGE	NO	00:01 - 59:59 Minutes:Seconds
ESTIMATED TIME OF ARRIVAL AT PLANNED LAUNCH RANGE	NO	00:00 - 23:59 Hours:Minutes
WAYPOINT TURN ANGLE	NO	L 180° - R 180°

* SAIR indications are displayed by SAIR video highlighting. See item 22, figure 1-26

** See figure 1-31 for safe launch restrictions.

Figure 1-30. RBL Launch Data Display (PRGM-DN) Ranging Data

RELEASE RESTRICTION	INDICATION	CORRECTIVE ACTION
CLIMB	1) Minimum altitude exceeded	Climb
DIVE	1) Maximum altitude exceeded	Descend
ACCEL	1) Minimum Mach exceeded 2) Dynamic Pressure too low 3) Air speed too low	Increase IAS
DCLR	1) Maximum Mach violated	Decrease IAS
LVL OFF	1) Maximum flight path angle exceeded 2) Minimum flight path angle exceeded	Level off
BRG CHG	1) Waypoint turn too large	Decrease approach azimuth to waypoint
LNCH BRG	1) Maximum bearing exceeded	Decreases relative bearing from aircraft to aimpoint (aimpoint = waypoint or, if no waypoint defined, aimpoint = target)
A/C–>WPT	1) Aircraft too close to waypoint	Increase range from aircraft to waypoint
A/C–>TGT	1) Aircraft too close to target	Increase range from aircraft to target
WPT–>TGT	1) Waypoint too close to target	Increase range from waypoint to target
Blank	No restrictions	N/A

Figure 1-31. RBL Launch Release Restrictions

ENGINE START INDICATION

The SMO will launch missiles as either Engine Start After Launch (ESAL) or Engine Start Before Launch (ESBL) based on predicted conditions when the operator commands ITL. The predicted conditions used by the SMO for determination of start mode are true airspeed, AGL altitude, air density, and aircraft pitch. The default engine start mode (ESAL) commands the engine to start after missile release from the pylon. If the SMO predicts the missile, after launch, will not be able to start its engine before impacting the ground, the SMO will command the engine to be started prior to the missile being released from the pylon (ESBL). The ESAL/ESBL indication is displayed on PRGM-DN. Prior to transmitting ITL to the missile, the SMO will reprocess the ESAL/ESBL algorithms to determine which type of launch should be performed for that missile. It is possible for both ESAL and ESBL missiles to be launched at the same target location.

SAFE AND IN RANGE INDICATION

The SAIR status is displayed in the middle of the RBL Launch Data display PRGM-DN. The SAIR display indicates if any launch restrictions exist or if the aircraft is within missile flight range of the selected target. The following are the SAIR indications:

- Normal video indicates the aircraft is not yet within range, and no launch restrictions exist.
- Bright underlined video indicates the aircraft is within the missile flight range to the target and no launch restrictions exist
- Blinking reverse video indicates at least one launch restriction exists

SAFE LAUNCH RESTRICTIONS

Figure 1-31 lists the release restrictions for an RBL launch. These restrictions are displayed in reverse blinking video on the PRGM-DN display.

IN-RANGE RESTRICTIONS

In-Range restrictions are determined by calculating the distance from the current aircraft position to the selected target location via the waypoint, if a waypoint exists. This calculated range is displayed in the MSN RNG TO TGT window on PRGM-DN.

If the calculated range to the target is greater than the maximum flight range of the missile, the following indications will be displayed on the MSN RNG TO TGT line:

- The target range will be displayed in reverse video.
- SAIR will be displayed in normal video as long as a launch restriction does not exist
- The Time To Go to range window will display the estimated time required for the aircraft to reach the maximum missile flight range. This estimate is based on the current groundspeed of the aircraft and assumes the aircraft is flying towards the aimpoint.

If the calculated range to the target is less than the minimum flight range of the missile, the following indications will be displayed on the MSN RNG TO TGT line:

- The target range will be displayed in normal video.
- SAIR will be displayed in bright underlined video as long as a launch restriction does not exist
- The Time To Go to range window will be blank

PLANNED LAUNCH RANGE INDICATIONS

Planned In-Range indications are determined using the calculated target range displayed in the MSN RNG TO TGT window on PRGM-DN, and the planned launch range entered by the operator, displayed on line 4 LNCH RNG.

If the calculated target range is greater than the planned launch range, the following occur to indicate the planned range situation:

- The RNG TO LNCH window will display in normal video the difference between target range and planned launch range. The display is limited to a maximum of 99 NM.
- The TTG window will display the estimated time required for the aircraft to reach the planned launch range. This estimate is based on the current groundspeed of the aircraft and assumes the aircraft is flying towards the aimpoint.
- The ETA window will display the estimated time of arrival to the planned launch range. This estimate is based on the current groundspeed of the aircraft and assumes the aircraft is flying towards the aimpoint.

If the calculated range to the target is less than the planned launch range, the following indications will be displayed on line 4 LNCH RNG:

- The RNG TO LNCH window will display 000 in bright underlined video

- The TTG will display 000 in bright underlined video
- The ETA window will be blank

AIMPOINT DATA

The aimpoint data is displayed on the line above line 4 LNCH RNG. The data provides identification of the aimpoint and the range and relative bearing from the aircraft to the aimpoint. The first window on the line identifies the aimpoint as a target (TGT) or waypoint (WPT). The relative bearing (BRG) window provides the initial turn angle the missile will accomplish after launch. The relative bearing and range will be displayed in normal video as long as there are no release restrictions. The release restrictions are as follows:

- If the bearing from the aircraft is greater than the maximum allowed for the missile, the aimpoint relative BRG window data will be in reverse video and a LNCH BRG message will be displayed in the message window at the end of the MSN RNG TO TGT line.
- If the range from the aircraft to the aimpoint is too close, the aimpoint RNG window data will be in reverse video and a A/C–>WPT or A/C–>TGT message will be displayed in the message window at the end of the MSN RNG TO TGT line.

The waypoint turn angle data is displayed in two windows at the end of the line following the RNG ____NM. The windows will be blank if no waypoint has been defined for the selected mission. If a waypoint is defined, the first window will display Δ BRG in normal video and the second window will display the turn angle in degrees relative to the aircraft heading. The turn angle will be displayed in normal video if it is less than or equal to the maximum allowed turn angle for the missile. If the turn angle is greater than allowed, the turn angle will be displayed in reverse video and a BRG CHG message will be displayed in the message window at the end of the MSN RNG TO TGT line.

BOL Target Ranging

The only ranging data considered for BOL missions are engine start parameters and safe release restrictions. Engine start for BOL launches is accomplished in the same manner as for RBL launches and is displayed on the first line of PRGM-D0. The release restrictions for an BOL launch are contained in figure 1-32. These restrictions are displayed in reverse blinking video on the right side of the PRGM-D0 display between lines 3 MSL/TGT and 4 SEEKER ENBL RNG.

RELEASE RESTRICTION	INDICATION	CORRECTIVE ACTION
CLIMB	1) Minimum altitude exceeded	Climb
DIVE	1) Maximum altitude exceeded	Descend
ACCEL	1) Minimum Mach exceeded 2) Dynamic Pressure too low 3) Air speed too low	Increase IAS
DCLR	1) Maximum Mach violated	Decrease IAS
LVL OFF	1) Maximum flight path angle exceeded 2) Minimum flight path angle exceeded	Level off
Blank	No restrictions	N/A

Figure 1-32. BOL Launch Release Restrictions

AIRCRAFT ELECTRICAL SYSTEM

Primary system power is 400 Hz ac furnished from engines No. 1, 3, 5, and 7 generator power boxes. Power is distributed from buses in the main generator power boxes (forward wheel well) and from the secondary buses located in the aircraft. Aircraft dc power is furnished primarily for system control. Aircraft power is removed from the missile during launch countdown after missile battery power is switched to the missile circuitry. The OAS No. 1 and 2 circuit breakers located on the right forward BNS circuit breaker panel (figure 1-33) are the source for control power for the OAS and missile systems. Essential power, fill-in power for critical avionics and missile navigation functions, pylons and ejectors unlock power, and power for electro-explosive devices are distributed from the power distribution box in the forward wheel well. Figure 1-34 shows related circuit breakers and their locations.

AIRCRAFT WEAPON CONTROL EQUIPMENT

Aircraft Weapon Control Equipment (WCE) for the AGM-84 missile consists of the Armament Interface Unit (AIU), Environmental Control Unit (ECU), Weapon Interface Units (WIU), and Weapon Personality Adapters (WPA). The AIU's function is to control application of power to the ECU, WIUs, and WPAs. The ECU supplies cooling air to the WIUs. The WIUs' function is to provide ejector control. The WPAs' functions are to enable power application to the missiles and provide communication to and from the missiles. AIU power is supplied when the OAS is turned on. Power to the ECU, WIU, and WPA is supplied when MIU power for the pylon is selected using the MIU POWER Switches on the OAS Power Control panel.

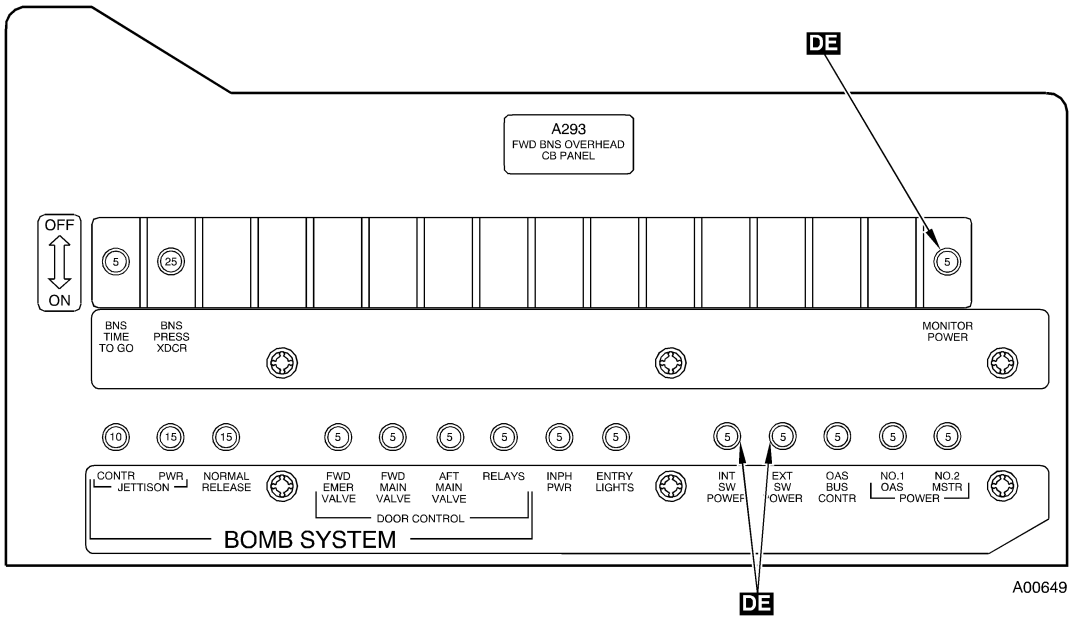
WCE STATUS MONITORING

The operator can review the operational status of the WCE using FRMT-6 PME Status display. FRMT-6 lists AIU, ECU, L WIU, R WIU, L WPA, and R WPA. For bus communication failures, an A or C, corresponding to the applicable bus, will be displayed next to the LRU name. For an LRU failure, an X will be displayed next to the LRU name. CF-66, fault reset command, will clear the display of faults which have been corrected.

WCE status is also displayed on FRMT-7 AGM-84 Status and Inventory. The LRU names (AIU, ECU, WIU, and WPA) will be displayed in reverse video for an LRU communication failure or when statused as failed.

AIRCRAFT NAVIGATION SYSTEM

The B-52 offensive avionics system (OAS) is a computer controlled electronics system providing nearly automatic navigation and missile delivery by use of computers programmed by magnetic tapes containing the flight computer program and mission data information. The OAS provides present position, speed, direction, pitch and roll data, acceleration, altitude, and update and reference data to the missile for missile navigation computations. For information on OAS navigation, refer to the applicable flight manual.



RIGHT FORWARD BNS CIRCUIT BREAKER PANEL

Figure 1-33. Circuit Breaker Panels

CIRCUIT	BREAKER NOMENCLATURE	AMPERE RATING	LOCATION	TYPE	FUNCTION
MISSILE JETTISON	JETTISON POWER	15	Right fwd BNS overhead CB panel	DC	Pilot's Jettison switch power
	JETTISON CONTROL	10	Right fwd BNS overhead CB panel	DC	Pilot's Jettison switch power
	NORMAL RELEASE	15	Right fwd BNS overhead CB panel	DC	Ejector unlock consent

Figure 1-34. Circuit Protection

MISSILE JETTISON

Missile jettison is accomplished by one of three methods; using the navigator's weapon jettison select switch on the WCP, the Alternate Jettison Control Panel at the navigator's station or the pilot's bomb bay and missile jettison control switch. All methods require unlock consent.

WARNING

The AGM-84 SMO has no interlocks preventing jettison on the ground.

NOTE

The radar navigator's jettison switch was excluded from operation with the AGM-84, however, a malfunction in the jettison system could enable the switch, making it function in the same manner as the pilot's switch.

The preferred method uses the OAS and the AGM-84 SMO thru the LOCATION/STATION switches and the WEAPON JETTISON SEL switch on the Weapon Control Panel (figure 1-7) to selectively jettison missiles. CF E can also be used in place of the WCP.

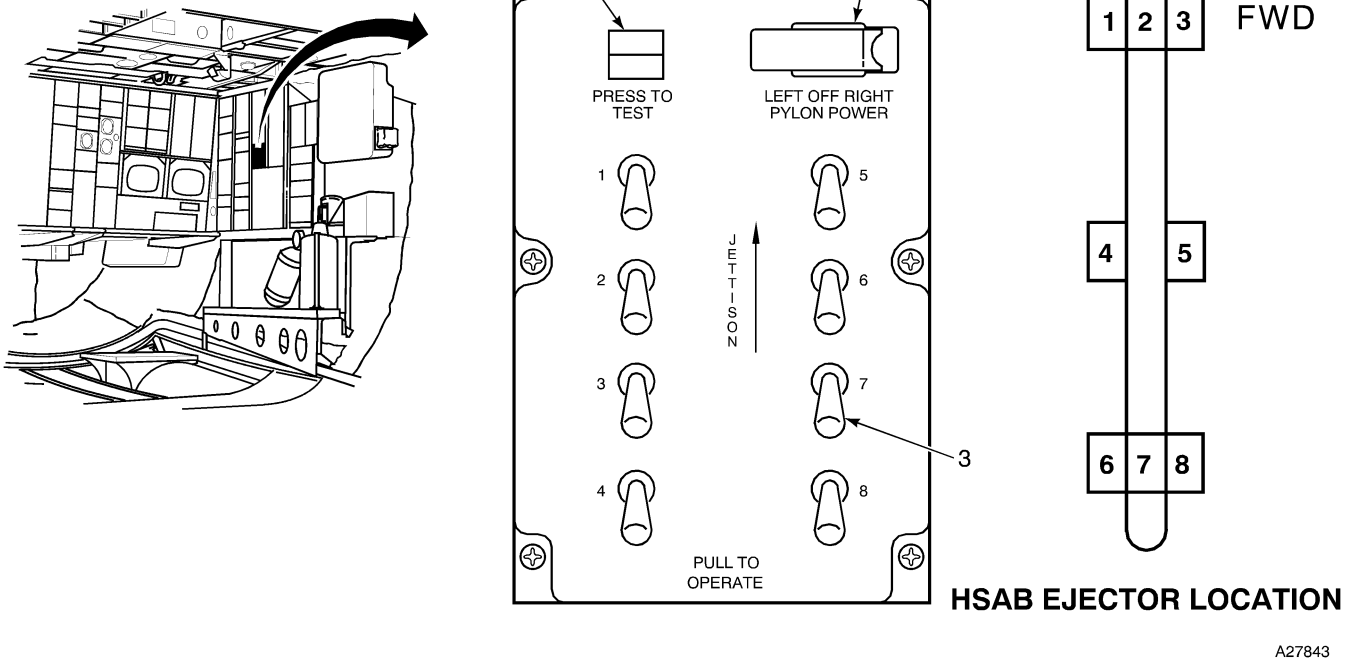
The second method using the Alternate Jettison Control Panel (AJCP) located at the navigator's station, figure 1-35, allows selective jettison of external weapons without the OAS operational or the SMO loaded or when WCP jettison is not possible. The AJCP will selectively jettison the missiles one at a time.

WARNING

The AJCP has no interlocks preventing jettison on the ground. With unlock consent, actuation of AJCP switches while on the ground with power applied to the aircraft will result in weapon jettison.

NOTE

The SMO can not detect AJCP jettison commands and interprets the commands as uncommanded EED power available faults. Therefore if the AJCP is used for jettison with the SMO loaded, the SMO will interpret the command as a fault and remove WIU power at the effected station.



WARNING

The AJCP has no interlocks preventing jettison on the ground. With unlock consent, actuation of AJCP switches while on the ground with power applied to the aircraft will result in weapon jettison.

NO.	CONTROL/INDICATOR	FUNCTION
1	POWER and STORES Jettison Light	Two part light: PWR – Comes on when the pylon power (No. 2) switch is placed to either LEFT or RIGHT indicating power is applied to the AJCP. JET – Comes on when any jettison switch (No. 3) is placed up to command jettison.
2	PYLON POWER Switch	Applies Jettison power to the selected pylon.
3	JETTISON Switch (8)	Switches 1 thru 8 command jettison at the respective HSAB ejector location.

Figure 1-35. Alternate Jettison Control Panel

The third method, jettison using the pilot's Bomb Bay and Missile jettison switch (figure 1-36) should be used only if jettison by the other methods is not possible. OAS must be up and running with the WIU and the WPA powered for jettison with this switch. Using the pilot's jettison switch all missiles will be jettisoned. The JETTISON POWER and JETTISON CONTROL circuit breakers on the Right forward BNS circuit breaker panel must be in for the Pilots' jettison switch to function.

WARNING

- The pilot's bomb bay and missile jettison control switch will only be used if jettison by the WCP and CF-E is impossible. When this switch is used, all weapons will be jettisoned and proper separation clearance cannot be ensured.
- The AGM-84 SMO has no interlocks preventing jettison on the ground. With unlock consent, actuation of pilots' jettison switch while on the ground with power applied to the OAS and the WIU will result in weapon jettison.

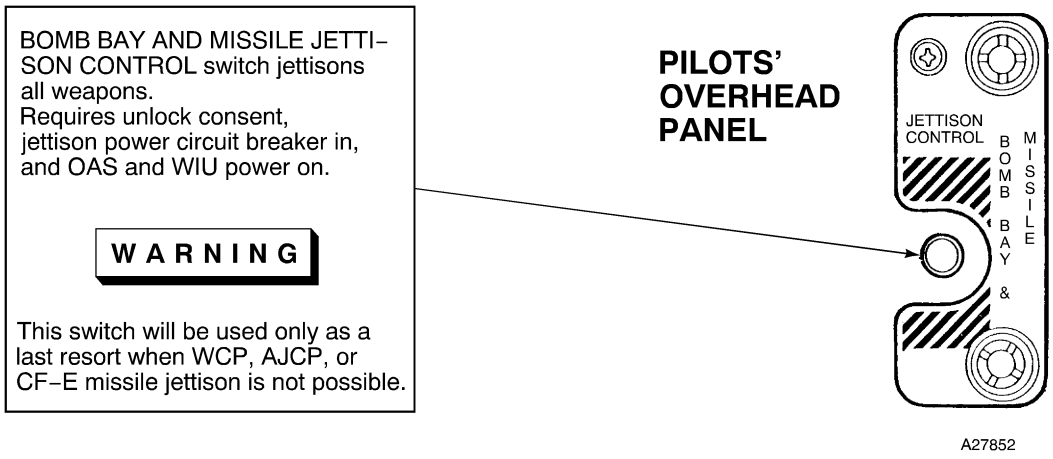


Figure 1-36. Bomb Bay And Missile Jettison Control Switches

Normal Aircrew Procedures

section II

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GENERAL

Detailed operating instructions for the Harpoon missile from aircraft preflight through landing are presented in chronological order. The step procedures are of the call-response type in which code letters appear after each response to indicate which member of the crew is to accomplish that step. Identification symbols are used after each response, except when the entire checklist is accomplished by a single crewmember, such as pilot or navigator. Code letters are as follows: (P) pilot, (CP) copilot, (N) navigator, and (RN) radar navigator. The checklists for the strike launch mission have been designed to accommodate the production of the abbreviated checklists included in the affected crewmembers checklists.

PREFLIGHT PROCEDURES

BEFORE EXTERIOR INSPECTION (POWER OFF) (RN/N)

In preparation for preflight inspection, perform the following:

1. Check Aircraft Form 781 – Completed (P-N)

   Check status of aircraft and aircraft system which may be pertinent to AGM-84D launch or simulated launch mission. Review engineering status of each loaded missile.

2. Pilot's Munitions Consent Panel: (RN)

   a. LOCK-UNLOCK Switch – Guard closed

3. Weapon Control Panel: (N)

   a. WPN JETTISON Switch – Guard closed

   b. NUCLEAR LOCK-UNLOCK Switch – Guard closed

4. Alternate Jettison Control Panel: (N)

   a. PYLON POWER Switch – OFF, Guard closed

   b. POWER Light – Off

5. Proceed to aircraft EXTERIOR INSPECTION (POWER OFF) checklist (step 1) (RN/N)

EXTERIOR INSPECTION (POWER OFF) (RN/N)

NOTE

If any discrepancies are found, notify MMS personnel.

1. External Heavy Stores Adapter Beam:

   a. Pylon General Condition – Checked

      Check the general condition of the pylon for surface damage. Check that pylon and HSAB fairings are installed, and both relay access doors are fastened.

   b. Missiles – Checked

      (1) Check for scratches on radome, radar antenna, telemetry antenna (if installed), and on missile body.

      (2) Check tail fins secure, no movement.

      (3) Check engine exhaust covers removed, umbilical cable connector connections secure, bail wire over bail rod, and bail rod secure.

      (4) Check missile wings indicate locked (sliding lock knob is directly under arrow).

      (5) Check arming lanyard installed.

   c. MAU-12 Inflight Safety Lockout Pin Hole – Bolt and nut installed

   d. MAU-12 Sway Braces & Ejector Feet – Seated and locked

      Check sway brace locknut tight. Check both ejector feet against missile.

   e. MAU-12 Cartridge Retainers (Bolts) – Torqued, secured

      Check that cartridge retainers cannot be unscrewed by hand. If they can, call MMS personnel.

WARNING

If undue resistance is encountered when removing a lockpin, cease further action and call MMS.

   f. MAU-12 Ground Safety Lock Pin(s) – Removed, counted, and stowed

      There will be one pin per missile.

2. Proceed to aircraft INTERIOR INSPECTION checklist (step 1) (RN/N)

AFTER ENGINE START

1. OAS Master Power Switch – ON (N)
2. Missile Status Check: (N)
   a. FRMT 7 – Entered
   b. MIU Power Switches – ON

      Apply MIU power to missile loaded locations only.

   c. Missile Status – P and OF (all missiles)

      Status windows for each missile will be blank before MIU power is turned ON and will show P and OF while MIU power is ON. Status will return to blank when MIU power is turned OFF. Check for OAS related faults; transient faults are possible. FRMT 7 information should match aircraft weapon load exactly. If not, call qualified personnel.

   d. MIU & Missile Master Faults Not Present – Checked
   e. MIU Power Switches – Off

RBL MISSION MISSILE DATA ENTRY

DEFINING MISSION PARAMETERS FOR RBL TARGETS

1. FRMT-13, N – Entered

   (N= target number 1-8)

2. Data/Parameters – Modify, as required

   Individual parameters can be modified by selection of the line on which they are displayed using MDFY-X keys on the IKB (X = display line number 1 through 5). The selected line will be copied at the bottom of the display. Moving the cursor using the left and right arrows keys allows the desired data/parameter to be typed in. Pressing the ENTER key enters the data, clears the copied line from the bottom of the display, and transfers the modified data on the applicable display line. Data on FRMT-13, N cannot be modified after ITL has been commanded for that target.

   a. Missiles per Target – Modified/Entered, if required

   b. Search Pattern – Modified/Entered, if required

   c. Planned Launch Range – Modified/Entered, if required

   d. Search Priority (Elliptical Pattern Missions Only) – Modified/Entered, if required

   e. Search Range Before Target (Rectangular Pattern Missions Only) – Modified/Entered, if required

   f. Search Range Beyond Target (Rectangular Pattern Missions Only) – Modified/Entered, if required

   g. Terminal Maneuver – Modified/Entered, if required

   h. High Fly-Out – Modified/Entered, if required

   i. Range To Descent – Modified/Entered, if required

TARGET LOCATION ENTRY

Defining Targets by LAT and LONG

1. FRMT-11, N – Entered

   Entering target latitude and longitude requires FRMT-11, N be displayed. N= the AGM-84 target number (1–8).

   a. MDFY-1 – Entered

      Entering MDFY-1 copies line 1 to the bottom of the screen for modification.

   b. LAT and LONG – Keyed in and entered

      The entered LAT and LONG will be copied onto line 1, and the UTC on line 1 will be updated. Line 2 will change to:

      2 TGT REF PT = **AIRCRAFT** (A) / TARGET (1-8) A

      The line 3 azimuth and range will continuously update to display the range and azimuth from the aircraft to the target.

Defining Targets by Azimuth and Range

1. FRMT-11, N – Entered

   Entering target Azimuth and Range requires FRMT-11, N be displayed. N= the AGM-84 target number (1-8).

   a. TGT REF PT On Line 2 – Verify **AIRCRAFT**

      If AIRCRAFT is the point as indicated by **AIRCRAFT** proceed to step d., otherwise perform steps b. and c..

   b. MDFY-2 – Entered

      The information on line 2 will be copied to the bottom as follows:

      2 TGT REF PT = AIRCRAFT (A) / **TARGET** (1-8) N

      N = the AGM-84 target 1 thru 8 for which the range and azimuth are currently defined from. The cursor will be placed under N.

   c. A – Entered

      Type A to replace N in the window following (1-8) and then press the ENTER key. Line 2 will be changed to:

      2 TGT REF PT = **AIRCRAFT** (A) / TARGET (1-8) A

      This indicates the target is now relative to the aircraft.

   d. MDFY-3 – Entered

      The information on line 3 will be copied to the bottom

   e. Desired Azimuth and Range – Entered

      Type in the desired azimuth and range on the line at the bottom of the MFD and press the ENTER key. The entered azimuth and range will be copied onto line 3. The TGT LAT, LONG, and UTC on line 1 will be updated.

Defining Targets Relative to Another Target

1. FRMT-11, N – Entered

   Entering target location relative to another target requires FRMT-11, N be displayed. N= the AGM-84 target number (1-8).

   a. TGT REF PT On Line 2 – Verify **TARGET**

      If TARGET is the point as indicated by **TARGET** proceed to step d., otherwise perform steps b. and c..

   b. MDFY-2 – Entered

      The information on line 2 will be copied to the bottom as follows:

      2 TGT REF PT = **AIRCRAFT** (A) / TARGET (1-8) A

      The cursor will be placed under A at the end of the line.

   c. TARGET Number – Entered

      Type the target number (1 thru 8) to replace A in the window at the end of the line and then press the ENTER key. Line 2 will be changed to:

      2 TGT REF PT = AIRCRAFT (A) / **TARGET** (1-8) N

      N = 1 thru 8. This indicates the target is now relative to the AGM-84 target N.

   d. MDFY-3 – Entered

      The information on line 3 will be copied to the bottom

   e. Desired Azimuth and Range – Entered

      Type in the desired azimuth and range on the line at the bottom of the MFD and press the ENTER key. The entered azimuth and range will be copied onto line 3. The TGT LAT, LONG, and UTC on line 1 will be updated.

Defining Targets By Radar X-Hairs

NOTE

Before commanding CF-573, N, FRMT-1 or FRMT-2 and radar track control must be selected with DCPPI/(LOS), PPI/(LOS), or PPI/(North-Stabilized) on the radar.

1. CF-573, N – Entered

Entering target location using the radar X-Hairs requires CF-573, N be displayed. N= the AGM-84 target number (1-8). TGT/WPT N DESIGNATE **TGT**/WPT (0/1) 0 will be displayed at the bottom of the screen. The 0 at the end of the line indicates targets can be defined by pressing the X-HAIR ON TGT switch.

If a target location had been previously defined, the X-Hairs will be placed on the target location, if possible. If the target position is off the radar screen, the X-Hairs will not move. In either case, if a target is defined, TGT and the latitude and longitude of the target will be displayed on the bottom line of the MFD.

If no target location has been defined, the X-Hairs will not move and the latitude and longitude at the bottom of the MFD will be blank.

The latitude and longitude of the X-Hairs will be displayed on the second line from the bottom of the MFD.

a. X-Hairs – Move to desired target

As the the X-Hairs are moved using the track ball, the X-Hair latitude and longitude on the second line from the bottom of the MFD are updated.

b. X-HAIR ON TGT Switch – Press

TGT and the latitude and longitude of the target will be displayed on the bottom line of the MFD.

WAYPOINT LOCATION ENTRY

Defining Waypoints by LAT and LONG

NOTE

The target must be designated before waypoints can be entered.

1. FRMT-11, N – Entered

   Entering target latitude and longitude requires FRMT-11, N be displayed. N= the AGM-84 target number (1-8).

   a. MDFY-4 – Entered

      Entering MDFY-4 copies line 4 to the bottom of the screen for modification.

   b. LAT and LONG – Keyed in and entered

      The entered LAT and LONG will be copied onto line 4, and the UTC on line 1 will be updated.

Defining A Waypoint Relative to Its Target

NOTE

The target must be designated before waypoints can be entered.

1. FRMT-11, N – Entered

   Entering waypoint location relative to its target requires FRMT-11, N be displayed. N= the AGM-84 target number (1-8).

   a. MDFY-5 – Entered

      The information on line 5 will be copied to the bottom.

   b. Desired Azimuth & Range – Entered

      Type in the desired azimuth and range on the line at the bottom of the MFD and press the ENTER key. The entered azimuth and range will be copied onto line 5. The WPT LAT, LONG on line 4, and UTC on line 1 will be updated.

Defining Waypoints By Radar X-Hairs

NOTE

- The target must be designated before waypoints can be entered.
- Before commanding CF-573, N, FRMT-1 or FRMT-2 and radar track control must be selected with DCPPI/(LOS), PPI/(LOS), or PPI/(North-Stabilized) on the radar.

1. CF-573, N – Entered

   Entering waypoint location using the radar X-Hairs requires CF-573, N be displayed. N= the AGM-84 target number (1-8). TGT/WPT N DESIGNATE **TGT**/WPT (0/1) 0 will be displayed at the bottom of the screen. The 0 at the end of the line indicates targets can be defined by pressing the X-HAIR ON TGT switch.

   If a target location had been previously defined, the X-Hairs will be placed on the target location, if possible. If the target position is off the radar screen, the X-Hairs will not move. In either case, if a target is defined, TGT and the latitude and longitude of the target will be displayed on the bottom line of the MFD.

   If no target location has been defined, the X-Hairs will not move and the latitude and longitude at the bottom of the MFD will be blank.

   If a waypoint location for this mission was previously designated, a **W** will be placed on the radar display at the target location. If the waypoint position is off the radar display, the **W** will not be displayed.

   The latitude and longitude of the X-Hairs will be displayed on the second line from the bottom of the MFD.

   a. 1 As The Last Item Of The TGT/WPT Line – Entered

      The line will change to:

      TGT/WPT N DESIGNATE TGT/**WPT** (0/1) 1

      The 1 at the end of the line indicates waypoints can be defined by pressing the X-HAIR ON TGT switch.

      If a waypoint location had been previously defined, the X-Hairs will be placed on the location, if possible. If the waypoint position is off the radar screen, the X-Hairs will not move. In either case, if a waypoint is defined, WPT and the latitude and longitude of the waypoint will be displayed on the bottom line of the MFD. A **T** will be placed on the radar display at the target location. If the waypoint position is off the radar display, the **T** will not be displayed.

      The latitude and longitude of the X-Hairs will be displayed on the second line from the bottom of the MFD.

   b. X-Hairs – Move to desired waypoint

      As the the X-Hairs are moved using the track ball, the X-Hair latitude and longitude on the second line from the bottom of the MFD are updated.

   c. X-HAIR ON TGT Switch – Press

      The crosshair position will be displayed on the bottom line of the MFD as WPT with its latitude and longitude. The waypoint will be selected as the sighting point with WPT being displayed in window 1 of CF-573.

BOL MISSION MISSILE DATA ENTRY

DEFINING TARGETING PARAMETERS FOR BOL MISSIONS

1. PRGM-D0 – Entered

2. BOL Target Number – Checked

   After selecting PRGM-D0, all BOL targeting data can be modified and target relative bearing must be entered prior to commanding ITL.

3. Data/Parameters – Modify, as required

   Individual parameters can be modified by selection of the line on which they are displayed using MDFY-X keys on the IKB (X = display line number 1 through 5). The selected line will be copied at the bottom of the display. Moving the cursor using the left and right arrows keys allows the desired data/parameter to be typed in. Pressing the ENTER key enters the data clears the copied line from the bottom of the display and transfers the modified data on the applicable display line. The only data on PRGM-D0 which can be modified after ITL has been commanded for that mission is missiles per target.

   a. High Fly-Out – Modified/Entered, if required

   b. Range To Descent – Modified/Entered, if required

   c. Terminal Maneuver – Modified/Entered, if required

   d. Missiles per Target – Modified/Entered, if required

   e. Seeker Enable Range – Modified/Entered, if required

   f. Target Relative Bearing/Launch Range – Entered

MISSILE INFLIGHT PROCEDURES

MISSILE PREPARATION FOR LAUNCH

NOTE

- Perform this checklist no later than 30 minutes prior to descent to the low level tactical area or prior to penetrating the high level tactical area.
- If the MISSILE PREPARATION FOR LAUNCH checklist is accomplished, the POST LAUNCH/ABORT checklist must be completed.

1. Cabin Pressurization – COMBAT (if applicable) (CP)
2. Personal Locator Beacon Lanyards – Notify crew to set as briefed (RN/N)
3. Exterior Lights – As briefed (P)
4. Walkway Lights Circuit Breakers – Out (RN)
5. Jettison Power & Jettison Control Circuit Breakers – In
6. FRMT 7 – Entered
7. MIU Power Switches – ON
8. Missile Status – P and OF (all missiles)

   Status windows for each missile will be blank before MIU power is turned ON and will show P and OF while MIU power is ON. Heater power on time window shows 00:00 and starts to count up. Check for OAS/Missile related faults; transient faults are possible.

9. MIU & Missile Master Faults Not Present – Checked

MISSILE LAUNCH PROCEDURES

MISSILE POWER APPLICATION

1. FRMT 7 – Entered

2. MIU Power – ON

3. Missile Status – P and OF (all missiles)

   Status windows for each missile will be blank before MIU power is turned ON and will show P and OF while MIU power is ON. Check for OAS/Missile related faults; transient faults are possible.

   All missiles should indicate WARM. If required CF-571 will override minimum heater power on time and allow power application to all missiles

4. Location & Station – Selected

5. Weapon Power Switch – ON (1 second)

6. Missile Status – H and ON (all missiles selected for power application)

   H and ON is displayed on the first line of each station. Power on time window displays 00:00 and starts to count up. No faults should be displayed on the third line.

MISSILE LAUNCH

NOTE

The master caution light will come on and remain on any time there is a disagreement between the pilot and navigator unlock switches.

1. PRGM-DN (RBL Missions) or PRGM-D0 (BOL Missions) – Entered
2. Target Data, Missile Parameters, and Missile(s) Selected For Launch – Checked

   After entry of PRGM, the SMO determines the missile(s) to be launched against the selected target. The selected missiles are displayed by location and station at the bottom of the MFD, in planned launch sequence from left to right. The status of each missile is displayed under its location and station.

3. Weapon Control Panel LOCK-UNLOCK Switch – UNLOCK (N)

   a. Nuclear Caution Light – On (actual release only)

4. Munitions Consent Panel LOCK-UNLOCK Switch – UNLOCK (P)

   a. Nuclear Caution Light – Off (actual release only)

5. PREARM-SAFE Switch – PREARM (1 second) (N)

   Commanding Prearm sends the Intent To Launch (ITL) signal to the missile(s) selected for the currently designated target. Only one Prearm command is required per selected target regardless of the number of missiles assigned to that target.

6. ITL Missile Status – Displayed

   ITL is displayed below the location and station at the bottom of the PRGM display indicating the ITL command has been sent to the missile(s)

7. STG – Displayed (engine start before launch targets only)

   STG below the location and station indicates the engine start command has been sent to the missile(s). It takes approximately 17 seconds for the missile engine to start and reaches 84% (launch ready) power level.

8. READY Missile Status – Displayed

   READY status indicates the missile is ready to launch

9. Missile MAN LNCH Switch – Pressed
10. Missile Status Indication – AWAY

    AWAY is displayed along with the location and station at the bottom of all MFDs for each missile launched.

MISSILE LAUNCH HOLD

1. Pilot's or Navigator's LOCK-UNLOCK Switch – LOCK

   With UNLOCK consent removed, the SMO will not transmit any ITL or launch commands to the missiles. All selected missiles will indicate HOLD on the PRGM display. If the hold was entered after ITL, HOLD will be in reverse video for those missiles having received ITL.

MISSILE LAUNCH TERMINATION

MISSILE LAUNCH ABORT

1. Location & Station Of Missile(s) To ABORT – Selected
2. PREARM-SAFE Switch – SAFE (1 second) (N)

   Any selected missile(s) having received the ITL command will be aborted by powering down the MGU and crushing the fuel line to the engine. If the selected missile(s) had not yet received the ITL command, they will be aborted by removing operate power.

POST LAUNCH/ABORT

Accomplish after the last available missile is launched or aborted, and/or the MISSILE PREPARATION FOR LAUNCH check has been performed.

NOTE

The master caution light will come on and remain on any time there is a disagreement between the pilot and navigator unlock switches.

1. Jettison Power & Jettison Control Circuit Breakers – Out (RN)
2. FRMT 7 – Entered
3. LP & RP Location & ALL Station – Selected
4. Weapon Power Switch – OFF (1 second)
5. Missile Status – Checked

   Any station power status block with a missile present should indicate OF.

6. MIU Power Switches – Off

AFTER PARKING

NOTE

Missile release system safeing procedures must be accomplished by the navigator and radar navigator if qualified maintenance personnel are not available.

1. Missile(s) Aboard – Install MAU-12 ground safety lockpin(s)
2. Engine Inlet/Exhaust Cover(s) – Installed

Emergency Aircrew Procedures

section III

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MISSILE FIRE (N)

1. FIRE WARN Message on FRMT 7 – The missile is automatically aborted to a no go condition and no launch mode is available. Refer to command guidance for missile disposition.

2. Visual Missile Fire – Proceed to SELECTIVE JETTISON checklist

HUNG MISSILE (N)

WARNING

- A hung missile should be considered susceptible to inadvertent release at any time.
- A hung missile that has been given ITL remains active until the battery is completely discharged. All personnel stand clear of the missile for 2 1/2 hours or until power is verified off and control actuators have stopped running.

A missile is defined as a hung missile if it has been given Intent To Launch (ITL), that is, all systems are set for launch and the launch has been commanded and the missile did not launch. A missile is also considered a hung missile when jettison has been attempted and the missile did not separate from the aircraft.

NOTE

Refer to command guidance concerning jettison or retention of a hung missile(s). If jettison is required to satisfy the launch order sequence, see the SELECTIVE JETTISON checklists.

MISSILE JETTISON

SELECTIVE JETTISON USING THE WCP/SMO

WARNING

- The AGM-84 SMO has no interlocks preventing jettison on the ground. With unlock consent, actuation of WCP LOCATION/STATION switches and the WEAPON JETTISON SEL switch while on the ground with power applied to the OAS and the WIU will result in weapon jettison.
- Do not jettison a forward shoulder missile with the forward center missile still present. Clearance between the two missiles cannot be ensured.
- If jettison of a shoulder mounted missile is necessary and its adjacent centerline missile cannot be launched, the centerline missile must be jettisoned first.
- If a missile(s) does not seperate from the aircraft during a jettison attempt, that missile should be considered susceptible to inadvertent release at any time.

NOTE

- Selective jettison using the WCP is the preferred method of jettison when OAS is loaded and operating with the AGM-84 SMO loaded.
- The navigator will record the coordinates, time and descriptive location of jettisoned weapons for later use by appropriate authorities.

1. Crew – Alerted (RN)
2. Command Authority – Contacted, if possible (P)
3. Impact Area – Cleared (P-CP-RN)

   Clear area visually and/or by radar to the maximum extent possible.
4. OAS Master Power – ON (N)
5. Processors – Loaded (N)

   NOTE

   OAS must be loaded and operating with the AGM-84 SMO loaded in order to enable jettison.
6. MIU Power Switches – ON (pylon location of missile(s) to be jettisoned) (N)
7. Bomb Door Control Valve Circuit Breakers (3) – Out (N)
8. Pilot's Munitions Consent Panel LOCK-UNLOCK Switch – UNLOCK (P)
9. Master Caution Light – On
10. NUCLEAR LOCK-UNLOCK Switch – UNLOCK (N)

11. Master Caution Light – Off
12. Location & Station Switches (Missiles To Be Jettisoned) – Selected (N)
13. Weapon Power Switch – OFF (1 second) (N)
14. Location & Station (Missiles To Be Jettisoned) – Selected (N)
15. WCP Weapon Jettison Select Switch – Select (1 second) (N)
16. Jettison Monitored – Missile AWAY (N)

    JETT, along with the LOC/STA for all missiles jettisoned, is displayed at the bottom of all MFDs.

SELECTIVE JETTISON USING THE AJCP

WARNING

- The AJCP has no interlocks preventing jettison on the ground. With unlock consent, actuation of AJCP switches while on the ground with power applied to the aircraft will result in weapon jettison.
- Do not jettison a forward shoulder missile with the forward center missile still present. Clearance between the two missiles cannot be ensured.
- If jettison of a shoulder mounted missile is necessary and its adjacent centerline missile cannot be launched, the centerline missile must be jettisoned first.
- If a missile(s) does not seperate from the aircraft during a jettison attempt, that missile should be considered susceptible to inadvertent release at any time.

NOTE

- Selective jettison using the WCP is the preferred method of jettison when OAS is loaded and operating with the AGM-84 SMO loaded.
- If AJCP jettisons are commanded with OAS loaded and operating with the AGM-84 SMO loaded and the WIU(s) powered, the WIU will be powered off by the OAS. An uncommanded EED power available fault will be displayed by OAS.
- The navigator will record the coordinates, time and descriptive location of jettisoned weapons for later use by appropriate authorities.

1. Crew – Alerted (RN)
2. Command Authority – Contacted, if possible (P)
3. Impact Area – Cleared (P-CP-RN)

   Clear area visually and/or by radar to the maximum extent possible.
4. Pilot's Munitions Consent Panel LOCK-UNLOCK Switch – UNLOCK (P)
5. Master Caution Light – On
6. NUCLEAR LOCK-UNLOCK Switch – UNLOCK (N)
7. Master Caution Light – Off
8. AJCP Pylon Power Switch (Location Of Missile To Be Jettisoned) – LEFT or RIGHT selected (N)
9. AJCP JETTISON Station Select Switch (Missile To Be Jettisoned) – Actuated (N)

WARNING

- Pilots' Bomb Bay & Missile Jettison switch is always active when Jettison Power and Control circuit breakers are in and, with WIU controlled weapons, unlock consent is present with OAS and WIU power on.
- The AGM-84 SMO has no interlocks preventing jettison on the ground. With unlock consent, actuation of pilots' jettison switch while on the ground with power applied to the OAS and the WIU will result in weapon jettison.

1. Crew – Alerted (RN)
2. Command Authority – Contacted, if possible (P)

WARNING

To ensure missiles are safe for jettison, power off all missiles before jettison.

3. Impact Area – Cleared (P-CP-RN)

   Clear area visually and/or by radar to the maximum extent possible.

4. Jettison Control & Jettison Power Circuit Breakers (2) – In (N)
5. Pilot's Munitions Consent Panel LOCK-UNLOCK Switch – UNLOCK (P)
6. Master Caution Light – On
7. NUCLEAR LOCK-UNLOCK Switch – UNLOCK (N)
8. Master Caution Light – Off
9. Pilots' Bomb Bay & Missile Jettison Switch – Pressed (momentarily) (P)

NOTE

After missiles have been released perform the following.

10. Jettison Monitored – Missiles AWAY (N)

    JETT, along with the LOC/STA for all missiles jettisoned, is displayed at the bottom of all MFDs.

NOTIFICATION PROCEDURES – DANGEROUS MATERIALS

Procedures for alerting the fire department and other base support elements for aircraft carrying dangerous materials are as follows:

DEFINITION OF TERMS

Definitions of some of the terms used in communications are as follows:

- Dangerous Materials: Any material that is flammable, corrosive, an oxidizing agent, explosive, toxic, radioactive, nuclear, unduly magnetic, or biologically infective or any other material that (because of its quantity, properties, or packaging) may endanger human life or property.

- Firefighting Time: A period that begins when the material becomes enveloped in flames and terminates when the material can be expected to detonate, deflagrate, or begin burning.

- Withdrawal Distance: The minimum permissible distance, between firefighters, rescue, and/or nonessential personnel and the site of the accident (fire/detonation), without protective barricades.

- Department of Transportation (DOT) Classifications: Classifications established by DOT for handling dangerous materials in transit. They define classes of dangerous materials.

- Inert Devices: Devices containing no dangerous material but closely resembling nuclear or explosive items that are classified as dangerous.

- Net Explosive Weight (NEW): The actual (or high explosive equivalent) weight of explosive substances contained within a munition/weapon to be used when applying quantity – distance criteria or other standards.

AIRCRAFT COMMANDER'S RESPONSIBILITIES

The aircraft commander must ensure that crew members thoroughly understand the operational mission requirements and procedures governing the dangerous materials to be airlifted. The aircrew will comply with applicable backup and emergency inflight notification procedures, plan flight routes to avoid overflight of heavily populated or otherwise critical areas, and refuse to accept any ATC clearance that, in the aircraft commander's judgment, would interfere with operational necessity or flight safety. For each flight "Dangerous Cargo," "Inert Devices," or both (as appropriate) will be entered in the "Remarks" section of the DD Form 175 or "Other Information" section of the DD Form 1801 (ICAO Flight Plan) unless prohibited by regulations governing the area of operation.

BACKUP NOTIFICATION PROCEDURES

If the ETE is less than 1 hour or if other known circumstances will preclude timely receipt of information, the aircraft commander will contact the base of intended landing by priority telephone and provide tactical call sign, ETA, DOT class of dangerous material aboard, DOD quantity-distance class (when applicable), NEW (total weight in pounds of all DOT Class A and Class B explosives on board), withdrawal distance and firefighting time (if assigned), request for special handling (if required), inert devices (when applicable) and line numbers and quantities (if applicable).

INFLIGHT NOTIFICATION PROCEDURES

At least 30 minutes (or as soon thereafter as practical) before the ETA, the aircraft commander will contact the base operations dispatcher, control tower, approach control, or other agency specified in the applicable FLIP announcing that they have dangerous material and to verify receipt of arrival notification If advance notice has not been received, request that the information stated in backup notification procedures, be relayed to the military base operations or civil airport manager to pass to appropriate base support elements (Example: "Bird 51, ETA – 1200Z, DOT Class A explosives, DOD class 7, "NEW" four zero pounds, four zero zero zero feet, 3 minutes, request isolated parking, four each M-XXX bombs in bomb bay. Please relay immediately to fire department and other base support elements.")

INFLIGHT EMERGENCY NOTIFICATION PROCEDURES (WORLD WIDE)

Under inflight emergency conditions or for unscheduled landings, the aircraft commander will inform the appropriate Air Traffic Control Facility of the nature of the emergency, intentions, and, as practicable, the information as stated in backup notification procedures. (Example: "Bird 51, 60 miles east of intended landing base – Nest AFB, No. 1 and 2 engines out; six personnel, forward section of aircraft; have dangerous cargo in bomb bay of aircraft, four zero pounds of DOT class A explosives; if explosives become enveloped in flames, detonation may be expected after 3 minutes; withdrawal distance is 2000 feet; 10,000 gallons of fuel remaining, apply emergency procedures accordingly.")

Inert Devices

If inert devices are carried, the radio call will be similar to inflight emergency notification procedures (world wide), identifying the devices as inert, that they present no hazard, and including the amount of fuel remaining. (Example: "Bird 51, 60 miles east of intended landing base – Next AFB, No. 1 and 2 engines shut down, six personnel forward compartment, inert cargo in bomb bay of aircraft; no hazard; 10,000 gallons fuel remaining; apply emergency procedures accordingly.")

CONUS Civil Airports

When aircraft must land at a CONUS civil airport which has no control tower, information in inflight emergency notification procedures (world wide), as applicable, will be furnished to the nearest FAA Flight Service Station.

Aircraft Ditching/Abandonment

If the aircraft must be ditched or abandoned, the navigator should record the coordinates and descriptive location of abandoned cargo for later use by appropriate authorities.

FIREFIGHTING AND EVACUATION CRITERIA

These emergency procedures consist of actions to take if munitions are involved in a fire. The aircrew should be thoroughly familiar with these instructions.

Aircraft fires involving conventional munitions cannot be definitized to any one set of circumstances and environmental conditions. This precludes development of reliable standardized test criteria and reliable specific item firefighting and withdrawal times. The conclusion to be reached from available data is that a munitions reaction to fire is a function of case thickness and type of explosive filler which can be varied by environmental conditions. Since the circumstances of a fire cannot be predicted, specific item by item firefighting and withdrawal times cannot be determined with any degree of reliability.

Normally, aircraft fire involving munitions occurs under a set of circumstances wherein it is impossible to know immediately the specific missile, bomb, or CBU model number. Such information is absolutely essential for specific firefighting and withdrawal times. Therefore, these times are presented for family groups only; i.e., bombs, CBU's, missile, etc.

- Bombs: See T.O. 1B-52H-34-2-1
- CBUs: See T.O. 1B-52H-34-2-1
- Missiles: Missiles normally react in a propulsion, detonation, or both between $^{+}45$ seconds and 2 minutes. A propulsion hazard (missile flight) exists within 45 seconds and a major hazard to environment and firefighting capability exists after 1 minute. Approach the fire, if necessary, from the side of the aircraft.

The firefighting guidance provided in AFI 91-201 will be utilized in all instances. There is no specific withdrawal time assigned to items which do not align into one of the family groups mentioned above.

Supplementary Data

section IV

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EXERCISE TRAINING MISSILE

The exercise training missile, air, ATM-84D-1 (exercise missile) (see figure 4-1), is identical to the tactical missile, except that the warhead section is replaced with an exercise section. The exercise missile is used to train aircraft crews in missile launching procedures and operational testing and evaluation of the Harpoon weapon system.

EXERCISE SECTION

The exercise section simulates the physical characteristics of the warhead section to evaluate missile performance. The exercise section contains a guided missile fuze, inert fuze booster, pressure probe, with a telemetry system with signal conditioner, C-band transponder, and a flight termination system. The forward launch lug is mounted on the upper surface of the exercise section. A wraparound antenna is isolated on the forward end of the exercise section. The aft altimeter antenna (signal reception) is flush mounted on the aft under side of the exercise section. The wraparound antenna contains antennas for the beacon/C-band transponder, telemetry system, and flight termination system.

FLIGHT TERMINATION SYSTEM

The missile FTS has two modes: (1) Command terminate, and (2) Fail Safe terminate.

The command terminate system is engaged when the Fail Safe Lockout CF-576 is YES. In this mode, missile flight is terminated when the FTS receives a series of tones in a specific order. This mode can be used once range safety has confirmed that the missile can receive tones five, one, and two.

The Fail Safe terminate system is engaged when the Fail Safe Lockout CF-576 is NO. In this mode, missile flight is terminated when continuous tone five is no longer received by the FTS. Tone five must be received by the missile before intent-to-launch is attempted; absence of tone five will inhibit launch. If the tone is removed after ITL, but prior to release, the missile will be terminated 10 seconds after ITL. If tone five is removed while the missile is in flight, the missile will terminate flight within 5 seconds. When missile termination occurs, the fuel line is severed and all control surfaces are actuated to a missile nose-over.

TRAINING MISSILE, INERT WARHEAD

Training missile, inert warhead, air ATM-84D-1A (inert warhead missile) (see figure 1-1) is identical to the tactical missile except that the warhead section is replaced with an inert warhead. The inert warhead missile is used to train aircrews in missile launching procedures.

INERT WARHEAD

The inert warhead has the same physical characteristics as the warhead section. Functional differences are an inert guided missile fuze, inert fuze booster, and inert explosive filler.

TRAINING MISSILE, INERT AND BALLISTIC AIR TEST VEHICLE (CAPTIVE)

Training missile inert air launch missile, air ATM-84A-1B (inert missile) and captive air launch missile, air ATM- 84A-1C (captive missile) (see figure 4-2) are inert boiler plate training shapes which simulate exactly the external characteristics, weight, and center of gravity of the tactical missile. The inert and captive air launch missiles are used to train personnel in air launch missile handling and aircraft uploading and downloading. The captive air launch missile is certified for captive carry flight on the aircraft.

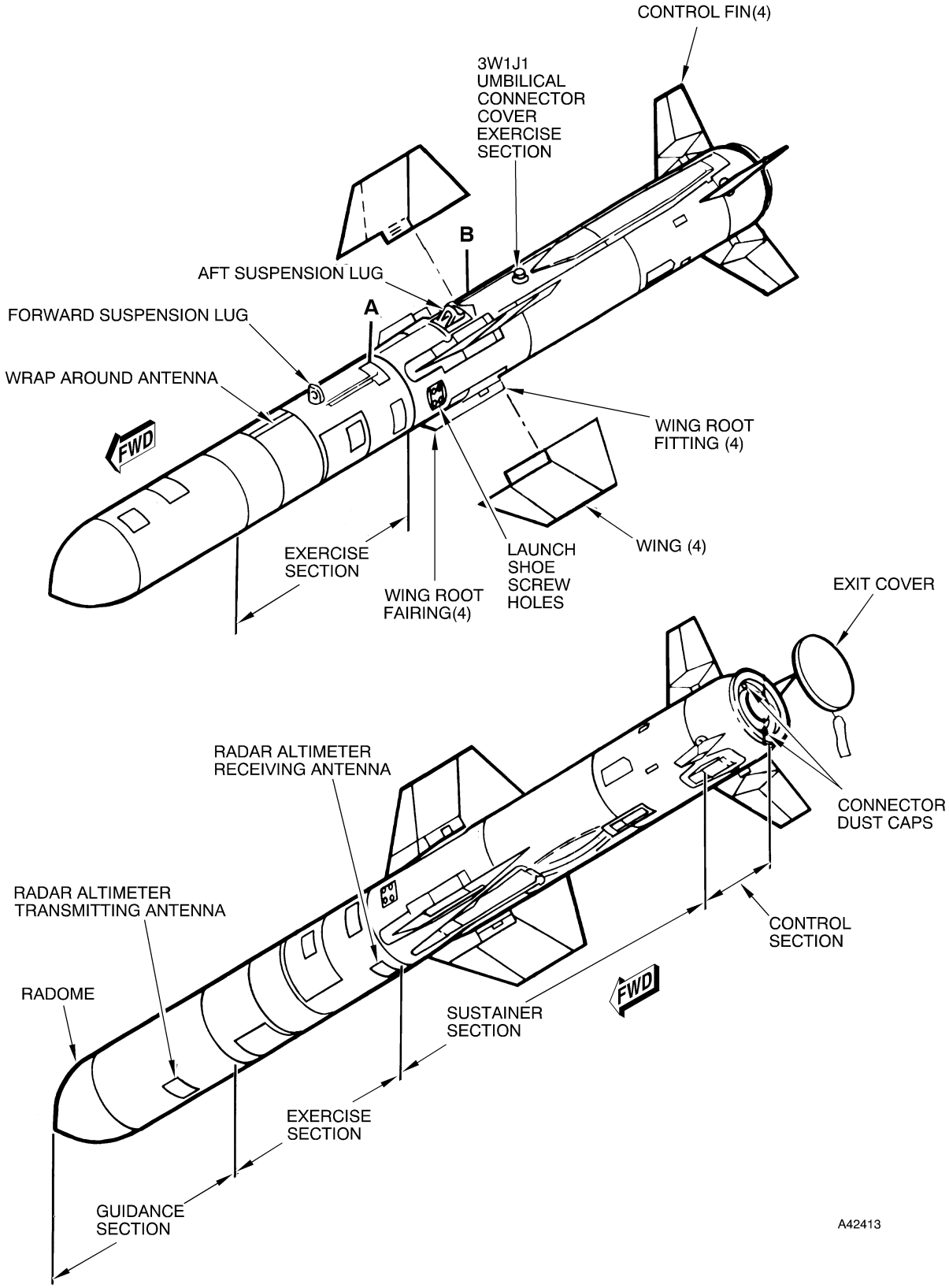
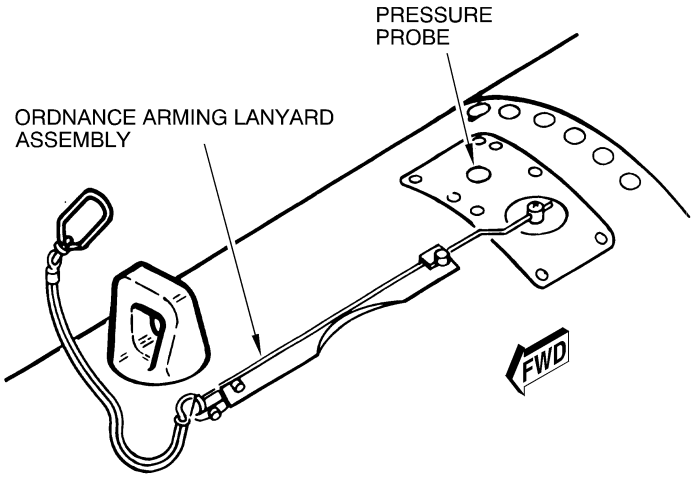
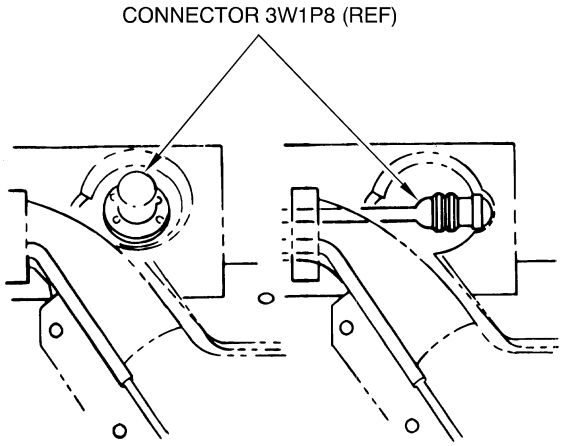


Figure 4-1. Exercise Air Launch Missile (Sheet 1 of 2)



DETAIL A



SUSTAINER SECTION
SERIAL NUMBER GQN 0001 – 0110

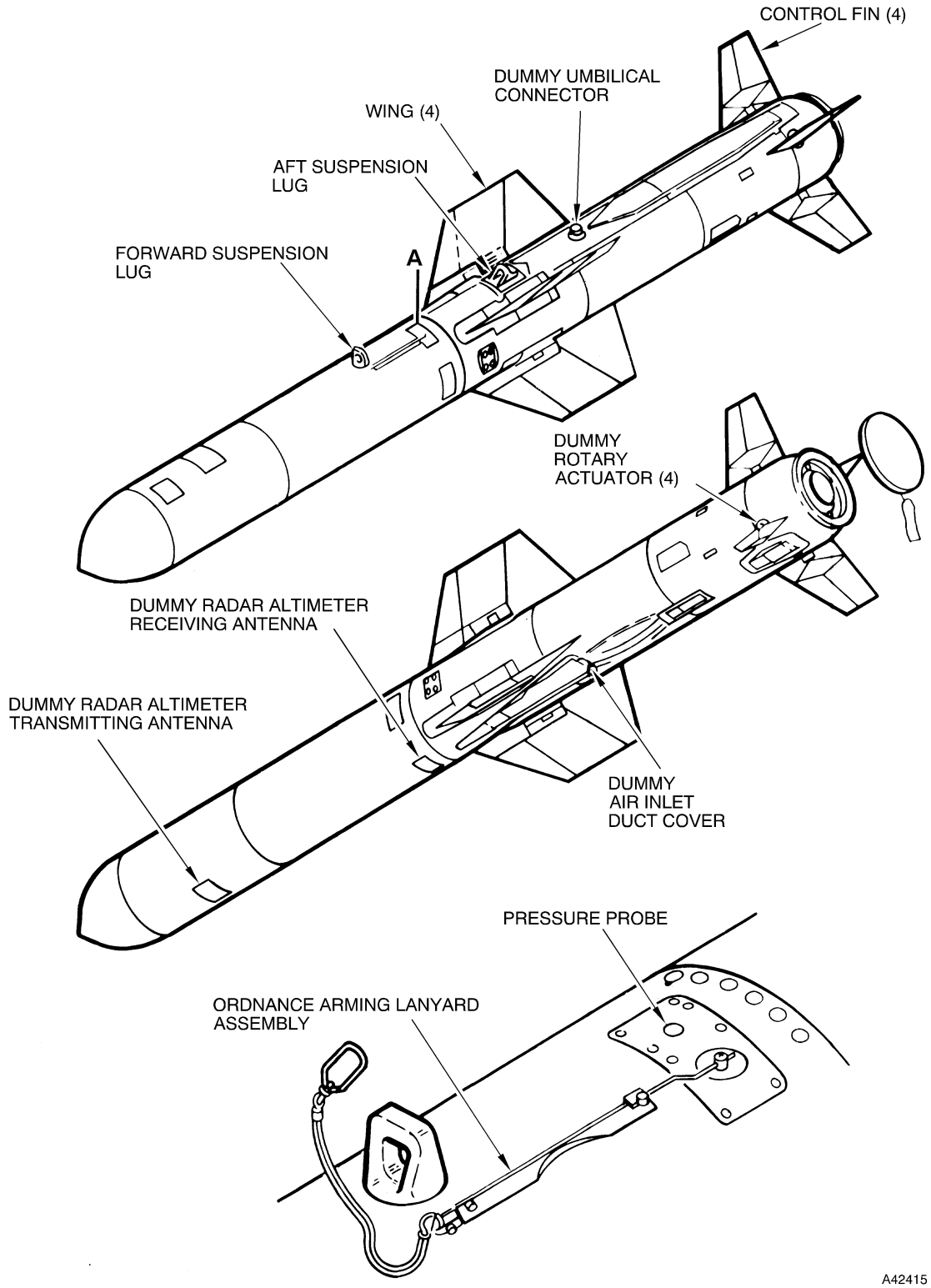
SUSTAINER SECTION
SERIAL NUMBER GQN 0111 – UP

FWD

DETAIL B

A42414

Figure 4-1. Exercise Air Launch Missile (Sheet 2 of 2)



DETAIL A

Figure 4-2. Inert Missile

Operating Limitations

section V

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NOTE

The minimum time required for missile heater power to be applied prior to allowing missile operate power application is determined using outside air temperature. Since outside air temperature is available only when the aircraft is airborne, the maximum time of 30 minutes will be required any time that power is applied while the aircraft is on the ground, unless missile heater power on time override is commanded.

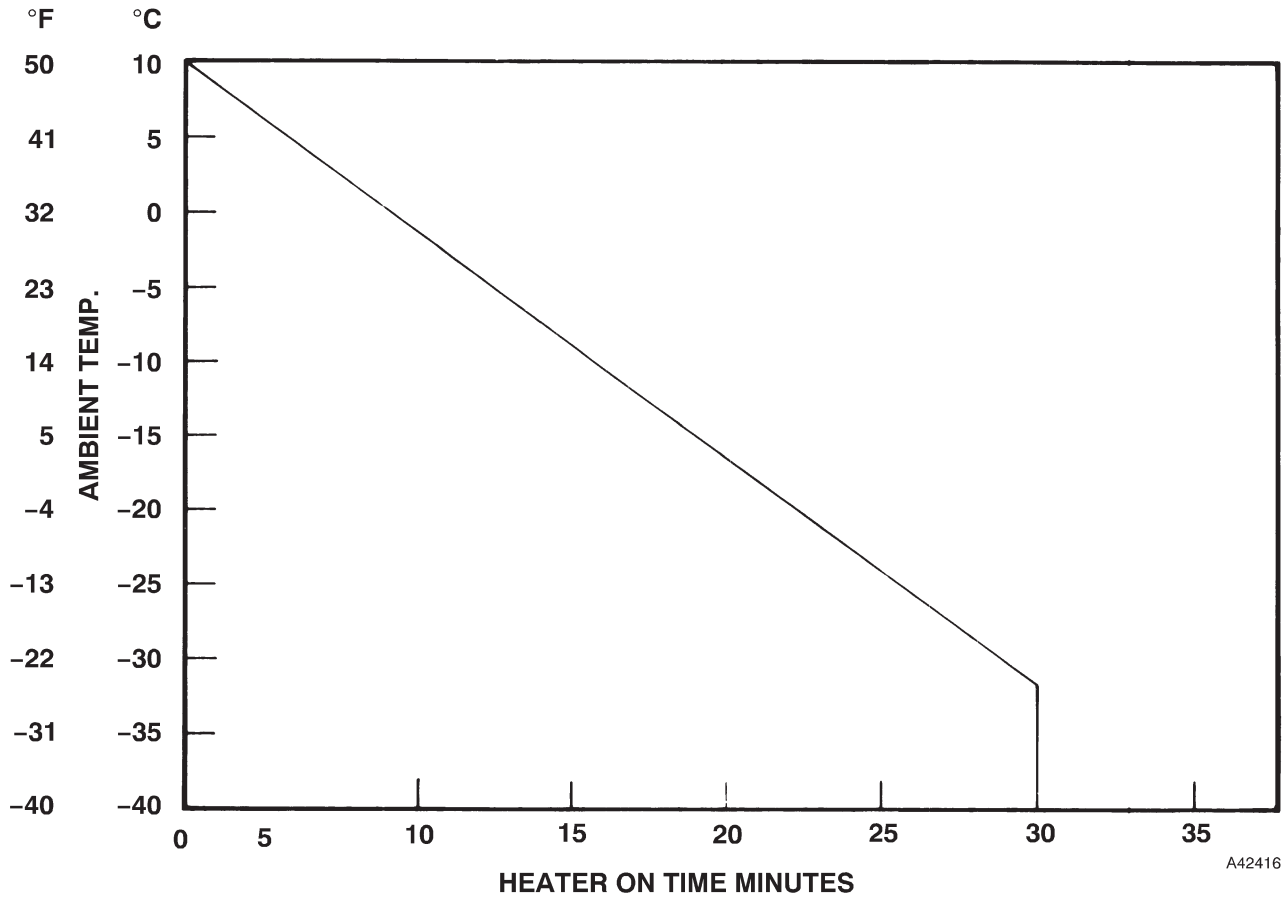

Figure 5.1 Heater Requirements

Mission Planning

section VI

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GENERAL

For mission planning information refer to command Tactical Doctrine.

System Operations

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AIRCRAFT AGM-84 OPERATION

The AGM-84D-1 missile flies in a cruciform configuration (wing in X configuration rather than + configuration) at high subsonic speeds with over the horizon ranges. The missile is capable of launch from low and high altitudes (above 20,000 ft), with engine start before launch or after launch, depending on the B-52 aircraft altitude and airspeed at separation. No data link from the launching platform is required by the missile after launch. The tactical missile has a low-level trajectory, active guidance, counter-countermeasures capability and contact detonated high explosive blast type warhead to ensure high probability of success. When the target comes within the search area of the active seeker, the high resolution system detects and locks on the target. After target acquisition, the missile flies at sea skim altitude and then executes the terminal maneuver (sea skin or pop-up) into the target. The AGM-84D-1 tactical air launch missile has extended range over previous models due to the use of JP-10 fuel in lieu of JP-5 fuel, and selectable search priority. For typical flight profiles of the AGM-84D-1, see figure 7-1.

The aircraft OAS is used to warm up, initialize, and control the launch of the missile. During cruise flight, the Midcourse Guidance Unit (MGU) utilizes inputs from the radar altimeter, and its own attitude reference assembly, for guidance along the predetermined bearing. After target acquisition and lock-on, the radar seeker provides bearing information for the MGU to guide the missile to its target.

POP-UP MANEUVER

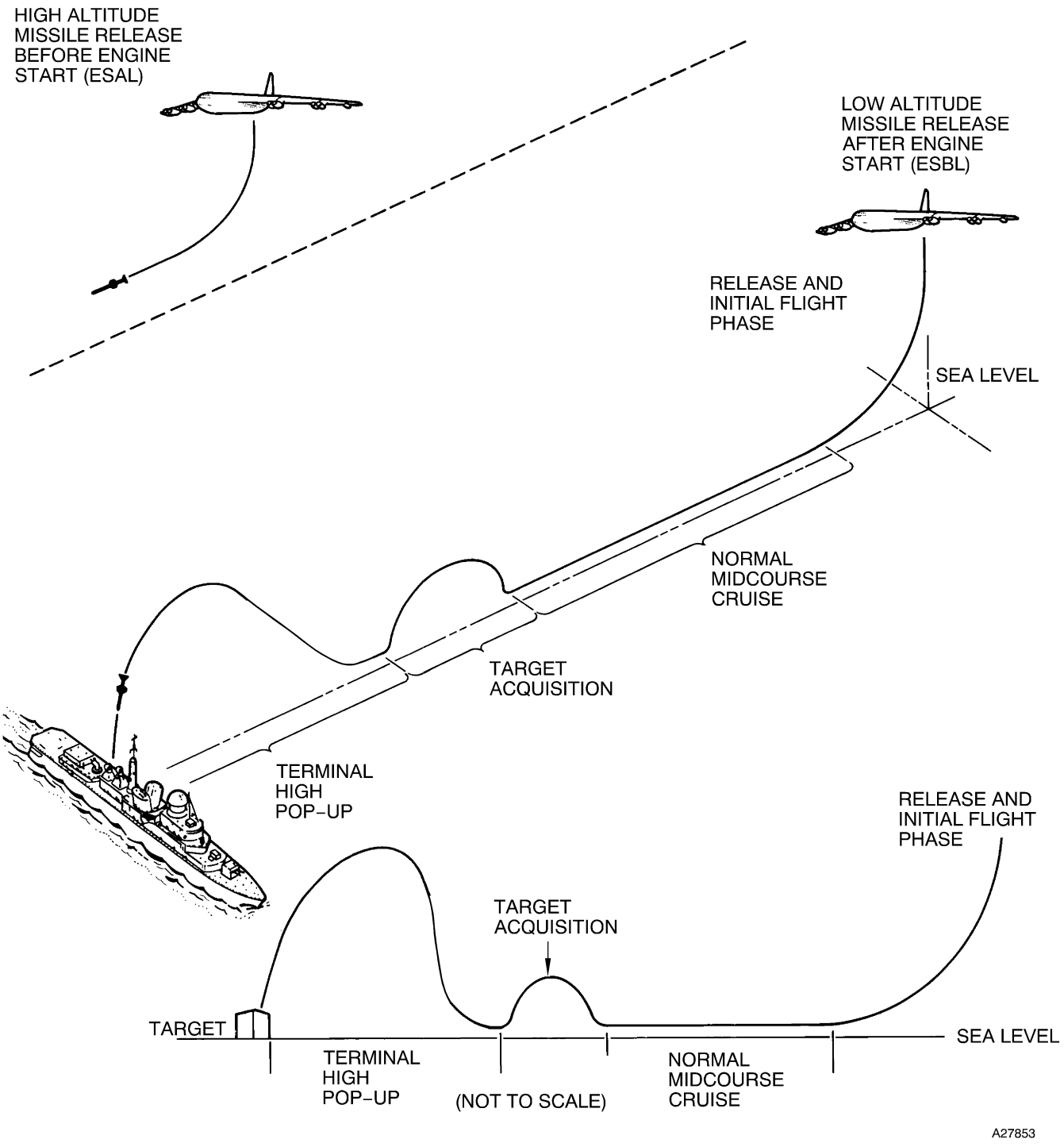


Figure 7-1. Missile Flight Profiles (Sheet 1 of 2)

SEA SKIM MANEUVER

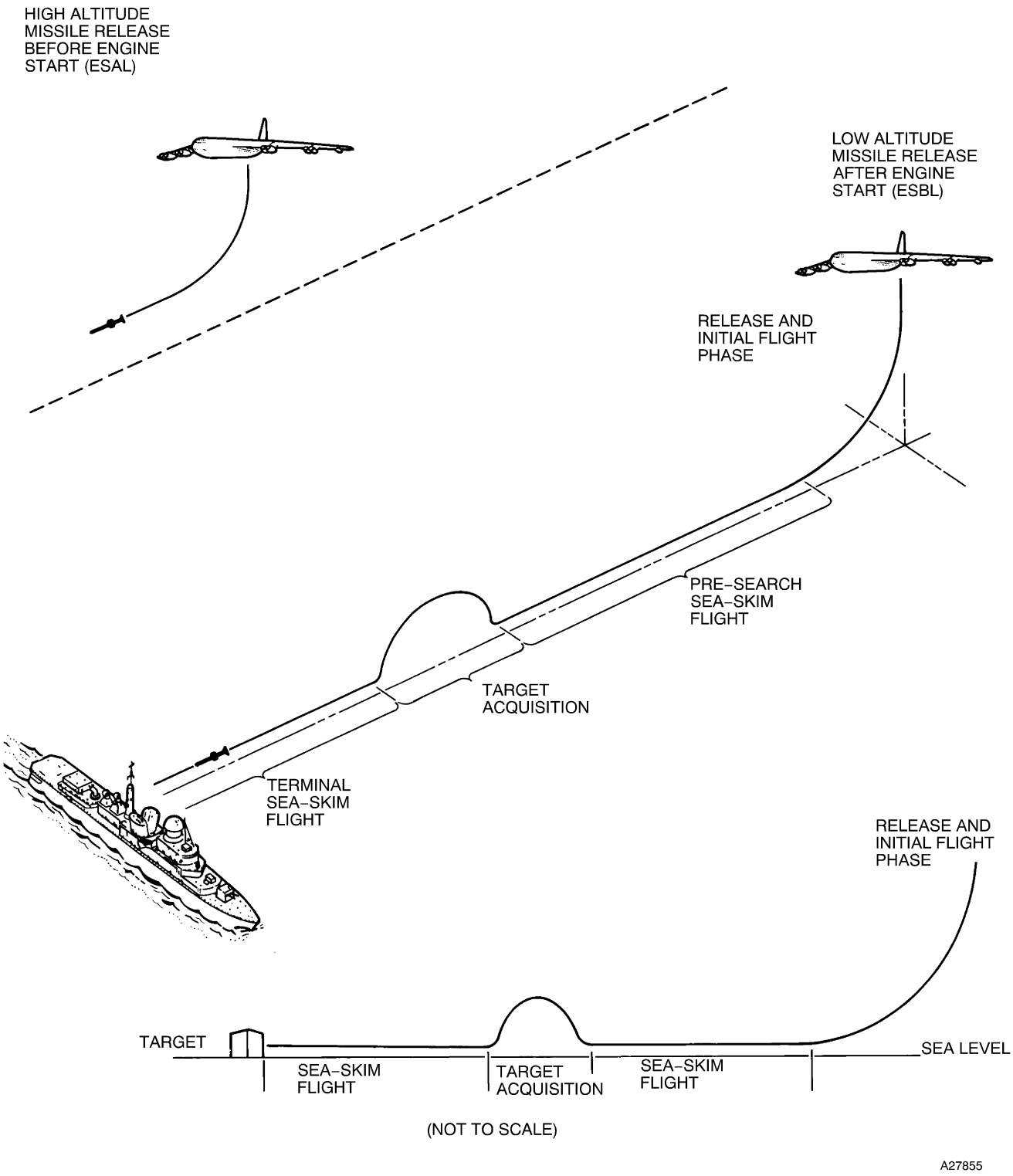


Figure 7-1. Missile Flight Profiles (Sheet 2 of 2)

MISSILE OPERATION

SMO INITIALIZATION

The Harpoon SMO is identified by AGM-84D on the CF-62 menu and is loaded using CF-62, N. The SMO is automatically initialized and begins processing immediately upon load of the SMO into the ACUs. SMO LOAD CMPLT will be displayed on the bottom of each MFD following completion of SMO loading.

The SMO contains the software for the following capabilities:

- WIU/WPA power
- Missile power application
- Target and mission parameter definition
- Target/mission selection
- Selected target ranging
- Missile launch
- Missile jettison

When the SMO is loaded it is initialized in the STRIKE mode. The mode can be changed using CF-5 commands.

WIU POWER APPLICATION

Pressing the MIU/LP or MIU/RP switches on the OAS Power Control Panel to the ON position commands power to the WIU and the WPA in the respective pylon. The SMO applies power to the missile's heater and battery when the WIU/WPA are turned on. If the MIU switch was in the depressed (ON) position when the SMO was loaded or restarted, the switch must be pressed to unlatch and then pressed a second time to command power application. Unlatching the switch by pressing again will remove power from the WIU and WPA.

MISSILE POWER CONTROL

Missile Power Application

Missile power is applied by selecting, on the WCP, the location and station of the missiles to be powered and then momentarily positioning the WCP WPN PWR switch to ON. A power command will be issued to only the selected stations, and only if a missile is indicated as present for those stations. FRMT-7 displays missile power status. The ejector status will indicate H and the power status will change from OF to ON. Heater Power status will change from WARM to 00:00 and begin to count up to 59:59.

A LOC/STA?? advisory message will be displayed when weapon power is commanded ON or OFF if:

- No location/station is selected on the WCP/CF-E
- One or more stations are selected on a pylon and both the ejector and umbilical status at one or more of those stations show a missile not present.

Missile Power Removal

Missile power is removed by selecting, on the WCP, the location and station of the missiles to be powered and then momentarily positioning the WCP WPN PWR switch to OFF.

If weapon power is commanded off after an ITL has been commanded for any of the missiles selected for power removal, a LOC/STA?? advisory message will be displayed. Power will be removed from all selected missiles that have not had ITL commanded, but not from the missile receiving ITL. This is due to the fact that missile power has already been removed, or will be removed as soon as missile enable status is received from that missile.

MISSILE MISSION DATA

Prior to launch, target and mission data must be defined by the operator. Since B-52/Harpoon missions are not preplaned, the operator must accomplish real time weapon mission planning. The following mission types can be loaded in the AGM-84D missile:

- Range and Bearing Launch (RBL) Elliptical
- Range and Bearing Launch (RBL) Rectangular
- Bearing Only Launch (BOL)

Range and Bearing Launch (RBL) Elliptical

The RBL Elliptical missions are used when a specific target location can be defined and the operator desires that the missile search a standard predefined pattern size around the target. The pattern size around the target, primarily an elliptical shape, is calculated by the SMO. Figure 7-2 depicts RBL elliptical missions with and without waypoints.

RBL elliptical missions have the following characteristics:

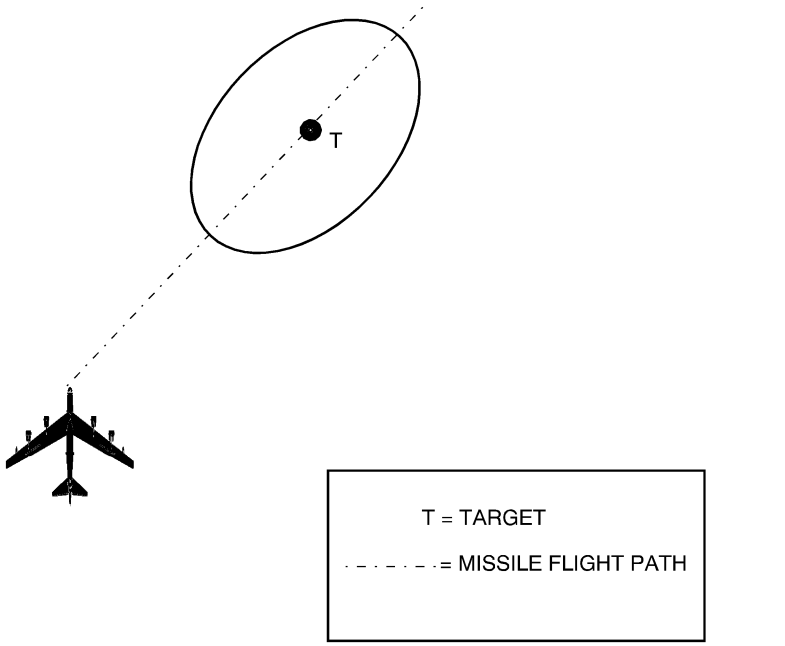
- Target location is defined as a geographic position
- Missile seeker search pattern is an ellipse centered about the target location
- Seeker search pattern size is automatically determined
- Missile will not search outside of the defined search area for the target
- A waypoint may be used
- Mission data can be defined before or after target selection
- When the missile can no longer search the specified search area, the missile will self destruct by nosing over to impact the surface.

NOTE

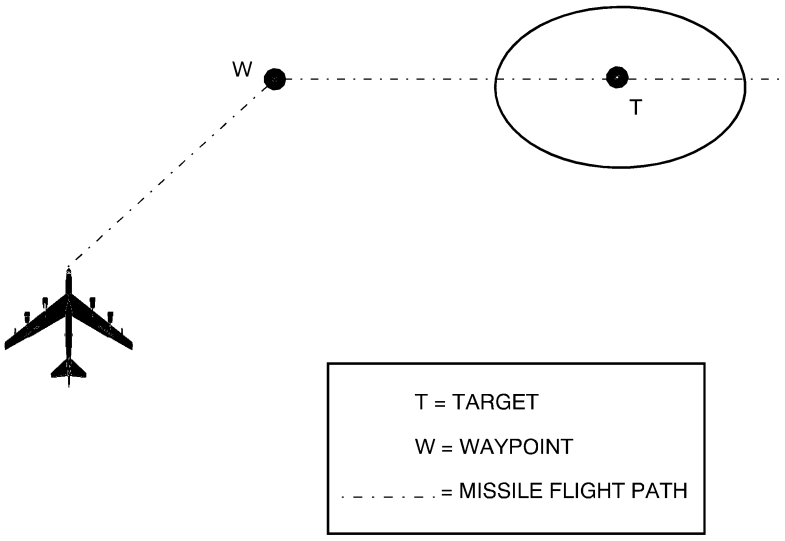
Zero (0) values initially displayed for target range and bearing are space holders only and do not have the value of zero. If the values need to be zero, the zeros must be re-entered by the operator in order for the system to accept the target.

SEARCH PRIORITY PATTERNS

The NORMAL, RIGHT, LEFT, NEAR, and FAR search patterns for RBL elliptical missions are shown in figure 7-3.



RBL ELLIPTICAL MISSION WITHOUT WAYPOINT



RBL ELLIPTICAL MISSION WITH WAYPOINT

A27857

Figure 7-2. RBL Elliptical Missions

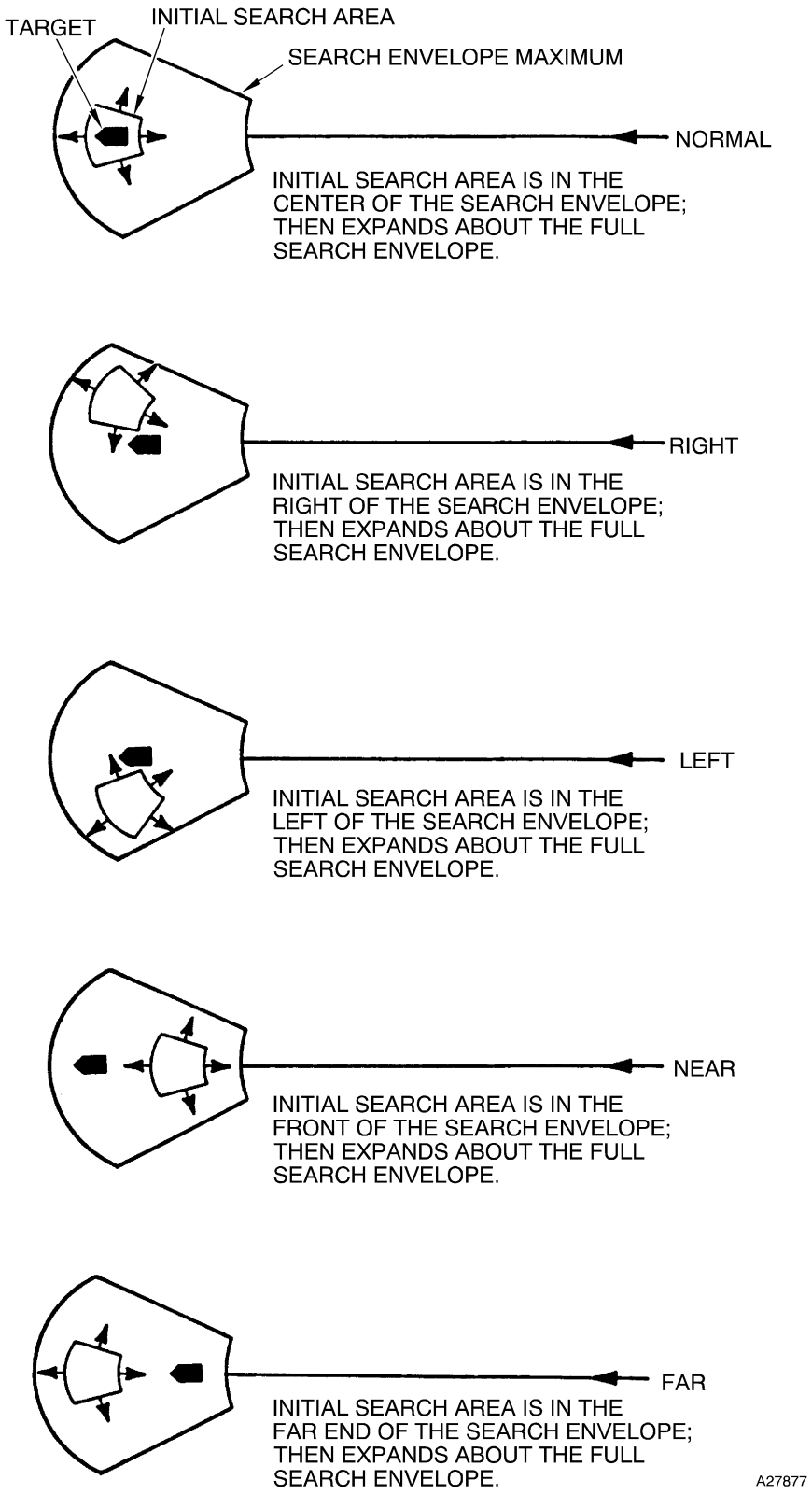


Figure 7-3. Search Priority Patterns For RBL Elliptical Missions

Range and Bearing Launch (RBL) Rectangular

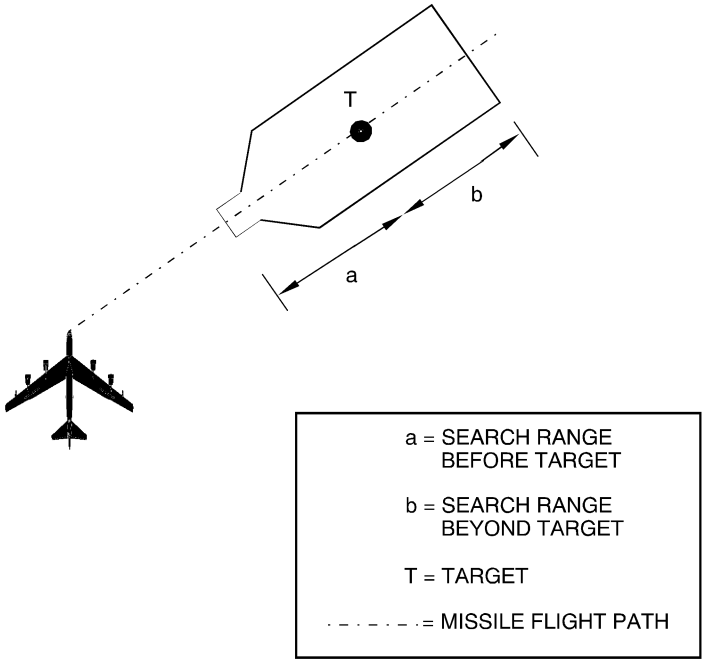
The RBL Rectangular missions are used when a specific target location can be defined and the operator desires that the missile search a lane prior to and beyond the target coordinates. The pattern size around the target coordinates, primarily a rectangle, is defined by identifying the range from the target at which the seeker is to begin and end its search. Figure 7-4 depicts RBL rectangular missions with and without waypoints.

RBL rectangular missions are very similar to RBL elliptical missions and have the following characteristics:

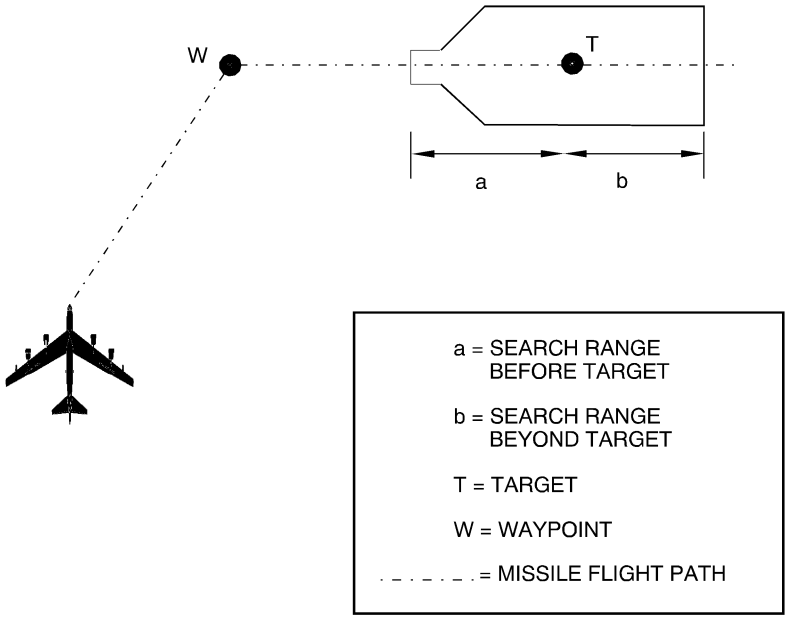
- Target location is defined as a geographic position
- Missile will not search outside of the defined search area for the target
- A waypoint may be used
- Mission data can be defined before or after target selection
- When the missile can no longer search the specified search area, the missile will self destruct by nosing over to impact the surface.

A rectangular RBL differs from an elliptical in the following ways:

- Missile seeker search pattern is a rectangular shape, not an ellipse
- Seeker search pattern size is determined by the operator, not automatically



RBL RECTANGULAR MISSION WITHOUT WAYPOINT



RBL RECTANGULAR MISSION WITH WAYPOINT

Figure 7-4. RBL Rectangular Missions

Bearing Only Launch (BOL)

The BOL missions are used when no specific target location can be defined and the operator desires that the missile search for a target without discrimination. The pattern is primarily a rectangular shape. It is defined by the relative bearing from the aircraft heading which the missile will fly and the distance the missile is to fly prior to turning on its seeker and beginning its search. The missile will end its search when it runs out of fuel. Figure 7-5 depicts BOL mission.

BOL missions have the following characteristics:

- No geographic target location is defined
- After launch, the missile will fly a specified bearing from the aircraft heading
- Missile seeker search pattern is a rectangular shape
- Missile will not search outside of the defined search area for the target
- A waypoint cannot be used
- Mission data cannot be predefined and stored
- The missile will attack the first target identified
- When almost out of fuel the missile will self destruct by nosing over and impacting the surface.

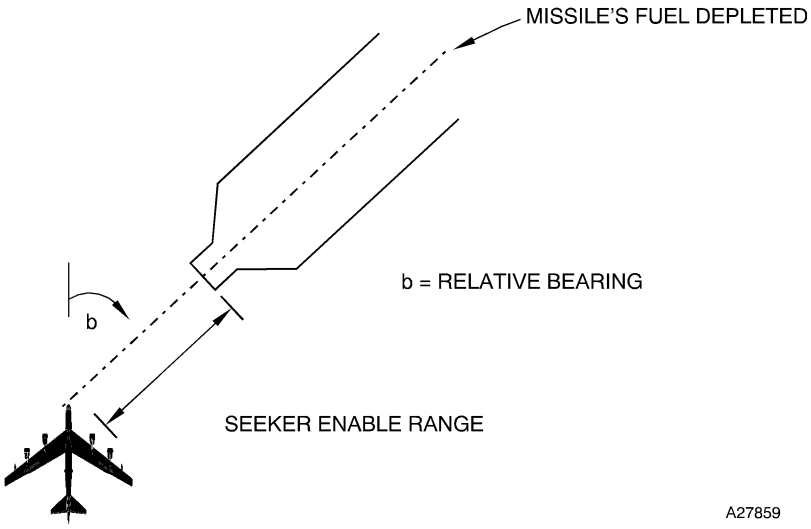


Figure 7-5. BOL Missions

MISSILE PREARM/INTENT TO LAUNCH (ITL)

The following conditions must be met in order to command PREARM (ITL) to the missiles using the WCP PREARM/SAFE Switch:

- The aircraft must be in flight
- Target location selected and Launch Data Display (PRGM-DN or PRGM-D0) displayed
- No AIU faults present
- No WIU faults present
- No WPA faults present
- Missiles available for launch.
- Missile operate power applied
- No missile fatal faults present
- Missile is not blocked
- No release restrictions exist
- WIU enable power is available
- No missile jettisons being processed
- Pilots' and navigators' unlock consent are both applied

MISSILE LAUNCH

Missile launch is monitored using PRGM-DN for RBL missions and PRGM-D0 for BOL missions. Intent to Launch (ITL) is commanded using the NUCLEAR PREARM SAFE Switch on the WCP. Actual missile launch for all missiles assigned to a selected target location is accomplished by pressing the MISSILE MAN LNCH Switch on the WCP once. A launch command will be accepted any time after the first missile to be launched is ready for launch.

After PRGM-DN or PRGM-D0 has been selected, the SMO will determine which missiles will be selected for launch. The selected missile location(s) and station(s) will be displayed at the bottom of the Launch Data display in the expected launch sequence from left to right. The selected missile and launch sequence data will be continuously updated until ITL is commanded. Once ITL has been commanded, the selected missiles and their launch sequence will not change. The individual missile status will be displayed in the window below the location/station number. Figure 7-6 lists the selected missile data displayed at the bottom of the Launch Data displays (PRGM-DN or PRGM-D0).

The following conditions must be met in order for the SMO to accept a missile launch command from the WCP MAN LNCH switch:

- At least one missile is launchable
  Missile has received ITL command and responded with Missile Enabled
  No missile BIT faults present
  Missile has received engine start command and responded with Missile Ready
- No AIU faults present
- No WIU faults present
- No WPA faults present
- No release restrictions exist
- WIU enable power is available
- No missile jettisons being processed
- Pilots' and navigators' unlock consents are both applied

When the missile launch command has been accepted, the SMO will transmit ejector squib fire commands to ejector for the missile which can be launched.

Controlling Missile Launch

The operator can control which missiles are to be launched and when they are to be launched.

CONTROLLING MISSILE SELECTION

The SMO automatically selects missiles for launch. The only way to control missile selection after target location selection is by selectively removing power from missiles selected to be launched. Since the SMO applies heater power and battery power to the missiles when the WIU/WPA are turned on, the missiles can be re-powered and ready for launch in approximately 25 seconds.

CONTROLLING LAUNCH TIME LINE

Once ITL and launch have been commanded for a selected target location the SMO will automatically launch all the desired missiles as fast as possible. However it may be desired to launch multiple missiles at a single target, but have greater delays in the time they reach the impact point. This can be controlled by the missiles per target field on the Launch Data display (PRGM-DN or PRGM-D0). As missiles are launched against a selected target, the MSL/TGT window is decremented by one. When MSL/TGT reaches 0, no more missiles are ITLed and the launch processing is complete. If it is desired to launch additional missiles against the same target, the operator can modify the MSL/TGT to add more missiles and then command ITL and launch.

DATA DESCRIPTION	DISPLAY TEXT	VIDEO	DEFINITION
Missiles Selected For Launch	XY (X=L/R Y=1/2/3/7)	Normal	Missile selected and available for launch
		Reverse Highlighted	Missile was selected and available for launch when ITL was commanded, but is no longer available for launch
	Blank	Reverse Highlighted	Desired MISSILE PER TARGET is greater than the number of missiles currently available for launch.
State Of Missiles Selected For Launch	MM:SS	Normal	Accumulated operate power on time when maximum operate power on time (10 minutes) has not been exceeded
		Reverse Highlighted	Accumulated operate power on time when maximum operate power on time (10 minutes) has been exceeded
	ITL	Normal	ITL command has been transmitted to the missile
	STG	Normal	Engine start command has been transmitted to the missile
	READY	Normal	Missile is ready for launch
	HOLD	Reverse Highlighted	Missile is ready for launch, but cannot be launched due to ITL restriction
		Normal	Missile is ready for launch, but cannot be launched due to release restriction
	BLKD	Reverse Highlighted	Missile is blocked by another missile which is not ready for launch
	ABORT	Reverse Highlighted	Missile is aborted
	OFF	Normal	Missile does not have power applied

Figure 7-6. Missile Selection Data

In the same manner, the operator can command no additional missiles to be launched by changing the MSL/TGT to 0. If this is performed, only missiles which have received ITL will be launched.

Suspending Missile Launch

Launches can be suspended by removing either pilots' or navigators' unlock consent. If unlock consent is not available the SMO will display HOLD on the bottom of the Launch Data display in either normal video for launch hold or reverse video for ITL hold.

SMO COMMANDED MISSILE LAUNCH PROCESS TERMINATION

Normal missile launch sequence will be terminated before all of the selected missiles have been launched if any of the following occur:

- Detection of any missile fault that removes missile power from the faulted missile.
- Detection of any fault of the WIU or WPA on either pylon requiring removal of power from the WIU or WPA on that pylon.

When a WIU/WPA fault occurs requiring WIU/WPA power removal, commands are issued to remove all power from the missiles interfacing with the WIU/WPA before removing WIU/WPA power. An abort and deselect command will be sent to any missile at the affected location having received a ITL command but not yet launched. If a missile at the opposite location has received an ITL command before the fault was detected, an attempt to launch that missile will be made.

The SMO will return to the pre-ITL state after launch processing is complete for the missile at the opposite location, which had received the ITL command prior to the fault.

- The number of missiles remaining to be launched at the selected target will be displayed in MSL/TGT window on the launch data display (PRGM-DN, or PRGM-D0) This number will equal the number of missiles per target for the selected target when ITL was commanded minus the number of missiles successfully launched.

- Missiles will be selected to complete the launch if sufficient missiles are available for launch. The selected missiles will be identified in the location/station window at the bottom of the launch data display (PRGM-DN, or PRGM-D0) and shown, from left to right, in the expected launch sequence. The missile status will be shown in the window below the location/station window. If sufficient missiles are not available, one location/station window for each desired missile that is not available will display reverse video blanks. The associated status window and the remaining location/station and status windows will display blanks in normal video.

After the SMO has returned to the pre-ITL state, the operator can select another target, deselect the current target with CLR-D, or continue the launch as follows:

- Modify the mission data as required

- Command ITL to resume the launch sequence

- Command manual launch when the missile(s) is ready.

MISSILE LAUNCH ABORT

Missile launch may be aborted from the WCP by selecting LOCATION and STATION and placing the PREARM/SAFE switch in SAFE. Any missiles having already received ITL will be aborted by disabling power to the missile MGU and crushing the fuel line inside the missile. If the missiles have not received ITL, the missiles will be powered off.

The following conditions must be met in order for the SMO to accept a missile abort command from the WCP PREARM/SAFE switch:

- No WIU faults present for the missile location
- No WPA faults present for the missile location
- The selected missile is present

MISSILE JETTISON

Missile jettison is accomplished by one of three methods; using the navigator's weapon jettison select switch on the WCP, the Alternate Jettison Control Panel at the navigator,s station or the pilot's bomb bay and missile jettison control switch. All methods require unlock consent.

WARNING

The AGM-84 SMO has no interlocks preventing jettison on the ground. With unlock consent ground jettison can occur.

NOTE

The radar navigator's jettison switch was excluded from operation with the AGM-84, however, a malfunction in the jettison system could enable the switch, making it function in the same manner as the pilot's switch.

The preferred method uses the OAS and the Harpoon SMO thru the LOCATION/STATION switches and the WEAPON JETTISON SEL switch on the Weapon Control Panel (figure 1-7) to selectively jettison missiles.

The second method using the Alternate Jettison Control Panel (AJCP) located at the navigator's station, figure 1-35, allows selective jettison of external weapons without the OAS operational or the SMO loaded or when WCP jettison is not possible. The AJCP will selectively jettison the missiles one at a time.

NOTE

If the AJCP is used to perform jettisons while the SMO is loaded and the WIU is powered on, the WIU will be powered off due to a detected uncommanded EED power available fault since the AJCP commands can not be detected by the SMO.

The third method, jettison using the pilot's Bomb Bay and Missile jettison switch (figure 1-36) should be used only if jettison by the other methods is not possible. All missiles will be jettisoned if the pilot's Bomb Bay and Missile jettison switch is used.

WARNING

- The pilot's bomb bay and missile jettison control switch will only be used if jettison by the WCP and CF-E is impossible. When this switch is used, all weapons will be jettisoned and proper separation clearance cannot be ensured.

- The AGM-84 SMO has no interlocks preventing jettison on the ground. With unlock consent, actuation of pilots' jettison switch while on the ground with power applied to the OAS and the WIU will result in weapon jettison.

SAIR RESTRICTION MESSAGES

The Harpoon SMO displays SAIR restriction messages for RBL launches on the PRGM-DN display. The messages are prioritized, with only the highest priority message displayed. These messages, their cause and the operator action are defined in figure 7-7.

ERROR MESSAGES

The Harpoon SMO has two major types of error messages; Master Faults and Advisory messages.

Master Faults

The SMO Master Faults are listed in figure 7-8. Master faults are an indication of OAS, WIU, WPA or missile failures. Master fault messages are displayed in reverse video at the left end of row 22 (figure 1-10). The text for WIU or WPA faults, not associated with a specific station are preceded L (left pylon) or R (right pylon). Missile faults and WIU/WPA faults associated with a specific station will be preceded the the location and station in an XY form, with X being L (left pylon) or R (right pylon) and Y being station 1,2,3, or 7.

No corrective action can be taken by the operator for WIU, WPA, or missiles faults although power re-application can be commanded by the operator when power has been removed from the faulted device. If the SMO has determined the power should not be re-applied because of the failure, the SMO will not respond to the power application command. The operator can override an ECU NO-GO fault and an ECU AC POWER fault with CF-68 command to allow WIU/WPA power application.

The SMO expects the ejectors to be in the unlocked position. If they are not pinned in the unlock position at one or more stations an uncommanded ejector unlock non fatal master fault UNCMD LK will be displayed for each of those stations. This will have no effect on the release of missiles since the SMO commands the ejectors to unlock prior to release being attempted from that station.

When both ejector unlock enable monitors for a WIU indicate the ejector unlock enable is not present., the message NO UE is displayed as a master fault for the respective WIU. Unlock enable power is provided to each WIU when both the pilots' missile consent switch and the Navigator's unlock consent switch are in the unlock position. This fault will still prevent a normal launch sequence, even if the ejectors are pinned in the unlock position, because the unlock enable relays control the EED power used to fire the squibs which eject the missile.

There are four types of Master Faults for the Harpoon:

- Safety critical faults (SC) - Safety critical faults present a safety threat to personnel or to the aircraft. The SMO will remove power from the faulted device and inhibit re-application of power by the operator. The missile will be deselect and aborted if a missile or station safety critical fault is detected.
- Permanent fatal faults (PF) - The SMO will remove power from the faulted device and prevent re-application of power. Any missile or station PF which occurs after ITL has been commanded to the missile will be treated as a SC fault.
- Transient fatal faults (TF) - The SMO will remove power from the faulted device. Re-application of power is allowed as long as the fault has cleared. Any missile or station TF which occurs after ITL has been commanded to the missile will be treated as a SC fault.
- Non fatal faults (NF) The SMO does not remove power from the faulted device.

SMO Advisories

SMO Advisories are messages designed prompt to the operator to correct an improper condition. The SMO Advisories are listed in figure 7-9.

SAIR MESSAGE	CAUSE	OPERATOR ACTION
A/C –>TGT	Range to the target is less than minimum missile range. Non-Waypoint/High Fly Out (HFO) launch: Range to the target is less than the minimum HFO range.	Switch to Low Fly Out (LFO) launch (if applicable) or select another target.
A/C –>WPT	Range to the waypoint is less than minimum range for a successful turn. High Fly Out (HFO) launch: Range to the waypoint is less than the minimum HFO range.	Switch to Low Fly Out (LFO) launch (if applicable), move the waypoint, or select another target.
ACCEL	Aircraft is below minimum mach,airspeed or dynamic pressure for missile launch.	Increase Airspeed.
BRG CHG	Change in missile bearing at the waypoint exceeds maximum for successful launch	Change waypoint position to be closer in line with the A/C and target OR Change A/C approach angle to the waypoint to be closer in line with the waypoint and target.
CLIMB	Aircraft is below minimum altitude for missile launch (also a function of flight path angle).	Increase Altitude
DCLR	Aircraft has exceeded maximum mach for missile launch.	Decrease Airspeed.
DCNT RNG	Descent range is less than minimum High Fly Out (HFO) range.	
	Non-Waypoint Launch: Descent range is greater than the missiles seeker enable range.	Set descent range between the minimum descent range and [Target minus search before] range.
	Waypoint Launch: Descent range is greater than the waypoint range.	Set descent range between the minimum descent range and the waypoint range. Some A/C-waypoint-target geometries define a impractically small descent range window. Minimum range to waypoint/target should be at least 25 NM at the start of data entry to allow for a reasonable descent range window over the course of the maneuver. The descent range boundary moves with the aircraft, and will become too large as the A/C closes on the target.

Figure 7-7. SAIR Restriction Messages (Sheet 1 of 2)

SAIR MESSAGE	CAUSE	OPERATOR ACTION
DIVE	Aircraft is above maximum altitude for missile launch (also a function of flight path angle).	Decrease Altitude
ENBL RNG	BOL enable range is too large for a meaningful search window.	Reduce enable range.
LNCH BRG	Non-Waypoint launch: Target bearing relative to A/C heading exceeds the maximum for launch.	Turn A/C towards the target.
	Waypoint launch: Waypoint bearing relative to A/C heading exceeds the maximum for launch.	Turn A/C towards the waypoint.
LVL OFF	Flight Path Angle limitation has been reached.	Reduce the rate of aircraft climb or descent.
SRCH BFR	Search before range is smaller than an elliptical search pattern would produce.	Increase search before range or switch to an elliptical search pattern.
SRCH BYN	Search beyond range is smaller than an elliptical search pattern would produce.	Increase search beyond range or switch to an elliptical search pattern.
WPT –> TGT	Waypoint is too close to the target for the current A/C to target travel range.	Increase the waypoint/target separation.

Figure 7-7. SAIR Restriction Messages (Sheet 2 of 2)

FAULT INDICATION CODING:

- NF = NON-FATAL FAULT
- PF = PERMANENT FATAL FAULT
- SC = SAFETY CRITICAL
- TF = TRANSIENT FATAL FAULT

FAULT INDICATION	FAULT CATEGORY	POSSIBLE CAUSE
AIU Master Faults		
AIU	NF	AIU communications failure or terminal failure
AIU 28 VDC	NF	Pylon 28 VDC WPA/missile power discrepancy
ECU	TF	ECU no-go
ECU PWR	TF	ECU AC power fault
WIU Master Faults		
CRIT PVE	NF	One critical verify fault or one critical command register fault
EED PWR	TF	38 VDC EED power on when not commanded on
EED PWR	NF	38 VDC EED power off when not commanded off
ESS PWR	TF	28 VDC ESS power on when not commanded on
ESS PWR	NF	28 VDC ESS power off when not commanded off
NO DRVR	NF	Ejector unlock driver status not true when commanded or ejector squib fire driver discrepancy
NO UE	NF	Unlock enable not present when commanded
UNCMD DRVR	TF	Two consecutive ejector squib driver status of true when not commanded
UNCMD DRVR	NF	One ejector squib driver status of true when not commanded
UNCMD UE	NF	Unlock enable status of true when not commanded
WIU	TF	Two consecutive communication failures, terminal failure, a critical command register fault, a critical verify fault, WIU not clear or WIU not reset
WPA Master Faults		
CARD FAIL	NF	WPA circuit card failure
WPA	TF	WPA communication failure, terminal failure or BIT failure
Non-Device Master Faults		
UNLOCK CONSENT	NF	Disagreement between the pilots' and the Navigator's unlock consent switches

Figure 7-8. AGM-84 SMO/Missile Master Faults (Sheet 1 of 3)

FAULT INDICATION	FAULT CATEGORY	POSSIBLE CAUSE
Station Master Faults		
ARM SOL	NF	WIU status indicates ejector arm solenoid discrepancy exists
BAT EXP	SC	Missile battery timer has expired
BIT FAILED	TF	Missile status indicates either missile seeker, computer/auto pilot, altimeter, or attitude reference assembly has failed
COMM FAIL	TF	Missile communications failure has occurred
FAIL_SAFE??	NF	WPA status for the indicated station indicates a Fail-Safe Lockout driver discrepancy for a test missile
FIRE WARN	SC	Missile status indicates the missile is on fire
HTR PWR	NF	WPA status for the indicated station indicates a heater power driver discrepancy exists
ICMP CONFIG	PF	Missile status indicates the missile configuration is incompatible with the SMO
NO ABORT	PF	Missile status does not indicate missile aborted after abort command was transmitted
NO ABRT DR	TF	WPA status for the indicated station does not indicate abort driver on when commanded
NO DESLCT	NF	WPA status for the indicated station does not indicate deselect driver on when commanded
NO ENABLE	SC	Missile status does not indicate missile has battery power available after an ITL command was transmitted
NO ENG STR	TF	WPA status for the indicated station does not indicate engine start driver on when commanded
NO GYROS	TF	Missile status indicates missile gyros are not up to speed
NO ITL	TF	WPA status for the indicated station does not indicate ITL driver on when commanded
NO OPR PWR	NF	WPA status for the indicated station does not indicate operate power is applied when commanded
NO READY	SC	Missile status does not indicate missile engine has started after an engine start command was transmitted
NOT LOCKD	NF	Ejector status indicates an illegal condition, either both locked and unlocked or neither locked nor unlocked

Figure 7-8. AGM-84 SMO/Missile Master Faults (Sheet 2 of 3)

FAULT INDICATION	FAULT CATEGORY	POSSIBLE CAUSE
Station Master Faults (Cont)		
STBY PWR	NF	WPA status for the indicated station indicates a standby power driver discrepancy exists.
UNCMD ABORT	PF	Missile status indicates missile has been aborted when not commanded
UNCMD ABRT DR	TF	WPA status for the indicated station indicates abort driver on when not commanded
UNCMD DESLCT	TF	WPA status for the indicated station indicates deselect driver on when not commanded
UNCMD ENABLE	SC	Missile status indicates the missile battery has power available when not commanded
UNCMD ENG STR	SC	WPA status for the indicated station indicates engine start driver on when not commanded
UNCMD ITL	SC	WPA status for the indicated station indicates ITL driver on when not commanded
UNCMD LK	NF	Ejector status indicates locked when not commanded
UNCMD OPR PWR	TF	WPA status for the indicated station indicates operate power is applied when not commanded
UNCMD READY	SC	Missile status indicates missile engine has started when not commanded
UNCMD RLS	TF	Missile present status indicates that a missile was released without a release command
UNSAFE	TF	Missile status does not indicate safe when it is desired safe
WPN PRESENT	NF	Missile present status is indeterminate

Figure 7-8. AGM-84 SMO/Missile Master Faults (Sheet 3 of 3)

FAULT INDICATION	CAUSE	OPERATOR ACTION
ITL Advisories		
INPUT DATA	ITL was commanded for an RBL rectangular mission when search range beyond the target had not been input	Input the required data.
	ITL was commanded for a BOL target when relative bearing had not been input.	Input the required data.
ITL INHBT	ITL was commanded while SIT is in progress and one of the following conditions exist: 1. Power is removed from one or both WIUs. 2.One or more ejectors indicate a missile is present. 3. No test set is present ITL was commanded while SIT is not in progress and one of the following conditions exist: 1. No target is selected. 2. Missile jettison is in progress. 3. The number of missiles for the selected target is zero. 4. No missiles are available for launch. 5. Release restrictions exist. 6. The aircraft is on the ground.	Examine the status of the system by viewing the pertinent displays and/or examining the aircraft and test equipment that is attached. Determine the problem and take the appropriate action.
Location/Station Selection Advisories		
B: LOCATION	Either the BAY LOCATION power switch or the BAY LOCATION select switch was pressed.	Do not select BAY LOCATION for Harpoon missiles.
LOCATION ??	A station switch was pressed with no location selected.	Select a location before selecting a station.
LOC/STA??	A missile is not present at one or more of the selected stations when a command is entered.	Select only stations with a missile present.
STATION??	An invalid station switch (4,5,6, or 8) was pressed	Select a valid station.

Figure 7-9. SMO/Missile Advisories (Sheet 1 of 2)

FAULT INDICATION	CAUSE	OPERATOR ACTION
Release Advisories		
NO CONSENT	Launch or jettison was commanded and either the pilots' or navigator's unlock consent switch or both are not in the unlock position.	Place both unlock consent switches in the unlock position. This is required to supply the necessary power to the WCE even if the ejectors are pinned open.
SIT Advisories		
SIT CMPLT	The System Integrity Test has been completed for all missiles that have had power applied.	None
Target/Waypoint Designate Advisories		
DESIGNATE INHBT	The X-HAIR-ON-TARGET switch was pressed while target and waypoint designation is inhibited because of an invalid entry command line.	Correct the invalid entry which is displayed in reverse video
SELECTED TGT	Target or waypoint designation using the radar was attempted for the selected target after ITL was commanded.	If the target is to be moved after ITL is commanded, terminate the launch with a CLR-D command.
WIU Advisories		
WIU DATA	One WIU communication failure	None

Figure 7-9. SMO/Missile Advisories (Sheet 2 of 2)

Glossary

ACFT ..... Aircraft
AGM ..... Air-to-Ground Missile
AHRS ..... Altitude Heading Reference System
AIU ..... Avionics Interface Unit
AJCP ..... Alternate Jettison Control Panel
ALT ..... Altitude
ATM ..... Air Launch Training Missile
AUR ..... All Up Round
BER ..... Bomb Ejector Rack
BIT ..... Built-In-Test
BOL ..... Bearing Only Launch
BRG ..... Bearing
DEG ..... Degree
ECU ..... Environmental Control Unit
ELP ..... Elliptical
EMR ..... Electromagnetic Radiation
ENBL ..... Enable
ESAL ..... Engine Start After Launch
ESBL ..... Engine Start Before Launch
FCP ..... Flight Computer Program
FDCU ..... Fire Detector Control Unit
FMS ..... Flight Management System
HCV ..... Harpoon Configuration Value
HFO ..... High Fly Out
HSAB ..... Heavy Stores Adapter Beam
HWS ..... Harpoon Weapon System
ITL ..... Intent-To-Launch
LED ..... Light Emitting Diode
LFO ..... Low Fly Out
LNCH ..... Launch
LOS ..... Line of Sight
LRU ..... Line Replaceable Unit
LSD ..... Least Significant Digit
MGU ..... Midcourse Guidance Unit
MIU ..... Missile Interface Unit
MSD ..... Most Significant Digit
MSL ..... Missile
RBL ..... Relative Bearing Launch
REL ..... Release
RECT ..... Rectangular
RNG ..... Range
SIM ..... Simulation
SKR ..... Seeker
SMO ..... Stores Management Overlay
SRT ..... Stores Release Test Set
SS ..... Station Select
STA ..... Station
TAS ..... True Airspeed
TGT ..... Target
WCE ..... Aircraft Weapon Control Equipment
WCP ..... Weapon Control Panel
WIU ..... Weapon Interface Unit
WPA ..... Weapon Personality Adapter
WPT ..... Waypoint

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