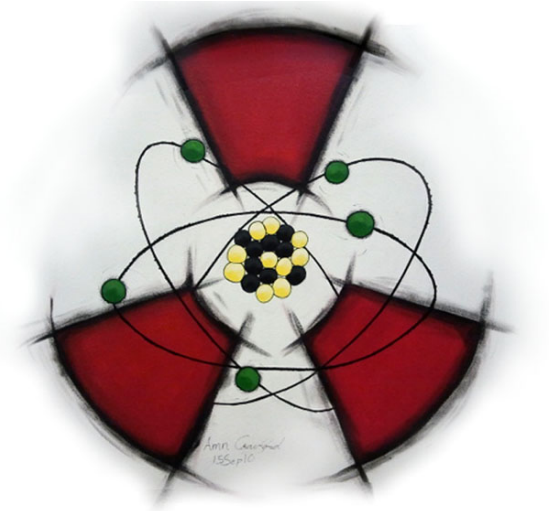
CDC 2W251B

Nuclear Weapons Journeyman

Volume 3. Guided Missiles and Delivery Systems



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VOLUME 3 OF Career Development Course (CDC) 2W251B, *Nuclear Weapons Journeyman*, covers guided missiles and delivery systems. The first unit gives an overview of the W80 warhead and the air-launched cruise missile (ALCM). We also discuss the weapon, support equipment, and safety and maintenance procedures. Unit 2 discusses the delivery systems (e.g., pylon, launchers, and ejector racks) that interface the missiles and bombs to the aircraft. Unit 3 covers handling operations for missiles, bombs, the pylon, the launchers, and launcher and pylon loader adapters. The last unit discusses pylon and launcher mate and demate. It also covers rack preparation, installation, and missile and bomb mate procedures.

This volume contains material that cannot be released to unauthorized persons. When you no longer need this volume, destroy it in an appropriate manner that will prevent its reconstruction.

A glossary is included for your use.

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NOTE:

In this volume, the subject matter is divided into self-contained units. A unit menu begins each unit, identifying the lesson headings and numbers. After reading the unit menu page and unit introduction, study the section, answer the self-test questions, and compare your answers with those given at the end of the unit. Then complete the unit review exercises.

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Unit 1. Guided Missiles

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IN THIS UNIT, we introduce you to the air-launched cruise missile (ALCM)—the air-to-ground missile (AGM)–86B ALCM. The ALCM has undergone extensive testing and modification and has proven to be a highly effective addition to the Air Force's weapons arsenal. The ALCM is a long-range, AGM that uses terrain correlation techniques for navigation. It takes advantage of a small radar profile, which makes it very difficult to detect and intercept. The ALCM uses the W80 warhead, and is a standoff weapon. The missile is launched outside the enemy's defense perimeters, thus reducing aircraft vulnerability.

1–1. W80 Warhead

In the 1970s, there was a need for a small, modern warhead for the Air Force's ALCM and the Navy's Tomahawk land attack missile-nuclear. There was also a growing concern to find a replacement for the W69 warhead used in the short-range attack missile (SRAM). Los Alamos National Laboratories was tasked to design the new warhead. The result was the W80 system, which met both the Air Force's and Navy's requirements.

401. Weapons summary

This lesson gives a brief, general overview of the W80 warhead. We also cover specific equipment used for W80 warhead handling and maintenance tasks applicable to the AGM–86/B.

Overview

The W80 war reserve (WR) warhead is a two-stage, thermonuclear device. Physical characteristics of the warhead are as follows: approximately 295 pounds, 32 inches long, and a maximum width of 13 inches. The warhead is equipped with a multiple code coded switch (MCCS) permissive action link (PAL) system and is changed only when directed by proper authority. The warhead incorporates a nonviolent command disablement system (CDS). An electrical connector is on the warhead electrical system (WES) cover and is the only interface the warhead has to the missile. The W80 mounts in the missile with two bolts in each of the two forward mounts and two bolts in the aft mount. Electrical bonding of the warhead to the missile is achieved through tin-plated faying surfaces at the mounting brackets.

Emergency procedures

If the warhead is involved in an accident or incident, emergency procedures will be performed before explosive ordnance disposal (EOD) personnel arrive. The procedures are addressed in the Technical Order (TO) 11N–W80–1 *Assembly, Testing, Maintenance and Storage Procedures with Illustrated Parts Breakdown W80–1*, and are designed to eliminate or reduce the risk of contamination or detonation. These emergency procedures apply only to a bare warhead or a warhead in the H1388 shipping and storage container before the arrival of EOD. If the warhead is installed in a missile, EOD's render safe procedures apply. In case of an accident, do not disassemble the warhead, do not apply electrical power of any kind, and do not connect or disconnect electrical cables. If it is necessary to clear weapons from the accident area, you can do so provided the warhead is intact with minor exterior damage.

Equipment

Before each day's use, visually determine that equipment is serviceable according to inspection procedures listed in applicable manuals. Most of the equipment used has very specific missile handling functions. During maintenance activities, you use these items to handle the warhead:

- H1387A warhead strongback.
- MHU–161/E guided missile warhead handling unit.
- MHU–69A/E missile handling cradle.
- MHU–71/E guided missile handling rail set.
- MHU–89/E work stand.
- CVU–138/E guided missile components protective cover.
- MHU–174/E guided missile lift truck.
- MHU–101/E fork adapter assembly.
- MHU–97/E boom hook adapter assembly.
- GSU–283/E warhead installation-removal positioner.
- MHU–170/E or MHU–170A/E guided missile warhead section lift truck.
- T557 digital thermometer. (Discussed in lesson 403.)

H1387A warhead strongback

The H1387A (fig. 1–1) is primarily used to install and remove the payload from the H1388. However, we also use it to perform other warhead handling actions.

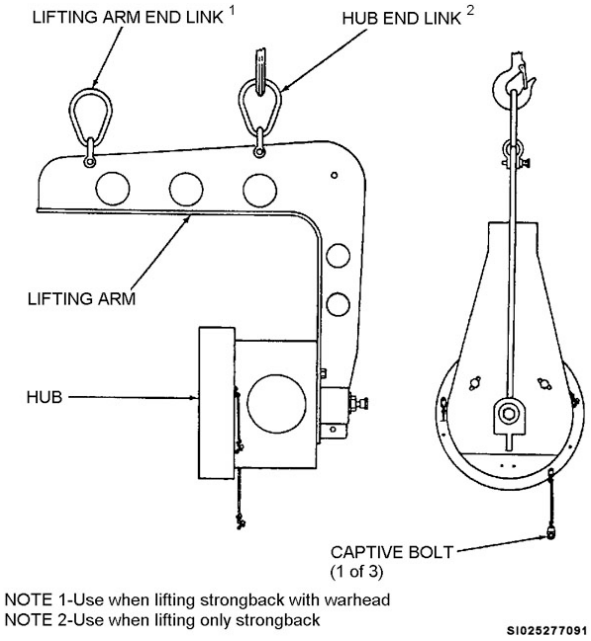

Figure 1–1. H1387A Strongback.

MHU–161/E guided missile warhead handling unit

This handling unit (fig. 1–2) supports and restrains the warhead during handling, transportation, and storage. The warhead mounts on the handling unit for all operations from initial removal from the shipping container to installing the warhead into the missile. The warhead is secured to the handling unit with three quick-release pins and a retainer. It also has two cradle adapters that interface with the MHU–69A/E.

MHU–69A/E missile handling cradle

This cradle supports the MHU–161/E and payload when it is stored on the MHU–71/E or MHU–89/E. Inspect the bow-springs on the cradle for cracks, EVERY time, before engaging the cradle brakes (fig. 1–2).

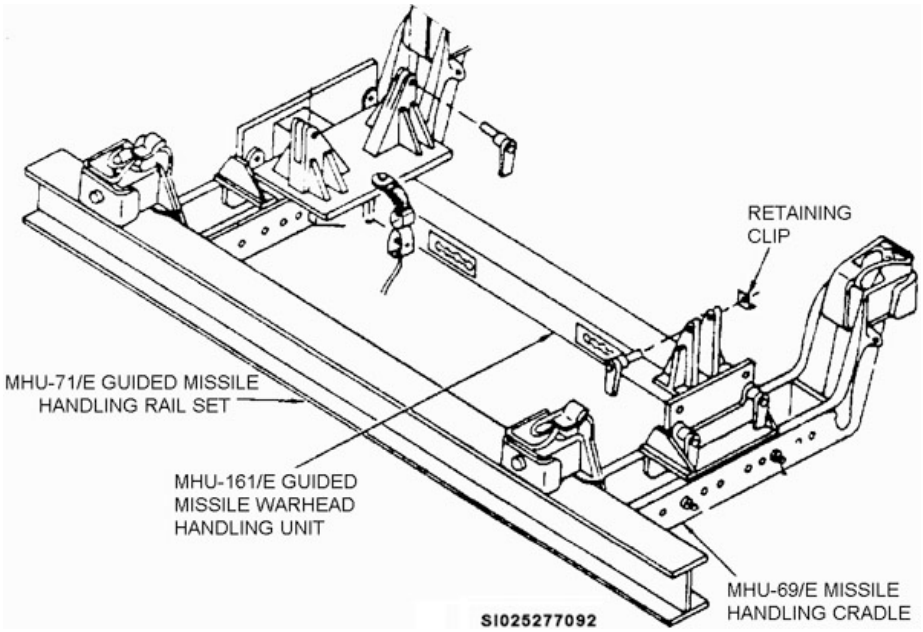

Figure 1–2. MHU–161/E guided missile warhead handling unit.

MHU–71/E guided missile handling rail set

The MHU–71/E mounts on the MHU–141/M munitions handling trailer (MHT) (fig. 1–3) and supports the warhead using the MHU–69A/E. Spring actuated stops on both ends stop the MHU–69A/E from accidentally rolling off. A removable center section allows access by lift trucks. The MHU–141/M can be fitted with two MHU–71/Es, which when combined, can transport four warheads: two payloads on each pair of rails. The payloads can *only* be transported on the solid rail sections, not the removable center section.

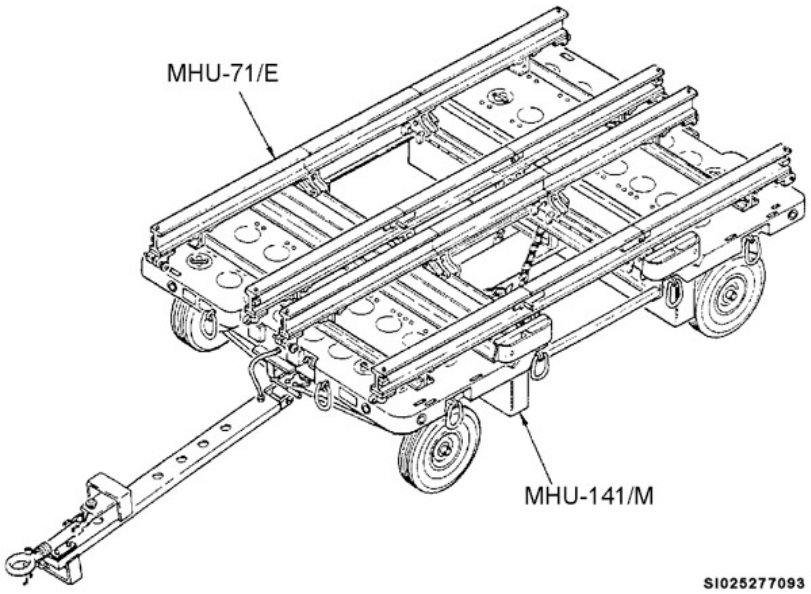

Figure 1–3. MHU–71/E on a MHU–141/M.

MHU–89/E work stand

This work stand (fig. 1–4) is essentially a rail set with four legs. It is very similar to the MHU–71/E but is used on the ground and *not* mounted on a trailer. Like the MHU–71/E, both ends of the rails have spring-actuated stops that prevent the payload from accidentally rolling off. No more than two payloads can be mounted on each MHU–89/E.

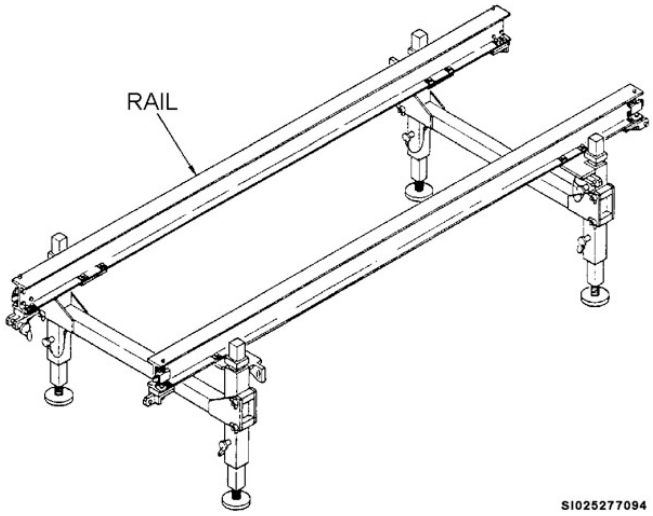

Figure 1–4. MHU–89/E work stand.

CVU–138/E guided missile components protective cover

The CVU–138/E (fig. 1–5) is used to environmentally protect the payload from the time it is removed from the shipping container until it is installed in the missile. The cover is olive drab colored laminated vinyl nylon or coated nylon cloth that conforms to the payload shape. The cover is secured to the payload with Velcro strips. It is a good maintenance practice to always install the CVU–138/E when the payload is removed from the missile.

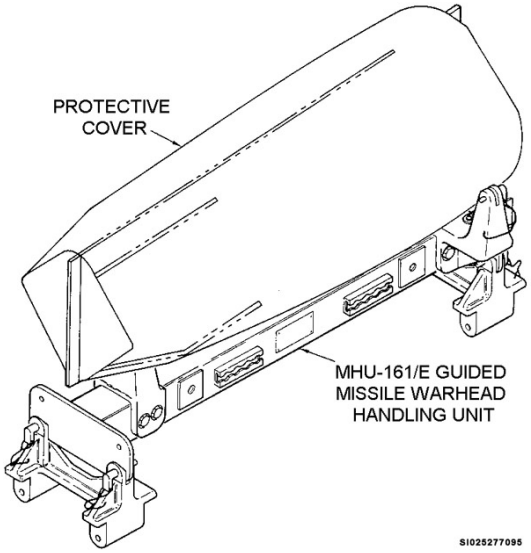

Figure 1–5. CVU–138/E guided missile components protective cover.

MHU–174/E guided missile lift truck

The MHU–174/E (fig. 1–6) supports the payload/missile during handling operations. It is an extremely useful piece of equipment, and you will operate it frequently. Use it to install the payload

on the GSU–283/E to transport a missile in the maintenance bay, transfer missiles to/from trailers, or mate missiles to pylons and launchers.

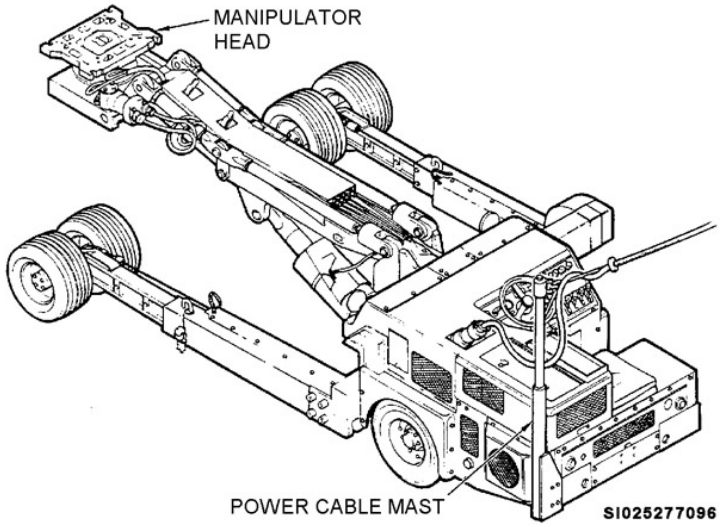

Figure 1–6. MHU–174/E guided missile lift truck.

MHU–101/E fork adapter assembly

The MHU–101/E (fig. 1–7) attaches to the MHU–174/E. The fork adapter works in concert with the MHU–97/E to transfer the warhead during handling procedures.

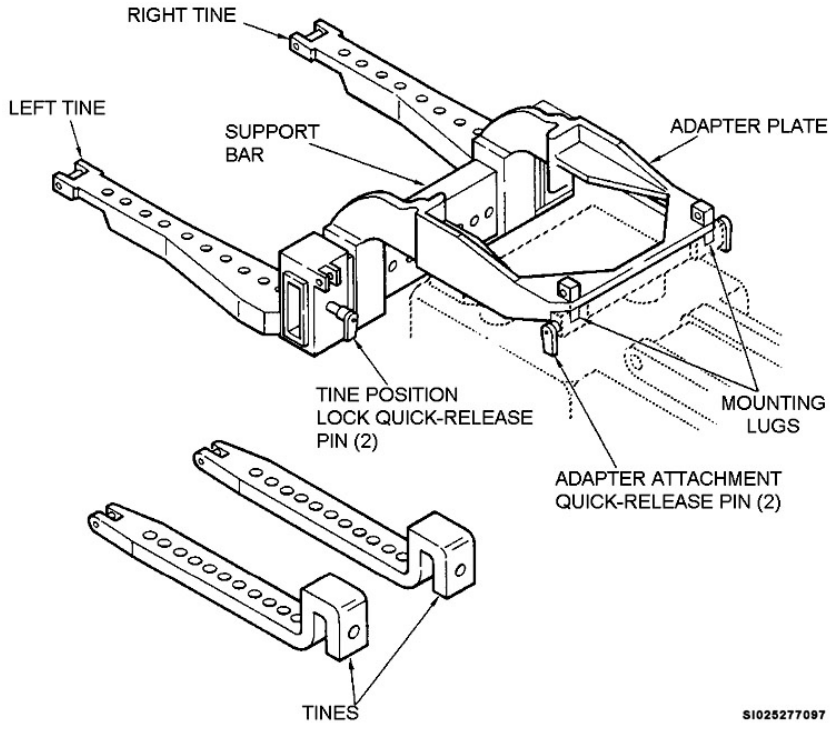

Figure 1–7. MHU–101/E fork adapter assembly.

MHU–97/E boom hook adapter assembly

The MHU–97/E (fig. 1–8) attaches to the MHU–101/E and facilitates lifting a payload with the load transfer assembly or H1387A. This hook adapter converts the lift truck into a mobile hoist.

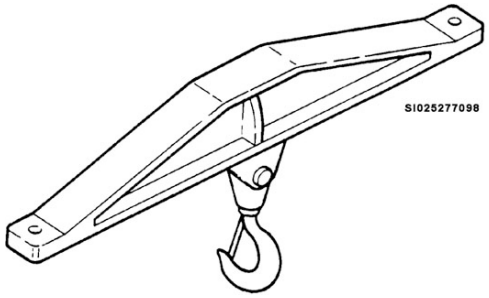

Figure 1–8. MHU–97/E boom hook adapter assembly.

GSU–283/E warhead installation-removal positioner

Use the GSU–283/E to install/remove payloads from missiles installed on a pylon and/or launcher (fig. 1–9). This device can mate payloads on the centerline and/or shoulder positions of a pylon and the index and/or adjacent positions of a common strategic rotary launcher (CSRL), essentially the bottom three missiles. The positioner consists of a beam assembly, elevator assembly, table assembly, and a load transfer assembly. The *beam assembly* is a rectangular frame that fits around the payload bay and mounts to the missile. The *elevator assembly* raises the payload into the payload bay and attaches to the beam with six quick-release pins. The *table assembly* attaches to the elevator assembly and provides lateral, longitudinal, roll, pitch, and vertical (known as yaw) control. The *load transfer assembly* hoists the payload (while on the handling unit) to and from the table assembly.

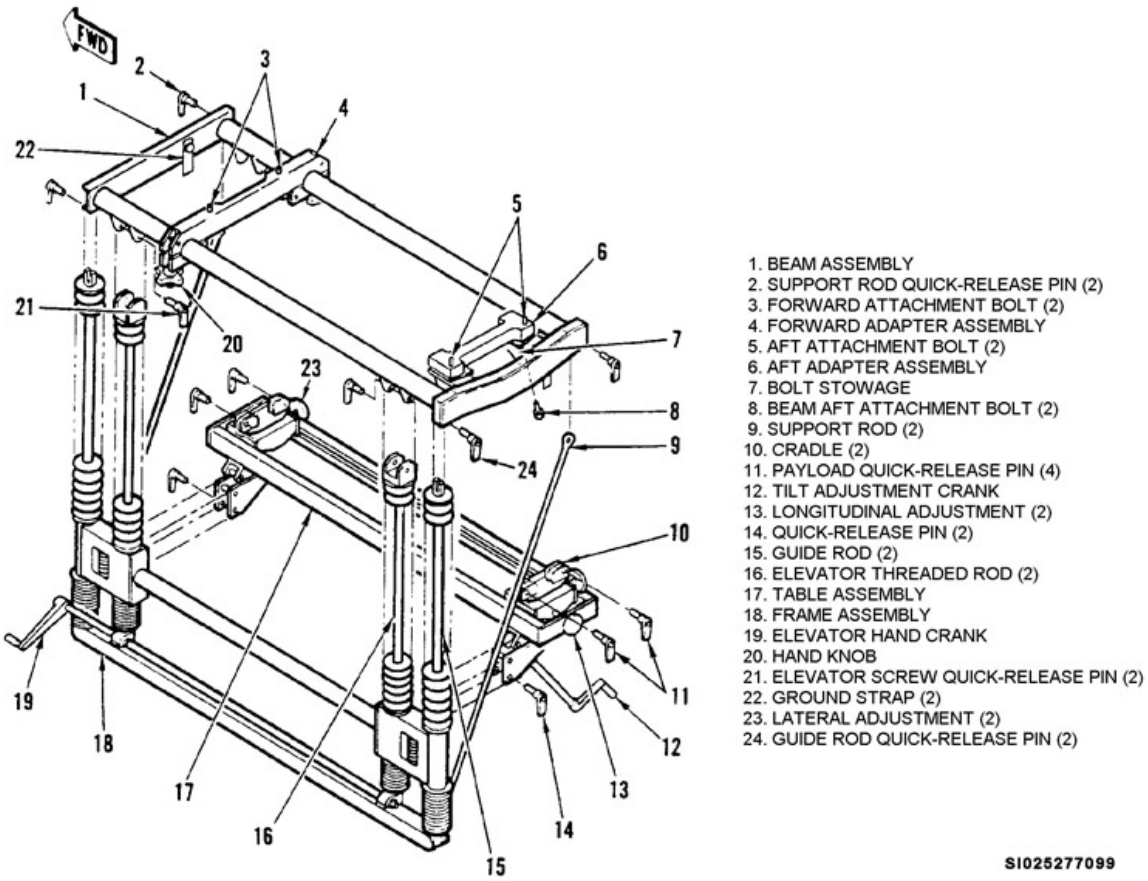

Figure 1–9. GSU–283/E warhead installation-removal positioner.

MHU–170/E or MHU–170A/E guided missile warhead section lift truck

Use the MHU–170/E (fig. 1–10) when installing/removing a payload to or from an ALCM mounted on a MHU–141/M. Basically, it performs the same functions as the GSU–283/E but is much simpler in design and in use. It can also support a payload during other maintenance activities. The difference between the MHU–170/E and the MHU–170A/E is the carriage assembly has been flipped over so the carriage assembly can reach higher to facilitate installing payloads while missiles are loaded on a CSRL or pylon.

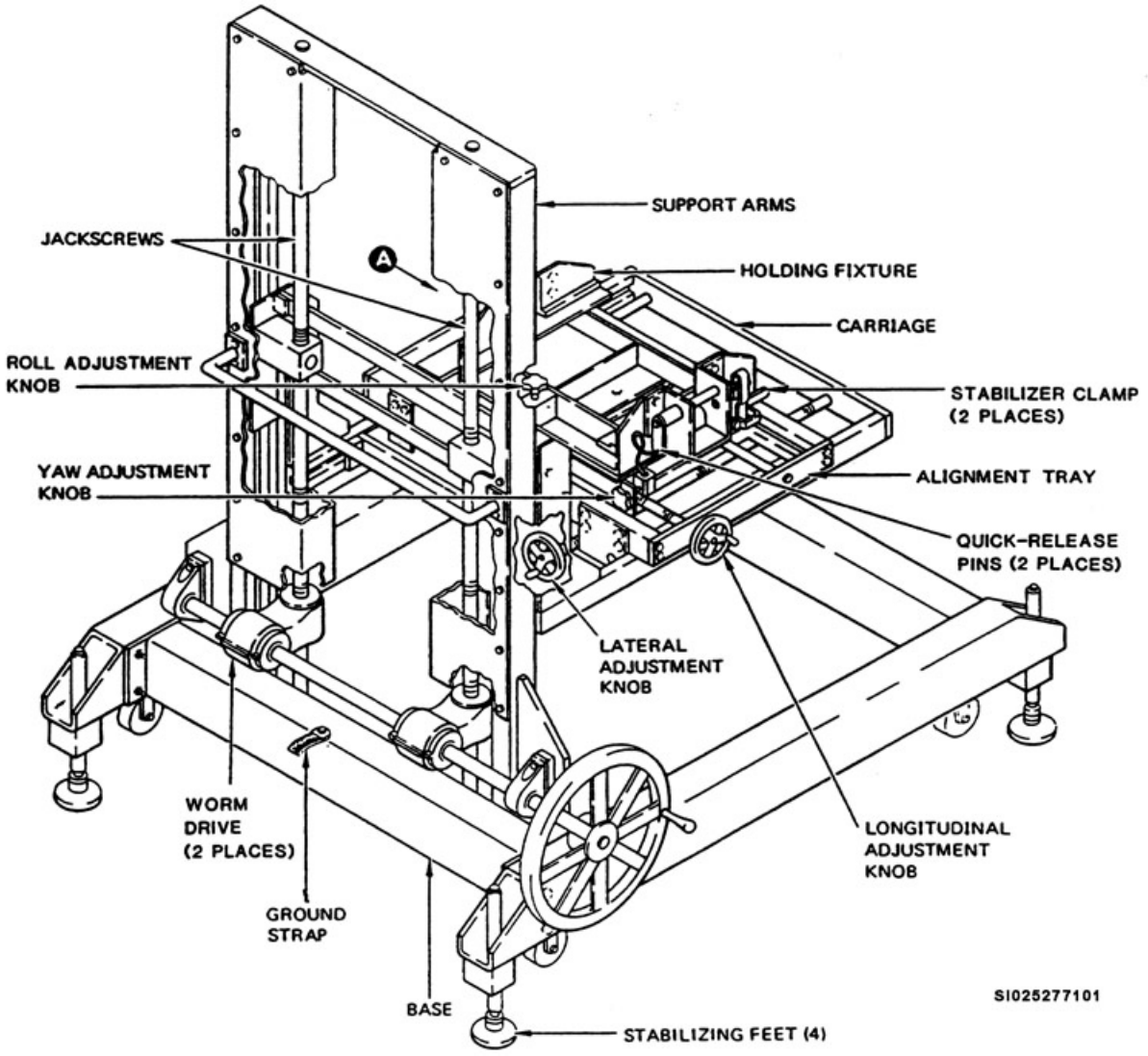

Figure 1–10. MHU–170/E guided missile warhead section lift truck.

402. Inspections and handling procedures

In this lesson, we discuss the inspections and handling procedures involved with the W80. Again, it is important to stress that although the lesson provides procedural steps in performing the operation, the governing procedures are contained in TO 11N–W80–1. Make sure you refer to the appropriate weapons manual before performing any procedures. Below are typical inspections and handling requirements for the W80:

- Verification inspection.
- Receipt inspection.
- Inspecting external surfaces of warhead.

- Inspecting H1388.
- Removing and installing warhead to/from H1388.

Verification inspection

The verification inspection consists of visually inspecting container contents to determine that item is as described by the shipping document. You perform a verification inspection by visually verifying the weapon serial number against the shipping document and the electronic inspection record card (eIRC).

Receipt inspection

The receipt inspection of a joint test assembly (JTA) is similar to the WR procedures. Upon initial receipt, remove the cover of the H1388 to gain access to the stenciled information. Next, compare the JTA and H1388 type and serial number with the eIRC and shipment message.

Inspecting external surfaces of warhead

Inspect the warhead per the –1 TOs before installing it into a missile, after removing from a missile, before shipping, before storing on chocks, or before installing into an H1388. Clean the warhead according to TO 11N–W80–1 and 11N–35–51, *General Instructions Applicable to Nuclear Weapons,* as necessary. A full external surface inspection may occur with the warhead suspended on the H1387A or other handling equipment. However, if a defect is discovered and requires measurement, the warhead must be physically stabilized. Inspect the warhead for any obvious damage and use the weapons-specific TO for acceptable criteria. Also, check the markings for legibility and touch up or re-mark, as necessary.

Inspecting H1388

The warhead is held in place by the foam support, inner container, pad and support assembly, and a cover with a locking ring (fig. 1–11).

Inspect the H1388 before shipment, upon receipt following shipment, and before packaging for storage. Inspect for dents or punctures and replace the container if you find the H1388 to have structural damage. Reject the H1388 if any weld is cracked or broken at any location other than the fore and aft reinforcing bands or if a total of more than two welds are cracked or broken on the fore and aft reinforcing bands. Reject and replace the locking ring if lugs are cracked or deformed so that the locking ring doesn’t perform its intended function. Repair the H1388 container according to TO 11N–35–51 instructions for repairing metals, plastics, fabrics, and other materials. Inspect H1388 markings for legibility and touch up or re-mark, as necessary. You must repair the H1388 surface if the paint is peeled, cracked, scraped, or otherwise damaged. Ensure you follow safety precautions for primer and paint.

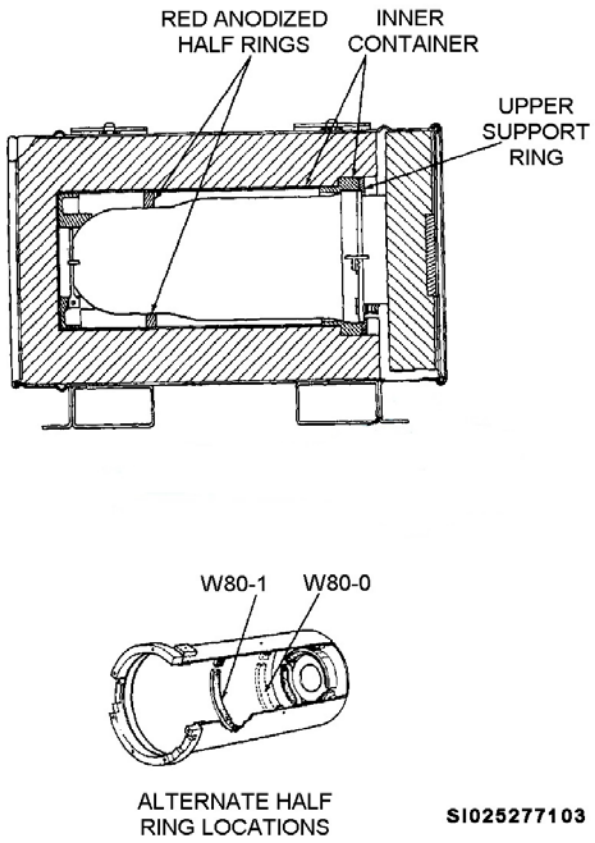

Figure 1–11. H1388 shipping and storage container.

Removing warhead from H1388

Refer to figure 1–11 as we discuss removing the warhead from the H1388. Press the pressure-equalizing valve momentarily, and remove the nut and bolt securing the locking ring to the cover/container. Then, remove the cover and pad and support assembly. Inspect the WES and the port cover for scratches, nicks, gouges, dents, corrosion, or other damage. Inspect DE1001 for any break, tear, cut, or other damage that exposes the metal braid.

Orient the H1387A with the lifting arm end link in the 12 o'clock position. Manually position the H1387A so that the hub portion slips over the WES (fig. 1–12). Use extreme care while sliding the H1387A over the WES to prevent damage to the warhead. Align proper holes of the strongback with holes in the WES and insert the three captive bolts. Tighten the three bolts to 90 ±5 inch-pounds (in-lb.).

The warhead may be removed using a forklift, lift truck, or other lifting device, such as a hoist. Attach the lifting device to the lifting arm end link on the H1387A and lift the warhead until a small gap appears between the warhead and the inner container. Remove the seven bolts securing the upper and lower support rings. Be careful not to drop the bolts or upper support ring when removing this hardware as it could damage the WES. Slowly move the lifting device and back the warhead out of the container. Use extreme care when removing the warhead from the container. Observe clearance to ensure the warhead is not contacting the head of a bolt that protrudes down from the top of the inner container (bolt secures the anti-rotation block to the inner container). Keep the aft mounts from catching on the inner container when the aft end of the warhead is exiting the container.

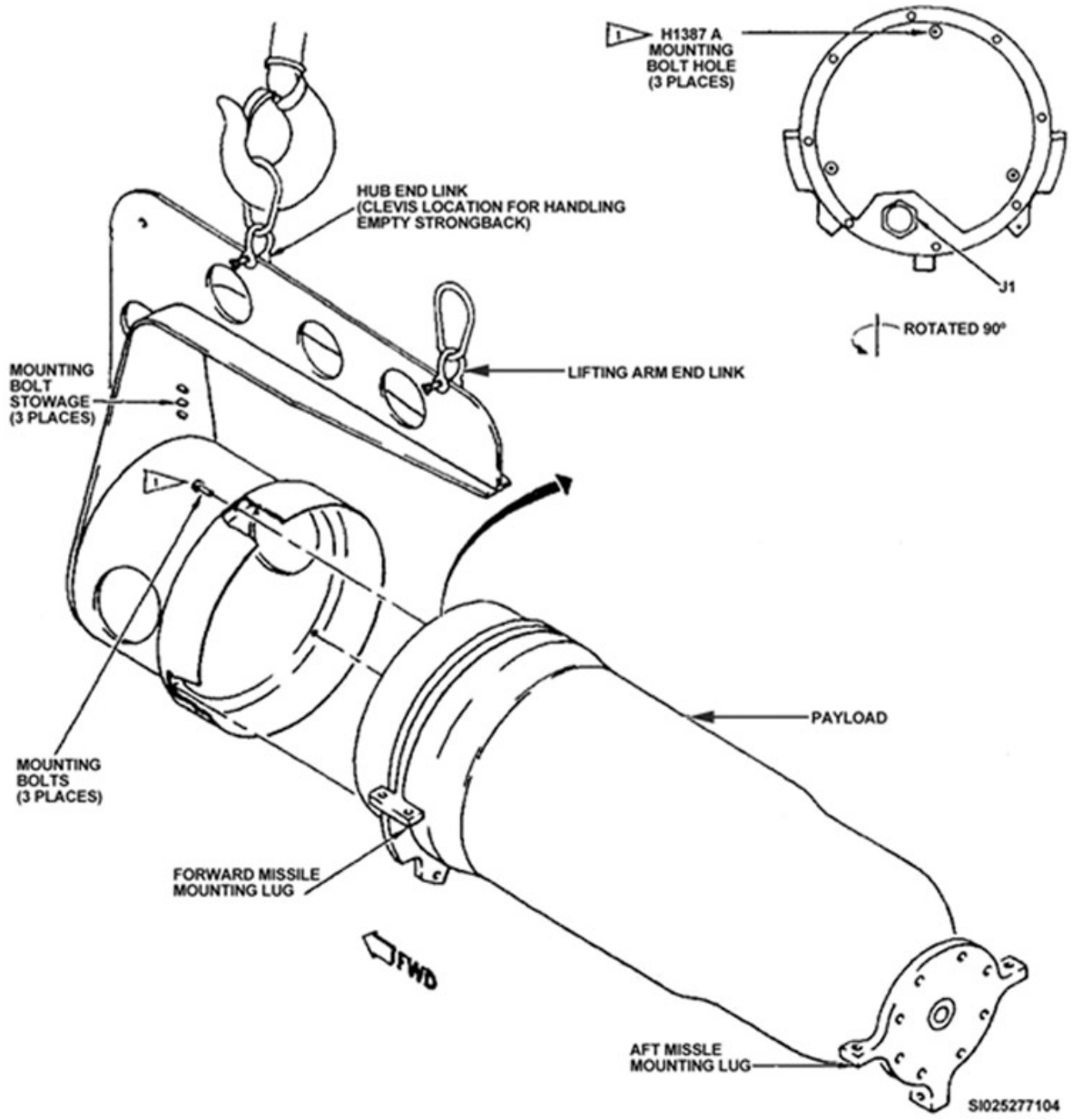

Figure 1–12. H1387A Strongback and W80 warhead.

Installing warhead into H1388

Prepare an empty H1388 before warhead installation. Position the container in the horizontal position and remove the nut and bolt securing the locking ring to the cover/container. Then remove the cover and pad and support assembly. Remove the seven bolts securing the upper and lower support rings and remove the rings. If present, remove the protective cap from the anti-rotation block. Verify proper configuration of the red anodized half-rings inside the inner container.

Inspect the H1388 pad and support assembly, compression pads, and foam support. Replace the pad and support assembly if it doesn't perform its intended function. Replace the compression pads by removing the pad and installing a new compression pad using TO 11N–35–51 procedures for joining sealing, bonding, and using rubber-base adhesives. Replace the foam support if it doesn't perform its intended function. You can glue chunks of foam back on using TO 11N–35–51 procedures. Small defects or deformations in the foam are acceptable. Now, the container is ready to receive a warhead using the removal procedures but in reverse order.

403. Maintenance and mate/demate procedures

This lesson contains authorized maintenance procedures, including an overview of the limited life component (LLC) replacement procedures. It also includes the mating and demating procedures using the MHU–170/E.

General

The extent of any maintenance is solely based on the procedures provided in TO 11N–W80–1. Anything outside established procedures requires authorization received through unsatisfactory report (UR) channels. Replace screws as necessary. Unless otherwise specified, items such as preformed packing and rubber seals may be reused or replaced at the discretion of the using organization.

LLC introduction

As a brief introduction, a LLC is a component that deteriorates in some respect over time and must be replaced periodically during weapon stockpile life. Make sure you have the correct replacement parts (i.e., LLCs and Group-X kit) before performing the LLC procedures to include the T557.

T557 digital thermometer

The T557 (fig. 1–13) is a digital thermometer measuring device used to determine the condition of the reservoir for the W80 warhead. You use the T557 before performing a limited life component exchange (LLCE). It is used with the CT1600 electrical cable assemblies and is run by a 9-volt dry battery.

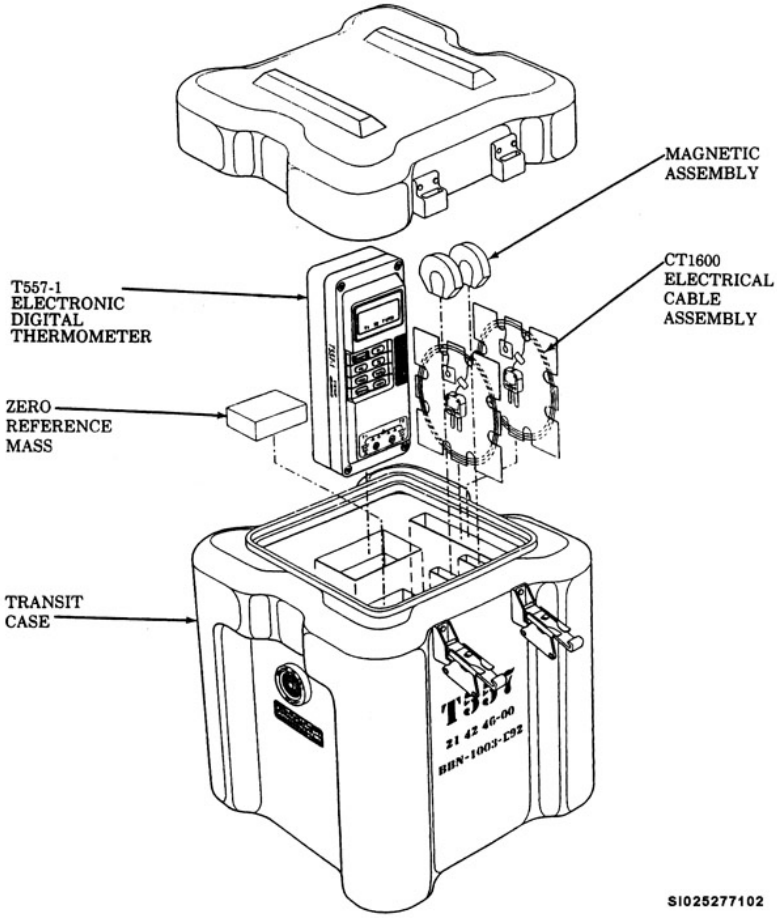

Figure 1–13. T557 digital thermometer.

Performing LLCE

Performance of this operation may be done with the warhead in container or out-of-container. Several methods are available to the weapons maintenance team to allow flexibility in maintenance scheduling and performance. Procedures are listed in the –1 manual to include inspecting replacement components. During the course of the operation, remember to document serial numbers of removed components and installed components for later reporting.

Mate and demate

As we previously mentioned, the payload is attached to the missile with six bolts. The operation normally takes about 30 minutes to complete, depending on team experience. We cover mating the payload to the ALCM using the MHU–170/E.

Before starting actual maintenance, there are several things to do. Make sure the work area is safe (i.e., fire extinguishers, fire exits clear, eyewash stations functional, etc.); prepare/inspect tools, test and handling equipment; and perform a missile safe status check. Visually inspect the warhead for damage and compare the warhead serial number against the work order. To remove the payload bay door, first open the arming-device access door so you can guide the arming-device streamer through the opening as the bay door is removed. Verify that you have the correct door for that missile by comparing the missile serial number marked on the inside of the door. Look for obvious damage, loose bolts, and screws and ensure all cables are connected. After verifying the missile is ready to receive the payload, you are ready to begin the mate operation.

Installing warhead to ALCM using MHU–170/E

The ALCM and MHU–159/E guided missile handling unit is positioned on the MHU–141/M and secured by the MHU–162/E swivel and link assembly. Make sure the missile and trailer are properly grounded and safe status checks are performed. Inspect the payload bay and tie the warhead interface cable (W15) out of the way inside of the payload bay with textile tape.

Transfer the payload onto the MHU–170/E and secure the MHU–161/E to the MHU–170/E with two quick-release pins and stabilizer clamps (fig. 1–14). Position the MHU–170/E on the right side of the missile for MHU–141/M operations (the lift truck can be on the right or left side for all other operations) and centered under the payload bay. Lock the wheel brakes and lower all four stabilizer feet until they make firm contact with the floor. You can adjust the stabilizer feet to facilitate payload alignment during the operation.

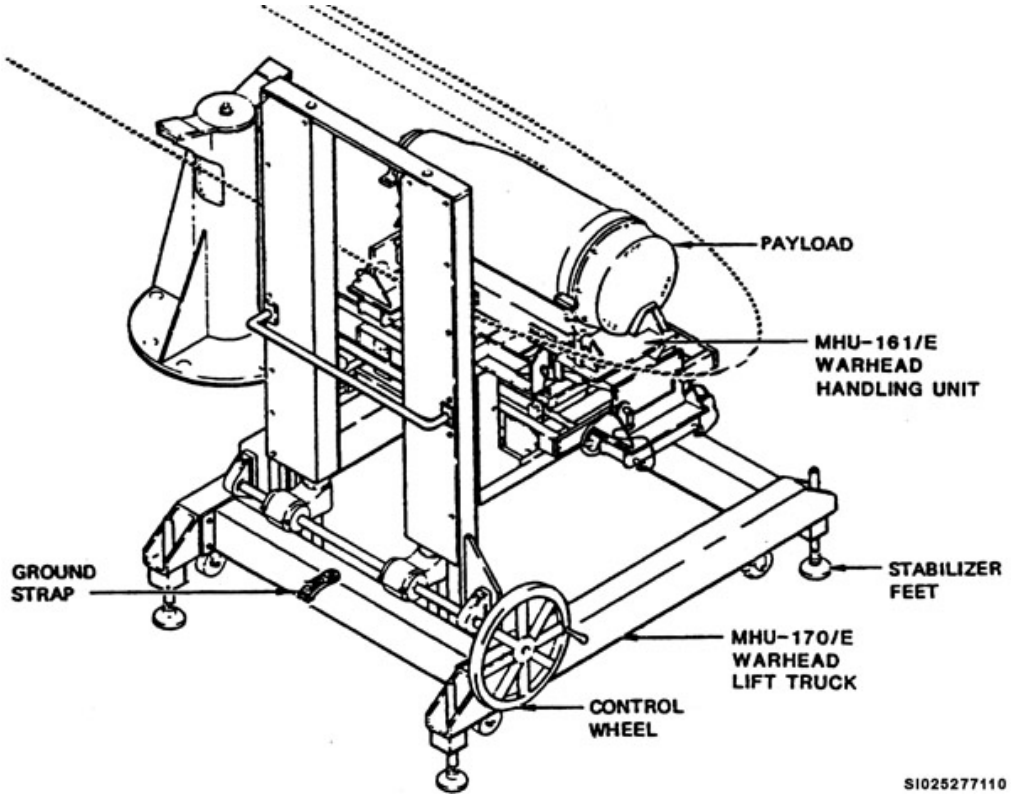

Figure 1–14. Warhead installation using MHU–170/E warhead lift truck.

Raise the payload into the payload bay using caution when raising the payload into the missile because it is possible to strike the aft end of the payload on the front end of the trailer. The MHU–170/E will not be aligned as precisely under the missile, so increased attention is necessary. Once the payload is mated and torqued according to technical data, lower the MHU–170/E table and remove it from the area. Remove the MHU–161/E and inspect and connect the W15 cable.

Locate the correct payload bay door and inspect it, cleaning all the mating surfaces on it and the missile with alcohol. Open the access door and thread the warhead-arming device (WAD) pin safety streamer through the opening. Position the door on the missile and finger-tighten all the fasteners. Slowly tighten fasteners 1 through 5 until the door is in contact with the missile faying surface. Check the missile-to-door gap along all the edges for proper clearance per the technical manual (TM). If the door gap is out of the specified tolerance, reject the door and notify the proper authority. If the gap is good, run the remaining fasteners in until they are flush. Now, using the sequence provided in TO 11N–W80.83–1, *W80 Warhead/AGM86 Missile, Mating/Demating Procedures,* torque all the fasteners according to technical data. Position beaded chain portion of the safety streamer in the access door and install the access door. Install fasteners far enough that the beaded chain is retained in the access door notch and that free motion is not restricted. If the chain is not properly positioned, or the door is over tightened, the chain may be snapped off. Check the view ports in the payload bay door to make sure the payload markings are visible. Finally, check the missile-to-door gap again; if there are any gaps greater than .010 inches, Air Force Specialty Code (AFSC) 2M0X1 missile and space systems electronic maintenance personnel may need to apply filler in them.

Removing warhead from ALCM using MHU-170/E

To remove the payload, you perform the mate procedures in reverse with a few minor exceptions. Once you disconnect the cable, you must install a protective cap on the J1 connector of the warhead. This cap protects the internal circuits from electrical pulse as well as protects the connector from damage. Thread locally manufactured ALCM payload demate guide rods into specified holes after you remove the first payload bolts. This prevents the warhead from shifting downwards when the

remaining bolts are loosened, and it prevents grooves being cut into the softer metal of the warhead mount through holes. Make sure you have adequate pressure up on the table so the payload does not drop as bolts are removed. When the payload is being installed into cradles on the rail set or work stand, unlock the cradles until the attachment quick-release pins are installed.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

401. Weapons summary

1. What interfaces the warhead to the missile?

2. How is electrical bonding of the warhead to the missile achieved?

3. If the warhead is involved in an accident, you are *not* authorized to perform which procedures?

4. What piece of equipment is used to remove the warhead from the shipping and storage container?

5. What piece of equipment supports the warhead from initial removal from the shipping container until it is install in the missile?

6. How many warheads can you transport on the MHU–141/M?

7. How many warheads can be placed on the MHU–89/E?

8. What two pieces of equipment convert the lift truck into a mobile hoist?

9. Which GSU–283/E assembly component hoists the payload on the handling unit?

10. The MHU–170/E is used for what?

402. Inspections and handling procedures

1. What information is verified on JTA during a receipt inspection?

2. How is the warhead positioned during the external inspection?

3. When do you inspect the H1388?

4. How is the H1387A oriented on the warhead for removal?

5. What are the rejection criteria for the pad and support assembly of the H1388?

403. Maintenance and mate/demate procedures

1. Who decides if the preformed packing and rubber seals may be reused or replaced?

2. What test equipment is used with the LLC exchange operation?

3. What are the two authorized configurations to perform a LLCE?

4. How is an ALCM and MHU–159/E secured to the MHU–141/M for payload mate with a MHU 170/E?

5. How do you position the MHU–170/E for payload mate?

6. What must you do if the final missile-to-door gap exceeds 0.010 inches?

1–2. Air-Launched Cruise Missile

The B–52 aircraft carries the AGM–86B missile either internally or externally. The internal configuration uses a rotary launcher, while the external configuration uses pylons. The B–52 can carry up to 20 ALCMs—eight missiles on the rotary launcher inside the bomb bay and six on each pylon mounted under each wing. We begin this section with a description of the ALCM weapon system components. Next, we cover ALCM support and protective equipment and discuss missile safety procedures.

404. Air-launched cruise missile description

The ALCM weapons system is made up of three major elements—(1) the AGM–86B missile; (2) the carrier aircraft equipment (CAE) used to carry, align, and launch the missile; and (3) the integrated logistic support (ILS) facilities needed for missile upkeep. All three elements blend to produce a reliable weapon system.

AGM–86B missile

The AGM–86B long-range weapon (fig. 1–15) is a subsonic (less than the speed of sound [738 miles per hour (mph)]), AGM that is powered by a twin spool turbofan engine and uses terrain correlation techniques for navigation. The missile is, in other words, an onboard digital computer that compares

the terrain the missile "sees" with digital maps carried internally to guide it to the target. Its small size and ability to fly close to the ground make this missile difficult to detect on enemy radar. If enemy radar detects it, the missile looks more like a small flock of birds. Think of the AGM–86B as an unmanned aircraft with a 600-pound thrust.

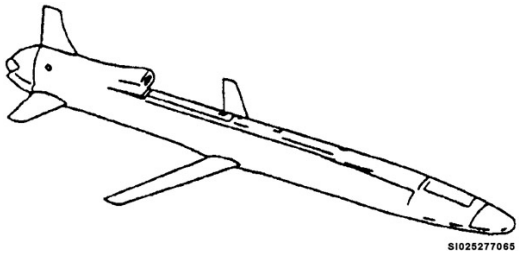

Figure 1–15. The AGM–86B missile-flight configuration.

The missile is 249 inches long (just under 21 feet) and weighs approximately 3,200 pounds. The wings, fin, elevons, and engine inlet are retracted close to the fuselage when the B–52 aircraft carries the missile(s) (fig. 1–16). This configuration, which we commonly refer to as the *captive configuration*, gives the missile a maximum width of 24 inches. Captive configuration also protects the missile during loading, handling, and storage procedures. After launch, the wings, fin, elevons, and engine inlet extend, and the missile converts to the *flight configuration*. When extended, the wings have a span of nearly 12 feet.

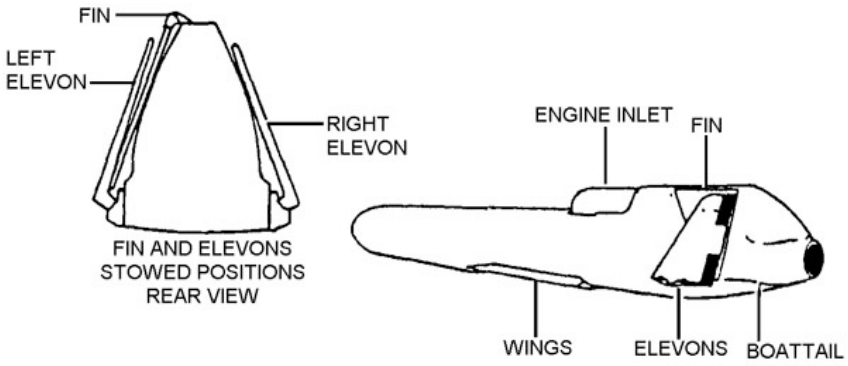

Figure 1–16. ALCM-captive configuration.

A complete missile includes the payload bay door, six warhead-mounting bolts and washers, and missile hard points where ground-handling equipment attaches. Structurally, the missile has three sections—forward, center, and aft.

Forward section

The forward section contains numerous environmental, navigational, and electrical pieces of equipment. Most notably, the nose cap, impact fuze, radar-receiving antenna, internal navigation element (INE), radar altimeter, WAD, pitot-static tube, umbilical enclosure, and the forward environmental control system (ECS) all make up the forward section.

Center section

The center section is made up of the fuel tank (the main structure), forward and aft clevis, rotary switch, heat exchangers, wing assembly, wing-deployment actuator, and transmit radar antenna. The center section also contains the payload bay.

Aft section

The aft section consists of the engine and engine support structures, the inlet and inlet support structure, the fin and fin housing, elevon and elevon support structure, boattail assembly, and access

panels. Figure 1–17 shows the general location of some of these missile components. Most components are known as shop replaceable units (SRU). AFSC 2M0X1 personnel are responsible for maintenance on the missile and components.

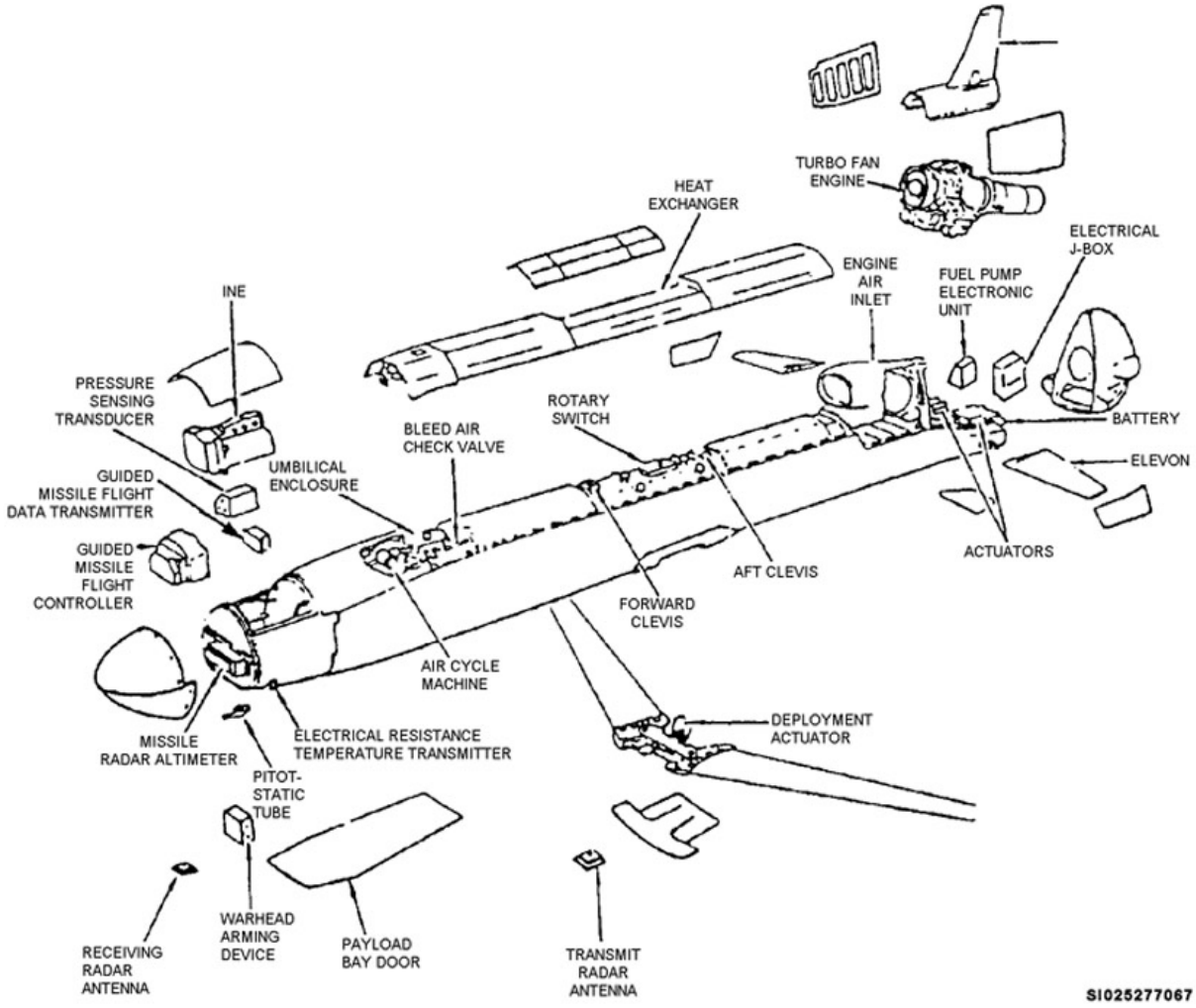

Figure 1–17. Missile components.

Missile subsystems

The ALCM subsystems are (1) the airframe, (2) electrical distribution system, (3) deployment system, (4) propulsion system, (5) fuel system, (6) ECS, (7) navigation-guidance system, and (8) safe, arm, and fuzing (SAF) system, fight control, and wings. We discuss only those systems you may deal with in your job:

- Deployment.
- Propulsion.
- ECS.
- SAF system.

Deployment system

The engine inlet and the missile control surfaces (wings, fin, and elevons) stay retracted until just after launch. The engine air inlet allows air to flow freely into the engine. Two methods are used to ensure extension of the inlet body during launch. The first is inertia, where the force of the missile being driven away or ejected from the rack snaps the inlet into position. This process is aided by

springs within the inlet structure. The second is a mechanical “backup,” which uses a lanyard connected between the engine inlet and the delivery system. The lanyard pulls the inlet into the open position when the missile is ejected. Wings, fins, and elevons extend by explosive actuators. Within the maintenance facility, releasing a mechanical latch in the actuators can manually deploy control surfaces. With the control surfaces deployed, any accidental firing of explosive actuators results in no external motion.

Propulsion system

Your exposure to the propulsion system is limited to the engine exhaust nozzle cover/desiccant assembly (fig. 1–18). This assembly prevents moisture accumulation and uses a humidity indicator to detect any moisture in the engine. Attach the desiccant release assembly and an explosive-powered ring to the boat tail assembly and connect it to the engine exhaust nozzle. Once the missile is launched, the explosive-powered ring ejects the cover/desiccant and the desiccant release assembly.

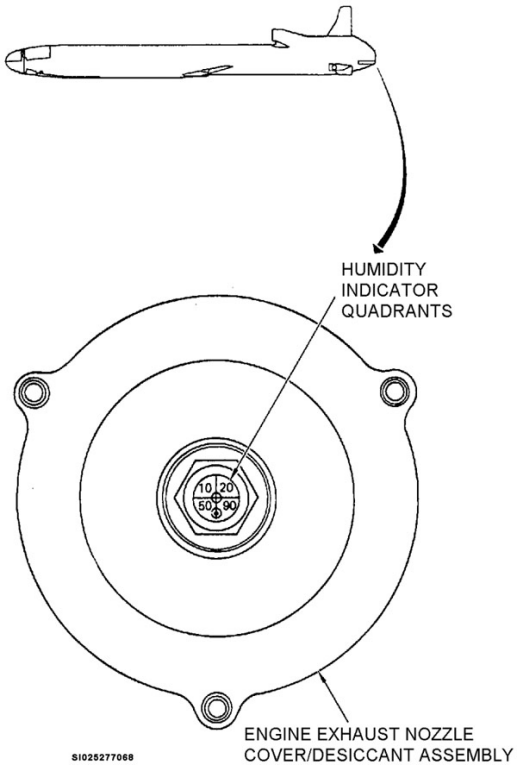

Figure 1–18. Engine exhaust nozzle cover/desiccant assembly.

ECS

The ECS is divided into two sections: forward and aft. The forward ECS keeps the internal navigating equipment at the proper operating temperature and interfaces the aircraft with the missile. The aft ECS supplies air to cool and ventilate the electrical generator and engine compartment. Before launch, the aircraft supplies conditioned air to the missile through the umbilical cable on the pylon or launcher.

SAF system

The SAF system (fig. 1–19) consists of the warhead, impact fuse, WAD, and rotary switch. The SAF system uses signals from the missile computer to control the warhead enabling and inhibit circuits. It also has monitor circuits that allow the carrier aircraft to determine the system’s status until launch.

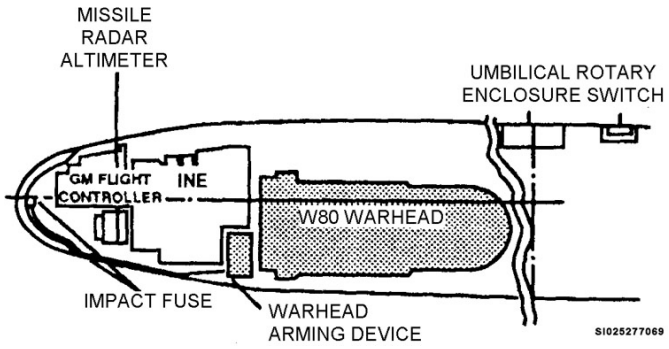

Figure 1–19. SAF system component locations.

Payload access

The ALCM has different payloads—a WR warhead, training warheads (Type 3 trainers), tactical ferry payloads (TFP), and a JTA. The payload is installed from underneath the missile (fig. 1–20). To gain access to the payload bay of the missile, you need to remove the payload bay door. It is held in place with 31 captive fasteners or screws. Figure 1–21 shows the payload bay door and the configuration of the door screws. Two view ports are provided in all doors so you can see if a payload is installed and determine its type and serial number.

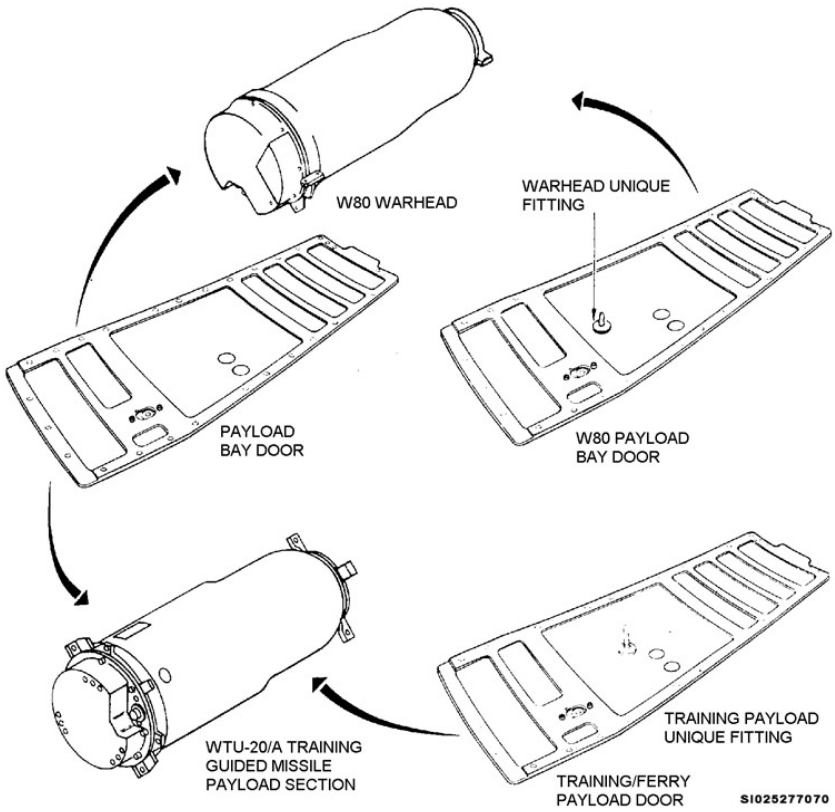

Figure 1–20. Payloads and payload bay doors.

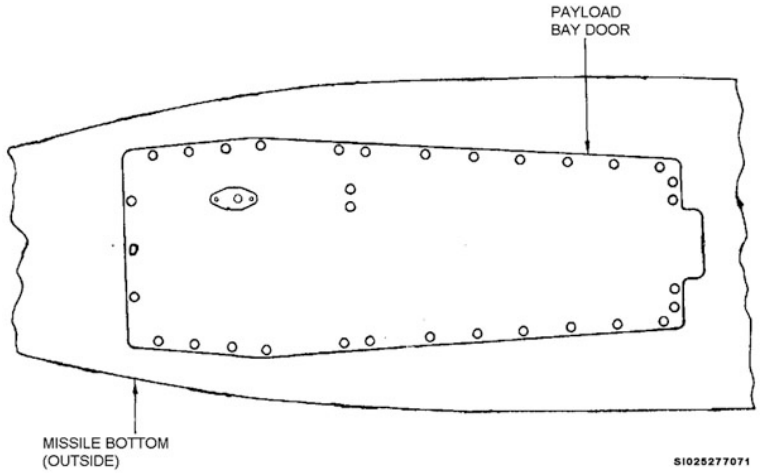

Figure 1–21. Payload bay door with screw orientation.

For instrumented test flights with JTAs, the payload door is changed out and replaced with an instrumented flight test door, which we refer to as either the nontactical test instrumentation kit (NTIK).

Integrated logistic support

ILS includes ground handling equipment, test and checkout equipment, TO publications, maintenance and storage facilities, and you, the technician.

Nuclear weapons technicians (2W2X1) and 2M0X1 personnel are the primary AFSCs responsible for maintaining the missile, warhead, launchers, and pylons in the integrated maintenance facility (IMF). Aircraft armament systems specialists (2W1X1) load pylons or launchers onto the aircraft. Loaded ALCM pylons and/or launchers in secure storage are maintained in structures in the weapons storage area (WSA). The structures have doors on each end and are commonly referred to as “drive-throughs.” This drive-through capability allows quick and easy delivery to, or removal from, the secure storage structures.

405. Support equipment and safety procedures

The items we discuss in this lesson are used in handling the AGM–86B. All handling equipment must be visually inspected before each day’s use to assure serviceability. Most of the equipment used has very specific missile handling functions. There are five special missile handling equipment items used:

1. MHU–159/E guided missile handling unit.
2. TLU–459/E engine inlet latch release tool.
3. Umbilical receptacle ring depressor.
4. Umbilical spanner wrench.
5. MHU–186/E missile hoisting beam.

MHU–159/E guided missile handling unit

This handling unit supports the missile during handling, transportation, and storage. It has two grounding strap attachments for missile grounding. The static-grounding cable is attached to the MHU–159/E first, next to any munitions-handling equipment (MHE) such as jammers or trailers, and finally to the facility ground point. The handling unit also has forklift tine slots for forklift maneuvering. Look at figure 1–22; note the forward and aft draw bolt details. First, these draw bolts are screwed/torqued into the two missile hard points. Then two nuts on the draw bolts are torqued to secure the MHU–159/E to the ALCM.

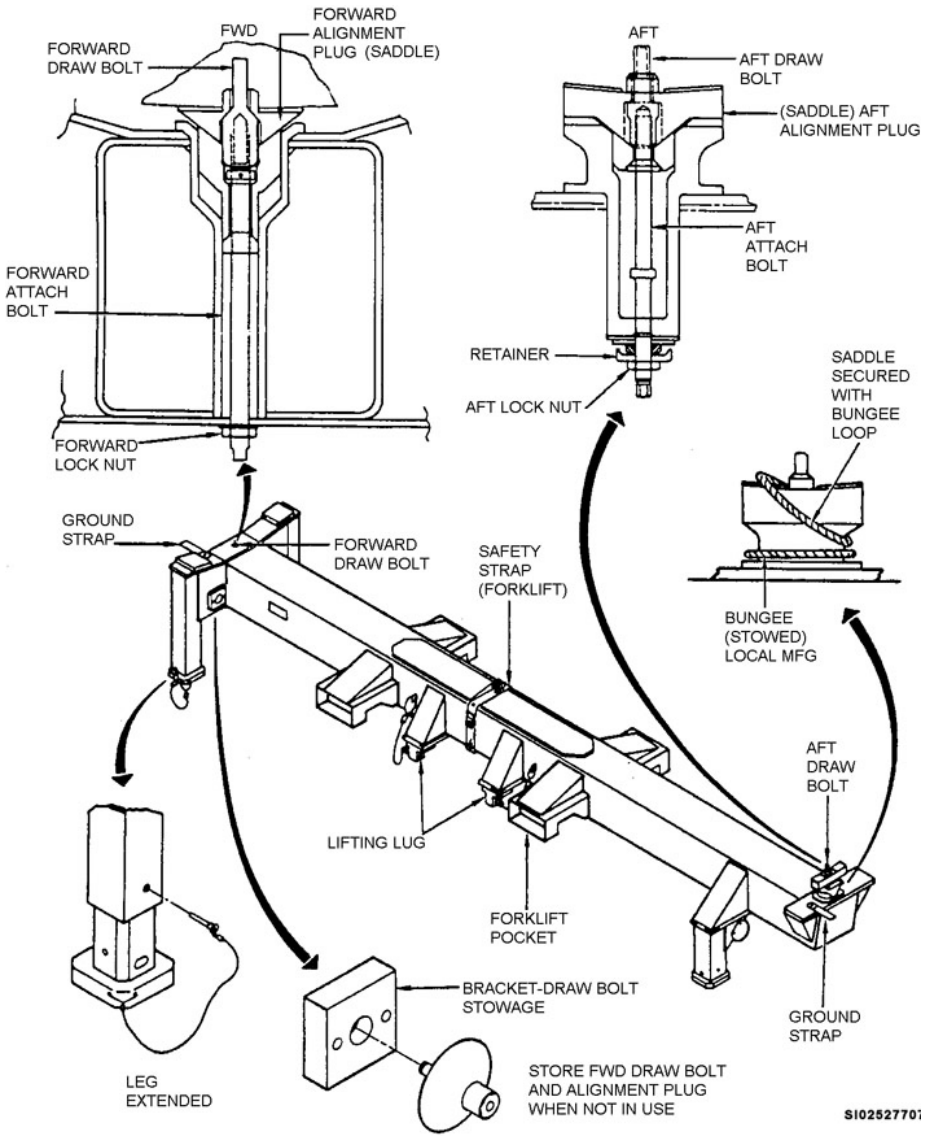

Figure 1–22. MHU–159/E guided missile-handling unit.

TLU–459/E engine inlet latch release tool

You use this tool to release the missile engine inlet latch mechanism and retract the inlet. You must retract the inlet before you load the missile on the pylon. Figure 1–23, number 12, shows the approximate positioning of the tool to retract inlet.

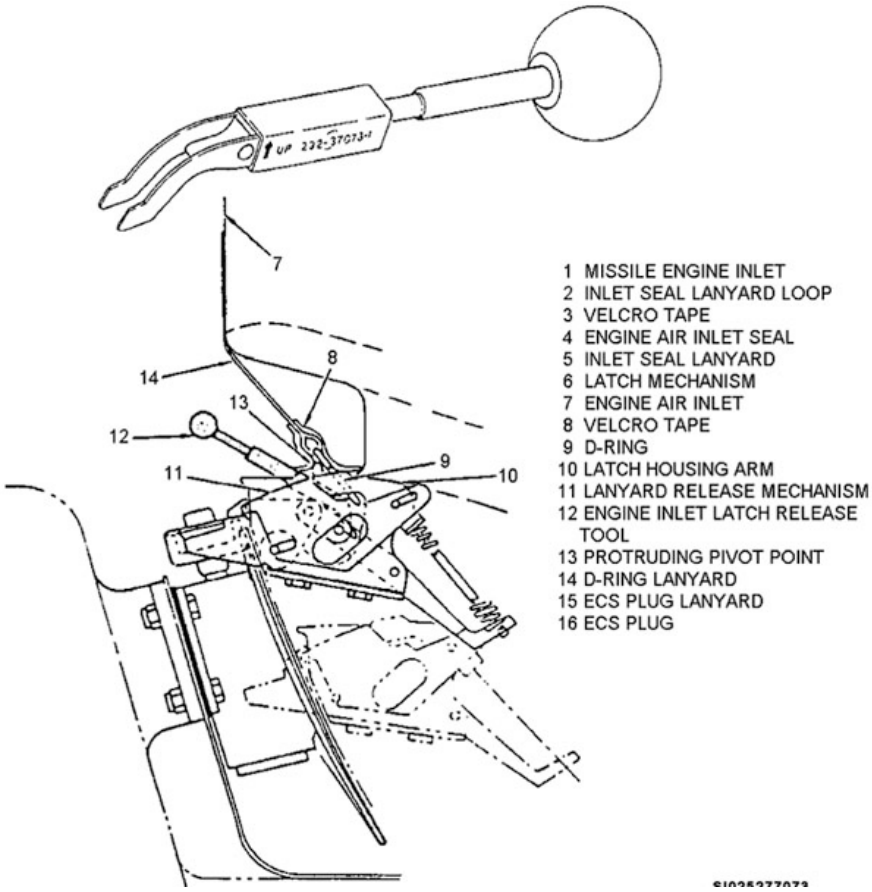

Figure 1–23. TLU–459/E engine inlet latch release tool.

Umbilical receptacle ring depressor

We use the umbilical receptacle ring depressor (fig. 1–24) for inspecting/cleaning the umbilical connector.

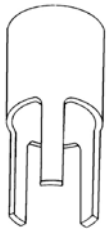

Figure 1–24. Umbilical receptacle ring depressor.

Umbilical spanner wrench

We use this spanner wrench (fig. 1–25) to connect/disconnect umbilical cables to/from the missile umbilical connector.

Figure 1–25. Umbilical spanner wrench.

MHU–186/E guided missile hoisting beam

The guided missile hoisting beam connects the missile to the hoist during lifting operations (fig. 1–26). If a missile has an ejector installed, adapters bolt to the ejector fittings and are secured to the beam

with quick-release pins. The shackle and hoisting ring attach to one of six different holes and allow you to lift the missile in any configuration.

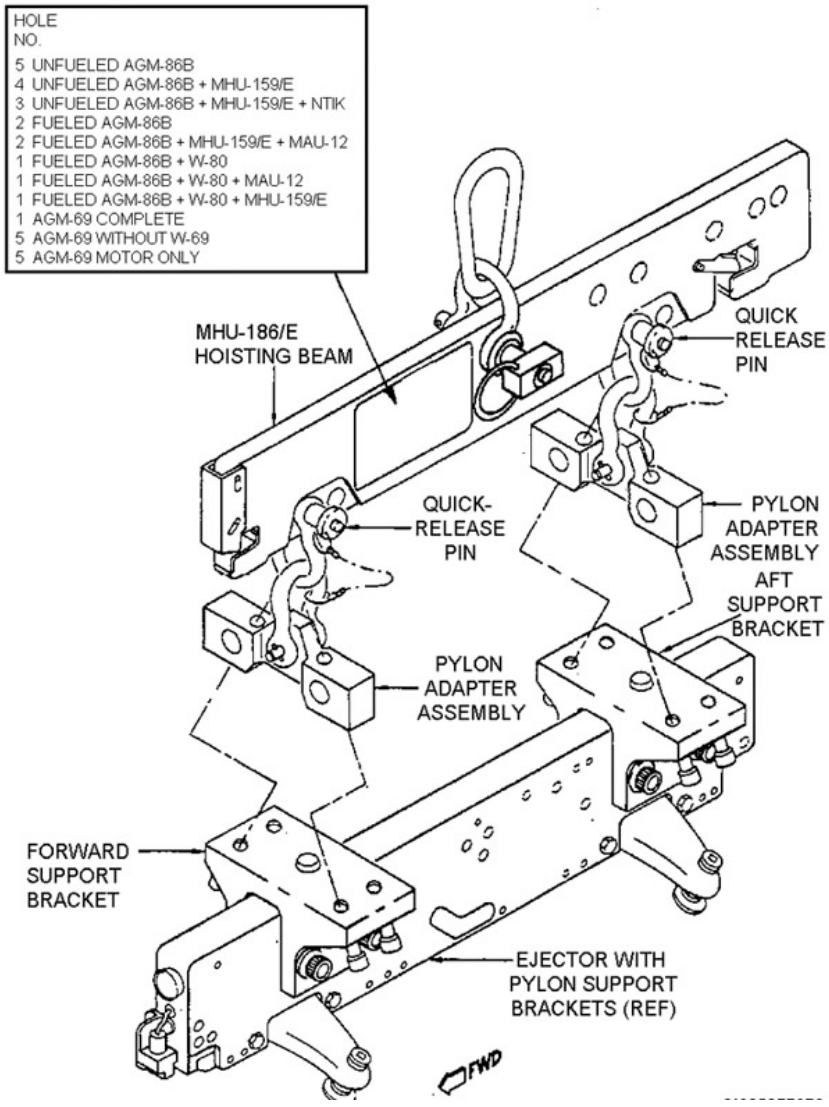

Figure 1–26. MHU–186/E guided missile hoisting beam.

Protective equipment and safety procedures

There are four protective and safety devices used to protect or ground the missile:

1. CVU–134/E guided missile components cover set.
2. CVU–143/E umbilical receptacle cover.
3. Fin, elevons, and wings protective covers.
4. Static ground cable.

CVU–134/E guided missile components cover set

The component cover set (fig. 1–27) protects the pitot-static tube and electrical resistance temperature transmitter (ERTT) and must be installed at all times during maintenance, storage, and handling operations. Remove the set before flight.

CVU–143/E umbilical receptacle protective cover

The umbilical receptacle protective cover (fig. 1–27) protects the umbilical receptacle from physical damage, electrical and electromagnetic pulse (EMP), and contamination during maintenance and storage.

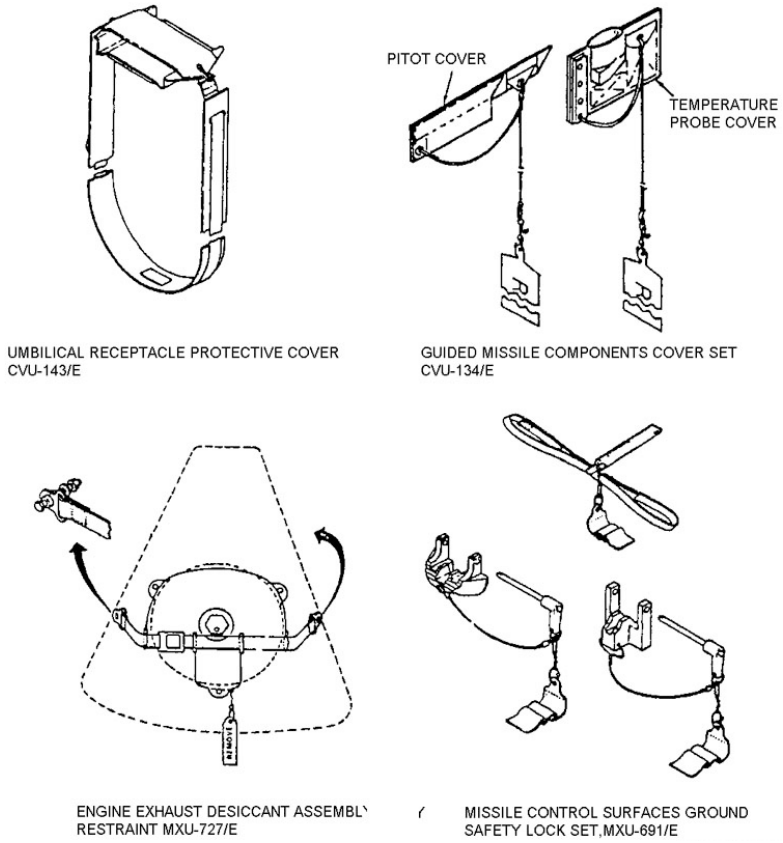

Figure 1–27. Missile protective equipment.

Fin, elevons, and wings protective covers

You may be tasked with making these protective covers from 1-inch foam pads (fig. 1–28). They protect missile surfaces during maintenance, handling, and storage operations.

Static ground cables

Static ground cables (fig. 1–28) are made from clamps and shielded ground wire. Use these cables to ground the missile during storage, handling, and maintenance. Static grounding reduces the risk of accidental initiation of explosive actuators and prevents damage to electrostatic sensitive devices. The missile must be connected to the facility ground at all times, except when in transit. The static grounding cable is attached to the MHU–159/E first, next to any MHE (jammers, trailers), and finally to the facility ground point. This keeps any possible electrostatic spark as far away from the missile as possible. Ground disconnection is always in the reverse order.

There are two missile safety items you can see but are not required to inspect, maintain, or install (fig. 1–27):

1. MXU–727/E engine exhaust desiccant assembly restraint—prevents the desiccant container from ejecting from the missile.
2. MXU–691/E control surfaces missile ground safety lock—inhibits the missile wings from deploying and locks the elevons and wing in the retracted position.

AFSC 2M0X1 personnel use these within the IMF. These safety devices minimize the adverse effects if accidental initiation of actuators occurs. During missile checkout procedures, the electrical current passing through the missile may cause undesirable side effects.

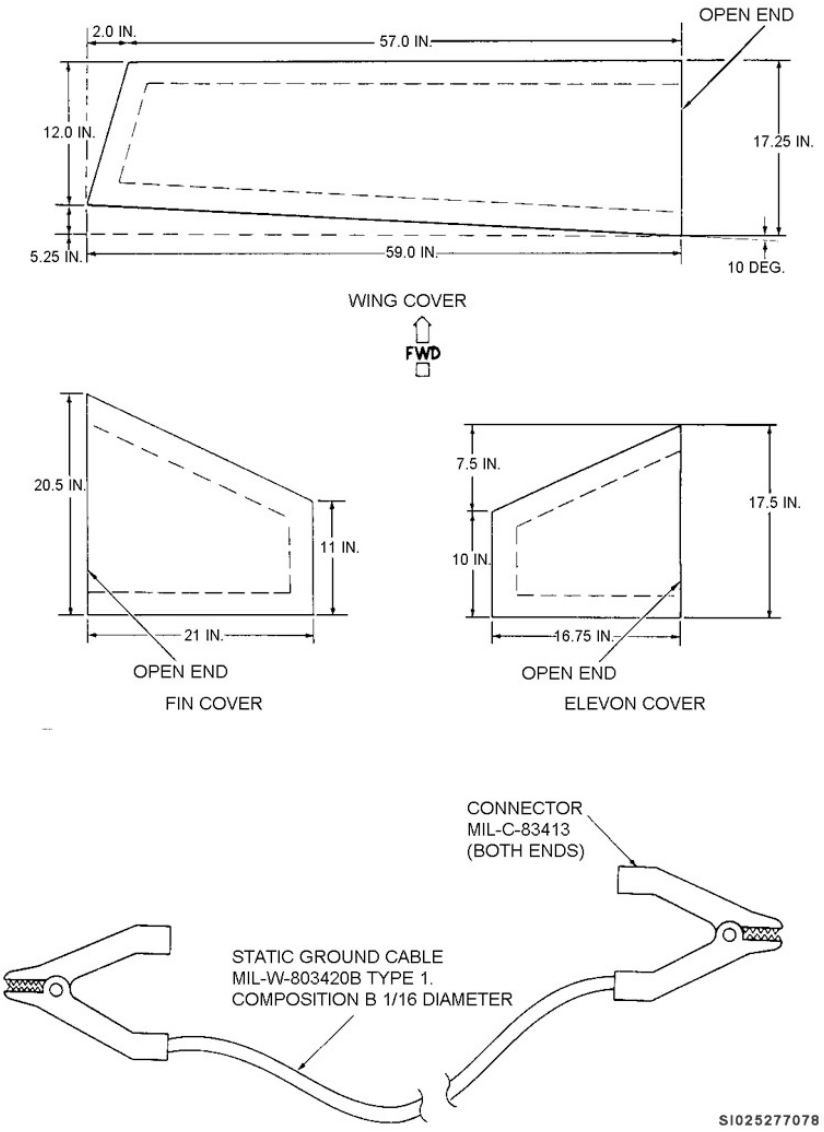

Figure 1–28. Locally made protective equipment.

Missile safe status check

Before performing any operations with the ALCM, you must perform a missile safe status check. Do this safety check before the first operation. TOs have specific safety check procedures that are dependent on the current configuration of the missile. There are safe status check procedures for a single missile on the ground and for missiles loaded on launchers and pylons also. Always ensure you are performing the correct safe status check.

CAUTION: If you find an unsafe condition, stop all maintenance, notify a supervisor, and take the appropriate actions required to correct the condition immediately. Do *not* continue the operation until the unsafe condition is corrected.

Refer to figure 1–29 as we discuss the following steps used to do a missile safe status check for a single ALCM on the ground:

1. Verify the missile is properly grounded.
2. Determine the payload bay configuration by sighting through the payload bay door view ports. Make sure the payload configuration meets the mission requirements. If necessary remove the payload according to the proper TO.
3. Inspect the missile for fuel leaks (visual leaks or presence of fuel vapors or odors) and obvious damage. If you or your teammates detect a fuel leak, the presence of fuel vapors, or odors, cease all operations, ventilate the area, and notify the proper authority. This inspection must include inspecting the missile radar antennas. If a fuel leak is confirmed, perform emergency procedures in according to directives.
4. Verify SWU–58/A rotary (separation) switch release is installed with no red band visible. The switch detent pin is found on the center of the missile between the lugs. If an ejector is installed, the switch detent pin is between the ejector and the missile.
5. Verify MAU–191/A WAD safing pin is installed and the indicator indicates safe (white “S” on a green background).
6. If ejector is installed, verify the following:
   a. Ejector in-flight safety lock indicates LOCK.
   b. (Pylon configured) Ejector ground safety pin is installed with streamer attached and visible.
   c. (Launcher configured) Ejector ground safety pin lock mechanism indicates GREEN.
   d. Ejector receptacle cover is installed on ejector receptacle J1 prior to transport.

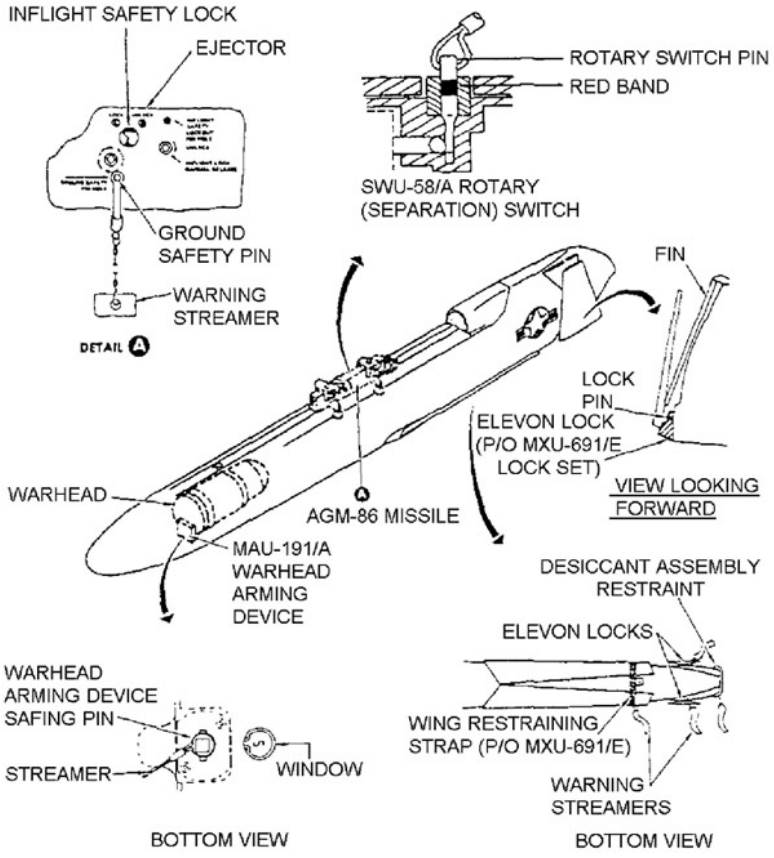

Figure 1–29. Safety check procedures.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

404. Air-launched cruise missile description

1. What makes the ALCM difficult to detect on enemy radar?

2. What is the difference between missile *captive* and *flight* configurations?

3. Which ALCM section houses the payload?

4. How does the mechanical “backup” work to extend the inlet body during launch?

5. What happens to the engine exhaust nozzle cover/desiccant assembly during missile launch?

6. What does the SAF system control?

7. What are the different ALCM payloads?

8. How are the payload doors secured to the missile?

9. What AFSCs are primarily responsible for maintaining the ALCM and warhead in the IMF?

10. Why are loaded pylons stored in structures with doors on each end?

405. Support equipment and safety procedures

1. Why is the MHU–159/E used?

2. Why do you use the TLU–459/E?

3. What tool do you use for inspecting and cleaning the umbilical connector?

4. What is the purpose of the CVU–143/E?

5. Why is missile grounding important?

6. What is the reason for connecting the ground cable to the missile before connecting to the facility ground?

7. What procedure must you do before performing any operations with the missile?

8. Briefly list the steps involved in the missile safe status check.

Answers to Self-Test Questions

401

1. Electrical connector on the WES.
2. Through tin-plated faying surfaces at the warhead mounting brackets.
3. Disassemble the warhead, apply electrical power of any kind, and connect or disconnect electrical cables.
4. H1387A.
5. MHU–161/E.
6. Four; two payloads on each pair of rails.
7. No more than two.
8. MHU–101/E and the MHU–97/E.
9. Load transfer assembly.
10. Installing or removing a payload into/from an ALCM mounted to a MHU–141/M.

402

1. The type and serial number of the JTA and H1388 is verified against the eIRC and shipment message.
2. It is suspended on the H1387A or other handling equipment.
3. Before shipment, upon receipt following shipment, and before packaging for storage.
4. Lifting arm end link in the 12 o'clock position.
5. Replace it if it doesn't perform its intended function.

403

1. The using organization.
2. T557.
3. Warhead in-container or out-of-container configurations.
4. By the MHU–162/E.
5. On the right side of the missile centered under the payload bay.
6. Have a 2M0X1 technician apply filler to the gap.

404

1. Its small size and ability to fly close to the ground.
2. In the *captive* configuration, the wings, fin, elevons, and engine inlet are folded close to the fuselage giving the missile a maximum width of 24 inches. After launch, these components extend and convert the missile to *flight* configuration.
3. Center.
4. A lanyard connected between the engine inlet and the delivery system pulls the inlet into the open position when the missile is ejected.
5. The explosive-powered ring ejects it.
6. The warhead enabling and inhibit circuits, and lets the aircraft determine the system status up until the moment of launch.
7. WR warhead, training warheads, TFPs, and JTA.
8. With 31 captive fasteners or screws.
9. 2W2X1 and 2M0X1 personnel.
10. Because it provides drive-through capability, allowing quick and easy delivery to, or removal from, the secure storage facility.

405

1. To support the missile during handling, transportation, and storage.
2. To retract the inlet before loading the missile on the pylon.
3. Umbilical receptacle ring depressor.
4. Protects the umbilical receptacle from physical damage, electrical pulse and EMP, and contamination during maintenance and storage.
5. It reduces the risk of accidental initiation of explosive actuators or damage to electrostatic sensitive devices.
6. This keeps any possible spark as far away from the missile as possible.
7. Missile safe status check.
8. (1) Verify the missile is grounded; (2) Make sure the payload configuration meets mission requirements, (3) Inspect the mission to make sure there are no fuel leaks or obvious damage; (4) verify the SWU-58/A detent pin is properly installed; (5) verify the MAU–191/A is installed and “S” is visible in the window; (6) if the ejector is installed, verify the ground safety pin is installed and the ejector safety lock shows LOCK.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

1. (401) The W80 warhead is equipped with a
   a. code activated processor (CAP) and command disablement system (CDS).
   b. permissive action link (PAL) and violent disablement system (VDS).
   c. multiple code coded switch (MCCS) PAL system.
   d. PAL and VDS.

2. (401) What piece of equipment is *primarily* used to install and remove the W80 warhead payload to and from the H1388 shipping and storage container?
   a. H1387A strongback.
   b. H1337A hoist swivel adapter.
   c. H1004 warhead hoisting adapter.
   d. H563 below-the-hook lifting device.

3. (401) The MHU–89/E work stand includes all the following capabilities *except*
   a. supporting up to two warheads.
   b. mounting on the MHU–141/M munitions handling trailer.
   c. supporting the payload during storage.
   d. preventing the payload from rolling off.

4. (401) You use the MHU–170/E guided missile warhead section lift truck when installing or removing payload to and from an
   a. air-launched cruise missile (ALCM) on a pylon.
   b. advanced cruise missile (ACM) on a launcher.
   c. ALCM/ACM on a pylon/launcher.
   d. ALCM on an MHU–141/M munitions handling trailer.

5. (402) What is an *acceptable* location to perform a full external surface inspection on a W80 warhead?
   a. Suspended on H1004 hoisting adapter.
   b. Inside the H1388 shipping and storage container.
   c. Mated into an air-launched cruise missile (ALCM).
   d. Suspended on the H1387A strongback or other handling equipment.

6. (402) Which component is *not* a part of the H1388 shipping and storage container?
   a. Foam support.
   b. Inner container.
   c. Caster assemblies.
   d. Pad and support assembly.

7. (402) To remove the warhead with the H1387A strongback, attach the lifting device to
   a. the aft clevis.
   b. the lifting arm end link.
   c. the middle lifting point.
   d. any convenient location.

8. (403) What other equipment do you use with the T557 digital thermometer to determine the condition of the reservoir during a W80 warhead limited life component exchange (LLCE)?
   a. CT1600 cable.
   b. DE1001 cable.
   c. H1601 nut connector.
   d. MHU–1405 template adapter.

9. (403) How are the air-launched cruise missile (ALCM) and MHU–159/E guided missile handling unit secured to the MHU–141/M munitions handling trailer for payload mate and demate?
   a. Bolts.
   b. Casters.
   c. Slotted grooves.
   d. Swivel and link assemblies.

10. (404) What air-launched cruise missile (ALCM) configuration gives the missile a *maximum* width of 24 inches?
   a. Navigational.
   b. Captive.
   c. Terrain.
   d. Flight.

11. (404) The two methods used on the air-launched cruise missile (ALCM) to extend the inlet body during launch are a mechanical backup and
   a. explosive actuators.
   b. engine exhaust.
   c. gravity.
   d. inertia.

12. (404) Which air-launched cruise missile (ALCM) payload bay door feature allows you to see if a payload is installed?
   a. View ports.
   b. Warhead access panel.
   c. Payload indicator device.
   d. Safe, arm, and fuzing (SAF) window.

13. (405) What interfaces between the MHU–186/E guided missile hoisting beam and a missile with an ejector installed?
   a. Retaining clips.
   b. Lifting lugs.
   c. Adapters.
   d. Shackles.

14. (405) The CVU–143/E umbilical receptacle protective cover protects the umbilical receptacle from
   a. physical damage during flight.
   b. electromagnetic pulse (EMP) during flight.
   c. physical damage during maintenance.
   d. pneumatic connection during maintenance.

15. (405) What is the function of the MXU–691/E control surfaces missile ground safety lock?
   a. Retracts the engine inlet latch mechanism before loading.
   b. Provides a point to attach the static ground cable.
   c. Prevents the desiccant container from ejecting.
   d. Inhibits the missile wings from deploying.

16. (405) When do you perform missile safe status checks?
    a. Before the first operation.
    b. After the first operation.
    c. Before the last operation.
    d. After the last operation.

Please read the unit menu for unit 2 and continue ➔

Unit 2. Delivery Systems

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407. Suspended loading and checkout frame and pylon loader adapters 2–7
2–2. Aircraft Guided Missile and Bomb Rotary Launchers 2–16
408. Common strategic rotary launcher and rotary launcher assembly introduction 2–16
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410. Ejector rack description 2–28

AIR-LAUNCHED MISSILES are stand-off weapons; however, they still need to be delivered to within approximately 1,500 miles of the intended target. The B–52 aircraft carries up to 20 missiles, 12 externally and eight internally, all with different targets. It also has the option to complement its 12 external missiles with eight internally carried gravity weapons. With such versatility, the B–52 continues to be a formidable deterrent today. In this unit, we discuss the systems that interface the missiles to the aircraft and play a major role in delivering weapons to the target.

2–1. SUU–67/A Aircraft Pylon

The SUU–67/A aircraft pylon is an aerodynamic structure that interfaces air-launched missiles to the B–52 aircraft. A B–52 can carry two pylons with up to six missiles on each pylon. The pylons are interchangeable with relation to left or right side of the aircraft and are attached under the wing between the inboard engine pods and the fuselage. The ALCMs are carried on the SUU–67/A. The missiles are loaded, launched, or jettisoned individually; the pylon can be jettisoned in an emergency, with or without the missiles attached.

406. Pylon introduction

As we discussed earlier, a weapon system encompasses more than just the missile. It includes the delivery system, support equipment, and personnel that maintain them. The SUU–67/A can also carry the conventional air-launched cruise missile (CALCM), but more importantly, it carries the ALCM. Figure 2–1 shows the typical configuration of the B–52 aircraft with pylons.

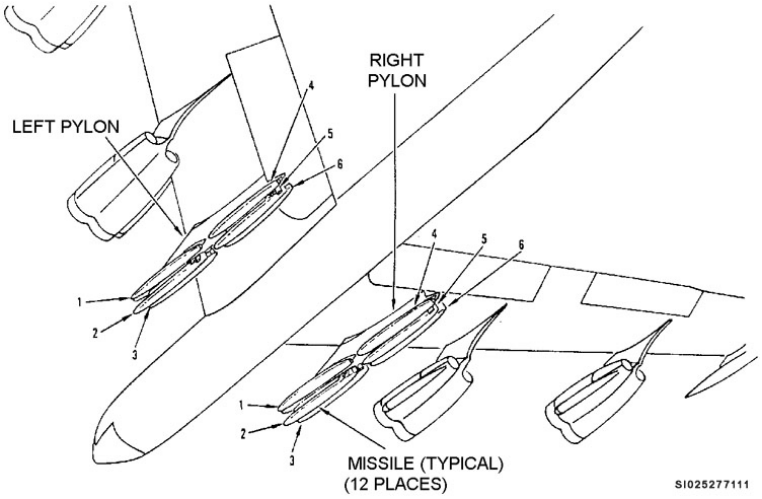

Figure 2–1. Typical pylon configuration on aircraft.

Pylon characteristics

Figure 2–2 shows the SUU–67/A with the missile fairings installed. Access doors, covers, and panels make servicing easier. The pylon is over 41 feet long, 60 inches high, and 26 inches wide without the missile fairing installed, and weighs about 4,500 pounds without missiles installed. The maintenance facility requires 28 volts direct current (VDC) and 115 volts alternating current (VAC), single-phase, 400-hertz (Hz) electrical power to service the pylon. It also needs 35 pounds per square inch gauge (psig) pneumatic (air) pressure to operate the pylon pneumatics, which cools the pylon and missile avionics. The pylon is designed to withstand stresses from an unbalanced load. One to six missiles can be mated to any position; however, a balanced load is recommended. The position numbering system is shown in figure 2–1.

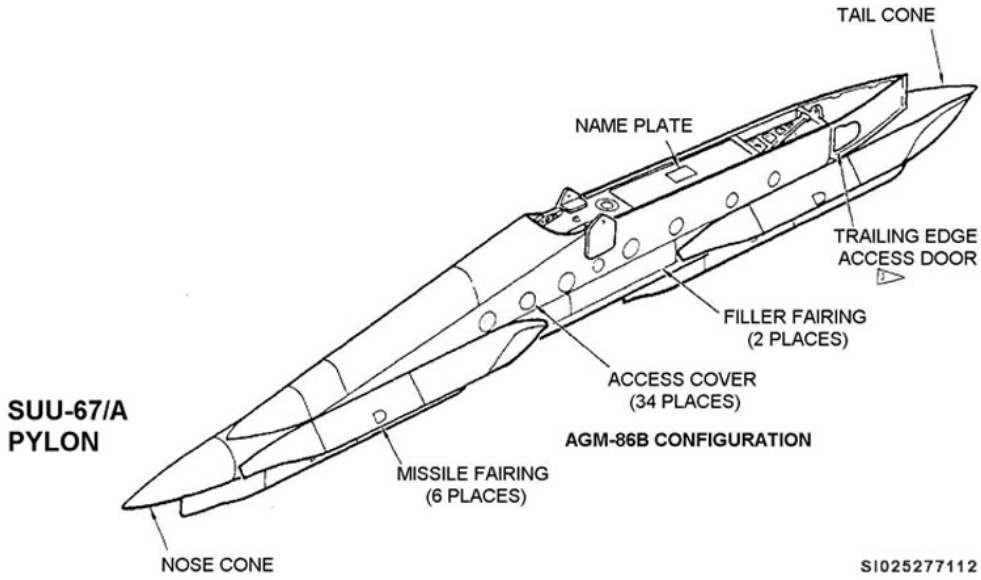

Figure 2–2. SUU–67/A pylon.

The pylon contains nuclear hardness design features. This means the pylon has components that might fail to function properly during a nuclear blast exposure if exact maintenance procedures are not followed. The nuclear blast environment includes nuclear radiation, EMP, and thermal radiation. It is imperative that nuclear hardness of the pylon be maintained. We do this by exactly following procedures in maintenance manuals that are clearly identified as hardness critical procedures (HCP).

Access doors

Pylon avionics are made up of a relay assembly and a decoder-receiver (DR). The avionics equipment is under the forward leading edge of the pylon. An avionics access door (fig. 2–3) allows you to work on these items and replace hardware items inside the pylon. Eighteen CAMLOC quick-release fasteners secure the door in the closed position. Support struts on the forward and aft ends of the door hold them in the open position.

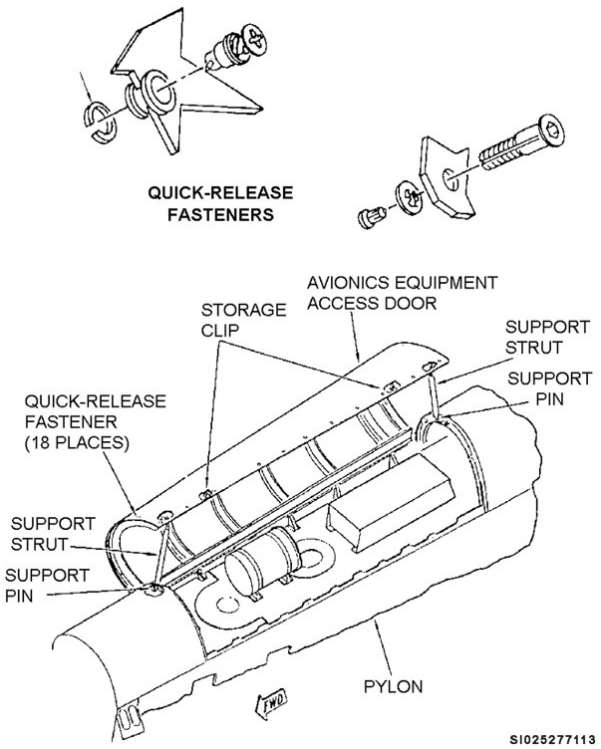

Figure 2–3. Avionics equipment access door.

Ejector access doors provide adequate space for working. Figure 2–4 shows the typical setup for a side or shoulder position and for the center position. These access doors are secured in the closed position with CAMLOC quick-release fasteners. Brackets and quick-release pins support the doors in the open position. Thirty-four small round access covers in both sides of the pylon structure allow you to perform maintenance on the internal electrical and pneumatic systems (fig. 2–2) and are secured with four screws each. Access doors on both sides of the trailing edge fairing provide easy access to the aft pylon support fitting. These aft access doors are held in place with six CAMLOC quick-release fasteners each. Figure 2–5 shows a hinged access door on the trailing edge fairing.

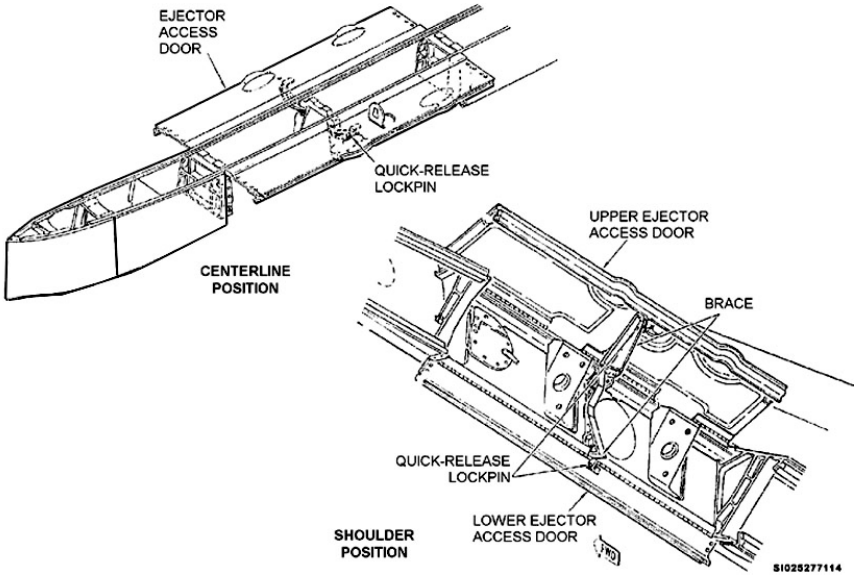

Figure 2–4. Missile mating positions.

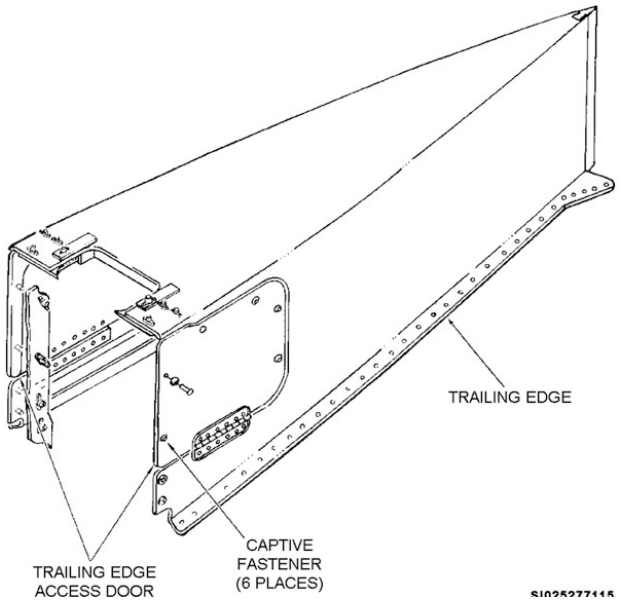

Figure 2–5. Trailing edge access doors.

Relay assembly

The relay assembly consists of switching circuitry for power and signal distribution. It signals the appropriate bypass valve to open after missile ejection. The relay assembly joins with the DR to send signals to the missiles through the umbilical cables.

Decoder receiver

The DR acts as the interface between the aircraft avionics and the missile stores. It receives electrical power and communicates data to the avionics control unit and weapon control panel. The DR joins with the relay assembly to send power and command words to the missile stores through the umbilical cables. It also sends command signals to the ejectors to release the missile.

Bypass valves

There are six bypass valves in the pylon—one for each missile position. These valves are located in pairs on the manifolds and are actuated by 28 VDC supplied by the relay assembly. When a missile is released, that station's corresponding bypass valve is signaled to close and cut off pneumatic flow to the now unused umbilical connector, thus preventing loss of needed cooling air.

Ducting

Conditioning air ducts interface with the aircraft duct system and the pylon. The conditioned air cools the avionics of the pylon and missile.

Electrical and pneumatic interface

Electrical and pneumatic missile connections are made through missile umbilical connectors on the pylon. Missile umbilical and ejector connector stowage procedures are provided for unused missile positions. Built-in ejector shorting devices for empty positions provide proper indications to the B–52 weapons panel. It is not necessary to carry empty ejectors in positions that will not be mated with missiles. Unused umbilical connectors are stored in umbilical storage brackets (fig. 2–6) or in the umbilical cover (fig. 2–7). The storage bracket arms are part of the pylon structure and secure in place around the umbilical connector with the quick-release pin shown in the figure. For the umbilical storage cover, the umbilical sits inside the cup-shaped cover and secures in place with screws.

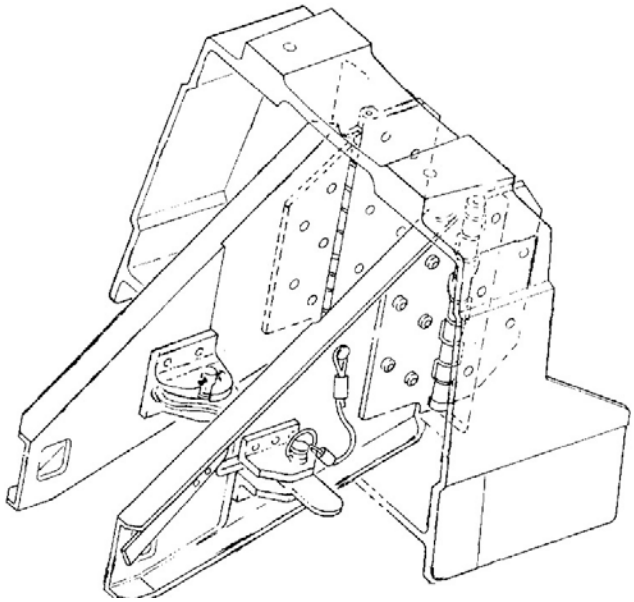

Figure 2–6. Umbilical support bracket.

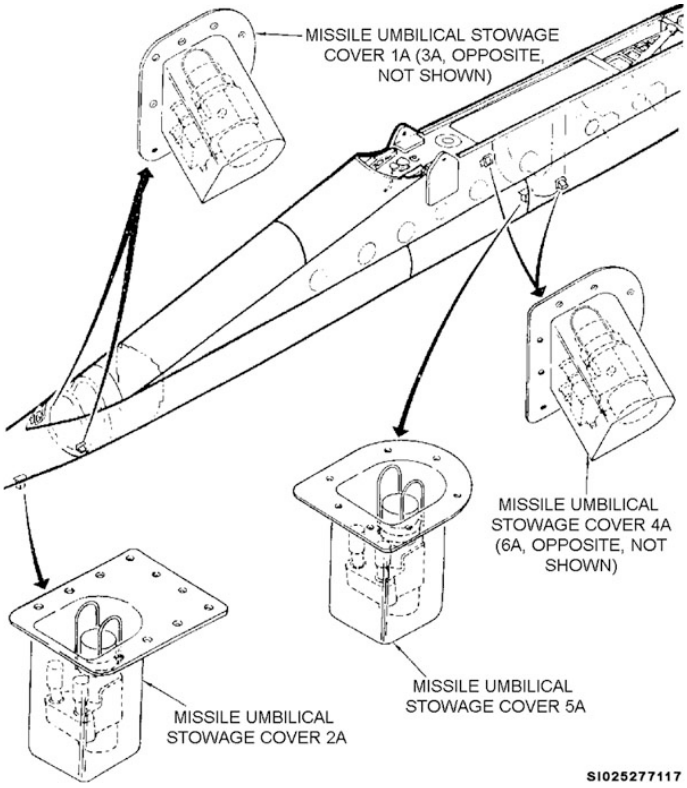

Figure 2–7. Umbilical cover.

Figure 2–8 shows the routing and location of the electrical system. Figure 2–9 shows the routing and location of the ECS. The electrical-pneumatic interface with the aircraft is through the breakaway connector, which is mounted between the forward pylon fittings (fig. 2–10). The breakaway connector creates an electrical and pneumatic connection between the pylon and aircraft or suspended loading and checkout frame (SLCF) when the pylon is mated.

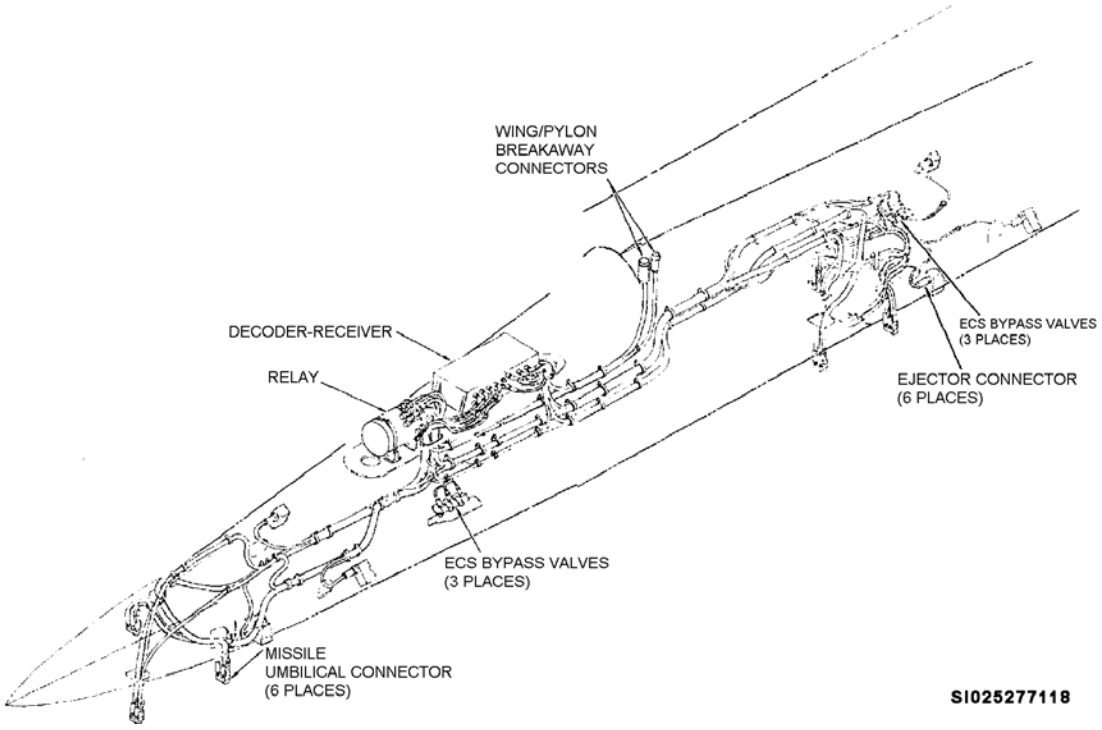

Figure 2–8. Pylon electrical system.

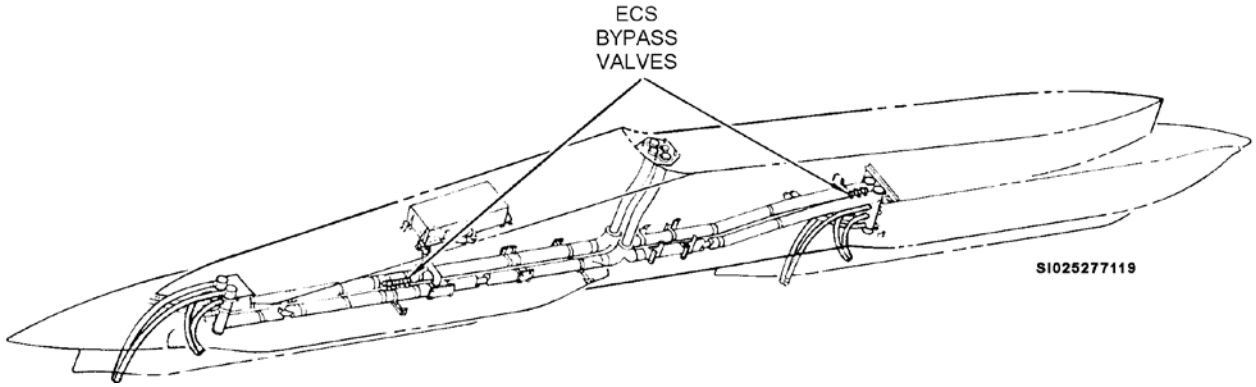

Figure 2–9. Pylon environmental control system.

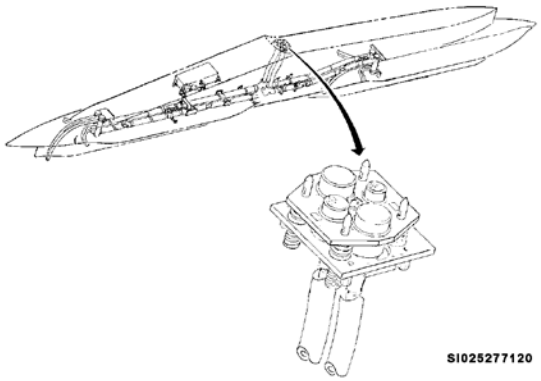

Figure 2–10. Breakaway connector.

407. Suspended loading and checkout frame and pylon loader adapters

You need certain tools and equipment when you have to work with the pylon. Inspect the equipment before each day's use, according to its respective TO. Using the proper equipment and making sure it is serviceable is very important. Disregarding this rule can damage equipment and seriously injure you or your coworkers. In the following paragraphs, we look at some of the common handling equipment and maintenance procedures for the pylon.

Suspended loading and checkout frame

The SLCF is a massive structure permanently mounted in the ceiling of the IMF that supports the pylon and launchers during checkout, loading, and maintenance. The frame is over 29 feet long, 7 feet wide, and weighs 11,000 pounds. It has a rated capacity of 56,000 pounds and is used for loading ALCMs on the pylons and launchers. An IMF will have anywhere from two to five SLCFs in the high bay. Figure 2–11 shows the pylon adapter and its mounting orientation.

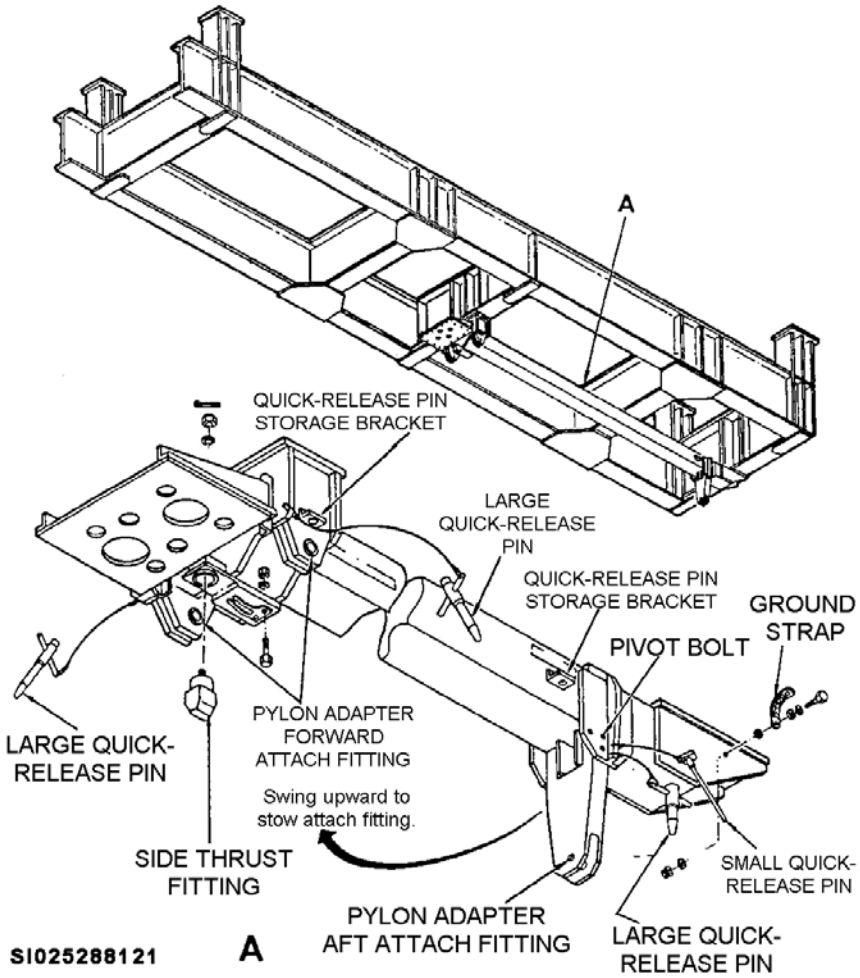

Figure 2–11. Suspended pylon/launcher loading and checkout frame.

Inspecting, maintaining, testing, and operating SLCF

TO 11N–H5079–2, *Operation and Maintenance Instruction with Illustrated Parts Breakdown, Suspended Loading/Checkout Frame*, contains detailed inspections and maintenance procedures for the SLCF. Prior to each day's use, visually determine that the equipment is serviceable.

Do not use any equipment that has been determined to be unsafe or unserviceable. The following table shows the requirements for the SLCF during the 180-day inspection:

SLCF 180-DAY INSPECTION REQUIREMENTS	
ITEM	**TASK**
SLCF	
Hydraulic lines	Visually inspect hydraulic lines and attaching hardware between adapters and facility hydraulic lines for leaks and signs of obvious damage.
Cruise missile pylon loader adapter	
General inspection	Inspect breakaway plate and connectors for damage, deterioration, and foreign material. Clean as required according to TO 00–25–234, *General Shop Practice Requirements for the Repair, Maintenance, and Test of Electrical Equipment*.
Attachment bolts	Visually inspect adapter bolts and nuts. If visual inspection indicates any nut has become loose, torque the nut to a minimum 261 (±29) foot-pounds (ft-lb.) and apply sealing compound EC-1252 to the nut, bolt threads, and washer.
Aft attachment fitting pins and lockpins	Make sure the quick-release pins are present, not excessively worn, and there is no elongation of the pinholes.
Rotary launcher assembly (RLA) adapter	
Adapter attachment nuts	Visually inspect the forward yoke support fittings attachment bolts and nuts. If visual inspection indicates any nut is loose, torque the nut to a minimum 1650 (±250) in-lb. torque and apply sealing compound EC-1252 to the nut, bolt threads, and washer. Visually inspect the aft yoke attachment bolts and nuts. If visual inspection indicates any nut has become loose, torque the nut to a minimum 175 (±25) in-lb. and apply sealing compound EC-1252 to the nut, bolt threads, and washer.
Hydraulic system	Make sure the swivel fitting does not bind when the forward yoke is down or in the stowed position.
Attachment fitting quick release pins	Make sure the quick-release pins are present and not excessively worn and there is no elongation of the pinholes.
Counterweight assembly balance	Perform counterweight balancing procedures per the TO 11N–H5079–2.
Air conditioning ducts	Check for normal wear and tear.
Air conditioning brackets, coupling, clamps, and hardware	Check all bracket hardware. Check all clamps for appropriate fit. Check the coupling for wear.

Inspecting and using ADU–490/E pylon loader adapter

The ADU–490/E pylon loader adapter (PLA) is a framework that provides support for the pylon during loading and unloading operations and during maintenance operations. The ADU–490/E also provides the interface between the pylon and the munitions lift trailer (MLT). The ADU–490/E is exclusively configured for the SUU–67/E pylon. Four swing arms support the entire weight of the pylon and are retractable for pylon removal.

Inspections and maintenance procedures for the ADU–490/E are contained in TO 11N–H5066–2, *Operation and Maintenance Instructions with Parts Breakdown, Organizational and Intermediate Maintenance Levels, Pylon Loader Adapter*.

Operational checkout

Check the operation of each leaning board for freedom of movement to and from the stowed to deployed position. Next check the operation of each leaning board lockpin for freedom of movement. Operate each swing arm drive screw (arm adjusting screw) to check for freedom of movement to

verify that all will fully extend and retract. Check each swing arm for freedom of movement to and from the stowed position. Also, check the operation of each of the four lifting hooks during extension and retraction. Be very careful when checking the lifting hooks since each hook weighs 80 pounds. If you pull too hard, you could fully remove the hook from the frame, which could result in injury.

Inspection

Prior to each day's use, visually determine that the equipment is in a serviceable condition. Do not use any equipment that has been determined to be in an unsafe condition.

The inspections and preventative maintenance is done on a 24-month cycle. Because there are minimum inspection requirements for the ADU–490/E, the time intervals for each inspection must not be exceeded. Local conditions (type of missions, special utilization, geographical locations, etc.) may dictate more frequent or more thorough inspections. Therefore, the commander and maintenance managers can use their judgment to increase the frequency or scope of any inspection as required. Listed in the table below are some of the areas that you inspect:

Pylon loader adapter	
✓	Damage, rust, or corrosion to painted surfaces.
✓	Presence and legibility of markings.
✓	Presence of and damage to reflective tape safety markers.
✓	Damage to and freedom of movement of quick release pins.
✓	Excessive wear and elongation of quick release pin holes.
Pylon loader adapter frame	
✓	Damage to identification plate and tie-down rings
✓	Damage, rust, or corrosion to lift hook holes.
✓	Missing parts of lifting hook.
✓	Freedom of operation of lifting hook.
✓	Evidence of structural failure or cracking of welds.
✓	Excessive wear or elongation of quick-release pin holes.
Walkway assemblies	
✓	Damage to fastening devices that hold walkway to frame.
✓	Damage to the ladders and leaning boards.
✓	Damage to pylon support fitting boxes and contents.
✓	Kickboards are in serviceable condition.
✓	Damage to protective pads.
Swing arms and lifting hooks	
✓	Damage to swing arms and lifting hooks.
✓	Damage to axles. Repair minor gouges, scratches, and corrosion by sanding surface using fine grit emery cloth. Reject axles for scratches or gouges that exceed 0.005 inches in depth.
✓	All swing arm drive screws (arm adjusting screws) will fully extend and retract.
✓	All swing arms rotate to and from stowed position.
✓	Evidence of binding or damage to swing arm ball attaching surfaces.
✓	Perform nondestructive inspection of four arms and four lifting hooks.

You lubricate the drive screw, leveling foot, swing arm bolt holes, faying surfaces, arm axle, thrust washer, and bushings also on a 24-month cycle. The uncoated areas of the PLA fitting are lubricated as required.

Pylon support fitting pad kit

The fitting pad kit allows the pylon to be suspended in the PLA. Figure 2–12 shows the kit and the attachment locations on the pylon. This pad acts like a “ball socket” that receives the “ball joint” from the PLA swing arm. These pylon support fitting pads are associated to the PLAs and should stay with them whenever a pylon is not in the PLA.

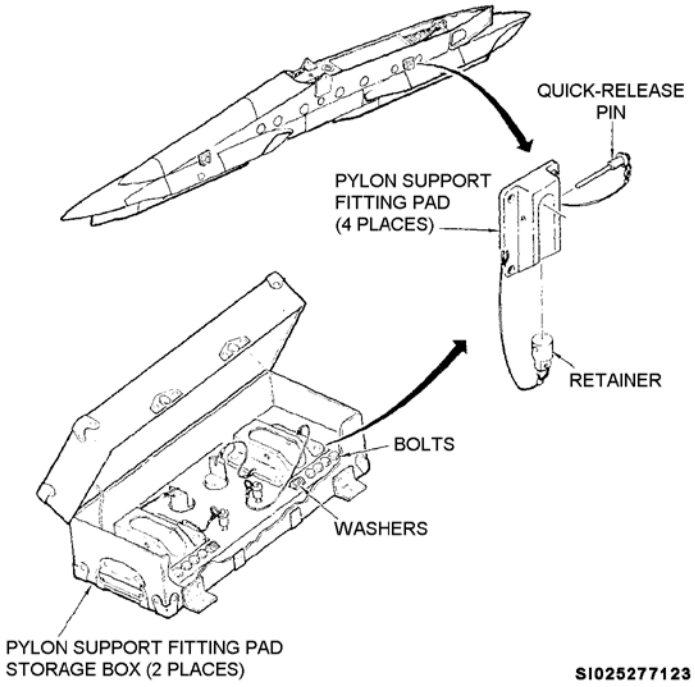

Figure 2–12. Pylon support fitting pads.

MHU–196/M munitions handling trailer

The MHT uploads and downloads the pylon from the aircraft or the SLCF. The PLA is required to transfer or transport a pylon in the trailer. Figure 2–13 shows the PLA mated to the trailer without a pylon installed.

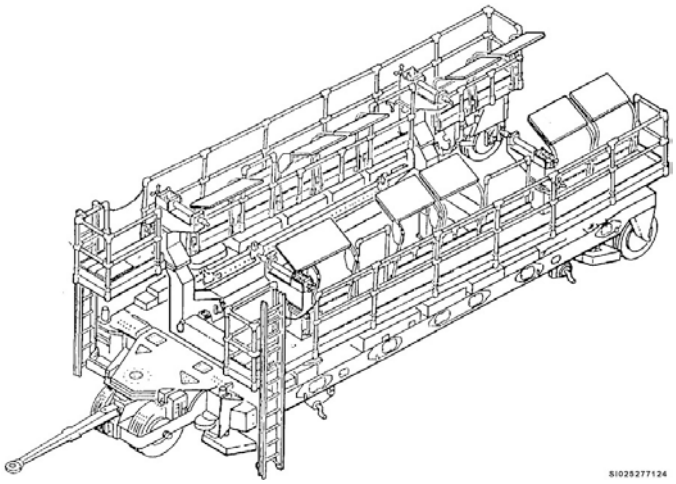

Figure 2–13. Munitions lift trailer and pylon loader adapter.

Pylon hoisting beam

Use the pylon hoisting beam (fig. 2–14) to remove the pylon from its shipping container or to load an empty pylon into the PLA. It has a rated capacity of 5,000 pounds and can be lifted with a hoist or a forklift. Ropes are attached to the beam when lifting with a hoist. This stabilizes the load since there is only one lifting point. You *cannot* use the beam to lift a pylon that has missiles installed.

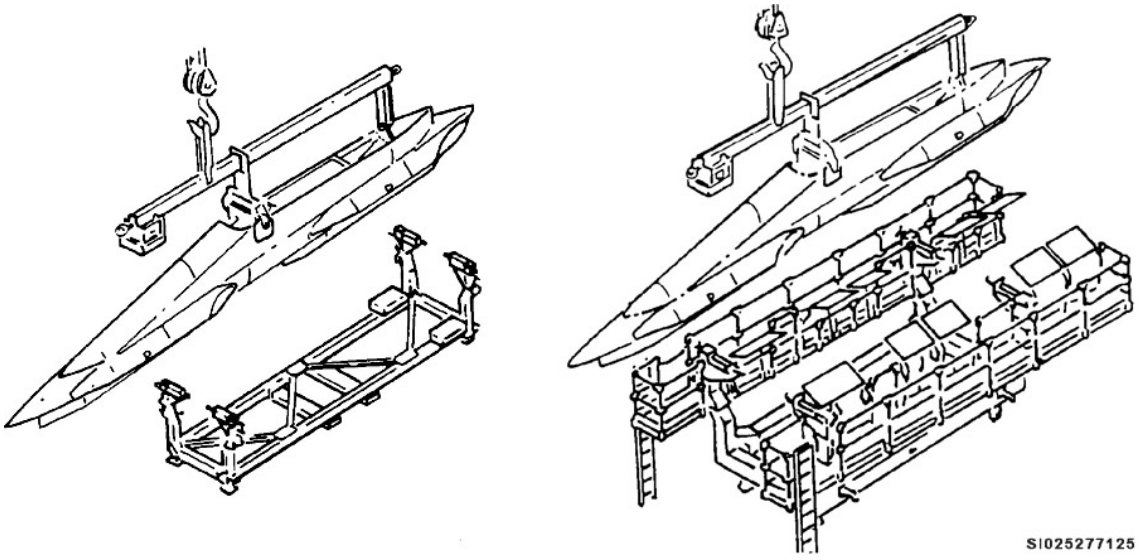

Figure 2–14. Pylon hoisting beam.

Pylon protective cover

Install the pylon protective cover when moving the pylon outside or when placing it in storage (fig. 2–15). The cover is made from a thick vinyl-type (weatherproof) material. It protects the breakaway connector, support fitting bearings, and upper pylon surface from environmental contaminants. To secure the protective cover, Velcro straps wrap around the pylon and attach to one another.

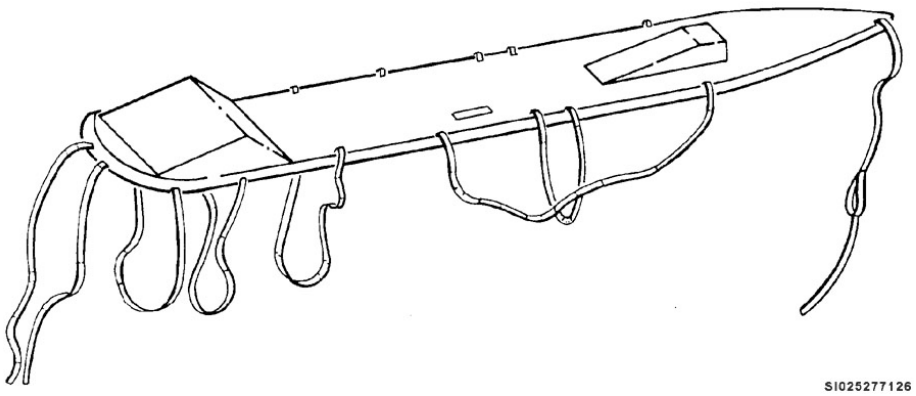

Figure 2–15. Pylon protective cover.

Nitrogen servicing cart

The nitrogen servicing cart holds two nitrogen cylinders, which provide dry air to clean electrical connectors and to check out the pylon ECS (fig. 2–16). The servicing cart and cylinders require periodic inspections to ensure they remain serviceable and reliable.

Nitrogen-charging adapter set

The nitrogen-charging adapter set (fig. 2–16) is used with the nitrogen servicing cart and facility air to perform the leak test on the pylon. It measures and controls airflow as it passes through a series of valves and meters.

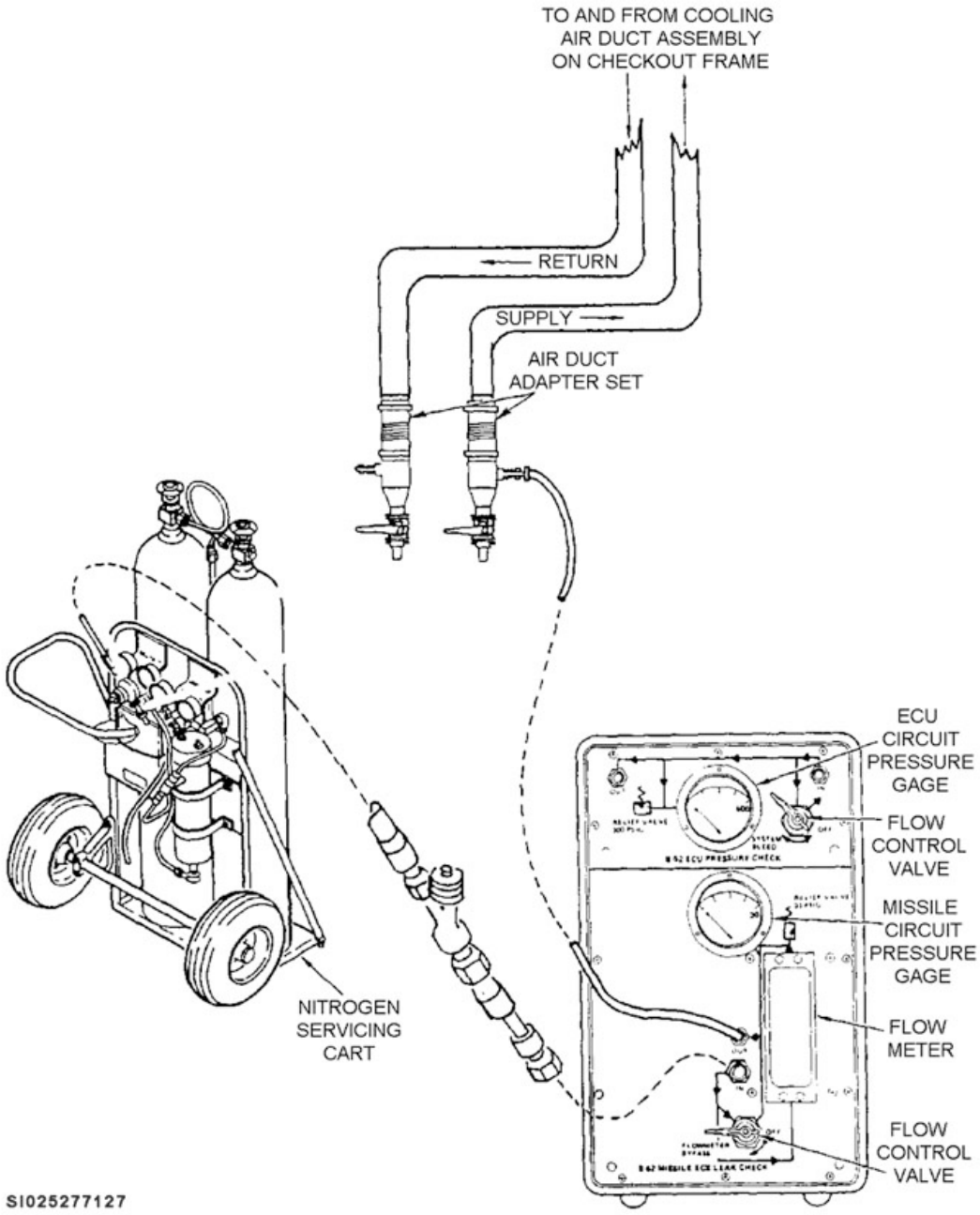

Figure 2–16. Leak test configuration.

MXU–690/E electronic component cooling unit

The MXU–690/E electronic component cooling unit (CCU) shown in figure 2–17 controls facility airflow to the missiles and pylon during check out procedures. This test set is used with a differential pressure gauge and facility air to check the function of the bypass valves. Several gauges in the CCU require periodic calibration; missile maintenance personnel maintain it.

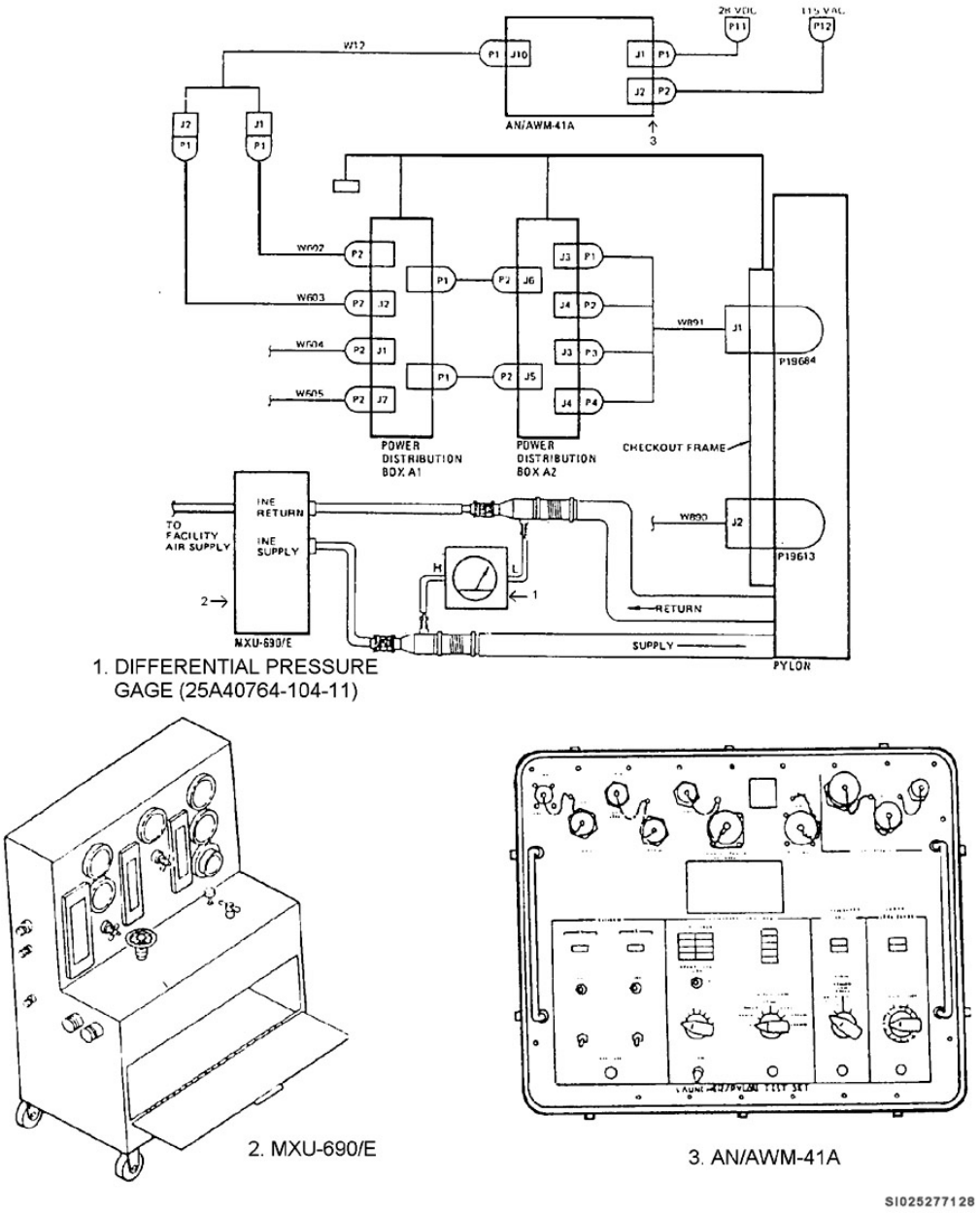

Figure 2–17. Electrical circuit test set and ECS bypass valve test setup.

Differential pressure gauge

Use the differential pressure gauge to check the operation of the bypass valves. It connects in line with the CCU. When the bypass valves open or close, the gauge indicates the pressure change. The gauge requires periodic calibration. Treat it with care.

Maintenance responsibilities

Maintenance responsibility for pylons is divided between you and 2M0X1personnel. The 2M0X1s maintain, repair, and check out the electronic components. You do the mechanical maintenance and repair. There are a few shared responsibilities. You may do minor electronic work and the 2M0X1s may do some mechanical work. Most of the 2M0X1s' work involves using and maintaining the electrical system test set (ESTS), which is a large computerized test unit used to checkout missiles and delivery systems.

For pylon maintenance, use TO 16W6–33–1, *Operation and Maintenance Instruction, Organizational and Intermediate Maintenance Levels, Aircraft Pylon Type SUU–67/A.* It covers operational checkout, inspection, preventive maintenance, troubleshooting, component repair or replacement, disassembly, cleaning, corrosion control, lubrication, and pylon assembly. We touch on a couple of these procedures.

Inspection and preventive maintenance

Periodic inspection is required every 24 months. The 24-month inspection requires a complete download of missiles. Table 5–1 in TO 16W6–33–1 lists the items to be inspected and acceptance criteria. Periodic inspections are mostly visual and normally do not require major pylon disassembly. Open access doors and remove access covers to inspect the interior equipment and hardware. Lubrication of pylon bearings is also an important part of preventative maintenance (fig. 2–18).

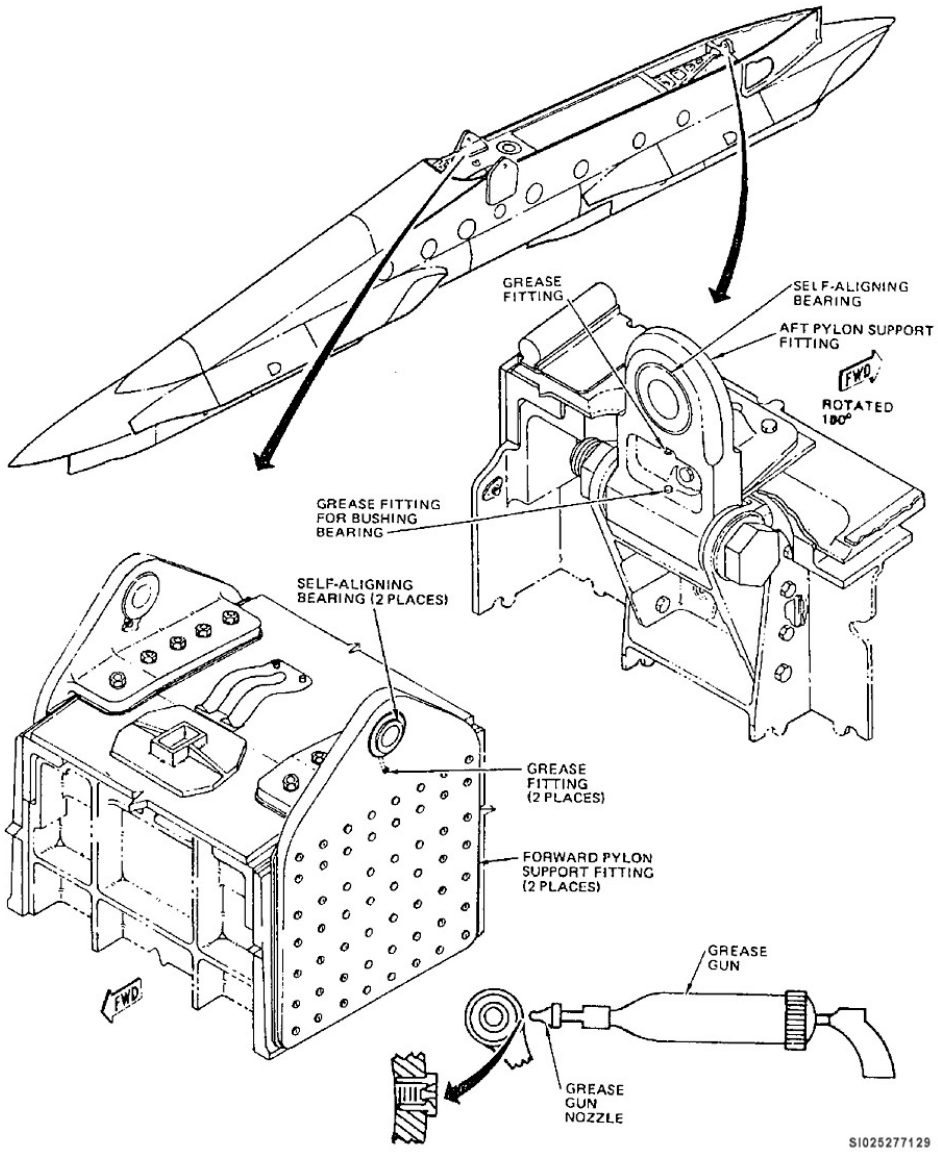

Figure 2–18. Pylon bearings.

Operational readiness inspection

The different operational readiness inspections that you perform are a preload inspection, final inspection, post download inspection, or a cross load inspection. A preload inspection is required prior to installing a missile or missiles on a pylon. You perform a final inspection after a pylon missile upload and prior to placing the pylon in ready storage. After removing a loaded or unloaded pylon from the SLCF or aircraft, you perform a post download inspection. A cross load inspection is performed following download of the pylon from an aircraft and before upload on the same aircraft or a different aircraft. Table 3–1 in TO 16W6–33–1 shows you what items to inspect and what conditions to look for during each inspection.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

406. Pylon introduction

1. Which pylon carries the ALCM?

2. What are the electrical and pneumatic requirements for operating the pylon in the maintenance facility?

3. In any position, how many missiles can be mated to the pylon?

4. The pylon has nuclear hardness design features. What does this mean?

5. How many bypass valves are in the pylon?

6. What provides the proper indications to the B–52 for empty pylon positions?

7. Where are unused umbilical connectors stored?

407. Suspended loading and checkout frame and pylon loader adapters

1. What equipment supports the pylon during checkout, loading, and maintenance?

2. What supports the pylon when it is not hanging in the frame?

3. When would you use the pylon hoisting beam?

4. Why is the pylon protective cover required?

5. What equipment controls facility airflow to the missiles and pylon during checkout?

6. What TO covers maintenance procedures for the pylon?

7. What is required for the pylon 24-month inspection?

2–2. Aircraft Guided Missile and Bomb Rotary Launchers

The aircraft guided missile and bomb rotary launcher (AGMBRL), more frequently called the CSRL, was developed and built by Boeing Military Aircraft Company for use with the B–52 aircraft. The rotary launcher assembly (RLA) was built by Boeing Military Aircraft Company for use with the B–2 aircraft. The launcher design provides an aircraft interface for bombs as well as for missiles. This adaptability for bombs resulted in the retirement of the clip-in assembly; the bomb's only other interface since the early 1960s. We divide our discussion of the CSRL/RLA into two lessons. In the first lesson, we describe the launchers. The second lesson covers the support equipment and some maintenance procedures used with the CSRL and RLA. Because the CSRL and RLA are very similar in design, we note *only* the differences.

408. Common strategic rotary launcher and rotary launcher assembly introduction

The CSRL (fig. 2–19) carries up to eight B61 bombs, eight B83 bombs, or eight ALCMs. The RLA (fig. 2–20) can carry eight B61–7 bombs, four B61–11 bombs, or eight B83 bombs. The CSRL cannot carry a mixed load of bombs and missiles. The RLA can carry a mixed load of bombs (B61s/B83s). Bombs are carried on alternating forward and aft weapon positions while ALCMs are carried only in the aft position. Weapons are ejected one at a time from the bottom centerline or the six o'clock position, also known as the *index position*.

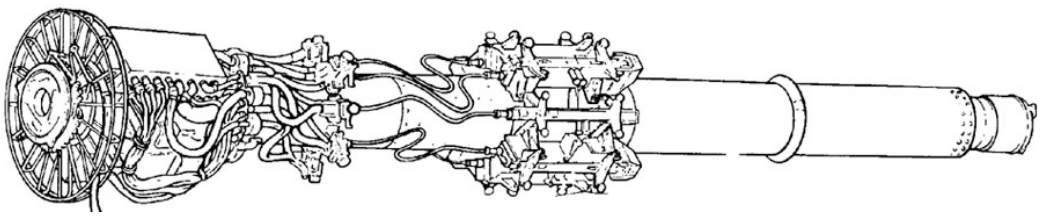

Figure 2–19. Common strategic rotary launcher.

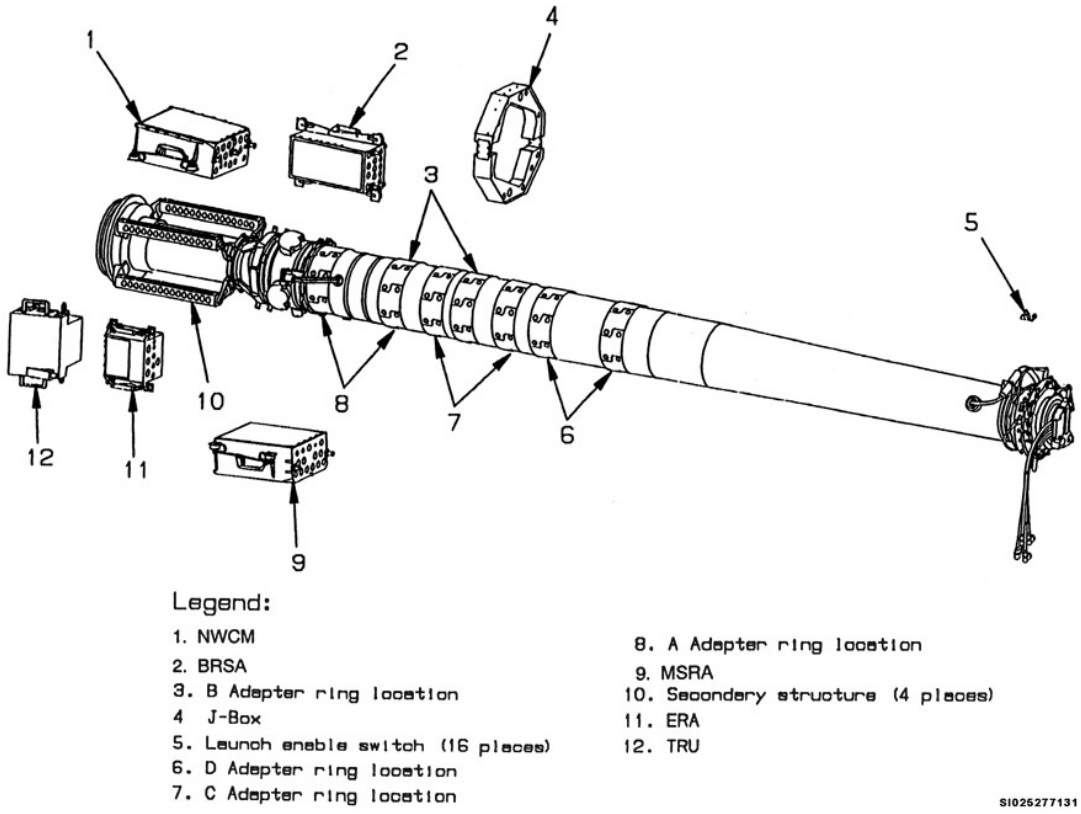

Figure 2–20. Rotary launcher assembly.

The CSRL and RLA contains nuclear hardness design features, which means the launchers have components which might fail to function properly during nuclear blast exposure if exact maintenance procedures are not followed. The nuclear blast environment includes nuclear radiation, EMP, and thermal radiation. It is imperative that nuclear hardness of the CSRL and RLA be maintained. We do this by exactly following procedures in maintenance manuals, which are clearly identified as HCPs. The launcher is divided into three major components/systems:

1. Mechanical interface.
2. Electrical system.
3. Pneumatic system.

Mechanical interface

The mechanical interface consists of the shaft, forward drive fittings, and an aft fitting assembly. All three combine to make a solid structure that can easily support 30,000 pounds. The system is easy to maintain as well as easy to load. The CSRL is over 22 feet long and weighs 3,428 pounds. The RLA is over 22 feet long and weighs 2,160 pounds.

Shaft

The shaft is made from 15-inch diameter tubular stainless steel (fig. 2–21). The forward and aft ends have bearing-mounted fittings that interface with the aircraft. Brackets on the shaft support the launcher's avionics components. The weapons, with ejectors installed, are bolted directly to the shaft. It also houses the cooling ducts from the aircraft. The electrical cables are located on the front end and are routed through a cable reel.

The RLA shaft is made of graphite/epoxy composite. The forward and aft ends have spherical bearings installed for quick installation and removal of the launcher from aircraft or SLCF. There are 52 weapon attach shear fittings that provide support for ejector pylon interface (PI) fittings. The

aircraft to launcher interface at the aft end of the launcher consists of an electrical twist cable located within the structural shaft.

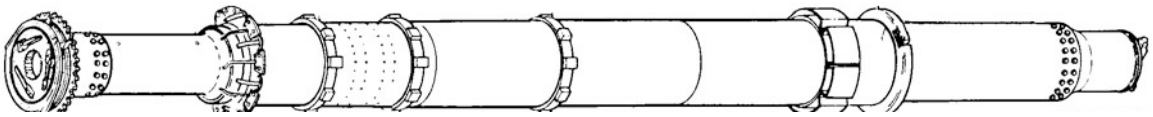

Figure 2–21. CSRL stainless steel shaft.

Forward drive fitting

The forward drive fitting interfaces the front of the launcher with the aircraft power drive unit, SLCF forward yoke, or the launcher-loading adapter. Refer to figure 2–22 for the locations of the forward drive fitting components. The forward drive fitting consists of a housing (A), spline drive assembly (B), bearing (C), bearing retainer, and aerospace ground equipment (AGE) ring (D). The pneumatic return line passes through the center of the spline drive. The bearing that allows the launcher to rotate is connected to the main shaft with a spline and three drag-link assemblies (E). The RLA forward end fitting contains a crowned spline that interfaces with the aircraft or SLCF for rotation. The RLA has an open-ended (no return) ECS. A coupling system in the forward end fitting connects to the aircraft/SLCF ECS. Conditioned air enters from the forward end fitting and is distributed through ducts, manifolds, and hoses.

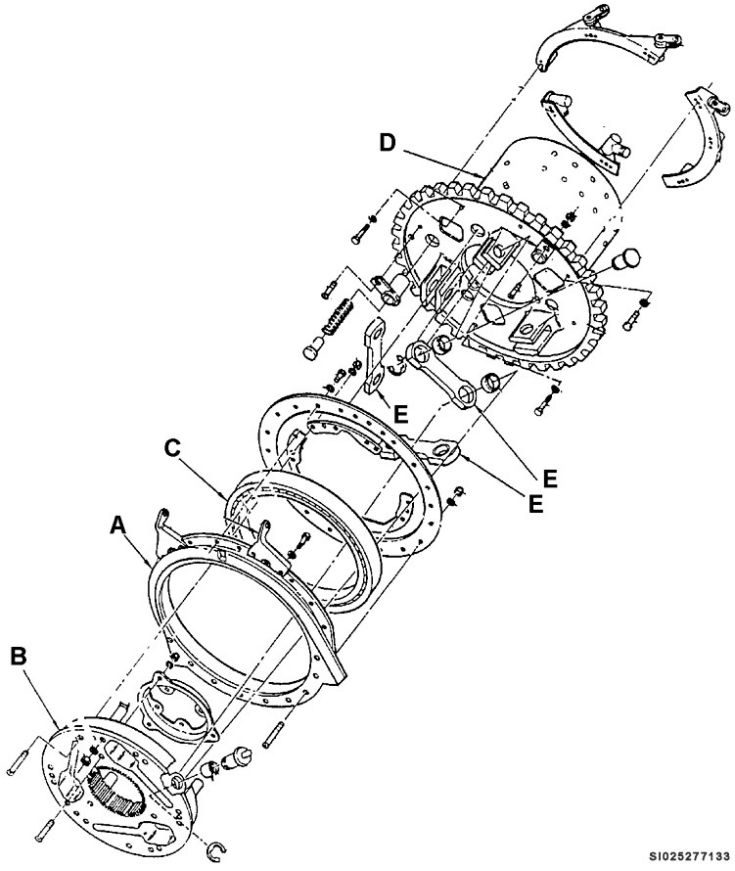

Figure 2–22. Forward drive fitting.

Aft end fitting assembly

The aft end fitting assembly (fig. 2–23) interfaces the aft end of the launcher to the aircraft aft yoke assembly, SLCF aft yoke, or the launcher-loading adapter. The aft end fitting assembly is made up of a retainer, mono-ball bearing, aft bearing housing, and aft end fitting. The pneumatic supply line passes through the end fitting centerline and provides air to the launcher. The launcher aft end fitting provides mechanical and structural support for the aircraft and SLCF.

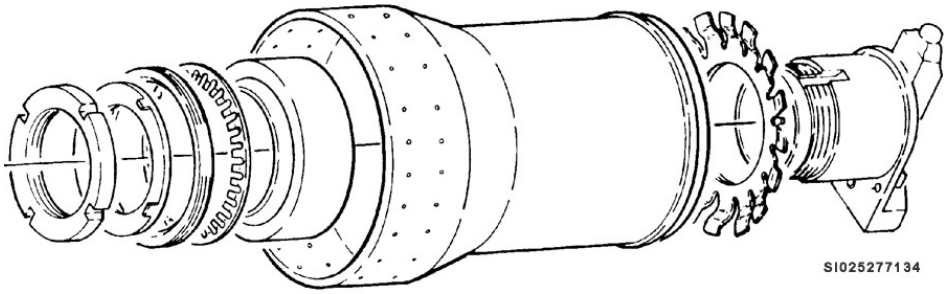

Figure 2–23. Aft end fitting assembly.

Electrical system

The CSRL electrical system consists of a DR, nuclear station logic unit (NucSLU), relay assembly, and associated nuclear-hardened wiring that interfaces with the weapons. The DR is the interface for ALCMs and the NucSLU is the interface for gravity bombs. The avionics system electronically controls and mechanically controls launcher rotation for weapon release. The enable switches communicate launcher position to the system. The RLA electrical system consists of a nuclear weapons control monitor (NWCM), transformer rectifier unit (TRU), bomb status relay assembly (BSRA), missile status relay assembly (MSRA), ejector relay assembly (ERA), dummy connector shorting plug, and launch enable switches (LES) (fig. 2–20).

Relay assembly

The relay assembly (CSRL) (fig. 2–24) consists of switching circuitry for power and signal distribution. It signals the appropriate bypass valve to open after missile ejection. The relay assembly joins with the DR to send signals to the missiles through the umbilical cables.

NWCM

The NWCM (RLA) provides control, monitor, release, and ejection of launcher mounted weapons.

DR

The DR (CSRL) (fig. 2–24) acts as the interface between the aircraft avionics and the missile stores. It receives electrical power and communicates data to the avionics control unit and weapon control panel. The DR joins with the relay assembly to send power and command words to the missile stores through the umbilical cables. It also sends command signals to the ejectors to release the missile.

TRU

The TRU (RLA) converts aircraft primary AC power to DC power and provides 28 VDC regulated power for launcher-mounted electronics and 35 VDC unregulated power for squib firing.

NucSLU

The NucSLU (CSRL) (fig. 2–24) acts as the interface between aircraft avionics and gravity bombs. It receives electrical power from the relay assembly and communicates command data to the aircraft avionics control unit. The NucSLU also sends commands to the ejectors for bomb release.

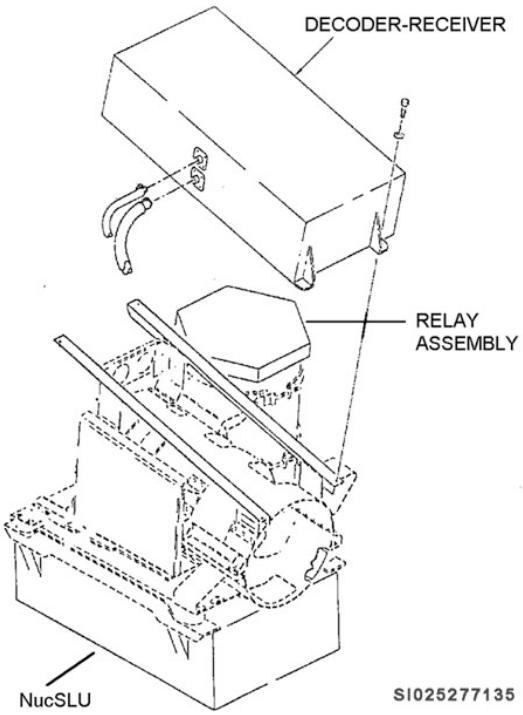

Figure 2–24. Launcher avionics.

Cable reel

The aircraft-to-launcher interface cable is at the forward end of the launcher and coils around a cable reel (CSRL). The cable reel (fig. 2–25) protects the aircraft-to-launcher cable from becoming tangled during launcher rotation. The cable reel remains stationary while the launcher rotates.

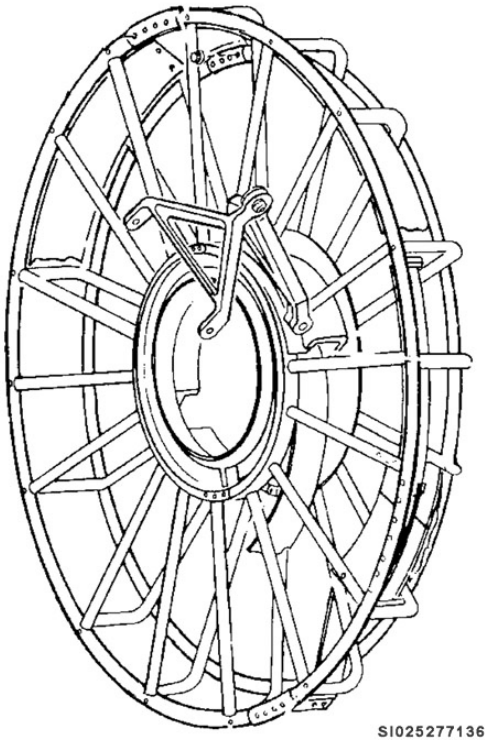

Figure 2–25. Cable reel.

BSRA

The BSRA (RLA) interfaces directly with bombs by providing discrete controls and monitor power.

Enable switches

The launcher (CSRL) is equipped with eight enable switches (fig. 2–26), one for each weapon station. These switches are located on the AGE ring and rotate with the launcher. When the launcher rotates to the index position for weapon release, a cam activates the corresponding enable switch for that station to the closed position and provides a ground path to unlock the indexed ejector.

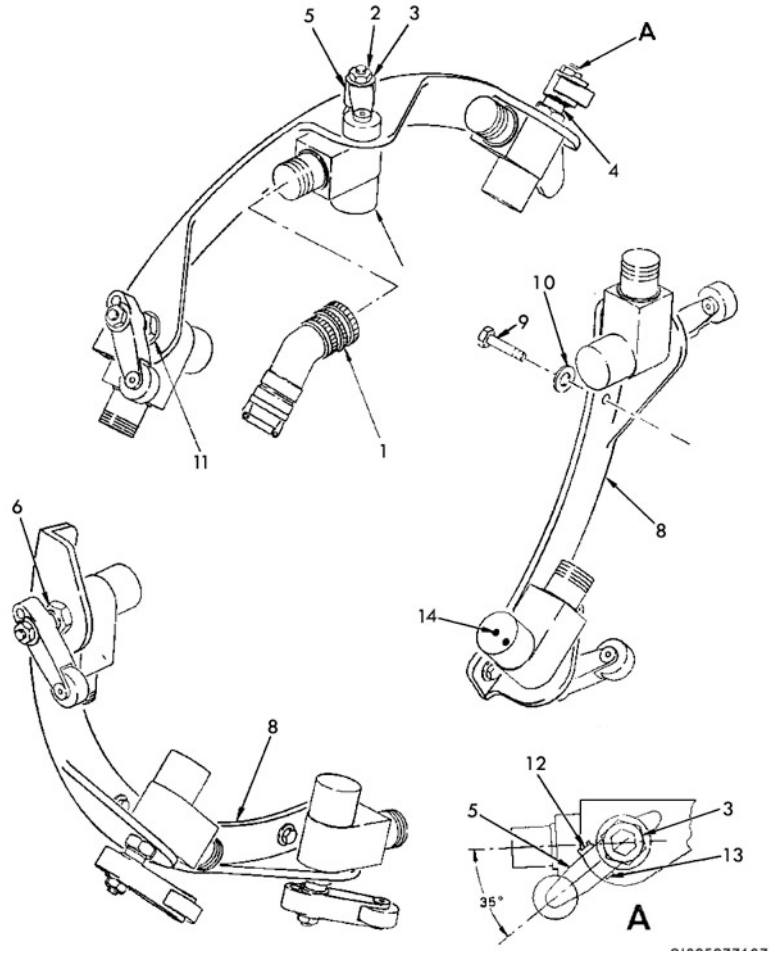

Figure 2–26. Enable switches.

Electrical relay assembly

The electrical relay assembly (RLA) interfaces directly with ejectors, the TRU, and the NWCM.

Dummy connector shorting plug

The dummy connector-shorting plug (RLA) completes pre-arm circuits in the NWCM.

LES

The 16 LESs (RLA) located at the aft end of the launcher prevent ejector squib fire signal from being received by an ejector at any location except the index (6 o'clock) position.

Pneumatic system

The CSRL pneumatic system provides cooling air to the DR, the NucSLU, and to the missiles through the umbilical air hoses. When gravity weapons are loaded, a shut-off valve at the NucSLU is opened to allow cooling air into the NucSLU. The RLA pneumatic system provides cooling air for the NWCM, TRU, BSRA, and MSRA.

Umbilical air hoses

There are eight umbilical hoses (fig. 2–27) on the launcher (CSRL), one for each position. The umbilical is a flexible connection between the launcher avionics and pneumatic system and the missile. The umbilical assembly has an air supply hose, air return hose, electrical cable, and umbilical connector.

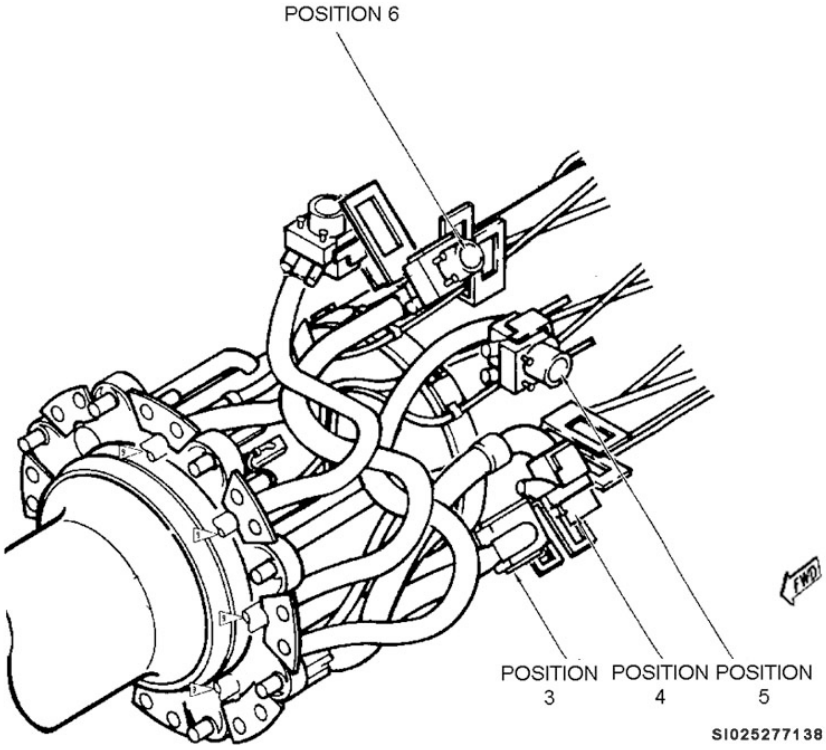

Figure 2–27. Umbilical hoses and umbilical connector.

Bypass valves

There are eight bypass valves (fig. 2–28) on the launcher (CSRL), one for each missile position. These valves are located in pairs on the manifolds and are actuated by 28 VDC supplied by the relay assembly. When a missile is released, that station's corresponding bypass valve is signaled to close and cut off pneumatic flow to the now unused umbilical connector, thus preventing loss of needed cooling air.

Ducting

CSRL conditioning air ducts (fig. 2–28) interface with the aircraft duct system at the centerline of the launcher. Air enters the launcher from the aft end and returns through the power drive unit drive spline at the forward end of the launcher. The RLA is an opened (no return) system. A coupling system in the forward end fittings distributes conditioned air through ducts, manifolds, and hoses.

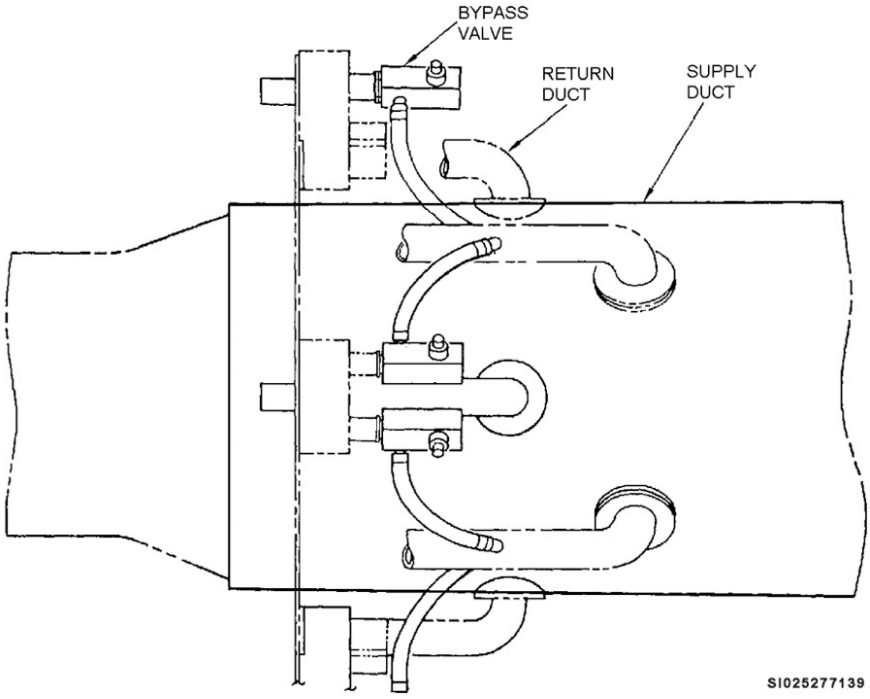

Figure 2–28. Ducting and bypass valves.

409. Inspecting, maintaining, and operating common strategic rotary launcher and rotary launcher assembly

Like the pylon, a number of tools are required for working with the CSRL and RLA. Inspect this equipment before each day's use, according to its respective TOs. Using the proper equipment and making sure the equipment is serviceable is very important. Disregarding this rule can damage equipment and/or seriously injure you or your co-workers. In the following paragraphs, we look at some of the common equipment items and maintenance procedures for the CSRL and RLA.

Nitrogen-charging adapter set

Just like the pylon, the nitrogen-charging adapter set (CSRL) performs the pressurization and leak test on the CSRL. It is used with the nitrogen servicing cart and facility air supply.

Environmental control system bypass valve adapter cable

This locally manufactured adapter cable (CSRL) is used for testing the launcher. Missile maintenance personnel make this cable adapter.

MXU–690/E electronic component cooling unit

The MXU–690/E (CSRL/RLA) controls airflow to the CSRL and RLA during checkout. This test set is used with the differential pressure gauge (CSRL), and the facility air. Missile maintenance personnel maintain this piece of equipment.

Differential pressure gauge

This special gauge (CSRL) connects in line with the CCU and checks for proper operation of the bypass valves. As the bypass valves open and close, the gauge indicates the pressure change. The gauge requires periodic calibration and must be treated with care.

Nitrogen-servicing cart

The nitrogen-servicing cart holds two nitrogen cylinders, which provide dry air to clean electrical connectors and to check out the CSRL. The servicing cart and cylinders require periodic inspections to ensure they remain serviceable and reliable.

MHU–196/M and MHU–204/M munitions lift trailers

The MLTs transport, upload, and download the CSRL and RLA to/from the aircraft and SLCF. The launcher loader adapter (LLA) is required to transfer the CSRL and RLA in the trailer.

Suspended loading and checkout frame

The SLCF is a massive structure that supports the CSRL and RLA during checkout, loading, and maintenance. The frames are approximately 29 feet long, 7 feet wide, and weigh 11,000 pounds. It has a rated capacity of 56,000 pounds and is used for loading ALCM and gravity bombs onto CSRL or RLA. An IMF has anywhere from two to five SLCFs in the high bay. Figure 2–29 shows the CSRL adapter yokes mounted on the frame and extended for use. Inspection and maintenance procedures are the same as we mentioned earlier.

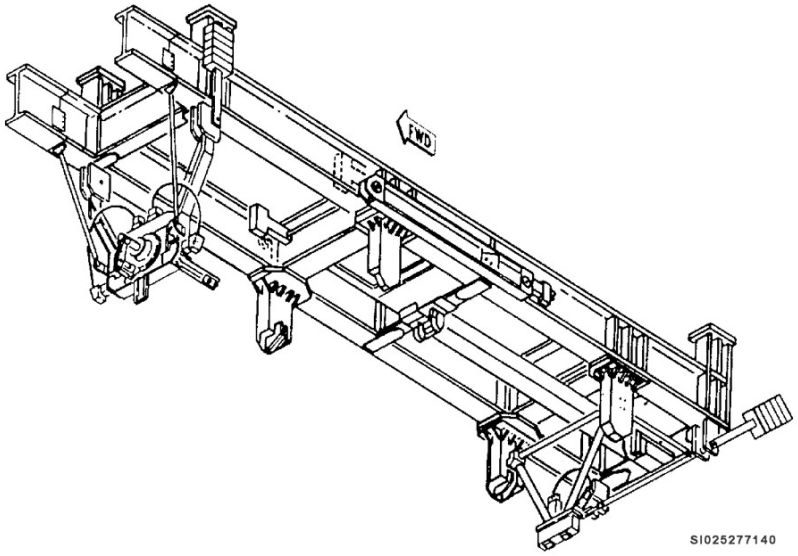

Figure 2–29. Common strategic rotary launcher yokes installed on the SLCF.

ADU–555/E (CSRL)/ADU–728/E (RLA) launcher loader adapter

The LLA supports the launcher when it is not in the SLCF and is also used to load the launcher to the aircraft. Figure 2–30 shows the LLA without the launcher installed.

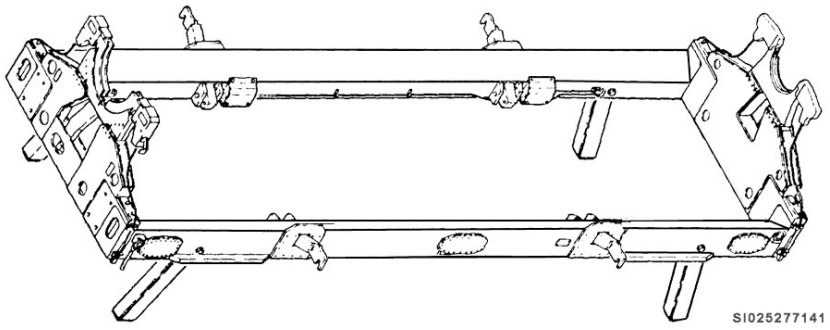

Figure 2–30. Launcher loader adapter.

Inspection and maintenance procedures for the ADU–555/E and ADU–728/E are contained in TO 11N–H5084–2, *Operational and Maintenance Instructions, Intermediate Maintenance Level, Launcher Loader Adapter*. Due to the volume of areas to be inspected, we only mention a few.

Some of the areas to be inspected are corrosion, markings, adapter hook nondestructive inspection, and fasteners for security.

Preparation for use

When you receive the CSRL or RLA at the IMF, perform the following procedures to prepare the launcher for use:

1. Install the launcher in the frame.
2. Install applicable electronics per applicable TOs.
3. Configure it for the type of load (missile or bomb).
4. Inspect pneumatic, electrical, and mechanical interface systems.
5. Perform a general condition inspection.
6. Perform pneumatic and electrical system operational checkout.

Preparation for shipment

Preparation for shipment consists of removing the DR, relay assembly, and NucSLU. Secure all loose cables to the launcher. No electrical checkout is required since you must do this procedure before loading weapons. The CSRL and RLA are shipped in the LLA (with the legs in the stored position). Place the launcher/LLA on the forward and aft dunnage platforms (fig. 2–31). TO 11N–L5001–2, *Aircraft Guided Missile and Bomb Rotary Launcher—Type A/A 48K–1 (V) 2*, and TO 11N–L5006–2, *Aircraft Guided Missile and Bomb Rotary Launcher—Operation and Maintenance Instructions*, give specifications for locally manufacturing the platforms. This shipping configuration keeps the launcher/LLA off the ground, protects it from damage, and is used for transport on a flatbed trailer.

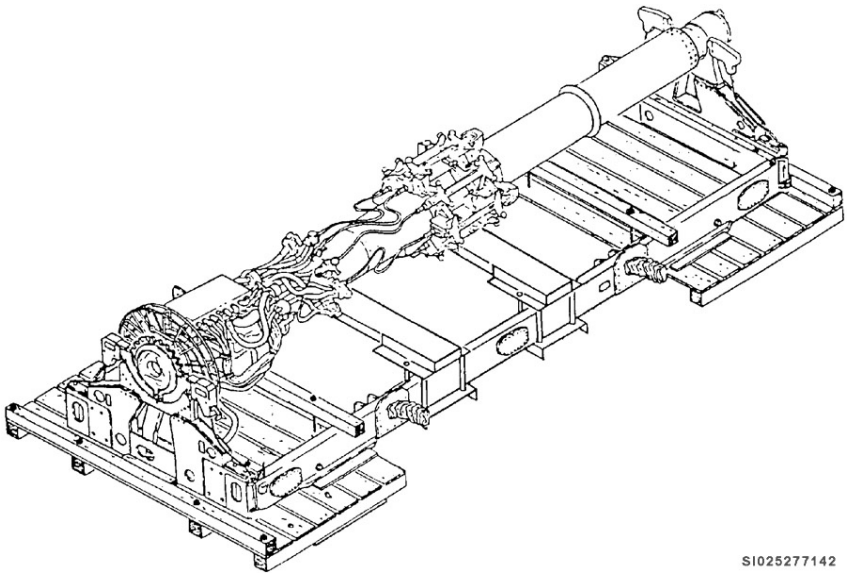

Figure 2–31. Launcher/launcher loader adapter in shipment configuration.

Launcher configuration

There are two configurations for the CSRL launcher: missile and bomb. For bomb configurations, some components have to be removed while some are moved to different positions on the launcher. The RLA can be configured with various gravity weapon combinations. Launcher configuration for the RLA includes ensuring all electronic assemblies are installed and launcher cable assemblies are positioned for proper “D” ring location. Once the reconfiguration is complete, inspect the launcher for damage that may have occurred during the configuration process. To configure the launcher for missiles, use the TO to guide you through steps that reverse those actions you took to configure the launcher for bombs.

Inspecting the launcher

General inspection of the CSRL and RLA consists of inspecting and cleaning the ejector attachment bolt holes, checking for proper safety wire installation, cleanliness of the launcher, and checking the attaching hardware for serviceability. Next, you inspect the electrical and pneumatic systems.

The *electrical system inspection* includes inspecting all cables and connectors. Use the inspection criteria for electrical connectors in TO 11N–35–51. A part of this inspection involves checking the cable routing and ensuring the interface harness is secured to the cable reel with three hose support straps. (These are 10-inch nylon straps with Velcro on the ends.)

The *pneumatic system inspection* on the CSRL confirms the position of the NucSLU shut-off valve, checks for damage to the pneumatic ducting, and verifies the security of all attaching hardware. The NucSLU shut-off valve is in the *open* position for *gravity bombs*; it's in the *closed* position for *missiles.*

Environmental control system operational checkout

In addition to the previous checks (CSRL), you also perform an operational check of the ECS. This checkout consists of two separate tests: pneumatic leakage test and bypass valve operation test.

The *pneumatic leakage test* is a checkout of the pneumatic system to ensure there is no air leakage from the umbilical cables, pneumatic lines, or any other connections. The leakage test may be performed with stores mated to the launcher. The *bypass valve operation test* ensures that each bypass valve will stop the airflow and reroute the air at each station after a missile has been launched. The launcher must be empty (no stores mated) to perform this test.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

408. Common strategic rotary launcher and rotary launcher assembly introduction

1. How many and what type of weapons does the CSRL carry?

2. How many and what type of weapons does the RLA carry?

3. How are weapons ejected from the launcher?

4. What are the three major components/systems that make up the launcher?

5. What two electrical system components of the CSRL send signals to the missiles through the umbilical cables?

6. What component of the RLA provides control, monitor, release, and ejection of launcher-mounted weapons?

7. What component of the CSRL acts as the interface between aircraft avionics and gravity bombs?

8. What is the purpose of the CSRL cable reel?

9. When the launcher is in the *release* position, what do the CSRL enable switches provide?

10. What components make up the umbilical assembly?

11. How many bypass valves are on the CSRL launcher?

12. What type of duct system does the RLA contain?

409. Inspecting, maintaining, and operating common strategic rotary launcher and rotary launcher assembly

1. What equipment lifts, transports, uploads, and downloads the launcher to and from the aircraft and SLCF?

2. What equipment supports the launcher when it is not installed in the checkout frame?

3. List the steps required to prepare a CSRL launcher for use after initial receipt.

4. What are the two CSRL and RLA configurations for the launcher?

5. When inspecting the pneumatic system, what do you check?

6. How do you position the NucSLU shut-off valve during bomb launcher configuration on the CSRL?

7. What two tests on the ECS of the CSRL do you perform?

8. Which ECS operational checkout can you perform with stores mated to the launcher?

2–3. MAU–12D/A and BRU–44/A Aircraft/Bomb Ejector Rack Assemblies

Ejector racks secure missiles and bombs to the pylon, CSRL, and RLA. The racks serve as a mating adapter as well as a reliable means of releasing the weapon. The ejector by itself is the basic component. Since each weapon is different, adapting the ejector to each weapon is required. Ejectors are adapted by PI fittings and sway brace feet.

In this section, we'll look at the MAU–12D/A and BRU–44A/A ejector rack assemblies. Pylon and launcher TOs govern which ejector is used (MAU–12D/A for pylon/CSRL and BRU–44/A for RLA), cleaning of the ejector, and inspection intervals. Pylon and launcher TOs direct you to use TO 11B29–3–25–2, *Field Maintenance and Overhaul Instructions with Illustrated Parts Breakdown, Aircraft Bomb Ejector Rack Assembly MAU–12D/A*, or TO 11B29–3–63–1, *Field Maintenance and Overhaul Instructions with Illustrated Parts Breakdown, Aircraft Bomb Ejector Rack Assembly*, for maintenance on the ejector. The ejector TO contains all the information required to inspect, overhaul, lubricate, and checkout the MAU–12D/A and BRU–44/A.

410. Ejector rack description

The MAU–12D/A and BRU–44/A (fig. 2–32) can forcibly eject or free-fall release conventional and nuclear munitions. The MAU–12D/A ejector can support stores up to the 5,000-pound weight class. It is 32 inches long, 11.25 inches wide (at the sway braces), and weighs about 70–90.5 pounds. The BRU–44/A is a little beefier and heavier, weighing about 130 pounds. Operating temperatures range from –65 to +350º F.

The racks operate by electrically firing impulse cartridges, which, in turn, actuate a gas-operated system to open the shackles that secure the weapon. The rack consists of eight major components/assemblies:

1. Side plate assemblies.
2. Mounting channel assemblies.
3. Piston block and orifice assemblies.
4. Shackle assemblies.
5. Gas tube assembly.
6. Breech assembly.
7. Arming solenoids.
8. Wire harness assembly.

Side plate assemblies

Two side plates (fig. 2–33) make up the assembly: left side plate and right side plate. They are 32 inches long and 6 inches high. They bolt to the mounting channel assembly and provide a side structure for the rack. Each side plate has four steel bushings, which form the bomb shackle pivot points. There are holes in each side for the mounting bolts, manual release access, and ground safety pin. The left side plate has an additional cutout for the breech assembly and cartridge retainers.

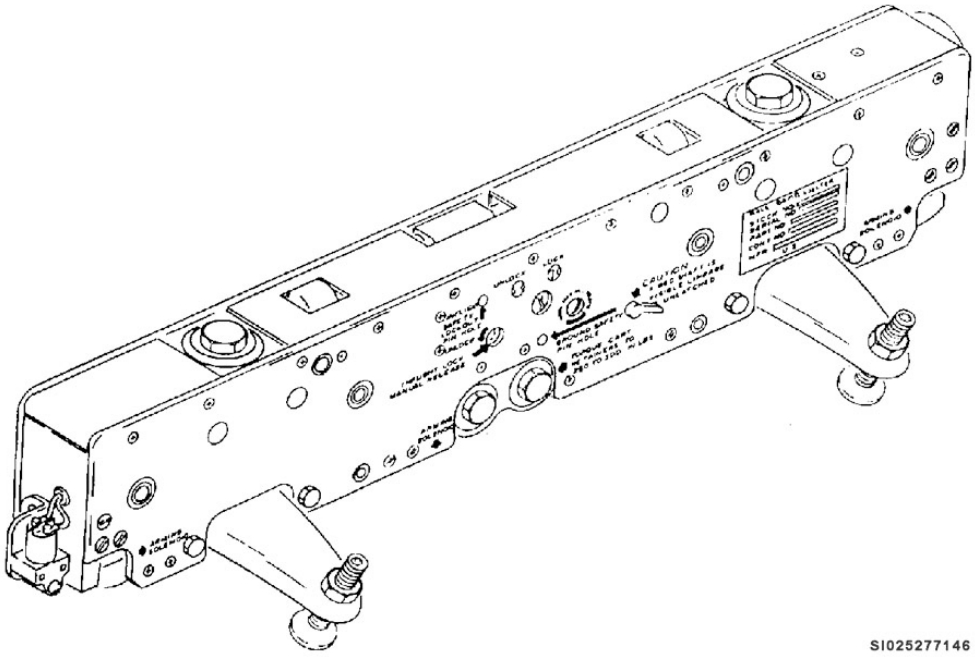

Figure 2–32. MAU–12/BRU–44 ejector rack.

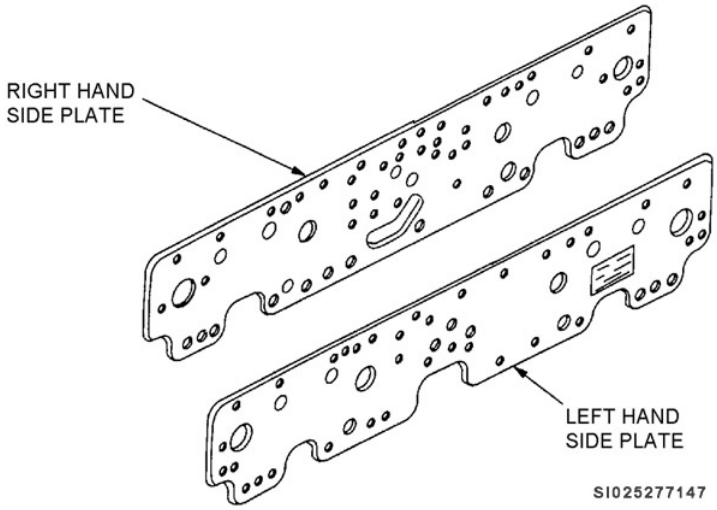

Figure 2–33. Side plates.

Mounting channel assemblies

The mounting channel assemblies (fig. 2–34) consist of the upper closeout channel, resistor mounting channel, and the channeling assembly. All three bolt between the side plates. The upper closeout channel is located between the piston and orifice assembly on top of the bomb rack. The resistor-mounting channel is located at the upper rear part of the bomb rack above the electrical receptacle. Two resistors are mounted on the underside of the assembly. The channeling assembly is located on the upper forward area and serves as a spacer between the side plates.

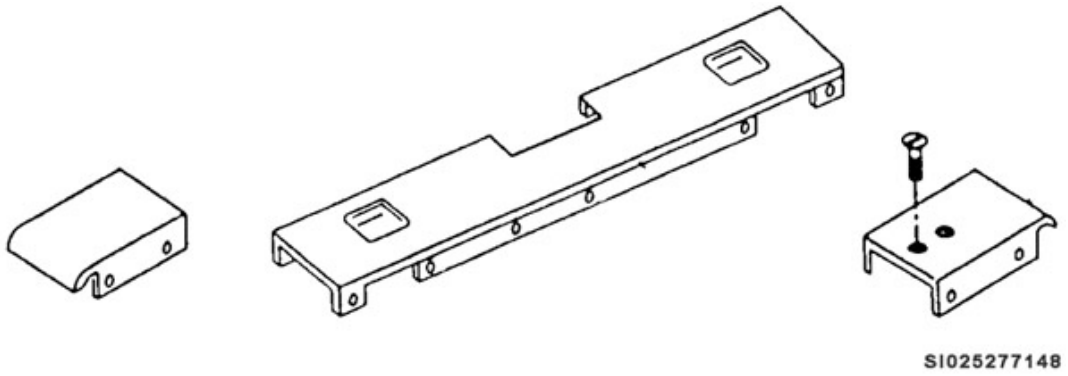

Figure 2–34. Mounting channel assembly.

Piston block and orifice assemblies

The ejector has two piston block and orifice assemblies (fig. 2–35). They are spaced 20 inches apart and are vertically centered. The blocks are made from extremely strong forged steel that is heat treated to 180,000 pounds per square inch (psi). They are cadmium plated as well. When the impulse cartridges are fired, gas is forced into the piston chamber through a changeable orifice, which regulates the ejection force of each piston. As the piston chamber fills with gas, it forces the piston to extend out the bottom of the rack 4½ inches, forcibly ejecting the weapon away from the aircraft. The blocks also have sway brace arms incorporated into them that keep the store properly aligned while in flight.

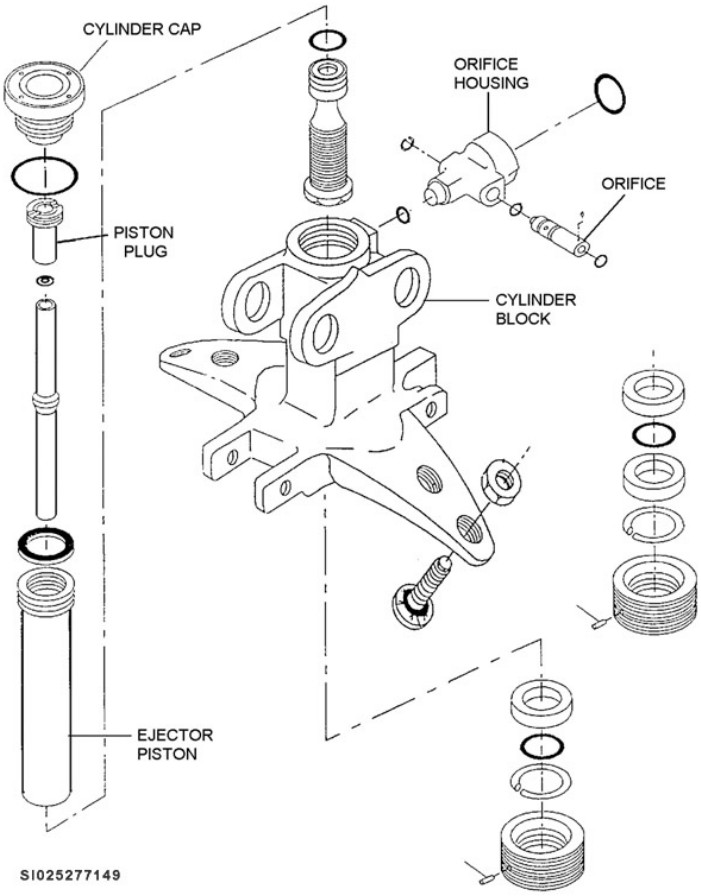

Figure 2–35. Piston block and orifice assembly.

Shackle assemblies

There are two sets of shackles (fig. 2–36) spaced 14 inches and 30 inches apart. They interconnect so only one actuating device is required. The bell crank, actuating rods, and connecting links are part of the assembly and ensure both shackle assemblies open simultaneous when the bell crank is actuated. The shackles are made from nickel-plated forged steel and have a tensile strength of 27,000 pounds.

Gas tube assembly

The gas tube assembly (fig. 2–37) is constructed from 0.604-inch diameter cadmium-plated tubular steel on the MAU–12D/A and 0.681 diameter cadmium plated steel for the BRU–44/A. It is a T-shaped system, which connects the breech assembly to the piston block and orifice assembly. Gas generated from the impulse cartridge enters the tube assembly and goes through the orifice into the piston chamber.

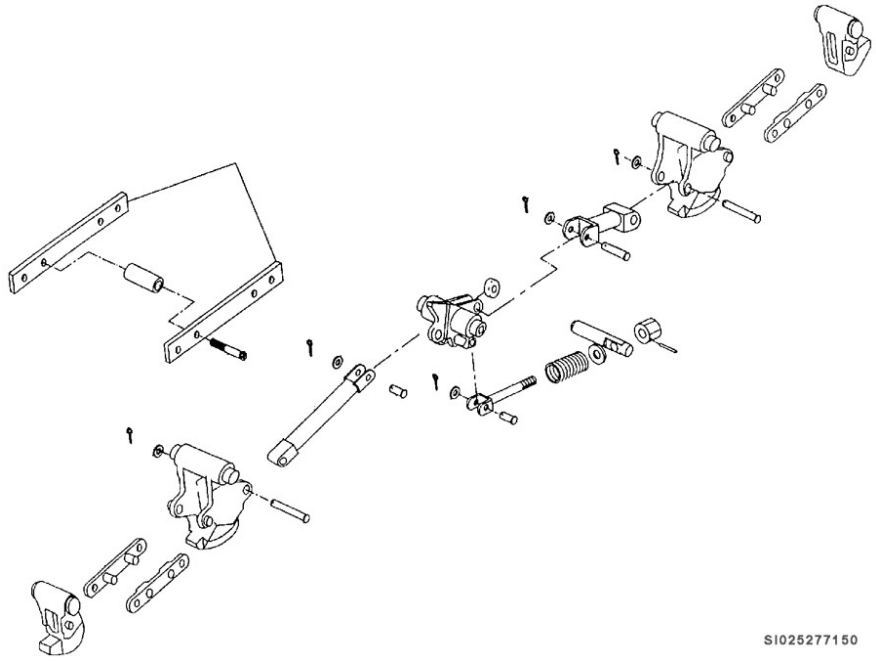

Figure 2–36. Shackle assembly.

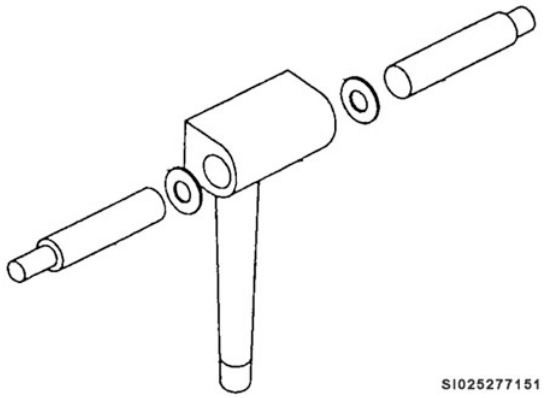

Figure 2–37. Gas tube assembly.

Breech assembly

The breech assembly (fig. 2–38) is located on the bottom of the ejector. It consists of two breeches that hold the impulse cartridges, two cartridge retainers, and a slave-piston assembly. It is made from forged steel and is cadmium plated. The cartridge-breech cavities are coated with phosphate to resist chemical corrosion generated when impulse cartridges are fired. There is a cutaway access hole in the center of the breech bottom for the center arming solenoid.

Arming solenoids

Three arming solenoids are incorporated into the ejector. They are positioned in the front, center, and rear of the ejector. When energized, they can hold up to a 600-pound pull force. The front and center solenoid are wired together, while the rear solenoid has its own circuit.

Wire harness assembly

The wire harness assembly (fig. 2–39) provides the electrical circuitry for the ejector. It receives the 24 ±4 VDC charge that operates the arming solenoids and fires the impulse cartridges.

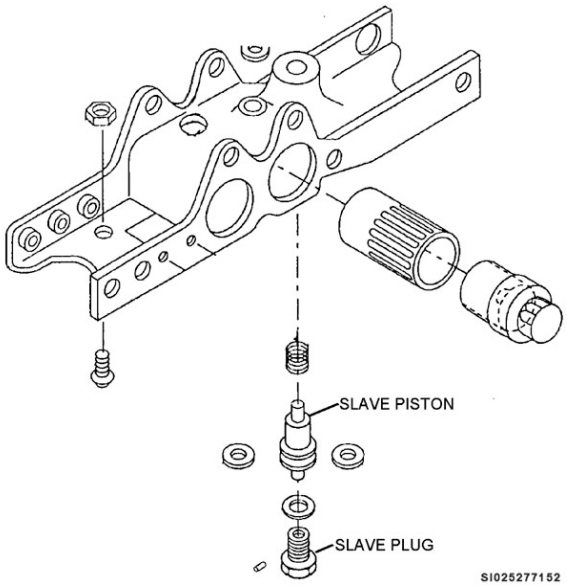

Figure 2–38. Breech assembly.

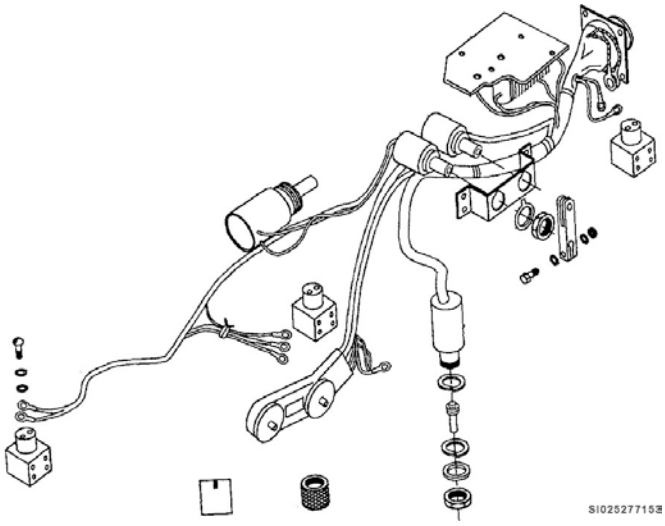

Figure 2–39. Wire harness assembly.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

410. Ejector rack description

1. How does the MAU–12D/A ejector operate?

2. List the eight major ejector components/assemblies.

3. Why is there an additional cutout on the left side plate of the ejector rack left side plate assembly?

4. How does the piston eject the weapon away from the aircraft?

5. The ejector rack gas tube assembly is constructed from what?

6. What components make up the breech assembly?

7. Where are the arming solenoids located?

8. What component provides the electrical circuitry for the ejector?

Answers to Self-Test Questions

406

1. The SUU–67/A.
2. 28 VDC and 115 VAC, single-phase, 400 Hz electrical power; 35 psig pneumatic (air) pressure.
3. One to six.
4. Because the pylon has components that might fail to function properly during a nuclear blast exposure if exact maintenance procedures are not followed.
5. Six, one for each missile.
6. Built-in ejector shorting devices.
7. In umbilical storage brackets or in the umbilical storage cover.

407

1. SLCF.
2. ADU–490/E.
3. To remove the pylon from its shipping container or to load an empty pylon into the PLA.

4. When moving the pylon outside or when placing it in storage.
5. MXU–690/E .
6. TO 16W6–33–1.
7. A complete download of missiles and inspection requirements listed in Table 5–1 of TO 16W6–33–1.

408

1. Up to eight B61s, eight B83s, or eight ALCMs.
2. Eight B61–7, four B61–11, or eight B83s, and no missiles.
3. One at a time from the bottom centerline position or the 6 o'clock position, known as the index position.
4. (1) Mechanical interface.
   (2) Electrical system.
   (3) Pneumatic system.
5. (1) Relay assembly.
   (2) DR.
6. NWCM.
7. NucSLU.
8. It protects the aircraft-to-launcher cable from becoming tangled during launcher rotation.
9. A ground path to unlock the ejector.
10. An air supply hose, air return hose, electrical cable, and umbilical connector.
11. Eight; one for each missile position.
12. Opened.

409

1. MHU–196/M and MHU–204/M MLTs.
2. ADU–555/E and ADU–728/E.
3. (1) Install the launcher in the frame.
   (2) Install the applicable electronics per TOs.
   (3) Configure it for the load.
   (4) Inspect pneumatic, electrical, and mechanical interface systems.
   (5) Perform a general condition inspection.
   (6) Perform pneumatic and electrical system operational checkout.
4. (1) Bomb.
   (2) Missile.
5. You confirm the position of the NucSLU shut-off valve, check for damage to the pneumatic ducting, and verify the security of all attaching hardware.
6. Open position.
7. (1) Pneumatic leakage test.
   (2) Bypass valve operational tests.
8. Pneumatic leakage test.

410

1. By electrically firing impulse cartridges, which, in turn, actuates a gas-operated system to open the shackles that secure the weapon.
2. (1) Side plate assemblies.
   (2) Mounting channel assemblies.
   (3) Piston block and orifice assemblies.
   (4) Shackle assemblies.
   (5) Gas tube assembly.
   (6) Breech assembly.

(7) Arming solenoids.

(8) Wire harness assembly.

3. For the breech assembly and cartridge retainers.
4. As the piston chamber fills with gas, it forces the piston to extend out the bottom of the rack 4½ inches.
5. 0.604-inch diameter cadmium plated tubular steel on the MAU–12D/A and 0.681 diameter cadmium plated steel for the BRU–44A.
6. Two breeches that hold the impulse cartridges, two cartridge retainers, and a slave piston assembly.
7. In the front, center, and rear of the ejector.
8. Wire harness assembly.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

17. (406) Nuclear hardness of the pylon is maintained when personnel
    a. follow exactly the procedures in the maintenance manuals that are clearly identified as hardness critical procedures (HCP).
    b. complete the HCP in any order as long as they complete all of them.
    c. complete all required continuity checks.
    d. complete all required safety checks.

18. (406) What provides easy access to the aft pylon support fitting?
    a. Missile fairing access doors.
    b. Avionics equipment access doors.
    c. Trailing edge fairing access doors.
    d. Upper and lower ejector access doors.

19. (406) Electrical and pneumatic *missile* connections on the pylon are made through the
    a. relay assembly.
    b. umbilical connectors.
    c. breakaway connector.
    d. missile interface unit (MIU).

20. (407) How many swing arms support the entire weight of the pylon and are retractable for pylon removal?
    a. 2.
    b. 3.
    c. 4.
    d. 5.

21. (407) What is attached to the pylon and acts like a “ball socket” that receives the “ball joint” from the pylon loader adapter (PLA) swing arm?
    a. Ball pads.
    b. Shear joint kit.
    c. Pylon adapter hooks.
    d. Pylon support fitting pad kit.

22. (407) What connects in line with the components cooling unit (CCU) and is used to check the operations of the bypass valves?
    a. Nitrogen charging adapter set.
    b. Differential pressure gauge.
    c. Barometric pressure gauge.
    d. Nitrogen servicing cart.

23. (407) Before mating missiles, the pylon requires a periodic inspection every
    a. 12 months.
    b. 24 months.
    c. 36 months.
    d. 48 months.

24. (408) The bearing that allows the launcher to rotate is part of the
    a. cable reel.
    b. relay assembly.
    c. forward drive fitting.
    d. aft end fitting assembly.

25. (408) Which part of the aircraft guided missile and bomb rotary launcher (AGMBRL)/common strategic rotary launcher (CSRL) provides mechanical and structural support for the aircraft and suspended loading and checkout frame (SLCF)?
    a. Cable reel.
    b. Relay assembly.
    c. Forward drive fitting.
    d. Aft end fitting assembly.

26. (409) What is the purpose of the nitrogen-charging adapter set?
    a. Checks the bypass valves for proper operation.
    b. Monitors the rotation of the rotary launcher.
    c. Fault isolates the launcher and pylon circuits.
    d. Performs pressurization and leak test of the launcher and pylon.

27. (409) Which areas are *not* inspected when inspecting a launcher loader adapter (LLA)?
    a. Adapter hooks.
    b. Fasteners.
    c. Markings.
    d. Cables.

28. (409) When preparing a launcher for shipment, you are *not* required to
    a. secure all loose cables.
    b. perform an electrical checkout.
    c. place the launcher on dunnage platforms.
    d. remove the decoder-receiver, nuclear station logic unit (NucSLU), and relay assembly.

29. (409) What position is the shut-off valve of the nuclear station logistic unit (NucSLU) in for missiles?
    a. Closed.
    b. Opened.
    c. Retracted.
    d. Recessed.

30. (410) Which assembly is *not* a major component of an ejector rack?
    a. Shackle.
    b. Gas tube.
    c. Side plate.
    d. Spline drive.

31. (410) What regulates the ejection force of each ejector piston of the aircraft/bomb ejector rack assemblies?
    a. Tube assembly.
    b. Actuating rods.
    c. Impulse cartridge.
    d. Changeable orifice.

32. (410) How many arming solenoids are incorporated into the ejector?
    a. 4.
    b. 3.
    c. 2.
    d. 1.

Please read the unit menu for unit 3 and continue ➔

Unit 3. Handling Operations

3–1. Air-Launched Missiles 3–1
411. Missile transfer procedures 3–1
412. Transfer missile using lift vehicles 3–5
3–2. Pylon and Launcher-Handling Procedures 3–8
413. Pylon loader adapter and pylon transfer to load the suspended loading and checkout frame 3–8
414. Launcher loader adapter and launcher transfer to the suspended loading and checkout frame 3–13

A LARGE PORTION of your job deals with moving weapons, missiles, trailers, pylons, and launchers. You perform two categories of handling operations: weapon transfer and transport. In general, transfer involves moving a weapon on and off a trailer, jammer, or forklift, or moving it around inside the maintenance bay. Transporting is moving the weapon from one location to another, like from the IMF to a storage structure or to the flight line. This unit covers transfer operations associated with missiles, pylons, and launchers. These operations include transferring a missile by hoist onto the MHU–141/M, moving a missile by lift truck and forklift, mating (wrapping) a launcher/pylon to the MHT, and transferring a pylon or launcher to the SLCF.

3–1. Air-Launched Missiles

Air-launched missiles are some of the heaviest weapons you are tasked to move. Because of the heavy weight and the power of the handling equipment you use, these operations can be deceptively dangerous. Specific procedures exist to make transfer operations safe; however, you must carefully follow them to prevent equipment damage or injury to personnel. In the following lessons, we cover moving missiles with the hoist and lift vehicles.

411. Missile transfer procedures

We cannot overemphasize the importance of following established ground-handling procedures. If you try to take a shortcut, or decide not to use published procedures, you are asking for an accident to happen. The procedures for the ground handling of an ALCM are in TO 11N–W80.83–2, *Ground Handling Procedures, AGM–86 Missile and Payload.* Figure 3–1 shows some lifting devices used with ALCMs. The ALCM uses the MHU–186/E. The hoisting beam uses adapters to lift weapons that have an ejector installed. Due to the different configurations of the racks, special hoisting adapters lift weapons that have pylon-configured ejectors installed; different adapters lift weapons that have CSRL configured ejectors installed.

The ALCM uses the MHU–159/E (fig. 3–2) and is installed onto the handling unit before it is transported or mated.

Using MHU–141/M with missile

We are going to transfer a missile from the floor onto the MHU–141/M. Our missile does not have an ejector installed, so we do not need the hoisting adapters. There are some items to cover before we begin the operation. First, you need to perform the missile safe status check. Also, check the missile for its configuration and choose the proper shackle position. Never assume you know how a missile is configured.

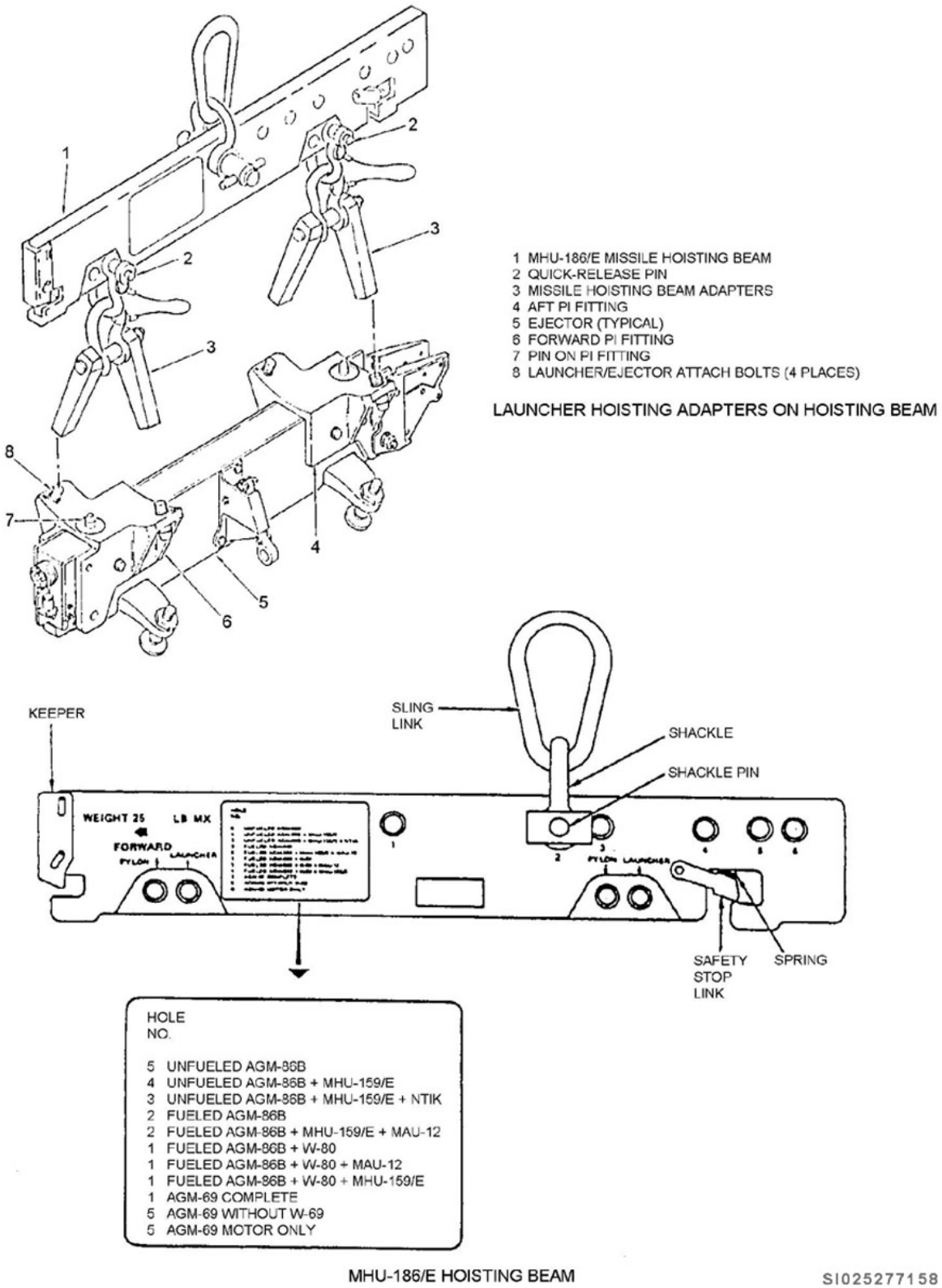

Figure 3–1. Hoisting beam and adapters.

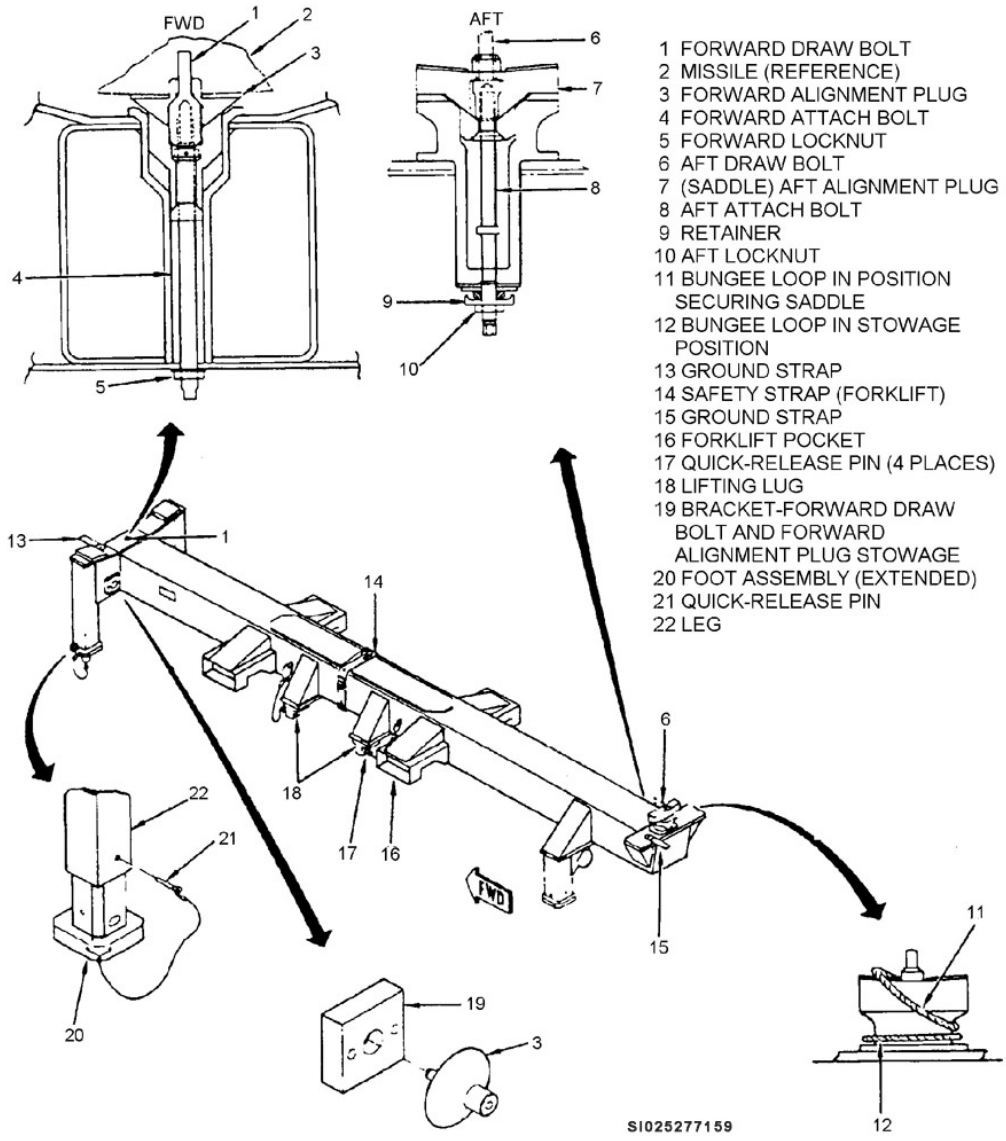

Figure 3–2. MHU–159/E guided missile handling unit.

The MHU–186/E has six positions for the lifting shackle. These accommodate different missile configurations. A decal on the hoisting beam lists the different configurations and the proper shackle position to use. Look at figure 3–1 to see how the shackle is positioned for different configurations. To hoist the ALCM onto the MHU–141/M (fig. 3–3), do the following:

1. Position the MHU–141/M, set brakes, chock wheels, and ground trailer to facility ground.
2. Perform the missile safe status check.
3. Install the hoisting beam on the missile. You can install the hoisting beam on the missile first and then attach the hoist, or put the hoisting beam on the hoist and then attach it to the missile. Make sure the FORWARD indicating decal on the hoisting beam points to the forward end of the missile.
4. Check that the keeper and safety stop link are properly engaged. Look at figure 3–1 to find these two safety devices.
5. Attach the hoist to the sling link and apply a slight preload to the lifting shackle, but do not lift the missile.
6. Double check to ensure the keeper and the safety stop link are properly engaged.

7. Visually verify mounting bolt and locknut installation on MHU–159/E.
8. Lift missile off the ground and stop, checking for proper braking on the hoist and ensuring the missile is properly balanced. Disconnect the ground from the facility ground.
9. Position missile over MHU–141/M.
10. Check that handling unit legs are retracted.
11. Connect a ground cable between the handling unit and trailer and then lower missile onto trailer but do not disconnect the hoist.
12. Move aft locking bars to the locked position and install quick-release pins.
13. Install forward quick-release pins.
14. Disconnect the hoist and remove the hoisting beam. When removing, exercise care not to damage the missile surface.

Just like all other maintenance, always inspect the weapon and handling equipment for damage that may have occurred during the transfer.

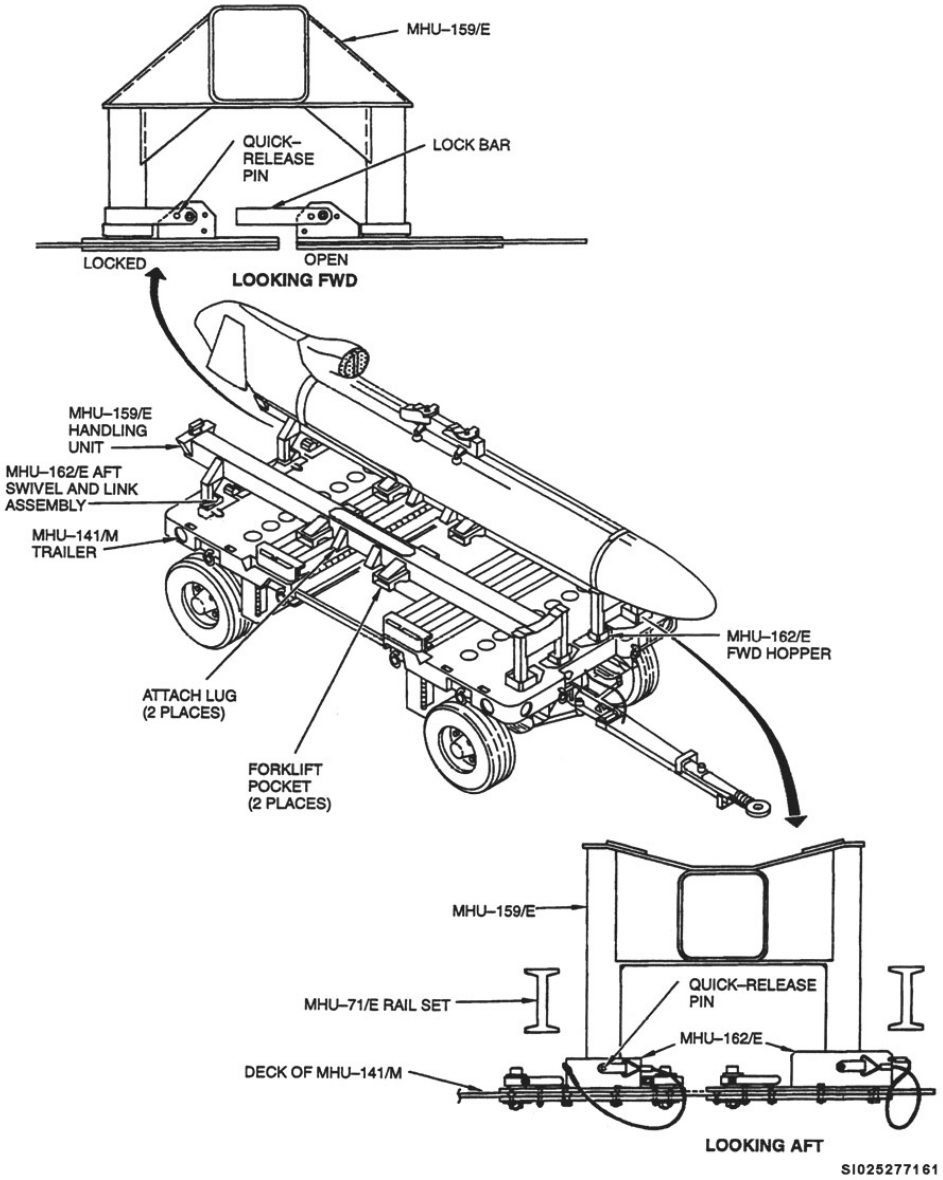

Figure 3–3. Missile transfer onto MHU–141/M.

412. Transfer missile using lift vehicles

Always perform the missile safe status check before moving a missile with a lift vehicle. We use two lift vehicles to move missiles: lift trucks (jammers) and forklifts. When using lift vehicles, the operator must always remain seated. When using a lift vehicle with an internal combustion engine, refer to Air Force Manual (AFMAN) 91–201, *Explosives Safety Standards*, for limitations. In this lesson, we cover both vehicles, first the lift truck and then the forklift. Unlike hoisting, the ejector has no bearing on using a lift vehicle.

Lift truck procedures

If you are using the MHU–174/E lift truck, make sure the electrical power cord or the mast does not contact the missile or handling unit. Inspect the lift truck prior to use according to TO 11N–H5053–2, *Maintenance and Operating Instructions, Guided Missile Lift Truck, MHU–174/E,* or the 35D5–3–8-series TOs if you use one of the MHU–83 type lift trucks.

If the missile is mounted on the handling unit on the MHU–141/M, you must do a few steps to prepare for missile removal:

1. Set the trailer brakes.
2. Chock the wheels and ground trailer to a facility ground.
3. Perform the missile safe status check.
4. Open and stow the trailer center rail section and spreader bar.
5. Make sure the handling unit attach bolts and locknuts are secure.

To move a missile with the lift truck, perform the following:

1. Spread the front lift truck wheels as far as possible. This enhances stability when lifting the missile.
2. Connect the ground between the handling unit and the lift truck.
3. Attach a ground cable from the lift truck to the facility ground.
4. Position the manipulator head under the missile-handling unit and attach with four quick-release pins inserted through the handling unit lifting lugs and slots in lift truck manipulator head (fig. 3–4).
5. Disengage the MHU–162/Es that secure the handling unit to the MHU–141/M.
6. Raise the missile clear of the trailer and disconnect the grounding cable between the handling unit and the trailer. As you move a missile with a lift truck, use spotters at each end of the missile to watch clearances.
7. Extend the handling unit legs to the fully extended position; ensure they are all correctly pinned.
8. Slowly lower the missile so the handling unit legs evenly contact the floor.
9. Connect a ground cable between the handling unit and facility ground; disconnect the ground cable from the handling unit and lift truck.
10. Disengage quick-release pins and lower manipulator head away from the stand.
11. Disconnect the facility ground from the lift truck and move the lift truck from the work area.

Once the movement is complete, it is time to inspect the missile and the handling unit. We can move missiles with either the MHU–174/E or the MHU–83B/E lift trucks. The procedures are the same for all of the different lift trucks. With all jammers, try not to make excessive and sudden movements. This puts a lot of stress on mechanical attachment points. Operate controls slowly to avoid sudden movements.

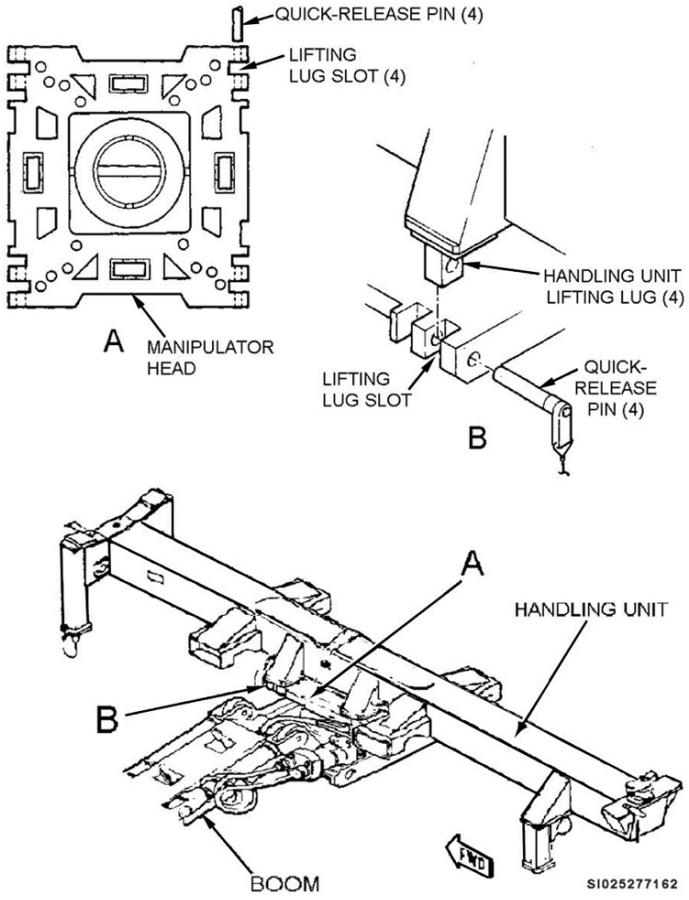

Figure 3–4. Missile-handling unit positioning on the lift truck manipulator head.

Forklift procedures

You may lift and maneuver a missile but not transport it with a forklift. You need a forklift that has a compatible lifting capacity as well as tines that can be spread wide enough to fit in the tine slots. Like other procedures, always perform missile safe status check before the operation. You also must ensure the forklift is inspected and signed off for the day. When using a forklift to lift a missile, always keep the tines level so the missile does not slide. If you are driving the forklift, remain seated on the forklift during the entire transfer operation.

If the missile is mounted on the handling unit on the MHU–141/M, you must do several steps to prepare for missile removal:

- Perform the missile safe status check.
- Set the trailer brakes, chock the wheels, and ground trailer to a facility ground.
- Make sure the handling unit attach bolts and locknuts are secure.

To transfer the missile with a forklift, perform the following:

1. Connect a ground cable between the forklift and the facility ground.
2. Connect the missile ground cable to the forklift.
3. Position the forklift tines so they fit in the tine slots (pockets) on the handling unit. Using a forklift with hydraulically controlled tines makes this job considerably easier.
4. Insert the tines, using care not to bind the tines inside the pockets.
5. Attach a tie-down strap around the handling unit and the forklift transverse beam. Tighten the strap far enough to take out all slack.

6. Disengage the MHU–162/E link and swivel assemblies securing the handling unit to the MHU–141/M.
7. Slowly raise the missile clear of trailer.
8. Disconnect the ground between the missile handling unit and the trailer.
9. Move the missile to suitable location.
10. Extend the handling unit legs as required and slowly lower the missile and handling unit to the floor.
11. Connect the ground cable between the handling unit and facility ground, and disconnect the ground cable from handling unit to the forklift.
12. Remove the strap from around the handling unit and forklift.
13. Transfer the missile ground cable to the facility ground.
14. Remove the forklift from the work area.

Inspect the missile, handling unit, and forklift for damage that may have occurred during the operation. This completes the forklift transfer operation. Remember, you can use the forklift to maneuver and lift a missile but not to transport one.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

411. Missile transfer procedures

1. In what publication do you find ground handling procedures for the ALCM?

2. What lifting beam do you use for lifting the ALCM?

3. What determines which hoisting adapters you use with the hoisting beams?

4. When you have to hoist an ALCM, when do you need to install hoisting adapters on the hoisting beam?

5. How many positions do the lifting beams have?

6. How do you orient the hoisting beam on the missile?

412. Transfer missile using lift vehicles

1. List the steps to prepare for missile removal from the MHU–141/M.

2. Why do you spread the lift truck wheels as far as possible?

3. What grounding procedures are required when preparing to move the missile with a lift vehicle?

4. How does the lift truck attach to the missile-handling unit?

5. What secures the handling unit to the MHU–141/M?

6. What must you do as you raise the missile clear of the trailer?

7. What must you do before disconnecting the ground cable from the handling unit and lift truck?

8. What missile handling procedures are authorized with a forklift?

9. What must you consider when selecting a forklift for missile transfer?

10. How do you position the forklift tines?

3–2. Pylon and Launcher-Handling Procedures

In this section, we cover mating the pylon/PLA into the trailer and hanging the pylon in the SLCF using the MHT. We also discuss some launcher/LLA operations.

We often call the process of mating the PLA/LLA to the trailer a “wrap” operation. There are several equipment items we use during ground handling procedures of the SUU–67/A pylon. The SLCF, ADU–490/E pylon loader adapter, and the MHU–196/M MHT are the three main items. Inspect equipment before each day’s use to make sure the equipment is reliable and safe.

413. Pylon loader adapter and pylon transfer to load the suspended loading and checkout frame

When loading the pylon onto the MHT, follow prescribed procedures in TO 11N–H5083–1, *Munitions Handling Trailer—MHU–196/M, and Munitions Lift Trailer—MHU–204/M, Mating and Demating.* We review the steps required to complete a wrap because the pylon must be in a PLA and on a MHT before you can load or ‘hang’ it in the SLCF.

Mating and demating adapter

Like most operations, make sure the weapons on the pylon are safe. Ensure you use the correct safe status procedures since the missiles are loaded on the pylon. We break down the PLA mate (wrap) into three, easy to do steps:

1. Preparation.
2. Wrap.
3. Postwrap.

Preparation

We begin with a check of the trailer and PLA for serviceability. Inspect the trailer and PLA forms and perform an inspection to check their condition. Perform preparation for use procedures any time you use the trailer. Also perform these MHT preparation procedures:

1. Install forward lift beam extensions (fig. 3–5). They are *probably* already installed from a previous operation.
2. Install the forward pendulum and fixed attachment fittings on the left and right lift beam extensions in position "A" (fig. 3–5). These may have been previously installed. These fittings require position changes depending on whether or not the MHT is configured for a PLA or a LLA.
3. Install the aft pendulum and fixed attachment fittings on the left and right lift beams, respectively, in position "F" (fig. 3–5). These may already be properly installed. These fittings do not move between pylon and CSRL configured trailers.

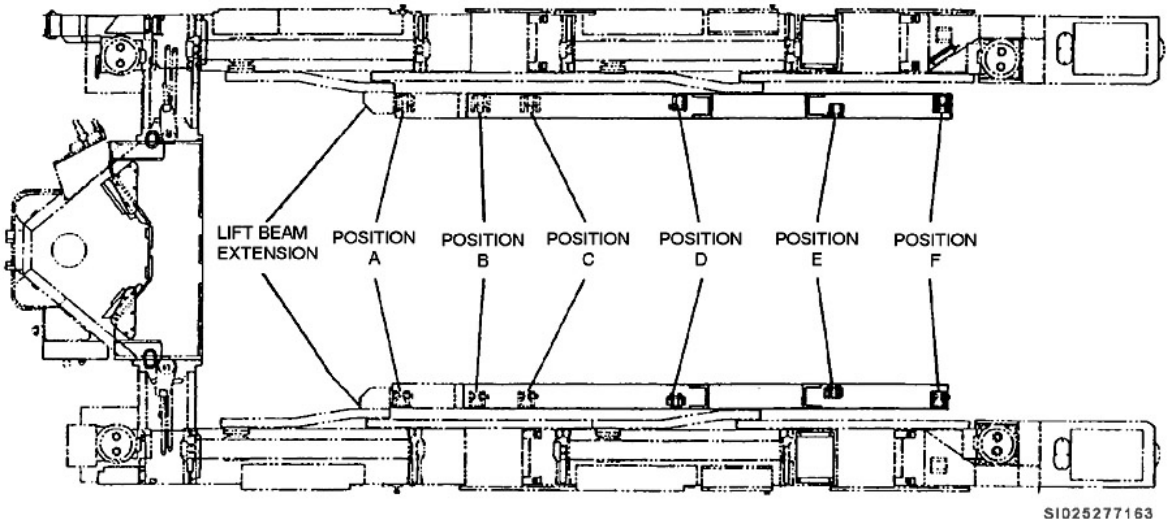

Figure 3–5. MHU–196/M attachment fittings and beam extensions.

4. Remove quick-release pins and shims from the attachment fittings.
5. Check that trailer width is at "V."
6. Retract the hooks on PLA.

Now you are ready to begin the wrap operation.

Wrap procedures

Now run the trailer start procedures. Start procedures deal with the trailer power-up and self-check of electrical safety devices. Perform these abbreviated wrap procedures:

1. Position the LIFT FORCE POUNDS switch to 40k. This switch is located on the main control panel A2.
2. Raise the lift beams off the travel locks. Retract the travel locks by opening the travel lock access door and pull the travel locks out until they reach the mechanical stop.
3. Lower the lift beams so they do not interfere with the adapter and do not touch the ground. Remember that you may be driving the MHT over uneven ground during the mate procedures. You must constantly ensure that the lift arms do not contact the ground.
4. Using the portable control unit (PCU) to drive the trailer, position the trailer around the PLA. Be sure to watch clearances between the two pieces of equipment.

5. Attach the trailer ground to the facility ground. Thus, any static electricity potential between the trailer and facility ground is discharged.
6. Extend the PLA hooks. Once they are pinned in place, check the quick-release pins are functioning properly by trying to push in on the ball-locks with your fingers. Also, attempt to remove the quick-release pin without depressing the release button.
7. Raise the right lift beam until the fixed attachment fittings seat against hooks. It may be necessary to use a flashlight to look under hooks for proper alignment.
8. After the fixed attachment fittings contact, raise the left lift arm until the pendulum blocks engage. The pendulum attachment fittings easily line up since they swing.
9. Install the shims and quick-release pins. You must install at least three shims on each attachment fitting to stop forward/aft shifting of the PLA hooks when the trailer suddenly moves or stops.
10. Raise lift beams until you can engage the travel locks. With the travel lock cover open, push travel locks inboard until they reach a mechanical stop and close the travel lock cover. Lower the lift beams until they contact all four travel locks.
11. Retract PLA legs. Because of the weight, this operation may require two people. One person lifts the leg while the other person removes and installs the quick-release pin.

Postwrap procedures

After you complete the wrap operation, follow these steps:

1. Remove the facility ground from the PLA; the PLA is physically connected to the trailer through the hooks and the trailer is connected to the facility ground.
2. Position the trailer wheels straight and engage the rear wheel assembly lockpins. The rear wheels must be locked for towing the trailer.
3. Center the X-Y jackpads and stow the jacks.
4. Perform trailer shutdown procedures.

Transporting pylons

Make sure all procedures are completed to prepare the MHU–141/M or MHU–204/M for towing. The following tow restrictions apply when transporting a loaded or unloaded on hardened surfaces: MHT

1. Unloaded – The maximum tow speed of an unloaded MHU–196/M is 20 mph and the MHU–204/M is 10 mph both on straightways. On sharp turns and maneuvering around obstacles, the speed must be reduced to 5 mph for both MHTs.
2. Loaded – The maximum tow speed of a loaded MHU–196/M and the MHU–204/M are both 10 mph. Again, for both, the speed around sharp turns and obstacles must be reduced to 5 mph.

Installing and removing pylon to/from load frame

Once the pylon/PLA is wrapped, you can load it into the SLCF. The SLCF provides a means of structural support for the pylon during checkout, maintenance, and missile loading. During the loading process, the pylon is secured to the SLCF with three quick-release pins: two forward pins and one aft pin. The procedures for installing the pylon in the SLCF are described in TO 16W6–33–1. The three steps that make up the process are preloading, loading, and postloading.

Preloading

Before positioning the pylon under the SLCF, you need to check the SLCF's AFTO Form 244, Industrial/Support Equipment Record, and make sure that the CSRL forward and aft yokes are in the stowed (up) position. Perform these preloading steps:

1. Place the SLCF aft pylon attach fitting in the retracted (up) position (fig. 3–6).
2. Torque the aft pylon support fitting to 875 ±125 in-lb. (fig. 3–7).

3. Lower leaning boards and secure them with quick-release pins.
4. Install ladders on the PLA. These ladders are stored under the catwalks of the PLA, and are held in place with quick-release pins (fig. 3–8).
5. Remove the pylon protective cover and the dust caps covering the electrical and pneumatic interface connectors and inspect them.

Once completed, you are ready to load the pylon into the SLCF. Let us move on to the loading procedures.

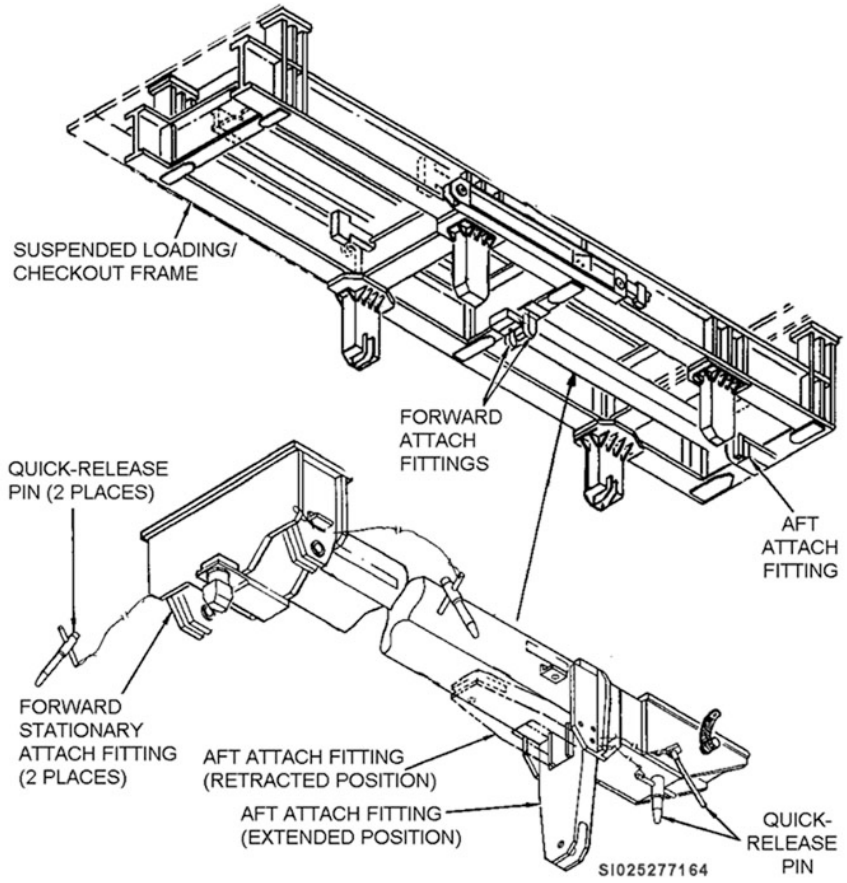

Figure 3–6. Retracted aft pylon attach fitting.

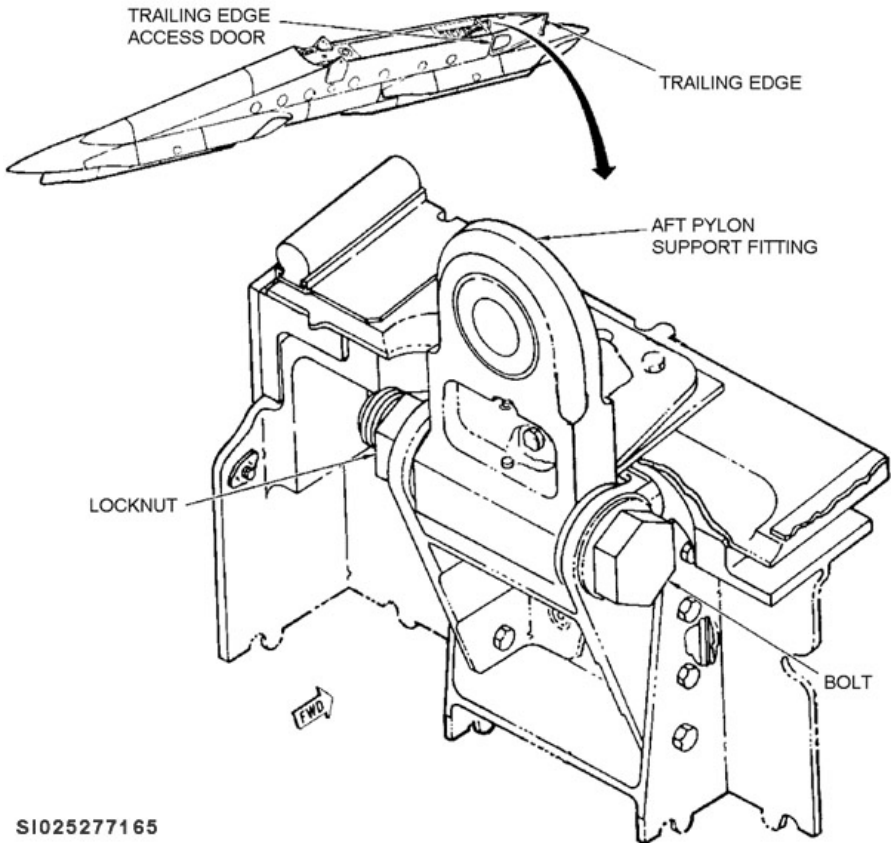

Figure 3–7. Aft pylon support fitting.

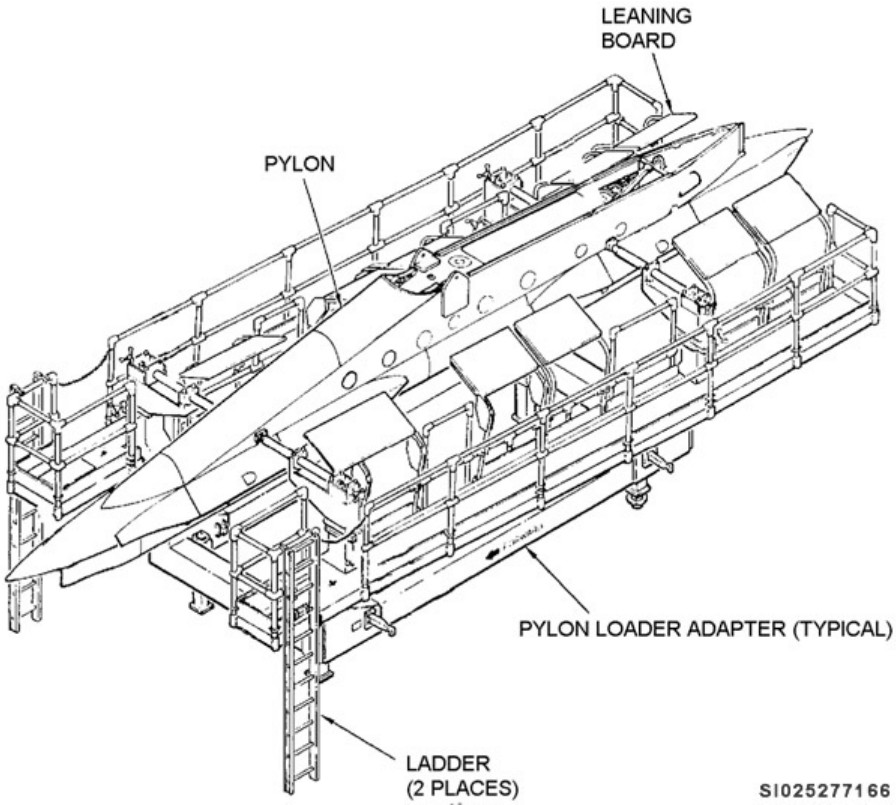

Figure 3–8. PLA with ladders installed.

Loading

You are now ready to position the pylon under the SLCF. Line up the pylon forward attach fittings with the attach fittings on the SLCF by looking from the side. Line up the pylon centerline with the longitudinal axis of the frame by looking at the pylon aft attach fitting with relation to the retracted aft attach fitting on the SLCF. Perform these loading steps:

1. Connect the MHU–196/M ground to the facility ground.
2. Lower the jackpads far enough to raise the trailer wheels off the ground.
3. Raise the lift beams off travel locks and retract the travel locks.
4. Lower the SLCF aft attach fitting and install the quick-release pin. This may require two people because of the fitting size and location.
5. Align the thrust fitting; misalignment of the thrust fitting can cause damage to the equipment.
6. Raise the pylon into position. You will need to use pitch and roll to make sure the pylon attachment fittings evenly engage the SLCF attach fittings.
7. Install the SLCF quick-release pins that hold the pylon into place. Install the two front pins first, and then pitch the back of the trailer up using the jacks to install the rear-fitting pin. Make sure the aft quick-release pin is installed from forward to aft. Improper installation can cause damage to the equipment.

Postloading

Remove the quick-release pins and retainers from the four pylon support fitting pads on the pylon. It is important to keep all body parts from between the lifting mechanism assembly and the MHT.

Perform these post-load steps:

1. Lower the PLA until the pylon weight is transferred from the swing arms to the three quick-release pins installed through the fwd and aft attach fittings and SLCF.
2. Fully retract the swing arms, rotate them 90 degrees (°) and out of the way of the missiles, and lock them in the stowed position. If the PLA is to be inspected or used on another pylon, remove the pylon support fitting pads and place them in the storage box.
3. Place the leaning boards in the retracted position. Make sure they will clear the missiles as the PLA is moved out of the way. While lowering the lift arms, make sure you and your coworkers monitor clearances on all sides. This requires the attention of everyone involved in the operation.
4. Once the PLA is lowered far enough to clear all the missiles, remove the trailer from the immediate work area.
5. Perform trailer shut down procedures. If the trailer is not immediately reused, stow all the equipment.

To remove the pylon from the SLCF, reverse the loading procedures. The pylon support fitting pads are torqued into place before the swing arms are attached. Do *not* rotate the swing arms into position for the support pads until all four arms clear the missiles. After downloading, make sure the trailer wheels are locked straight and X-Y jackpads are centered. Do not forget to inspect the pylon, missiles, and SLCF for any damage that may have occurred during the loading or unloading process.

414. Launcher loader adapter and launcher transfer to the suspended loading and checkout frame

When loading or mating the launcher/LLA into the MHT, follow the procedures in TO 11N–H5083–1. Just like with the PLA, we call this process a “wrap” operation. We review the steps required to complete a wrap because the launcher must be in a LLA and on a MHT before you can load it into the SLCF.

Inspecting and using launcher loader adapter

Perform all applicable safety checks. Mating the ADU–555/E LLA (fig. 3–9) to the MHU–196/M for CSRL or the ADU–728/E LLA to the MHU–204/M for RLA is similar to PLA mating procedures. The following paragraphs outline the wrap operation for the ADU–555/E LLA and the MHU–196/M. However, we expand on *only* those steps, which are peculiar to the LLA. We break down the LLA mate (wrap) into three, easy to do steps—preparation, wrap, and postwrap.

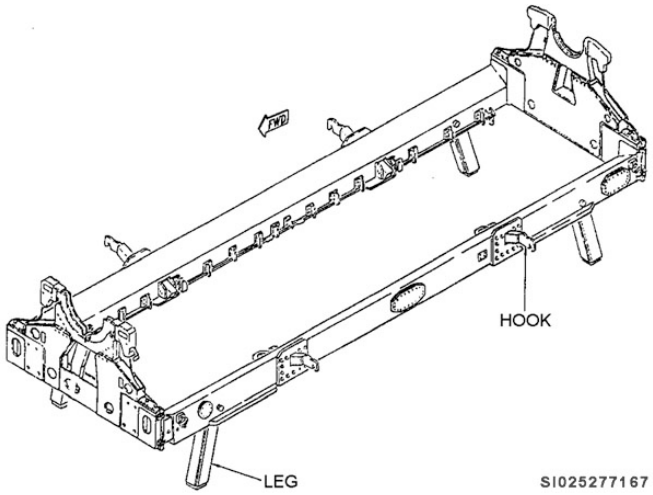

Figure 3–9. ADU–555/E LLA.

Preparation

We begin with a check of the trailer and LLA for serviceability. Inspect the trailer and LLA forms and perform an inspection to check the condition of both. Perform preparation for use procedures any time you use the trailer.

Also perform these MHT preparation steps:

1. Install forward pendulum and fixed attachment fittings on the left and right lift beams in position “B” (fig. 3–5). These are the fittings that require position changes depending on whether the MHT is configured for a PLA or a LLA.
2. Install aft pendulum and fixed attachment fittings on the left and right lift beams in position “F” (fig. 3–5). These fittings do not require movement between PLA and LLA configurations.
3. Check that trailer width is at “V” (same as the PLA).
4. Retract hooks on the LLA. Each side of the LLA has an actuating rod that controls a hook-locking pin. These actuating rods have handles, which are quick-release pinned in the locked and unlocked positions. To retract hooks, remove quick-release pins, and remove locking pins. You may need to use a socket and wrench/speeder to rotate the hook drive belt. Since the hooks will be retracted in a few minutes, it is not necessary to pin them in the retracted position.
5. Remove quick-release pins and shims from the attach fittings.

Now you are ready to begin the wrap operation.

Wrap operation

Now run the trailer start procedures. Start procedures deal with the trailer power-up and self-check of electrical safety devices. Perform these abbreviated wrap procedures:

1. Position LIFT FORCE POUNDS switch to 40,000 (40k) on the MHT.
2. Disengage travel locks.

3. Lower lift arms to the working height. Remember that you may be driving the MHT over uneven ground during the mate procedures. You must constantly ensure that the lift arms do not contact the ground.
4. Position the trailer around the LLA. As you position it, watch the clearances between the trailer and LLA.
5. Attach the trailer ground cable to the facility ground.
6. Extend the LLA hooks using a socket and wrench or speeder. After positioning the trailer around the LLA, align the trailer lift beam attachment fittings with the LLA hooks. Extend the hooks and lock them in place. Be sure lock pin handles are quick-release pinned in place (fig. 3–10).
7. Raise lift arms until the hooks seat against attachment fittings. Seat fixed attachment fittings first and then the pendulum attachment fittings.
8. Install at least three shims and quick-release pins.
9. Raise lift arms and retract the LLA legs.
10. Lower lift arms and engage travel locks.

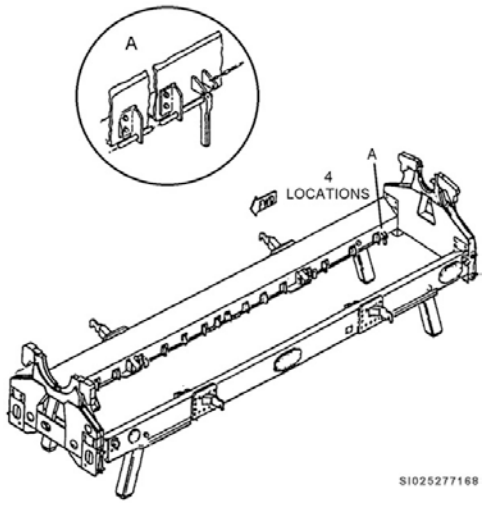

Figure 3–10. Lock pin handle location.

Postwrap procedures

Perform the following postwrap procedures:

1. Remove the facility ground from the LLA.
2. Position the trailer wheels straight and engage rear wheel assembly lock pins.
3. Center the X-Y jackpads and stow them.
4. Perform trailer shutdown procedures.

Installing and removing launcher to/from the suspended loading and checkout frame

Prepare both launchers (CSRL/RLA) and the SLCF according to procedures in TO 11N–L5001–1, *Nuclear Weapon Mate and Demate Procedures–Intermediate Maintenance Level*, and 11N–L5006–1, *Nuclear Weapons Mate and Demate Procedures, Intermediate Maint, Rotary Launcher Assembly* . We can break down the process of installing the launcher into the SLCF into three steps:

1. Launcher and SLCF preparation.
2. Loading.
3. Postloading.

Launcher and SLCF preparation

Assume that the forward and aft yokes are positioned down for mating the CSRL. Then follow these steps:

1. Ensure that the launcher spline key (similar to a drift key) is in the index (6 o'clock) position, and the frame power drive controller (FPDC) indicates 000.0° (±0.5°). If the FPDC is not in the index position, use specific procedures in TO 11N–L5001–1 for rotating and correct the condition.
2. Secure launcher cables to the wire harness cage (cable reel). This will prevent damage to the cables during launcher maneuvering and installation. The straps are provided as part of the launcher.
3. Rotate the launcher forward end plate until the arrow points down (fig. 3–11). The end plate and wire harness cage are under a slight tension and will tend to rotate somewhat on their own. To prevent this, secure this position by connecting a tie-down strap from the LLA to the wire harness cage.

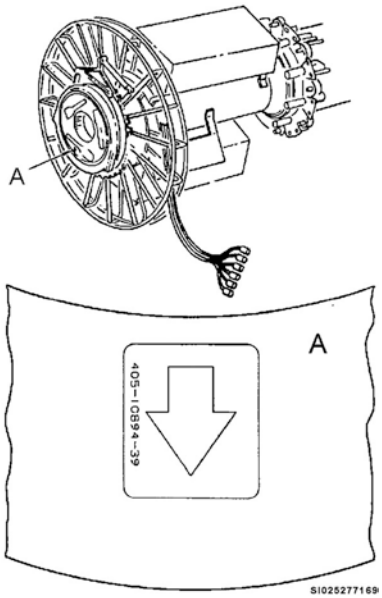

Figure 3–11. Arrow decal on launcher forward end.

NOTE: Refer to figure 3–12 as we discuss SLCF components to inspect and clean.

4. Remove the ECS caps from the forward and aft yokes, and inspect the ducts for damage.
5. Engage the forward yoke splines. Inspect the ECS duct by pushing in on the forward ECS duct ¼ inch and release. The duct should spring back out to its original position.
6. Inspect, clean, and lubricate the slot in the forward yoke plate, spline, and the ramp on the forward yoke with low-temperature grease.
7. Inspect and lubricate the forward yoke ECS duct and O-ring with pneumatic grease.
8. Inspect and clean the end plate. Pull down aft yoke support arm drive crank to raise support arm. Remove the caps from the forward and aft ends of the launcher, and inspect openings for damage or foreign material.
9. Engage support arm lock pins. Push in and rotate aft yoke downlock drive socket until downlock SCREW POSITION indicator shows SCREW IS DOWN. Inspect, clean, and lubricate the taper pins and cup with low-temperature grease.
10. Inspect and lubricate the aft ECS duct with pneumatic grease.

11. Prior to launcher loading, push in and rotate the aft yoke downlock drive counterclockwise (CCW) until the indicator shows SCREW IS UP. Push up the aft yoke support arm drive crank to lower the support arm.
12. Inspect, clean, and lubricate CSRL spline with low-temperature grease.
13. Inspect, clean, and lubricate the CSRL forward and aft ECS openings and O-rings with pneumatic grease (fig. 3–13).

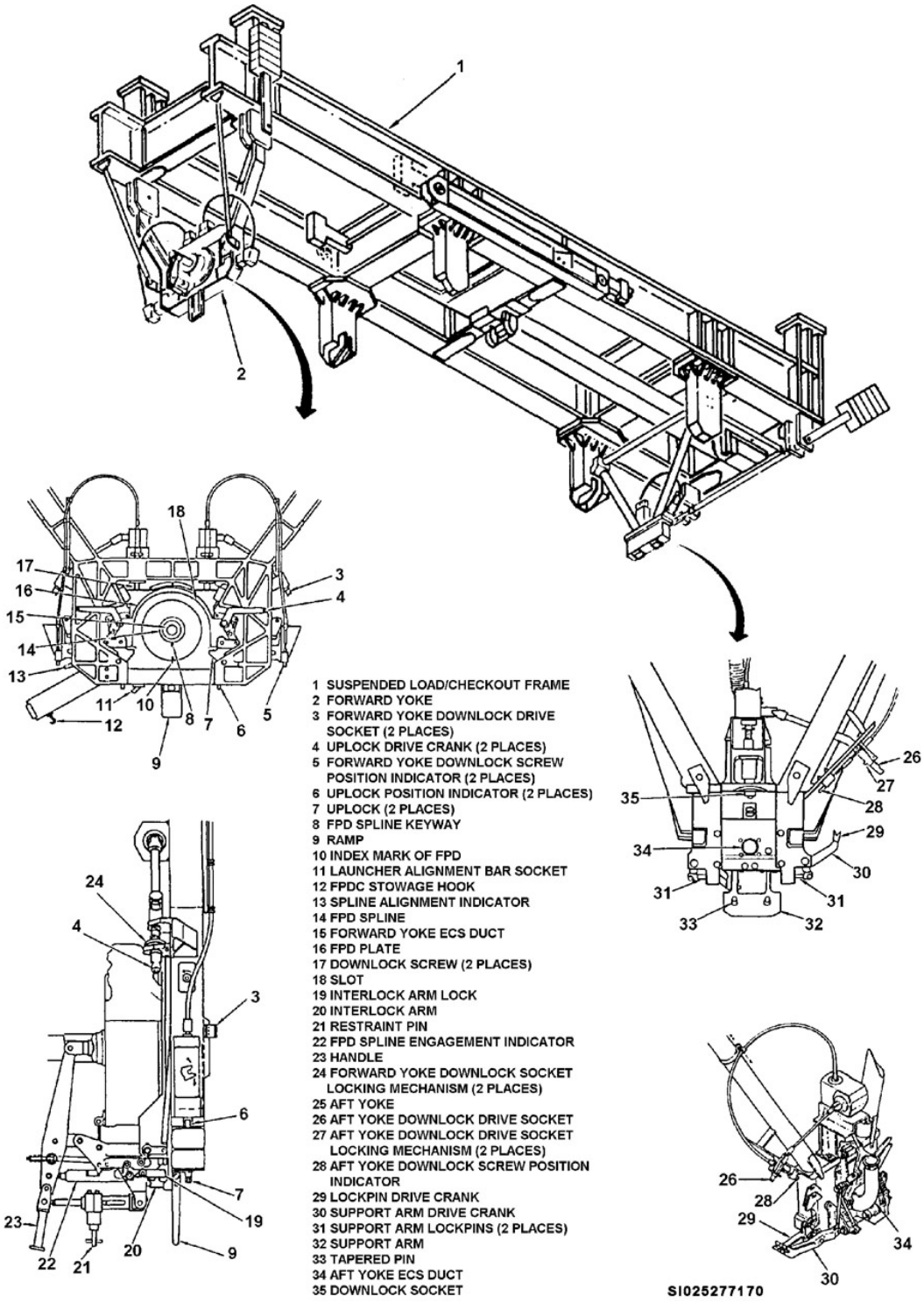

Figure 3–12. Forward and aft yoke assemblies.

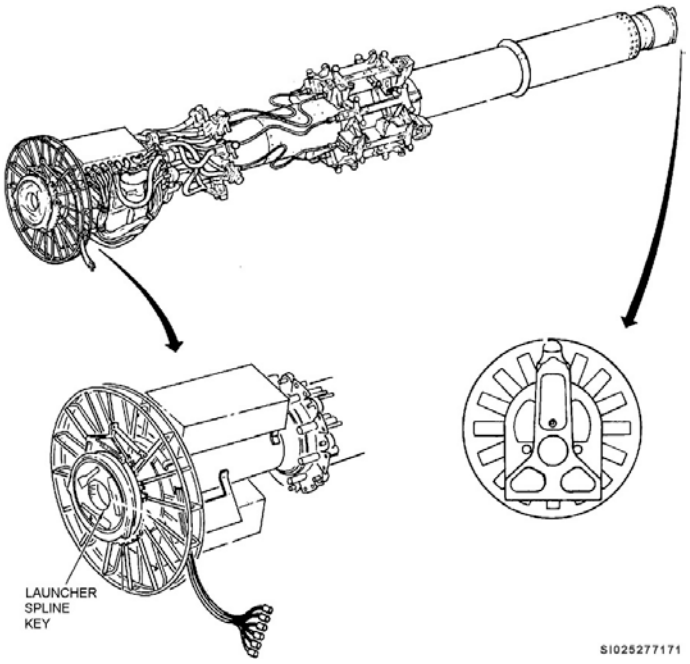

Figure 3–13. Launcher splines.

Launcher loading

Due to the similarities between the CSRL and RLA installation into the SLCF, we only cover installing the CSRL. Now that the launcher and SLCF are prepared, run the trailer start procedures. Position the LIFT FORCE POUNDS switch to 40k. Disengage travel locks. Lower lift arms and move launcher under the yokes. Use *extreme* care, as the lift arms need to be lowered until they are *almost* touching the floor so that the missiles will clear the forward yoke ramp. Clearances are *very* tight. Position the launcher under the SLCF equally spaced between the forward and aft yokes and perform the following:

1. Connect the trailer ground to facility ground.
2. Lower the jackpads and raise trailer until the wheels are approximately 6 inches off the floor.
3. Using the lift arms, raise the launcher to within 2 inches of the fwd yoke.
4. Pitch the aft end of the launcher down about 1 inch.
5. Raise the launcher until the forward end engages a slot in the forward yoke power drive collar. Continue to raise the launcher until the overtravel indicator is in the green band; do not let it enter the red band. Close the two forward yoke uplocks (fig. 3–12). The uplocks are located on each side of the forward yoke.
6. Disengage the spline lock pin while pulling forward on handle until the forward power drive spline indicator is in the SPLINE ENGAGED position (fig. 3–12). Release the retaining pin and move handle until spline is locked in SPLINE ENGAGED position.
7. While watching the forward end to ensure the launcher does go into overtravel (fig. 3–14), lift the rear of the launcher high enough to engage the aft yoke support; do not enter the overtravel on the rear yoke. The launcher end is in overtravel if the distance between the stop and nut is about 0.10 inches or if only one coil of the spring is still visible. Be extremely careful that the launcher does not contact the aft yoke while it is raising.
8. Raise aft yoke support arm (fig. 3–12) by pulling down the support arm drive crank.

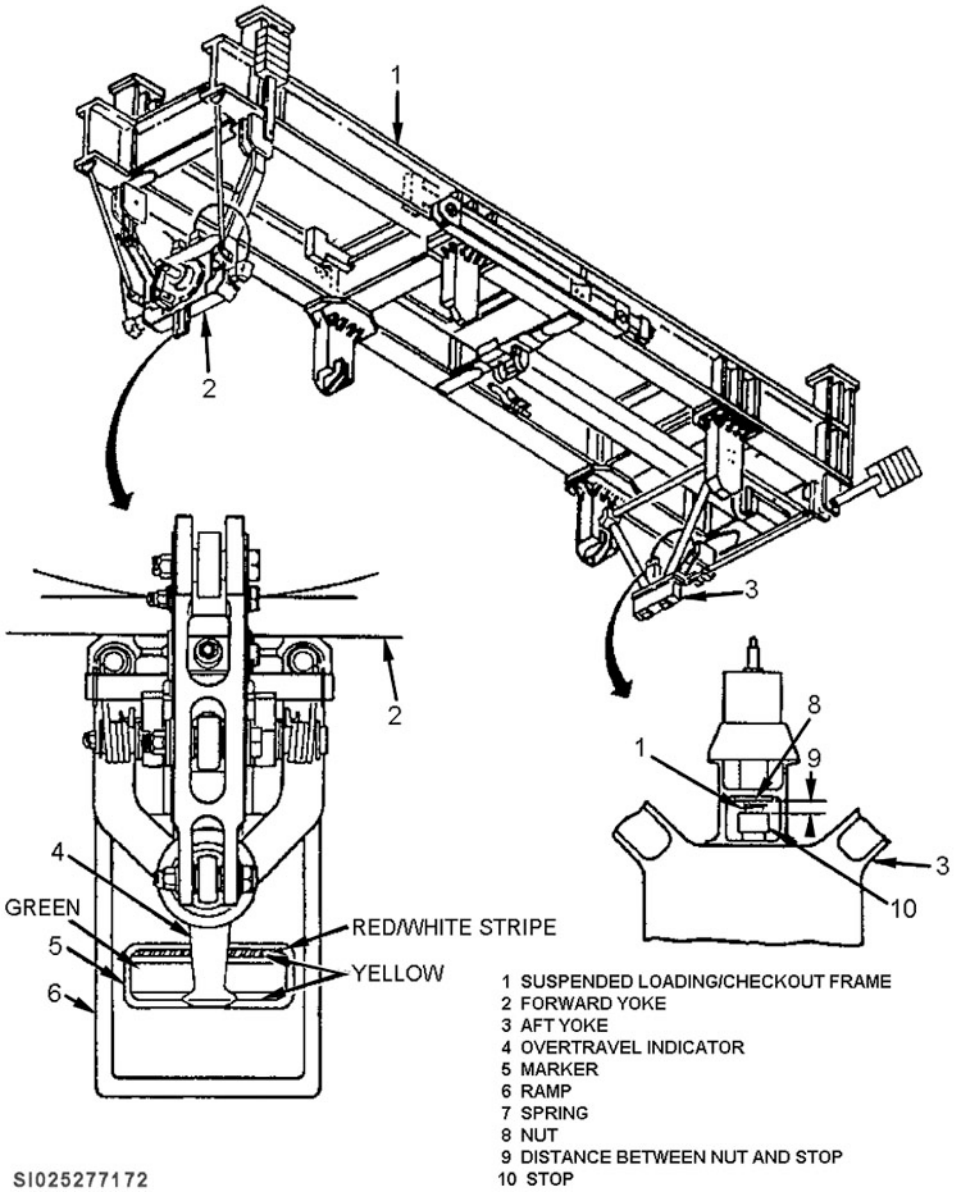

Figure 3–14. Overtravel indications.

9. Engage the aft yoke support arm lock pins by pulling down the lockpin drive crank.
10. Disengage the aft LLA lockpins (fig. 3–15). These lockpins secure the aft launcher fitting into the LLA.
11. Evenly lower the launcher while monitoring the forward UPLOCK POSITION indicators until the forward end rests on the uplocks and aft end rests on the support arm.
12. Rotate the forward and aft downlock drives (fig. 3–12) until the indicators show SCREW IS DOWN. The uplocks hold the launcher into the maintenance frame. Make sure visually the aft ECS duct runs smoothly into the aft ECS duct of the launcher. The downlocks secure the launcher against the uplocks, hold it in place, and prevent it from raising during weapons loading operations.
13. Disengage the two forward AGE ring lock pins by pulling down on the lockpin engagement knobs (fig. 3–15); these secure the launcher forward end into the LLA.

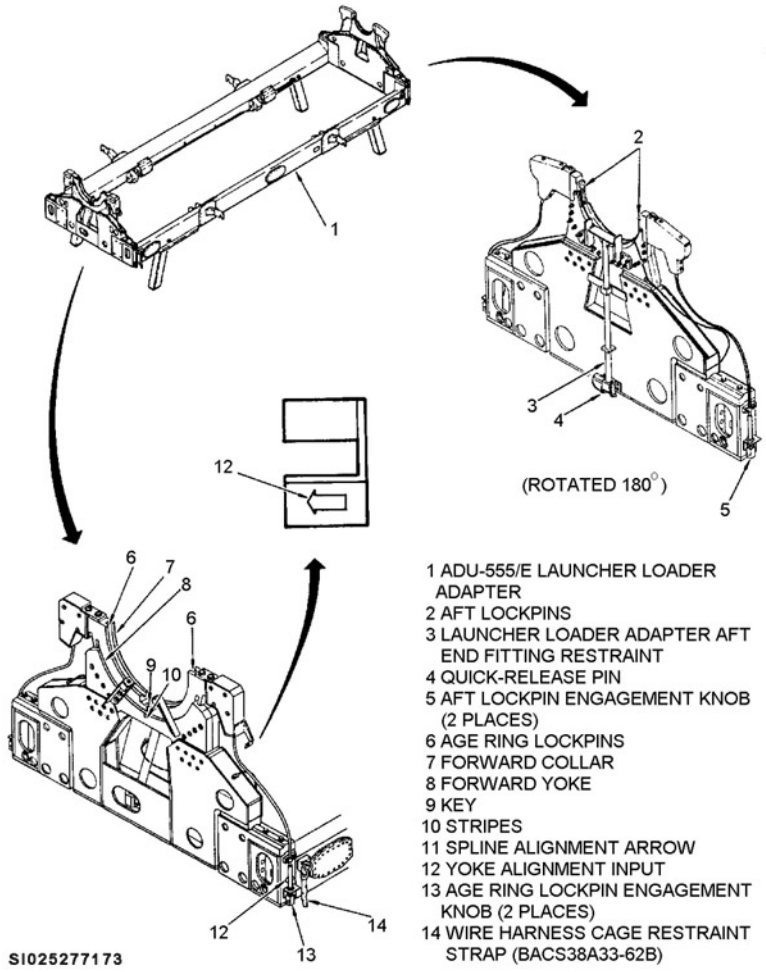

Figure 3–15. Launcher loader adapter lockpin location.

Postmate procedures

Postmate procedures are as follows:

1. While observing all launcher cables, lower the LLA.
2. Raise jackpads off the ground.
3. Remove the trailer from under the launcher and the immediate work area. Place lift arms on travel locks.
4. Perform trailer shutdown procedures. Stow PCU, stop switches, and power cable.

Your operation is now complete. Inspect the trailer, LLA, launcher, and weapons for damage that may have occurred during the mate operation.

Removal of launcher from SLCF

Due to the similarities between the CSRL and RLA, we only cover RLA removal from SLCF. Removing the launcher from the SLCF is the reverse of the installation procedures. You must ensure the FPDC indicates 000.0° (±0.5°) before removing the launcher from the SLCF.

Follow these steps to remove the RLA from the SLCF:

1. Ensure launcher and LLA are prepared for removal per applicable procedures.
2. Using MLT jacks, pitch aft end of LLA down.
3. Raise LLA until the LLA yokes are approximately 2 inches below and aligned with launcher AGE rings.

4. Push in and rotate aft yoke downlock drive socket fully CCW until SCREW POSITION indicator indicates SCREW IS UP.
5. Ensure LLA FWD yoke engages launcher forward AGE ring. Raise LLA until FWD yoke key engages.
6. Push up LLA forward lockpin engagement knobs to engage lockpins.
7. Rotate AGE ring as required while pushing in and rotating SLCF forward yoke downlock drive sockets fully CCW until SCREW POSITION indicators indicate SCREW IS UP.
8. Raise launcher FWD end until overtravel is indicated on overtravel indicator.

CAUTION: Do not raise the launcher beyond overtravel in FWD and AFT yoke.

9. Pull down and hold T-handle while pushing handle aft until spline engagement indicator indicates SPLINE DISENGAGED. Release T-handle and secure handle in SPLINE DISENGAGED position.
10. Open the uplocks by pushing up on the drive cranks. If additional force is needed, use the launcher support mechanism-actuating tool.
11. Raise LLA until aft yoke contacts launcher aft AGE ring. Engage LLA aft lockpins by pulling up on two knobs located at LLA aft corners.
12. Raise launcher aft end to overtravel. Ensure FWD end of launcher is not raised beyond overtravel line FWD yoke.
13. Disengage the support arm lockpins by pushing up on lockpin drive crank. If additional force is required, use the launcher support mechanism-actuating tool. Push up the support arm drive crank to lower support arm.
14. Remove cables from SLCF support. Monitor clearances and slowly lower MLT until the launcher is clear of the SLCF yokes.
15. Ensure the SLCF ECS duct O-ring is not in launcher ECS duct. Install ECS cap on launcher FWD ECS duct.
16. Remove MLT from under the SLCF. Position launcher cables to LLA to prevent damage. Raise lift arms and engage travel locks. Lower lift arms onto travel locks.
17. Stow MLT per applicable procedures.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

413. Pylon loader adapter and pylon transfer to load the suspended loading and checkout frame

1. When preparing the MHU–196/M for PLA wrap, where do you install the forward pendulum and fixed attachment fittings on the left and right lift beam extensions?

2. How is the trailer width set for PLA wrap?

3. During PLA wrap, when do you attach the ground cable to the trailer and facility ground?

4. At least how many shims must you install for each attachment fitting?

5. Why do you install shims on each attachment fitting?

6. Why does retracting the PLA legs take two people?

7. In what TO do you find procedures for installing the pylon in the SLCF?

8. Briefly, list the pylon preloading procedures.

9. How do you install the quick-release pins that hold the pylon in the SLCF?

10. When performing pylon post-load procedures, how do you retract the swing arms?

414. Launcher loader adapter and launcher transfer to the suspended loading and checkout frame

1. When preparing the MHU–196/M for LLA mate, where do you install the forward and aft pendulum and fixed attachment fittings on the lift beams?

2. What do the LLA actuating rods control?

3. Where do you find procedures for loading the launcher in the SLCF?

4. When the spline key is in the index position, what should the FPDC indicate?

5. Where do you secure the launcher cables during launcher installation?

6. How do you orient and secure the launcher forward end plate for installation into the SLCF?

7. How do you inspect the ECS duct?

8. How is the aft yoke downlock drive oriented in preparation for launcher loading?

9. How can you tell if the aft yoke has gone into overtravel?

10. What do the uplocks and downlocks secure?

Answers to Self-Test Questions

411

1. TO 11N–W80.83–2.
2. The MHU–186/E.
3. Whether lifting weapons have pylon configured ejectors installed or CSRL configured ejectors installed.
4. When an ejector is installed on the ALCM.
5. Six.
6. Make sure the FORWARD indicating decal on the beam points to the forward end of the missile.

412

1. (1) Set the trailer brakes.
   (2) Chock the wheels and ground the trailer to a facility ground.
   (3) Perform the missile safe status check.
   (4) Open and stow the trailer center rail section and spreader bar.
   (5) Make sure the handling unit attach bolts and locknuts are secure.
2. It enhances stability while the missile is lifted.
3. Connect ground between the handling unit and the lift truck; then attach a ground cable from the lift truck to the facility ground.
4. With four quick-release pins inserted through the handling unit lifting lugs and slots in the lift truck manipulator head.
5. MHU–162/E.
6. Disconnect the grounding cable between the handling unit and the trailer; use spotters at each end of the missile to watch clearances.
7. Connect a ground cable between the handling unit and facility ground.
8. Lifting and maneuvering.
9. You need a forklift with a compatible lifting capacity as well as tines that can spread wide enough to fit into the tine slots.
10. So they will fit in the slots (pockets) of the handling unit.

413

1. Position “A” of the MHU–196/M.
2. At “V.”
3. After positioning the trailer around the PLA but before extending the PLA hooks.
4. At least three.
5. To stop forward/aft shifting of the PLA hooks when the trailer suddenly moves or stops.
6. Because of the weight, one person lifts the leg while the other person removes and installs the quick-release pin.
7. TO 16W6–33–1.

8. (1) Place the SLCF aft pylon attach fitting in the retracted (up) position.
   (2) Torque the aft pylon support fitting to 875 ±125 in-lb.
   (3) Lower leaning boards and secure them with quick-release pins.
   (4) Install ladders on the PLA. These ladders are stored under the catwalks of the PLA, and are held in place with quick-release pins.
   (5) Remove the pylon protective cover and the dust caps covering the electrical and pneumatic interface connectors and inspect them.
9. Install the two front pins first, and then pitch the back of the trailer to install the rear-fitting pin.
10. Rotate the swing arms 90° and out of the way of the missiles.

414

1. Forward in position “B” and aft in position “F.”
2. Hook-locking pins.
3. TO 11N–L5001–1 for the CSRL and 11N–L5006–1 for the RLA.
4. 000.0° (±0.5°).
5. Wire harness cage (cable reel).
6. Rotate the forward end plate until the arrow points down. Secure this position by connecting a tie-down strap from the LLA to the wire harness cage.
7. Push in on the duct ¼ inch and release. The duct should spring back out to its original position.
8. Push in and rotate CCW until the indicator shows SCREW IS UP.
9. If the distance between the stop and nut is about 0.10 inches or if only one coil of the spring is still visible.
10. The uplocks hold the launcher in the maintenance frame; the downlocks secure the launcher against the uplocks, hold it in place, and prevent it from raising during weapons loading operations.

Do the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

33. (411) What are the two safety devices on the MHU–186/E hoisting beam?
    a. Sling link and keeper.
    b. Keeper and shackle guard.
    c. Keeper and safety stop link.
    d. Safety stop link and shackle guard.

34. (411) What do you do with the handling unit legs of the guided missile handling unit when hoisting the air-launched cruise missile (ALCM) onto the MHU–141/M trailer?
    a. Rotate them 180 degrees.
    b. Remove them.
    c. Extend them.
    d. Retract them.

35. (412) When using the MHU–174/E lift truck to handle the missile, make sure the
    a. continuity test is performed.
    b. proof load test was accomplished.
    c. ground points are connected firmly.
    d. power cord or mast does not contact the missile.

36. (412) When preparing to remove the missile from the MHU–141/M munitions handling trailer, do all of the following *except*
    a. set the trailer brakes and chock the wheels.
    b. ground the trailer to a facility ground.
    c. check missile inspection record card.
    d. perform the missile safe status check.

37. (412) What secures the missile-handling unit to the MHU–141/M munitions handling trailer?
    a. Twenty nuts and bolts.
    b. Spline fastener adapters.
    c. MHU–169/E cradle adapters.
    d. MHU–162/E link and swivel assemblies.

38. (412) What is required when moving a missile with a lift truck?
    a. Use spotters at each end of the missile.
    b. Remain clear of the aft end of the missile.
    c. Keep the lift truck wheels as close together as possible.
    d. Disconnect the lift truck from the facility ground during the move.

39. (412) What *must* you do *first* before lowering the missile and handling unit to the floor with a forklift?
    a. Shut the forklift off.
    b. Reinstall the missile cover.
    c. Connect a grounding cable.
    d. Remove the handling unit bolts.

40. (413) The *rear* pendulum and fixed attachment fittings are installed in which position on the MHU–196/M munitions handling trailer (MHT) for pylon loader adapter (PLA) mate?
    a. H.
    b. F.
    c. B.
    d. X.

41. (413) How many shims *must* you install on each attachment fitting when wrapping the pylon loader adapter (PLA)?
    a. Only one.
    b. Two or more.
    c. Three or more.
    d. No more than two.

42. (413) During the loading process, the pylon is secured to the suspended loading and checkout frame (SLCF) with
    a. four locking levers built into the frame.
    b. three locking levers built into the frame.
    c. two quick-release pins: one aft and one forward.
    d. three quick-release pins: two forward and one aft.

43. (413) During preloading, *before* positioning the pylon under the suspended loading and checkout frame (SLCF), make sure the
    a. swing arms are retracted; rotate them 90 degrees away from the missiles.
    b. launcher forward and aft yokes are stowed.
    c. frame aft pylon attach fitting is lowered.
    d. leaning boards are retracted.

44. (413) On the pylon loader adapter (PLA), how are the swing arms positioned when performing pylon post-load procedures?
    a. Fully retracted and rotated 90 degrees (°) to clear.
    b. Fully retracted and rotated 90° to engage.
    c. Fully extended and rotated 90° to clear.
    d. Fully extended and rotated 90° to engage.

45. (414) The *forward* pendulum and fixed attachment fittings are installed in which position on the MHU–196/M munitions handling trailer for launcher loader adapter (LLA) mate?
    a. A.
    b. B.
    c. F.
    d. H.

46. (414) How do you retract the hook on the launcher loader adapter (LLA)?
    a. Remove the bolts securing the hooks and pull on the actuating rods.
    b. Remove the quick-release pins and manually lift the hooks into place.
    c. Rotate the actuating handle counterclockwise until the hooks are stowed.
    d. Remove pins and use a socket and speeder to rotate the hook drive bolt.

47. (414) Where do you position the LIFT FORCE POUNDS switch on the munitions handling trailer (MHT) for wrap or launcher operations?
    a. 10 thousand (k).
    b. 20k.
    c. 40k.
    d. 50k.

48. (414) When preparing to load the launcher into the suspended loading and checkout frame (SLCF), the launcher spline key must be in the index or
    a. 12 o'clock position.
    b. 9 o'clock position.
    c. 6 o'clock position.
    d. 3 o'clock position.

49. (414) To secure the launcher in the suspended loading and checkout frame (SLCF), rotate the forward and aft downlock drives until the indicators show
    a. SCREW IS UP.
    b. SCREW IS DOWN.
    c. SPLINE ENGAGED.
    d. SPLINE DISENGAGED.

50. (414) What position *must* the frame power drive controller (FPDC) indicate before you can remove the launcher from the suspended loading and checkout frame (SLCF)?
    a. 000.0 degree (°).
    b. 090.0°.
    c. 180.0°.
    d. 360.0°.

51. (414) When removing the launcher from the suspended loading and checkout frame (SLCF), raise the launcher loader adapter (LLA) until the LLA yokes are approximately
    a. 2 inches below and aligned with the launcher aerospace ground equipment (AGE) rings.
    b. 2 inches above and offset with the launcher AGE rings.
    c. 4 inches below and aligned with the launcher AGE rings.
    d. 4 inches above and offset with the launcher AGE rings.

Student Notes

Please read the unit menu for unit 4 and continue ➔

Unit 4. Mate Procedures

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THE WEAPONS you work on are only one piece of a large weapon system. They are mated to aircraft that deliver them to a designated target. This unit covers the interface portion of the delivery system. The ALCM can be carried externally on pylons. ALCMs and gravity weapons can be carried internally on the AGMBRL for the B–52. We refer to the AGMBRL as the CSRL. The B–2 uses the RLA for gravity weapons only in two internal bomb bays.

4–1. Pylon Mate Procedures

This section covers mating ALCMs to the pylon. Pylons can carry up to 12 missiles externally on the B–52. We have broken down the section into two lessons: (1) rack inspection and installation onto the ALCM and (2) ALCM mate procedures.

415. Ejector rack preparation, installation, and removal

Weapons are mated to the pylon with the MAU–12D/A ejector racks. Two PI fittings are installed on each ejector. A shear bracket with a grounding block is installed on the rear PI fitting. The PI fittings are used to physically bolt the ejector rack to the pylon. The bonding assembly maintains a continuous ground loop between the missile and the aircraft. Figure 4–1 shows the PI fittings used on the ALCM. Ejector preparation consists of ejector inspection and ejector configuration. Let's review both of these and install an ejector on an ALCM.

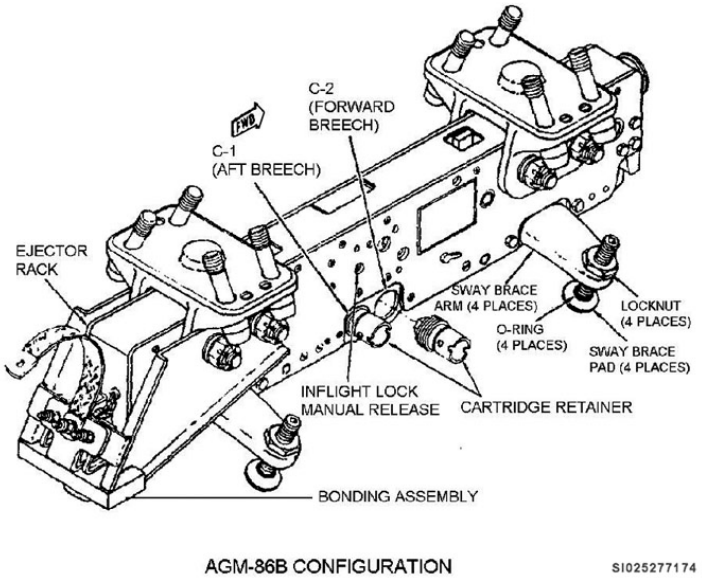


Figure 4–1. PI fitting configuration.

Preparing ejector

The ejector inspection process is usually completed well in advance. Most bases have a rack maintenance shop that performs all rack maintenance. The ejectors are prepared for installation and placed on a shelf. The “inspection completion date” and the “next inspection due date” is annotated on an AFTO Form 350, Reparable Item Processing Tag, and attached to the ejector.

When inspecting the ejector if old sealing compound is present, use a wire brush, or equivalent tool, and clean any sealing compound that might be on the sway brace threaded studs, locknuts, and sway brace arms. If necessary, clean other parts of the ejector as directed in TO 11B29–3–25–2. You may also have to perform checkout and analysis as described in the ejector TO.

Configuring ejector

Configuring an ejector is installing the proper PI fittings so the ejector can be mated to a pylon, CSRL, or RLA. Let’s look at installing the ejector on an ALCM, which will be mated to a pylon. The ejector is heavy, weighing approximately 90 pounds. Make sure you use enough help when lifting, supporting, or positioning the ejector or you might injure someone or cause damage to equipment. Ejector assembly includes inspecting the ends of the two gas metering orifices for the designation “No. 10.” Using a torque wrench, open and close the ejector shackles to make sure the linkage isn’t binding and operates within the allowable torque limits. These checks you can do before or after installing the PI fitting. Also, check for the presence of safety wire on the cartridge retainers, which lets everyone know the explosive cartridges are *not* installed.

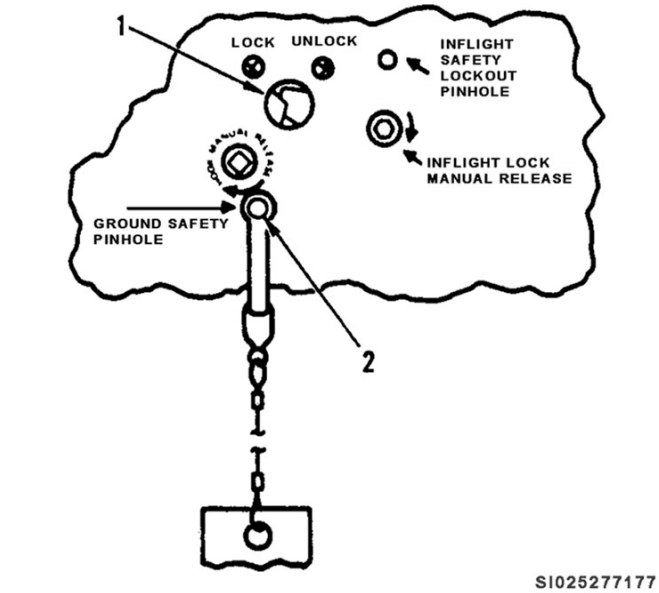
Let’s install the front PI fitting first. Install a bushing in each of the four holes on the PI fitting. Install the front PI fitting with two bolts, washers, and nuts. Coat the bolt threads with corrosion preventative compound (CPC). Torque the nuts to 16 to 20 in-lb. so the nut and bolt are aligned for cotter pin insertion, then install the cotter pins. Next, install the rear PI fitting with bushings on the ejector, and position the bracket assembly outside of the rear PI fitting. Install two bolts, washers, and nuts to secure the bracket and PI fitting. Coat the bolt threads with CPC. Torque the nuts to 16 to 20 in-lb. so the nut and bolt are aligned for cotter pin insertion, and install the cotter pins.

Installing/removing the ejector to/from the missile

The MAU–12 D/A ejector rack is the only device we use to attach the ALCM to the pylon. You can find the procedures for installing the ejector rack on the missile in TO 16W6–33–1. To begin the installation, you must perform a missile safe status check. Also, verify the missile serial number against the work order to make sure you have the proper missile.

ALCM

The ejector must be installed on the missile before you install the explosive cartridges or you might cause injury or even death to yourself or others. Also make sure the ejector part number is correct. Clean the shear bracket and missile ground pads with alcohol, then check the ejector piston feet and sway brace pads, make sure they are fully retracted. Attempt to separate the foot pad from the threaded stud by pulling the pad with moderate hand pressure. If the pad comes off or the area is damaged, replace the sway brace pad. Remove the ground safing pin and unlock the rack, thus opening the shackles. Remove the sensing switch cover. Align the rack over the missile and attach the rotary (separation) switch lanyard to the middle rack solenoid. Verify the connection by listening for an audible click or by feeling the D-ring snap in place. The lanyard must be looped out in a ‘U’ shape to either side of the rack and must be free to move. Now carefully lower the rack onto the missile clevises, using care not to pinch the lanyard. Rotate the HOOK MANUAL RELEASE clockwise (CW) to close the shackles. Verify the rack is locked by checking the IN-FLIGHT SAFETY LOCK inspection port and that it shows the IN-FLIGHT SAFETY LOCK is in the LOCK position (fig. 4–2). Now install the ground safing pin.



1. EJECTOR INFLIGHT SAFETY LOCK
2. EJECTOR GROUND SAFETY PIN

Figure 4–2. Ejector lock indications.

Next, lift the aft end of the ejector rack until the shackle is centered and held securely against the missile clevis, and then manually run down the aft sway brace footpads until they are finger tight against the missile. Repeat the steps for the forward end of the ejector rack. Now you are going to torque the four sway brace foot pads to 10 in-lb. using the following sequence: Left Rear, Right Front, Left Front, and Right Rear. During torquing operations, do not allow the sway brace pads to rotate on the missile skin; the rotation can cause damage to the missile skin. It may be necessary to hold the sway brace feet to prevent rotation. Minor movement is acceptable. Next, torque them again to 20-in-lb. in the same sequence as before and then check the rack alignment using the ALCM ejector rack alignment template. Make sure that the three ‘feet’ of the template contact the missile surface. The center foot is allowed a maximum gap of .010 inches from the missile skin. Verify that the rack is aligned by choosing which side of the rack is most aligned, checking at the front and back of the ejector rack. Correct any problems with the rack’s yaw by lightly tapping (manually or with a rubber mallet) the ejector rack to move it the direction required for proper rack alignment. Check the roll of the rack by ensuring that there is less than a .020-inch gap between the alignment template the side plate of the rack. If there is a larger gap than this, you correct it by installing the sway brace protractors on each of the sway braces and tightening them by 2 numbers on one side and loosening them by 1 number on the opposite side. Repeat this until the rack ‘rolls’ enough that the gap between the rack and template is less than .020 inch.

After rechecking the alignment, you continue torquing the sway brace footpads. Make sure the sway brace foot pad locknuts are backed off enough so they will not lock up against the sway brace arm during the torquing operation. Using the Left Rear, Right Front, Left Front, and Right Rear sequence, torque each of them to 50, 100, 200, 300, 400, and finally 500 in-lb. After you reach the final torque, check the rack for proper alignment. First, check the rack’s yaw; if this is not aligned properly, remove the rack and reinstall it. Check the *roll* alignment of the rack again just as you did above. If the gap is greater than .020 inch now, only tighten one side by one number (on the sway brace protractors), and loosen the opposite side by one number. You can only repeat this process one time for each end of the rack. If it is still not aligned, you must back off all of the sway braces and start all over again.

Final procedures

Final rack installation is fairly easy. Torque the four sway brace pad locknuts to 250 ± 50-in-lb. to the sway brace arm to secure the sway brace pads. Make sure the ejector ground safety pin moves freely but do not remove it. Screw down ejector piston feet until they contact the weapon surface. Verify the shackle linkage is latched by looking in the inspection hole on the *right* side of the ejector and making sure the red shaft is *not* visible. Apply sealing compound to the sway brace threads, locknuts, and sway brace arms. Make sure the separation switch safety pin lanyard D-ring moves freely and the lanyard is not pinched (fig. 4–3). To remove the ejector racks, just reverse the installation procedures.

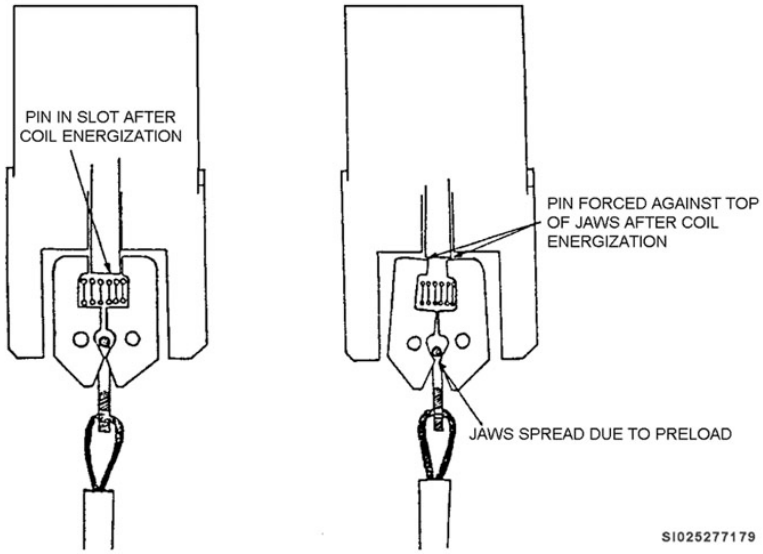


Figure 4–3. Separation lanyard D-ring installation.

Installing ejector cartridge

The ARD 446–1 ejector cartridge is used in the forward and aft breech, as shown in figure 4–4.

CAUTION: Be careful when you handle the cartridges because they are electrically primed and very susceptible to static electric discharges and contain explosives.

Before installing the ejector cartridges, perform an igniter circuit tester (ICT) and cartridge test adapter (CTA) self test. Perform a missile safe status check, and verify the missile is grounded and the ejector ground safety pin is installed. Cut and remove the safety wire, then remove the empty cartridge retainers from the ejector. Place the test equipment at the front end of the missile, remove the J1 connector cover from the ejector, and connect your test equipment. Before running the test, insert a $^{5}/_{16}$ inch Allen wrench in the “In-flight Lock” manual release hole, rotate the Allen wrench until you can install an “In-Flight Safety Lockout Pin,” then remove the Allen wrench. Follow the testing procedures in TO 16W6–33–1. After the test is complete use the Allen wrench, rotate the “In-flight Lock” until the “In-Flight Safety Lockout Pin” can be removed, then remove the Allen wrench. Disconnect the CTA cable from the test adapter and install the receptacle cover on A1J2.

CAUTION: Do *not* install ejector cartridges without the receptacle cover being installed or you may cause injury to yourself or others.

Ensure someone records the cartridge lot numbers and expiration dates for tracking purposes. If applicable, lubricate the O-rings on the cartridge retainers with a light coat of MIL–PRF–63460 break free. Before handling the cartridges, touch the facility ground long enough to discharge any static electricity. Obtain serviceable cartridges and inspect them according to TO 11A18–7–7, *Storage and Maintenance Procedures, Impulse Cartridges.*

CAUTION: While installing and torquing the cartridges into the breech, remain clear of the ejector orifice openings and breeches to prevent potential serious injury if one of the carts should accidentally fire.

The cartridge gas is explosively vented out of the orifices and will escape from around a cartridge retainer that is not torqued in.

One at a time, install the cartridges in the retainers. Hold the retainers so they point away from yourself and other people. Grasp the ejector long enough to discharge any static electricity and install the retainers. Torque the retainers to 275 ±25 in-lb. to secure them.

To avoid injury to yourself and others during the cartridge testing, everyone must stay away from the ejector, and must move beyond the forward end of the missile. Insert a $^{5}/_{16}$-inch Allen wrench in the "In-flight Lock" manual release hole, rotate the Allen wrench until you can install an "In-Flight Safety Lockout Pin;" then, remove the Allen wrench. Connect the test cable to the test adapter connector and run the test. After the test is complete, use the Allen wrench to rotate the "In-flight Lock" until the "In-Flight Safety Lockout Pin" can be removed. Then, remove the Allen wrench. Disconnect the test cable from J1 on the ejector rack and install the receptacle cover on J1. Now the missile is ready for mate to the pylon.

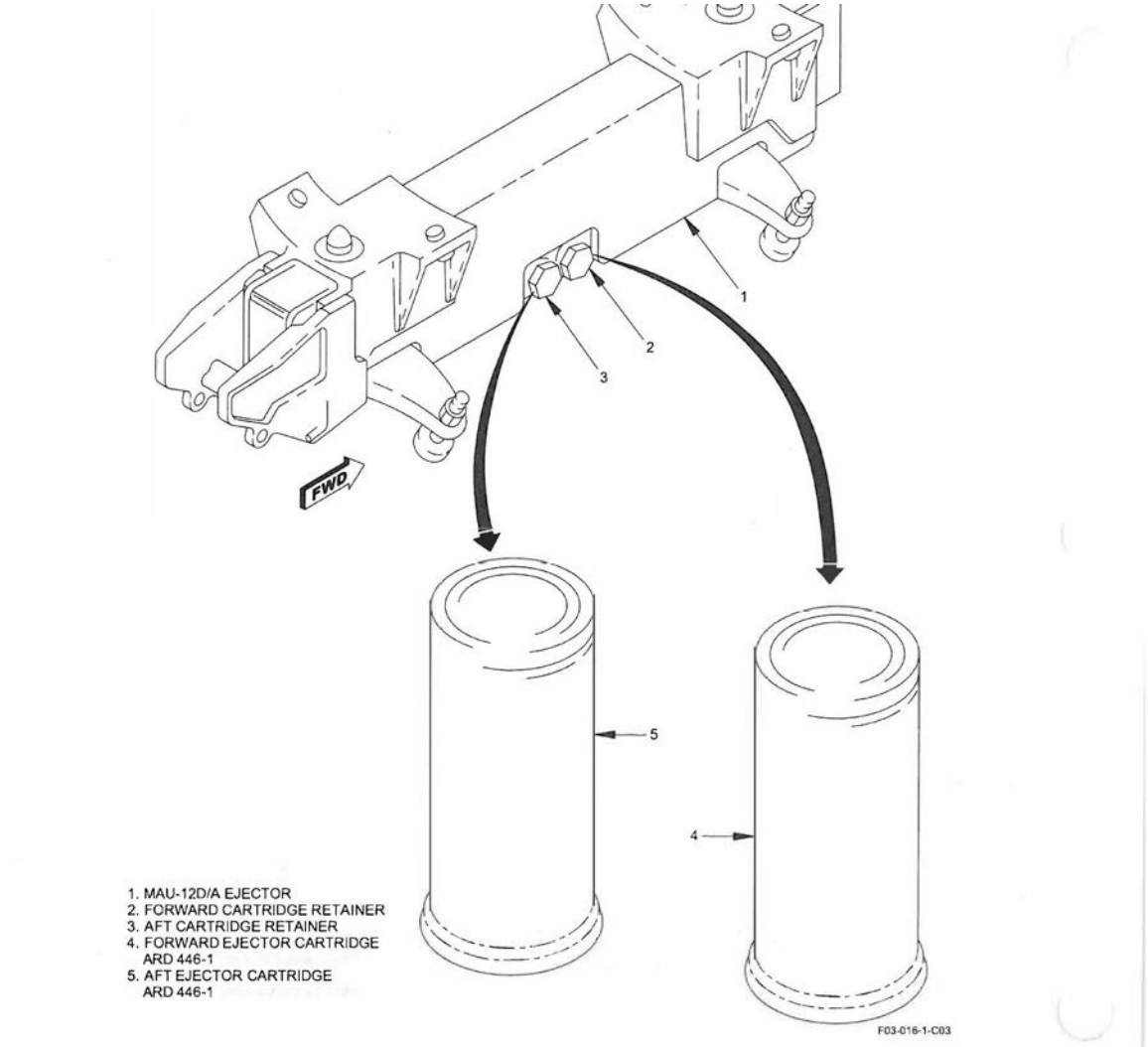


Figure 4–4. Cartridge installation.

416. Air-launched cruise missile mate procedures

The following lesson is an abbreviated extract from TO 16W6–33–1. Here we discuss preload preparation procedures for the ALCM, pylon, and loading (mating) the missile to the pylon.

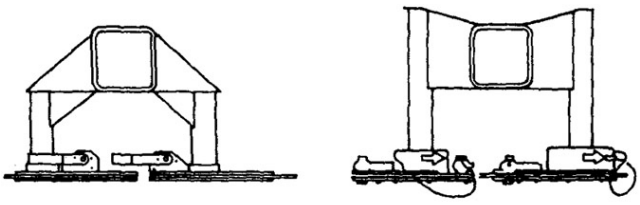
Operational readiness inspections

TO 16W6–33–1, Table 3–1, lists the items, conditions, and inspection requirements for missile/pylon operational readiness inspections. This table makes the inspection process easy to understand because you check only the items identified by an "X" under the type of inspection. There are four types of operational readiness inspections:

1. Preload—performed before mating missiles to the pylon.
2. Final—performed after completing the mate operation.
3. Post download—performed following download from the SLCF or aircraft before going into storage.
4. Cross load—performed following removal from a carrier aircraft before it can be reloaded on the same or another carrier aircraft.

Air-launched cruise missile mate

Let's discuss the procedures for mating an ALCM to a shoulder position. Mating a missile to a centerline position (positions 2 or 5) is easier because you simply lift the missile straight up to mate it. Shoulder positions (positions 1, 3, 4, and 6) are more difficult to mate because they are angled. This requires the use of the ADU–468/E positioning and restraint adapter (fig. 4–5), which allows you to position the missile at an angle for mating. It includes two roll blocks for use with the ALCM. The roll blocks stabilize the missile and prevent excessive strain from damaging the aft attach bolt when it is angled. Because this adapter is installed on the manipulator head, the missile cannot by picked up off the floor with the jammer. It either must be hoist transferred onto the ADU–468/E, or the missile must be positioned on an MHU–141/M trailer and then the jammer can be driven under the missile and picked up. The MHU–162/E (fig. 4–5) allows you to securely mount a missile on the MHU–141/M trailer.



SWIVEL AND LINK ASSEMBLY MHU-162/E

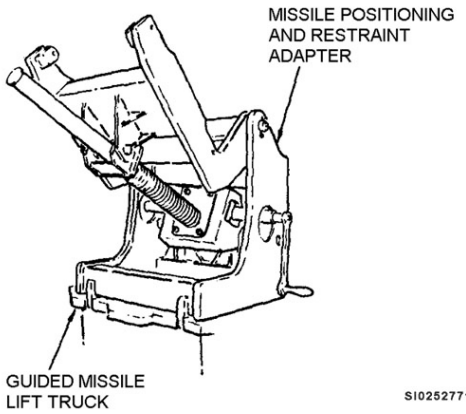


Figure 4–5. Missile-handling equipment.

Preparation

Pylon preparation and missile upload are NSP. The NSP steps in the TO must be followed as written to ensure nuclear surety is not degraded. Missile and pylon preparation is important for the mate operation to go smoothly. The pylon is installed in the SLCF and an empty pylon operational checkout must be performed before mating. Preparing the pylon involves removing the forward fairing and pinning the access panels in the open position. Inspect all CAMLOC quick acting fasteners for damage or missing parts; it is easier to replace them before the missile is on the pylon. Inspect the attach bolt inserts, the ground strap insert, the access cover inserts, and the hardware to be used on these items.

Inspect the pylon umbilical connector radio frequency interface (RFI) rings for missing or bent tines. Remove bent tines using tweezers (fig. 4–6). If more than three bent or missing tines are evident in any quarter or a total of 12 or more tines are bent or missing, replace the umbilical. When determining if there are more than three damaged tines in a quarter, visualize an imaginary 90° segment of the connector and *try* to fit the damaged tines into that segment. Inspect engagement fingers; any bent engagement finger requires replacement of the umbilical cable. Inspect the umbilical collar for tears and looseness. Also inspect the protective cover, shrink boot, and peripheral seal for cuts, tears, or nicks that might allow moisture intrusion. Replace damaged parts and clean off contamination with alcohol. Make sure the bonding surfaces are clean and free of paint. Clean with isopropyl alcohol and a nonmetallic brush as required.

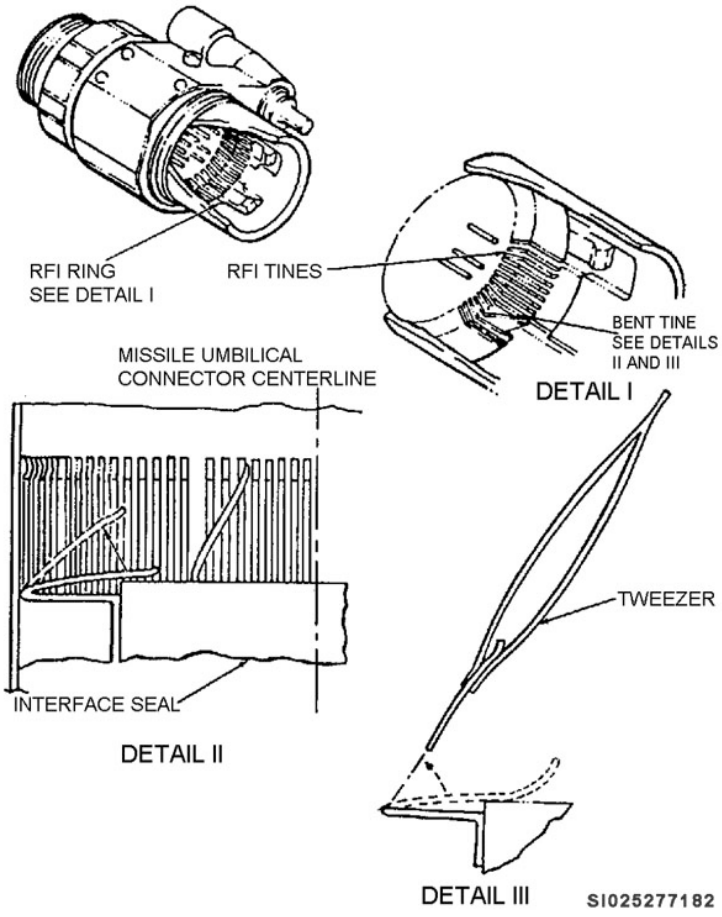


Figure 4–6. Umbilical radio frequency interface ring.

Position the ground safety pin on the side of the ejector that corresponds to the ground safety pin access D-door (fig. 4–7).

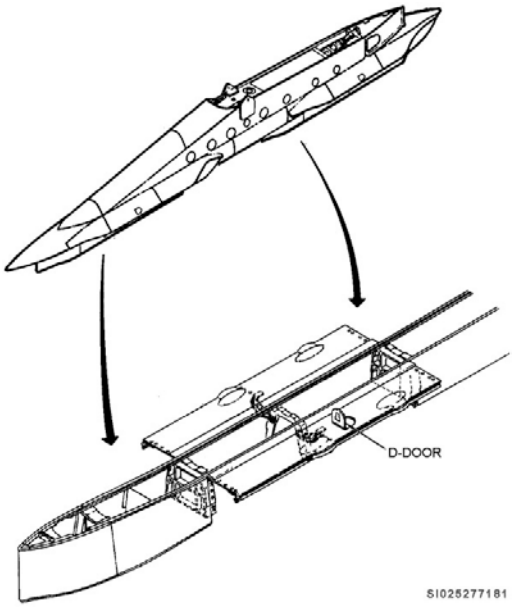


Figure 4–7. Safety pin access D-door.

If the safing pin is in the ‘wrong’ side of the rack, correct this deficiency by taking a second safing pin and while inserting it through the opposite or ‘correct’ side of the ejector rack, *push* the incorrectly positioned pin out of the rack. In this way, a safing pin is always installed in the rack internal linkages. *Never* simply remove the pin and then install it on the other side of the rack. The rack must remain pinned at all times while it is installed on the missile. Verify the CVU–134/E guided missile components cover set is installed on the temperature transmitter and Pitot-static tube. Verify the engine air inlet seal is properly installed. Carefully unlatch and move the ALCM engine air inlet to the lowered or retracted position. To do this, use the engine inlet latch release tool in the manner shown in figure 4–8.

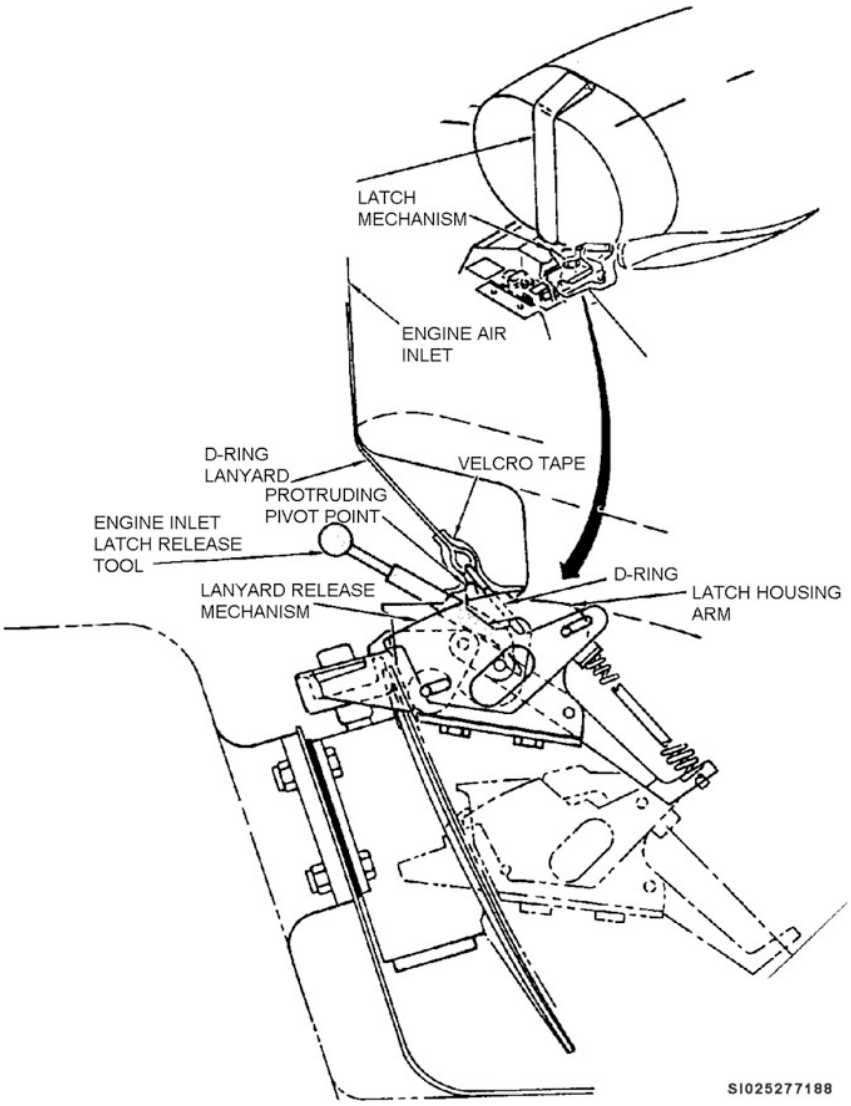


Figure 4–8. Lowering the engine air inlet.

Remove the umbilical receptacle protective cover and inspect the umbilical receptacle for foreign material. If necessary, clean according to TO 21M–AGM86B–2–1, *Maintenance Instructions, AGM–86 Missile*. Install two roll blocks on the aft beam of the missile-handling unit with two quick-release pins. Next, install the ADU–468/E on the lift truck with four quick-release pins. Because of the way that the ADU–468/E rolls the missile over for mating, it is important to position the missile properly on the adapter. The general rule is that you always pick the missile up from the opposite side from which you will be mating it onto the pylon. This means that if you are mating the missile to positions 1 or 4, which are on the left side of the pylon, you must pick the missile up from the right side and vice versa for positions 3 and 6, which are on the right side of the pylon.

Either hoist transfer the missile onto the ADU–468/E or, with the missile on the MHU–141/M trailer, position the lift truck under the handling unit. Either way, mate the positioning and restraint adapter to the handling unit with four quick-release pins (fig. 4–9). It attaches to the positioner the same way it mates directly to the lift truck. Attach a ground cable between the lift truck and facility ground; disconnect the ground between the handling unit and the MHU–141/M trailer. Remove the missile from the trailer. Rotate and position the positioning restraint adapter, as required, to load the missile.

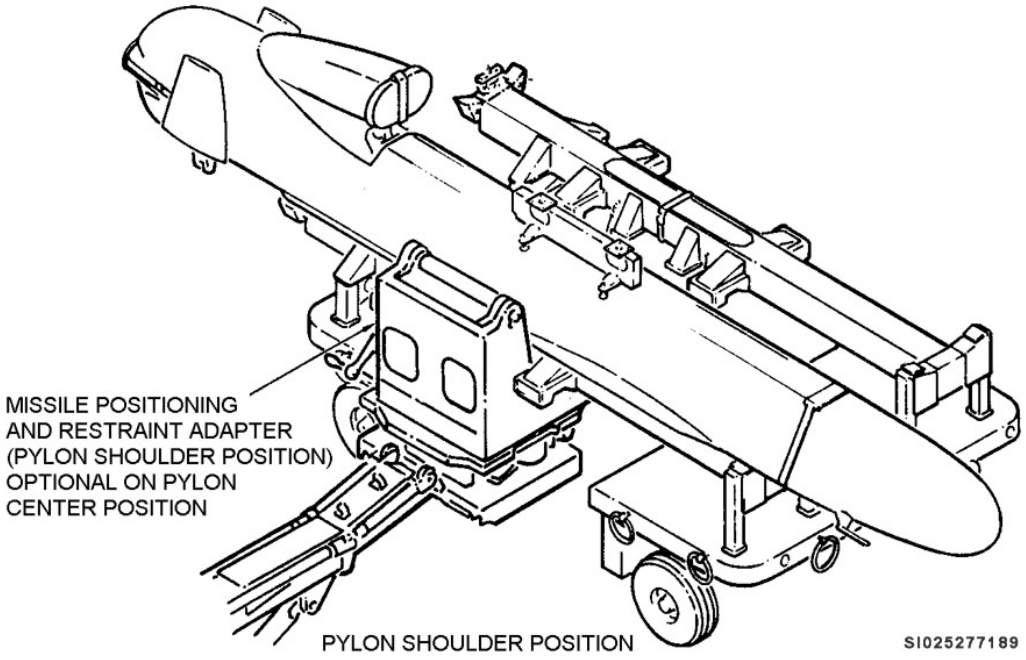


Figure 4–9. Positioning and restraint adapter with handling unit.

Mating procedures

Raise the missile to within a few feet of the pylon. Use the positioner crank handle to rotate the missile into position. Closely observe the clearances between the missile and the pylon as you move it about one foot from the station to be mated. Align the umbilical connector airports and locking sleeve with the airports and filler ring on the umbilical receptacle. Press the umbilical into the receptacle until you feel or hear a snap. Using the umbilical spanner wrench, turn the engaging nut CW until the nut contacts bottom. Verify it is fully seated by checking and making sure the yellow ring on the engaging nut is flush with the top of the housing assembly or partially covered by the connector housing shell. Lower and connect the protective cover. Make sure the protective cover is in the full down position to prevent moisture from leaking into the umbilical connector.

Position the bonding jumper (strap) to prevent it from being pinched. It may be necessary to use the positioner crank handle to make minor changes to the angle of the missile. Raise the missile until the PI fittings are firmly seated against the pylon. Install the eight attach bolts finger tight. With the locking collars fully depressed (fig. 4–10), torque the attach bolts to 610 in-lb. Visually check that the locking collar engages the attach bolt. If the locking collars do not engage at 610 in-lb. (they usually don’t), it will be necessary to reset your torque wrench to 800 in-lb. With one technician carefully turning the attach bolt and applying no pressure to the locking collar, have a second technician observe the locking collar. As you slowly turn the bolt, the locking collar should drop into position. If you reach 800 in-lb. before the locking collar drops, you must back off only that bolt and start the torquing process again. Your team chief will verify that the collars are properly locked.

Two different technicians can simultaneously connect the ejector cable and bonding strap. Remove the ejector receptacle cover and ejector cable cover, inspect the connectors, and connect the cable to the ejector receptacle. Safety wire the connector shell to the ejector using .020-inch steel wire. Clean the bonding strap and the pylon-grounding surface with alcohol as necessary to remove any contaminants. Attach the strap to the pylon-grounding point with the bolt and washer provided with the pylon; tighten securely.

Now that the missile is electrically bonded to the facility through the pylon, you can remove the handling unit. Back off the locknuts on the bolts that attach the handling unit to the missile.

WARNING: Use extreme care to ensure that all pressure has been removed from the attach bolts prior to loosening them. If there is any "sideways" pressure on the bolts as you unthread them from the missile, the MHU–159/E stand can jump away from the missile as the bolts pop free, possibly injuring personnel or damaging equipment.

Unscrew the handling unit attach bolts and make sure they drop free. You must be even more careful while removing the stand from a missile mounted on a shoulder position. It often requires quite a bit of 'tweaking' of the missile to align it properly for mating; every bit of this tweaking can put quite a bit of pressure on the attach bolts. The entire crew must pay very close attention while loosening the attach bolts, keeping an eye out for any sort of binding in the bolts or the stand and backing away from the missile as the bolts are loosened. You must ensure that the stand remains in contact with the missile until both attach bolts are completely unthreaded. The stands have been known to jump nearly a foot away from the missile if the crew does not properly remove ALL pressure from the attach bolts. Be very careful. After the handling unit attach bolts are free of the missile, use care not to make sudden or excessive movements, move the lift truck boom until the handling unit is clear of the missile. Move the lift truck from the immediate work area. Once the handling unit is removed, remove the roll blocks and put them back with the positioner.

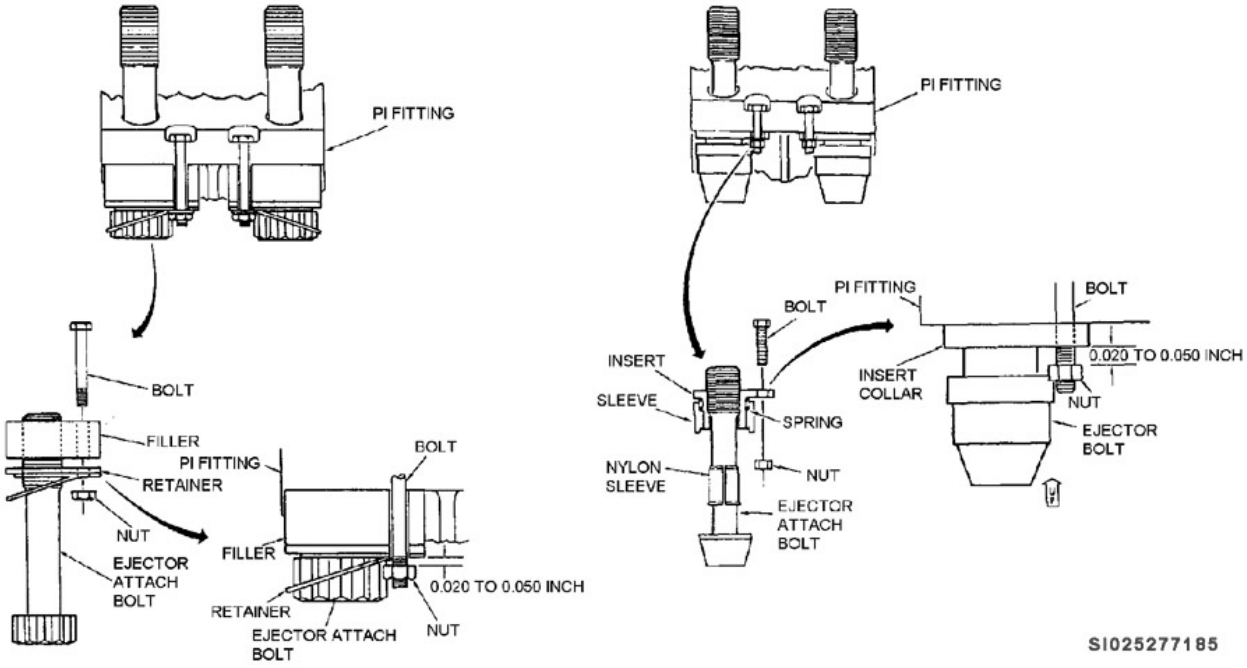


Figure 4–10. Locking collar configuration.

Inspect the missile and the pylon for damage that may have occurred during the mate operation. Position the umbilical support bracket arms around the umbilical connector and secure them in place with the quick-release pin (fig. 4–11). Remove the alignment adapters and the drawbolts from the missile, inspect and clean the missile mounting holes, and install the missile hardpoint plugs. Ensure the ejector ground safety pin and streamer protrude through the access D-door. Attach the engine air inlet seal lanyard loop to the pylon attach bracket with the quick-release pin (fig. 4–12).

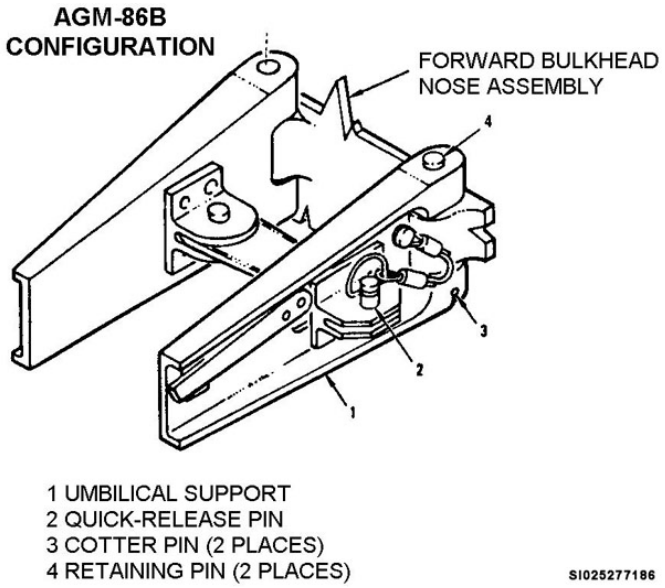


Figure 4–11. Umbilical support bracket.

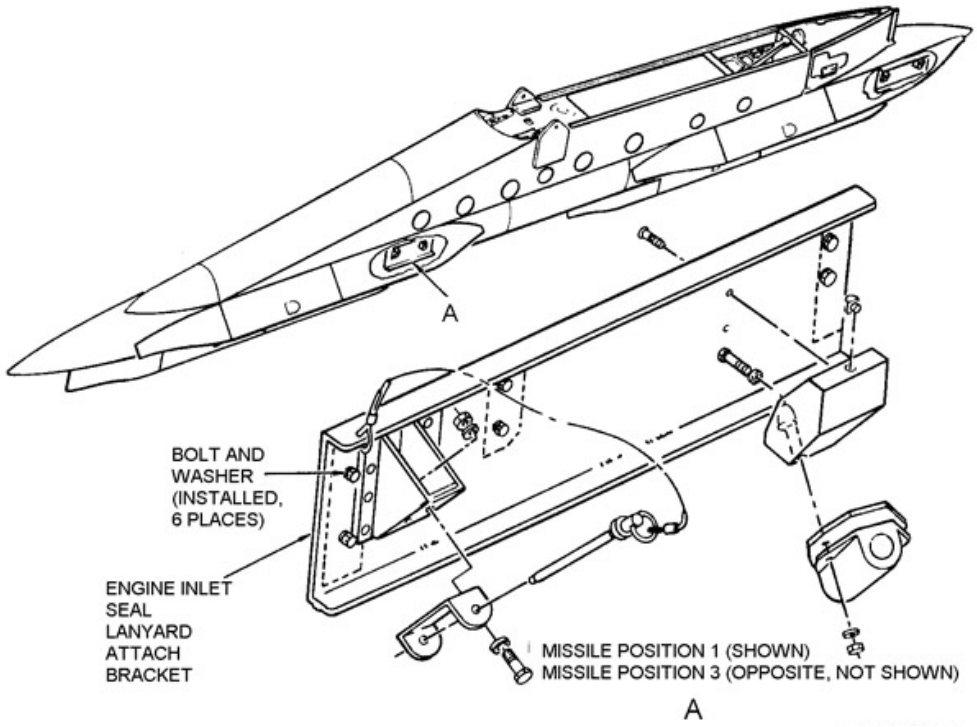


Figure 4–12. Engine air inlet seal lanyard attachment.

Your team chief will inspect all access areas before the panels and the forward fairing are installed. For most missile mate operations, all six missiles will be mated and the pylon loaded operational. The 2M0X1s perform ESTS checkout before the access panels and the fairings are installed. This is because if the loaded test fails, a “bad” missile might need to be downloaded and replaced. A final operational readiness inspection is required as the final inspection.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

415. Ejector rack preparation, installation, and removal

1. If ejector racks are prepared for installation and placed on a shelf in the rack shop, how are they annotated?

2. What orifice designation is used on the ALCM ejector?

3. Explain how to torque the PI fittings on the ejector.

4. How is the connection verified between the rotary (separation) switch lanyard and the middle rack solenoid?

5. Explain the first two tightening procedures for torquing the sway brace foot pads.

6. After final torque of the sway brace foot pads, how much of a gap can there be between the rack and the ALCM ejector rack alignment template?

7. After torquing the sway brace locknuts, where do you apply sealing compound on the ejector?

8. Which cartridges go in the forward and aft breeches on the ALCM ejector?

9. Why must you be careful when handling ejector cartridges?

10. What must you do before handling the ejector cartridges?

11. When must you remain clear of the ejector orifice openings?

416. Air-launched cruise missile mate procedures

1. Explain the four types of operational readiness inspections.

2. Why are pylon shoulder positions more difficult to mate?

3. What piece of equipment is required for mating an ALCM to the shoulder position?

4. What are the rejection criteria for the umbilical RFI rings?

5. If the ejector rack safety pin is on the “wrong” side, how do you correct the deficiency?

6. How does the positioning and restraint adapter attach to the handling unit?

7. What indicates the umbilical connector is properly installed?

8. If the locking collars do not engage after torquing the attach bolts to 610 in-lb., what do you do?

9. While torquing a PI fitting bolt, when must you back off the bolt and start over with the torquing process?

10. Who verifies the locking collars are properly locked?

11. After the missile has been mated to the pylon and prior to removing the handling unit, what can happen if the pressure is *not* removed from the handling unit attach bolts?

12. When do you install the missile hardpoint plugs on the ALCM?

4–2. Common Strategic Rotary Launcher Mate Procedures

This section covers mating ALCMs and gravity weapons to the CSRL. This launcher carries up to eight missiles or bombs. We have broken the section into two lessons: (1) rack preparation and installation onto the weapon, and (2) gravity weapon and ALCM mate procedures. Installing the ejector on the ALCM for launcher mate is very similar to ejector installation procedures for ALCM pylon mate. We discuss installing the ejector on the gravity weapon in this section. ALCM and bomb mate procedures are similar but enough differences remain to warrant covering them separately.

417. Ejector rack preparation, installation, and removal

Weapons are mated to the launcher using the MAU–12D/A ejector. One ejector safing mechanism and two PI fittings are installed on each ejector. A shear bracket with a grounding block is installed on the rear missile PI fittings. A bomb pullout extension cable and a bomb lanyard attachment assembly are installed on an ejector for a gravity weapon. Ejector preparation consists of ejector inspection and ejector buildup. Since ejector inspection is done in the same manner as for the ejectors used for pylons, we do not cover it entirely. We review the procedures that are different for gravity weapons.

Preparing and configuring the ejector

The ejector assembly includes inspecting the ends of the two gas metering orifices for the proper orifice designation. A gravity weapon ejector uses the “No. 6” orifice, while the ALCM uses the “No. 10” orifice. Also, you have to check the linkage inside the ejector for proper function by using a torque wrench to open and close the ejector shackles. You can do either of these two checks before or after installing the PI fittings. The cartridge retainers must be safety wired as an easy visual indication that cartridges are not installed. The PI fittings are installed in the same manner as the pylon PI fittings.

Install the safing mechanism on the left side of the ejector (fig. 4–13, step 1). This device is required because when the missiles are loaded on the CSRL, there is insufficient room to install a ground safing pin as we do on missiles mated to a pylon. The safing mechanism serves the same purpose, but essentially ‘bends’ the safing pin so that it can be operated from between the installed missiles. Both missile and gravity weapon ejectors have the safing mechanism installed. With the ejector in the locked position, remove the three screws from the left side.

To start, align the safing mechanism with the holes on the side plate. Two bolts require a conical washer placed between the ejector side plate and the safing mechanism. These washers keep the safing mechanism bracket from bending once the bolts are torqued. Install the bolts provided in the bomb suspension kit; do not tighten the bolts until you install all three. Lock the safing mechanism by moving the link up. Torque the top bolt to 240 ±24 in-lb. and the bottom bolt to 150 ±15 in-lb. Unlock the ejector safing mechanism by moving the link down, then torque the center bolt to 80 ±8 in-lb. With all three bolts torqued, the safing mechanism should operate smoothly. Verify that it moves in and out smoothly and, when installed, that it protrudes through the opposite side of the rack.

Next, install the PI fittings (fig. 4–13). Notice these procedures are different from the ejector procedures for pylon mating. Place the PI fittings onto the ejector and align the bolt holes. Install four bolts, four bushings, four spacers, washers (as required), and four castellated nuts on the two PI fittings. Torque the nuts to 20 in-lb. If cotter pin holes in the bolts don’t line up with the cutouts on the castellated nuts, back the nuts off a maximum of one flat and install the cotter pins. It is not permissible to tighten the nuts more than 20 in-lb. or you could damage the ejector. Coat the exposed bolt threads with CPC. Finally, install the bomb pullout extension cable on the ejector if required.

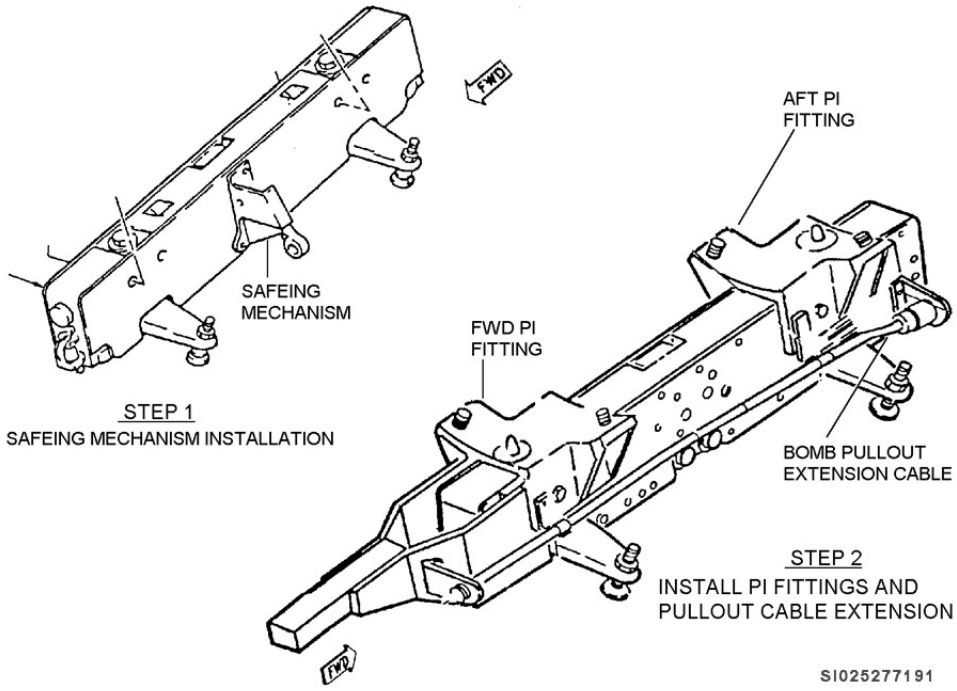


Figure 4–13. Launcher safing mechanism and PI fittings.

Installing and removing the ejector to/from launcher/bomb

The MAU–12D/A ejector rack is the only device we use to attach ALCMs and gravity weapons to a CSRL. You can find the procedures for installing the ejector rack on the missile and a bomb in TO 11N–L5001–1.

To begin the installation, you must first perform a visual monitor. Use the bomb maintenance TO (–1 series TO) for the specific visual monitor procedures. Most monitoring procedures have you check the general condition of the weapon, inspect the pull-out pin to ensure it is properly installed, and make a check of the preflight control panel for CDS status. Also verify the serial number against your work order to make sure you have the proper weapon.

You also need to perform preparation for strike procedures. The procedures are in the –1 series TO for the weapon. For the B83, the fins are positioned in the inverted "Y" position (fig. 4–14). For the B61, bombs mated in the forward stations must have the fins configured in the "+" position while bombs mated in the aft stations must have the fins configured in the "X" position (fig. 4–14). This is done to ensure adequate clearances between adjacent weapons. Check that the ejector feet are fully retracted and inspect the bottom of the sway brace pads for damage. Attempt to separate the foot pad from the threaded stud by pulling the pad with moderate hand pressure. If the pad comes off or the area is damaged, replace the sway brace pad. (If the ejector is being installed on a B61 or BDU–38 dummy bomb, run down the sway brace pads until 10 threads are exposed below the sway brace arms). Next, disengage the ejector ground safety pin, rotate the IN-FLIGHT LOCK MANUAL RELEASE to unlock the ejector, and use the HOOK MANUAL RELEASE to open the ejector shackles.

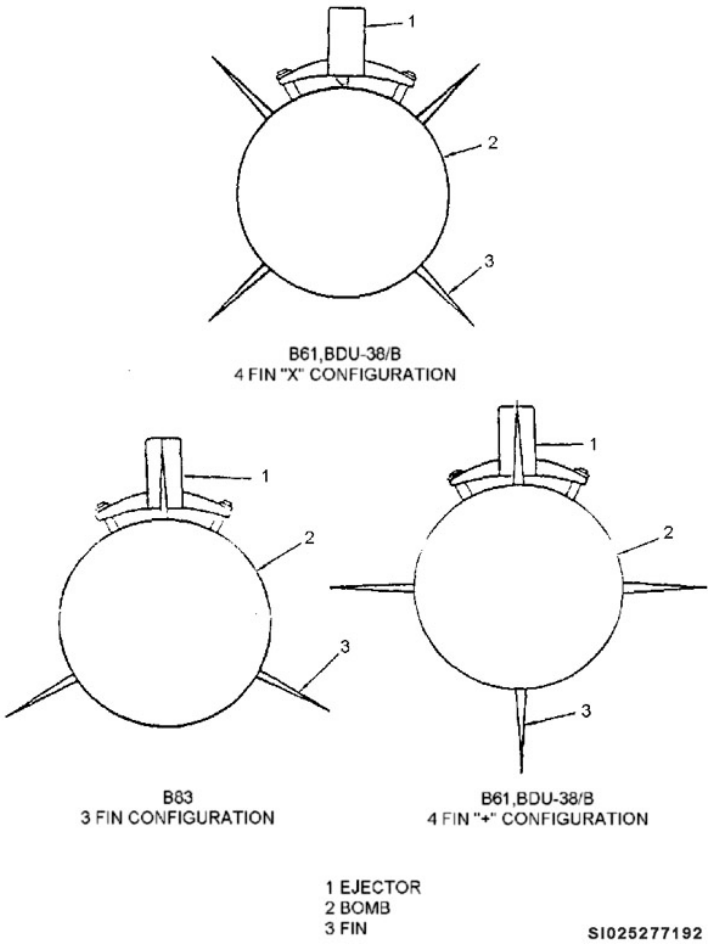


Figure 4–14. Gravity weapon fin configuration.

Lift the ejector, remove the sensing switch cover, and position the ejector rack on the weapon. The assembled ejector weighs over 90 pounds, so get help to safely lift it on the weapon. Close and lock the shackles on the bomb; make sure the IN-FLIGHT SAFETY LOCK indicates the ejector is properly locked. Install the ejector ground safety pin in the ejector. While holding the ejector tight against the bomb lugs, screw the sway brace pads down until they make contact with the bomb.

Visually check that the ejector is centered on the bomb and count the number of threads exposed below the sway brace arms. The number of threads under each arm should be approximately the same. If not, make any necessary adjustments. Then torque the sway brace pads to 20 in-lb. in the following pattern:

- Left forward.
- Right forward.
- Right aft.
- Left aft.

Now use a feeler gauge to verify there is at least a 0.080-inch gap between the ejector hook and the suspension lugs. Check both sides of the hook; this ensures the ejector is approximately centered over the bomb.

NOTE: You must use the same ejector tightening sequence used to apply the initial torque. Apply ⅛-turn increments to allow for a gradual and even tightening of the sway brace pads.

Install a protractor on each sway brace pad as an aid to track the tightening process. Use a breaker bar to tighten the forward left and right sway brace pads ⅛ turn. This causes the ejector to move away from the weapon and the rear sway brace pads to loosen. Retorque the aft sway brace pads to 20 in-lb. Continue the ⅛-turn tightening sequence. For the B83, apply six ⅛-turn increments. For the B61, apply a total of seven ⅛-turn increments. Check to see if the ejector hooks are centered in the bomb lugs with the threads exposed below the sway brace arms equally. If the threads are not approximately equal or the ejector hooks are not centered in the bomb lugs, remove the rack and repeat the installation process. Remove the protractors and torque the sway brace pad locknuts to 250 ±50 in-lb. to the sway brace arm to secure the sway brace pads.

Final rack installation is easy. Screw down ejector piston feet until they contact the bomb surface and make sure the ground safety pin is engaged. Apply a bead of sealing compound from the threads of the sway brace pad, across the nut, and onto the sway brace arms. Connect the bomb pullout cable to the weapon and connect the pullout lanyard to the lanyard attachment assembly as shown in figure 4–15. You connect the bomb pullout cable to the ejector bomb pullout extension cable receptacle during the mate operation.

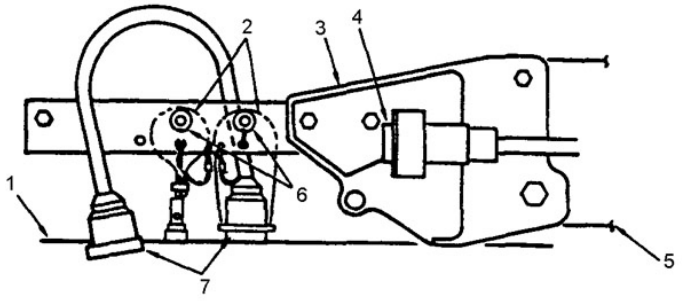


Figure 4–15. Pullout lanyard and pullout cable connection.

Installing ejector cartridges

ALCMs mated to the CSRL will have an ARD 446–1 cartridge installed in the forward and aft breech Since we are discussing gravity weapon procedures here, we'll be using two ARD 863–1 ejector cartridges instead (fig. 4–16). Remember the cartridges contain explosives; be careful when you handle them. Before installing the ejector cartridges, perform an ICT and CTA self test. Install a static ground cable between the ejector AFT PI fitting and the facility ground. Make sure the ejector ground safety pin is installed. If required, perform a visual monitor on the bomb.

Remove the cartridge retainers from the ejector and, if applicable, lubricate the O-rings with a light coat of breakfree. Place the test equipment at the front end of the missile, remove the J1 connector cover from the ejector, and connect your test equipment. Before running and tests, insert a $^{5}/_{16}$-inch Allen wrench in the "In-flight Lock" manual release hole, rotate the Allen wrench until you can install an "In-Flight Safety Lockout Pin," then remove the Allen wrench. Follow the testing procedures in TO 11N–L5001–1. After the test is complete, use the Allen wrench and rotate the "In-flight Lock" until the "In-Flight Safety Lockout Pin" can be removed, then remove the Allen wrench. Disconnect the CTA cable from the test adapter and install the receptacle cover on A1J2. Do not install ejector cartridges without the receptacle cover being installed or you may cause injury to yourself or others.

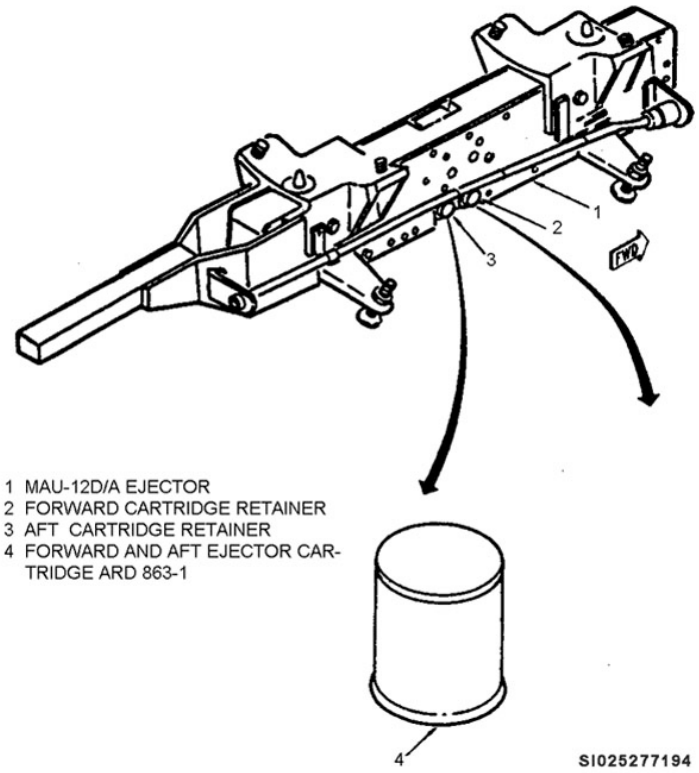


Figure 4–16. Cartridge installation.

Before handling the cartridges, touch the facility ground long enough to discharge any static electricity. Obtain serviceable cartridges and inspect them according to TO 11A18–7–7. Do *not* install cartridges that have exceeded the service life expiration date. Remain clear of ejector orifices and breeches while installing and torquing the cartridges into the breech. One at a time, install the cartridges in the retainers. Hold the retainers so they point away from you and other people. Grasp the ejector long enough to discharge any static electricity and install the retainers. Install the ARD 863–1 cartridges into the retainers; install one cartridge retainer in the aft breech and one cartridge retainer in the forward breech. Torque the retainers to 275 ±25 in-lb. to secure them.

To avoid injury to yourself and others during the cartridge testing, everyone will stay away from the ejector, and will move beyond the forward end of the missile. Insert a $^{5}/_{16}$-inch Allen wrench in the "In-flight Lock" manual release hole, rotate the Allen wrench until you can install an "In-Flight Safety Lockout Pin," then remove the Allen wrench. Connect the test cable to the test adapter connector and run the test. After the test is complete, use the Allen wrench and rotate the "In-flight Lock" until the "In-Flight Safety Lockout Pin" can be removed, then remove the Allen wrench. Disconnect the test cable from J1 on the ejector rack and install the receptacle cover on J1. Remove the static ground cable from the ejector AFT PI fitting.

Now the weapon is ready to be mated to the launcher. Because the procedures for mating an ALCM and a gravity weapon to the launcher are slightly different, we cover them separately. First, we discuss gravity weapons and then cover mate procedures for the ALCM.

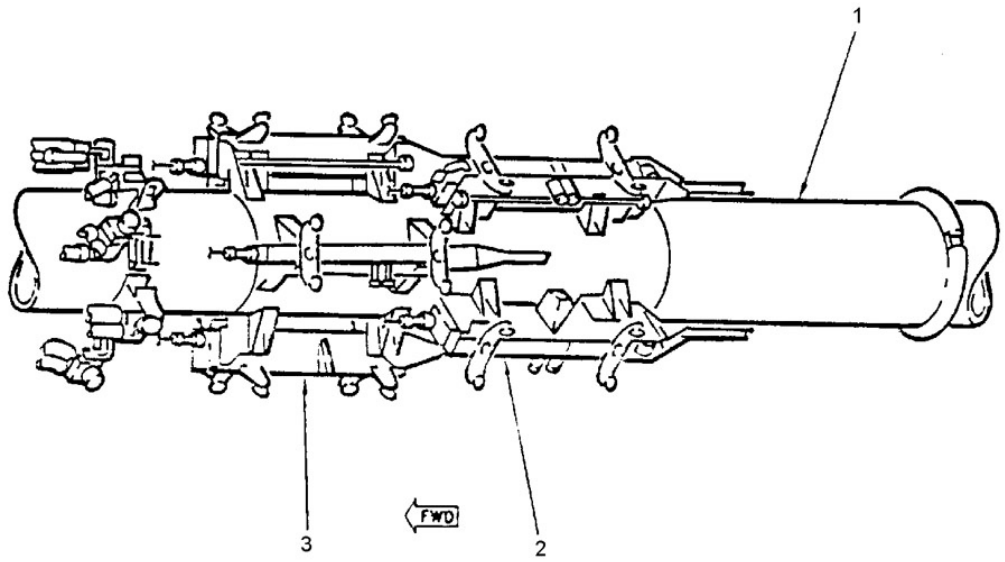
418. Mate and demate procedures

Eight gravity weapons can be mated to the CSRL. Four are mated in the forward position and four are mated to the aft position, or vice versa (fig. 4–17). Eight ALCMs can be mated to the CSRL. All are mated to the aft positions. First, we cover bomb mate, then ALCM mate procedures on the CSRL.

Operational readiness inspections

TO 11N–L5001–1, Table 5–1, lists the items, conditions, and inspection requirements for bomb/launcher operational readiness inspections. Table 6–1 lists the items, conditions, and inspection requirements for missile/launcher operational readiness inspections. These tables make the inspection process easy to understand because you check only the items identified by an “X” under the type of inspection. There are four types of operational readiness inspections:

1. Preload—performed before mating a weapon.
2. Final—performed after completing the weapon mating.
3. Post download—performed on a weapon-loaded launcher following download from the aircraft before going into storage.
4. Cross load—performed on a weapon-loaded launcher following download from an aircraft before upload on another aircraft without returning the launcher to a maintenance facility.



WEAPONS AND CABLES NOT SHOWN FOR CLARITY

1 LAUNCHER
2 AFT-A-EJECTOR MOUNTING POSITIONS
3 FORWARD-S-EJECTOR MOUNTING POSITIONS

SI025277195

Figure 4–17. Ejector installation for bombs.

Special tools and test equipment

The approved special tools and test equipment are listed in Table 2–1 of TO 11N–L5001–1. Some examples of the special tools and test equipment used with the CSRL are nitrogen charging adapter set, forklift adapter, weapon suspension tool, tester interface simulator, jammer, MHU–141/M trailer, and gravity weapon load adapters. Due to the quantity of equipment used, refer to the specific TOs for further information.

Bomb procedures

We use the B83 in this example. The bomb has been prepared for mate. The fins are placed in an inverted “Y” position, the bomb has been prepared for strike according to the –1 TO, and the wire rope pin assembly is installed. The ejector rack is installed on the bomb and the bomb operational readiness inspection is completed.

We break the gravity weapons mate into four, easy to do steps:

1. Launcher preparation.
2. Bomb transfer to lift truck.
3. Bomb mate to launcher.
4. Postmate procedures.

Launcher preparation

Before beginning the mate operation, you must prepare the launcher to receive the weapons. Sometimes one maintenance team prepares the launcher while another team performs the mate operation. If your team did not prepare the launcher, it's a good idea to verify these steps have been performed before you begin mating. Launcher preparation and inspection for bomb mate includes the following:

- Installing the launcher in the SLCF.
- Ensuring the empty ESTS check has been performed.
- Verifying the launcher is configured for the bombs to be mated.
- Performing the launcher preload readiness inspection.
- Rotating the launcher bomb position to be mated to the index (6 o'clock) position.
- Cleaning the launcher/ejector attach bolt holes in the launcher and inspecting the threads for serviceability.

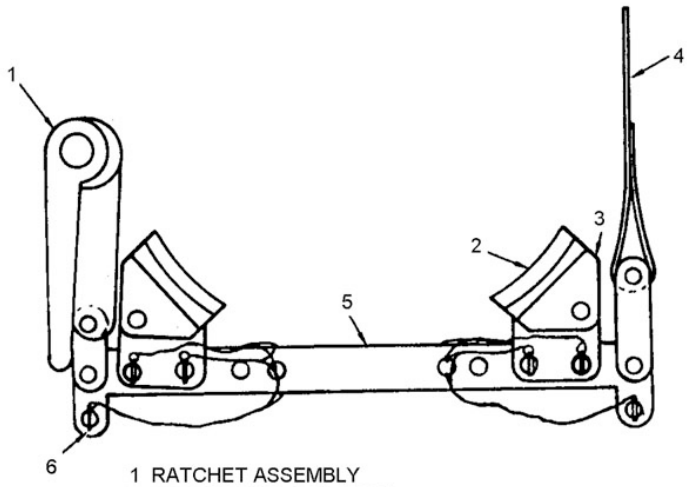
Bomb transfer to lift truck

You need to transfer the bomb from the trailer and onto the jammer. Use spotters on both ends of the bomb to watch clearances. The following are procedures for transferring bombs using a hoist. Perform a bomb visual monitor and ejector safety checks. After installing the gravity weapon loading adapter assembly on lift truck table, position the support blocks as follows: for B83s, position support blocks at the outer holes of the loading adapter assembly (fig. 4–18). For B61s, position the support blocks at the inner holes of the loading adapter assemblies. If using rollers, for B83s, install rollers in holes 2 and 2A on the lift truck table (fig. 4–19). For B61s, install rollers in holes 1 and 1A on the lift truck. Make sure the ejector sway brace pads and lock nuts are sealed to the sway brace arms and that the compound is not damaged.

If you are hoisting the bomb using a MHU–186/E, perform the following:

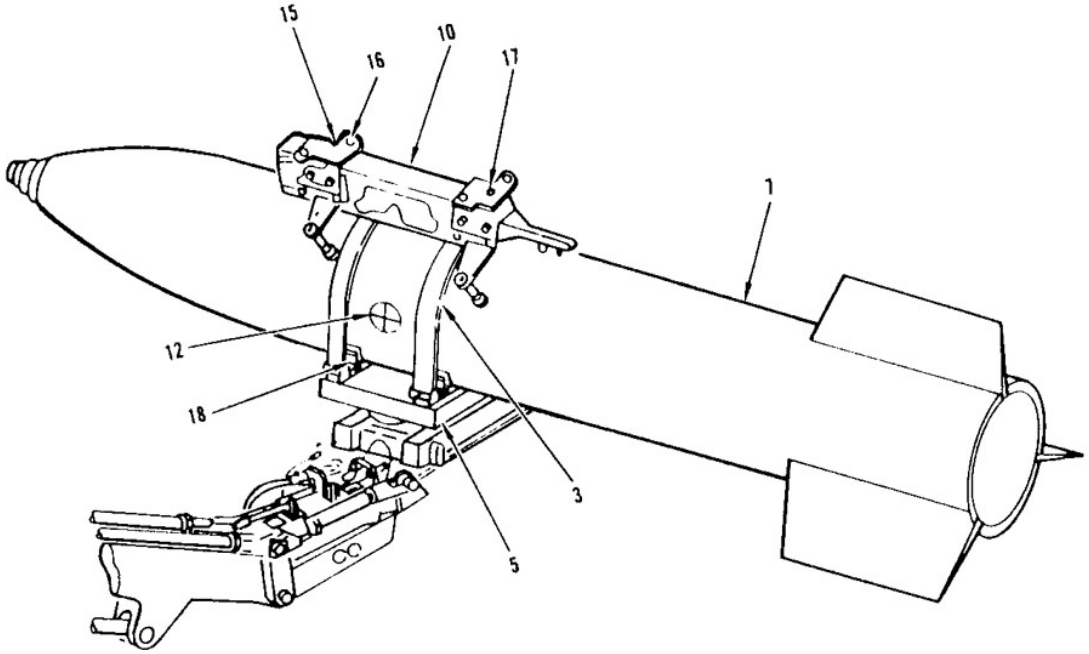
1. Install and secure the shackle in shackle position 1.
2. Inspect, clean, and lubricate the launcher bolts; install the adapter; and torque the bolts to 80 (±40) in-lb.
3. Attach the sling link to overhead hoist and position over bomb.
4. Using the hoist, slowly lift the bomb from the trailer and check for proper balance.
5. Position the bomb with the bomb center of gravity mark centered over the loading adapter assembly.
6. Slowly lower the bomb until the bomb mates with the loading adapter and support blocks.

CAUTION: To prevent the strap from pulling through the adjustment mechanism, ensure there is at least one-half wrap of strap on the take up spool. Secure the bomb to the loading adapter assemblies with safety straps. Remove the hoist from the area.



1 RATCHET ASSEMBLY
2 RUBBER PAD (2 PLACES)
3 SUPPORT BLOCK (2 PLACES)
4 SAFETY STRAP
5 GRAVITY WEAPON LOADING ADAPTER
6 QUICK-RELEASE PIN (6 PLACES)

Figure 4–18. Load adapter configuration for B83.



3 SAFETY STRAP (2 PLACES)
5 LIFT TRUCK TABLE
7 BOMB (TYPICAL)
10 EJECTOR
12 BOMB CENTER OF GRAVITY MARKING
15 PI FITTING
16 LAUNCHER/EJECTOR ATTACH BOLT (2 PLACES EACH PI FITTING)
17 PIN ON PI FITTING
18 GRAVITY WEAPON LOADING ADAPTER (2 PLACES)

Figure 4–19. Center of gravity orientation.

Bomb mate to CSRL

We start in station 1A or the forward position for station 1. We are going to do only one bomb here. If another one were to be mated, it would go into the 2B or aft position at station 2. Since we are using the B83, we place the fins in the inverted "Y" position. If we were using B61s, we'd place the forward station fins in the "+" position and the aft station fins in the "X" position. The basic steps for mating a bomb to the launcher are as follows:

1. Remove the bomb power cable and ejector cable from the stowage bracket at station 1.
2. Align the bomb under launcher and raise it to about 1 foot from the shaft (close enough to connect the cables).
3. Lubricate the launcher attach bolts with anti-seize compound. This prevents the bolts from seizing during ejector removal. The lubricant is toxic and very messy. This is the perfect time to apply the anti-seize to minimize exposure.
4. Connect the launcher bomb power cable to the ejector bomb pullout extension receptacle (J91).
5. Connect the bomb pullout cable to the ejector bomb pullout extension cable receptacle (J30).
6. Connect the launcher ejector cable connector to the ejector receptacle (J1).
7. While watching clearances on all sides, raise the bomb until the PI fitting guide pins engage the launcher. Continue to raise the bomb until the PI fittings are seated against the launcher.
8. Using a 12-point socket, install the four launcher attach bolts until they are hand tight. This is a very important step because the threads in the launcher attach bolt holes are machined at close tolerances. You must use care not to cross-thread the attach bolts during the installation process. Torque the attach bolts to 1900 ±100 in-lb. You may need two people for this operation: one person to torque and one person to make sure the locking collars are depressed when torque is applied.
9. Verify the locking collars fully engage the launcher/ejector attach bolts. If they are not engaged, set the torque wrench to 2300 ±100 in-lb. and slowly torque the attach bolts, stopping immediately when the collar drops. If a locking collar does not fully engage after the second torque is reached, completely loosen the attach bolt and redo the torquing process for the bolt.

Postmate procedures

Once your team chief verifies that the locking collars are properly positioned, remove the straps from the weapon and remove the lift truck from the immediate work area. It is important to closely observe all clearances during this operation. You are now ready for the next weapon. Once all the weapons are mated, the 2M0X1s perform the ESTS loaded operational checkout. When they approve the checkout, you must perform the final operational readiness inspection.

Missile procedures

For this discussion, the missile is prepared for mate. The missile safe status check is completed, the ejector rack is installed on the missile, and the missile preload operational inspection is completed. We break the ALCM mate into four, easy to do steps:

- Launcher preparation.
- Missile transfer to lift truck.
- Missile mate to launcher.
- Postmate procedures.

Launcher preparation

Before beginning the mate operation, the launcher must be prepared to receive the missiles. If your team did not prepare the launcher, it's a good idea to verify these steps have been performed before

you begin mating. You'll notice many items are the same for both bombs and missiles. Launcher mate preparation and inspection for missile mate includes the following:

- Installing the launcher in the SLCF.
- If required, ensuring the empty ESTS check has been performed and the complete 24-month inspection has been performed.
- Verifying the launcher is configured for missiles.
- Performing the launcher preload readiness inspection.
- Rotating the launcher missile position to be mated to the index (6 o'clock) position.
- Inspecting the missile umbilical connectors for dirt, grease, corrosion, bent contacts, missing pins, and damaged shells. Make sure the connector collar is not torn or damaged. The same criteria are used for the CSRL umbilical connector as are used for the pylon connector that we described earlier.
- Cleaning the launcher/ejector attach bolt holes in the launcher and inspecting the threads for serviceability.
- Locking umbilical bracket arms in the open position.

Missile transfer to lift truck

Before picking up the weapon, make sure the lift truck is serviceable. Check Air Force Technical Order (AFTO) Form 244, Industrial/Support Equipment Record, and make sure the lift truck is not overdue any inspections. Then, perform the prior-to-use inspection on the lift truck. Now, we are ready to transfer the missile to the lift truck. Either pick it up off of the floor, hoist transfer it onto the lift truck, or pick it up off the MHU–141/M trailer as follows:

1. Open the MHU–141/M trailer removable rail section and spreader bar.
2. Spread the front lift truck wheels as far as possible.
3. Connect a ground cable between the lift truck and facility ground; connect a ground cable between the handling unit and the lift truck.
4. Position the manipulator head under the handling unit, line up the attach lugs with the slots in the manipulator head, and mate the two. Use the four quick-release pins to secure the handling unit to the lift truck (fig. 4–20).
5. Position spotters at each end of the missile.
6. Remove the ground cable between the missile-handling unit and the MHU–141/M trailer.
7. Raise the boom until the lift truck has the entire weight of the missile.
8. Move the missile in position under the launcher.

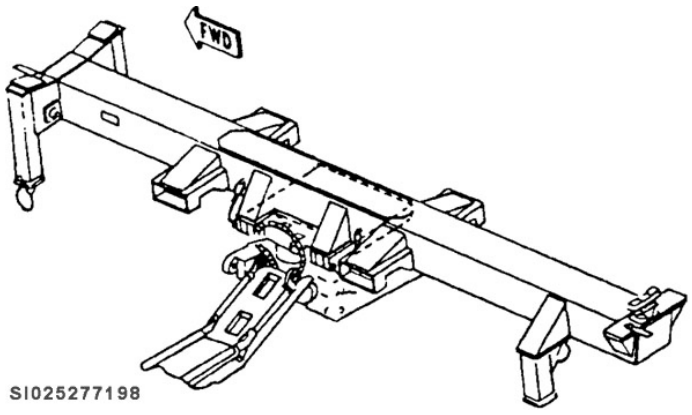


Figure 4–20. Manipulator head positioning under the handling unit.

Missile mate to CSRL

We start in position 1. Once this missile is mated, use the procedures outlined in TO 11N-L5001–1 to rotate the launcher to the next position. We cover the basic steps to mate a missile to the launcher; these are abbreviated steps to give you an overview of the operation. You'll notice some of these procedures are similar to bomb mate. Perform these missile mate procedures:

1. Carefully lower the engine air inlet. Use the same tool and procedures we used during ALCM mate to a pylon.
2. Remove the umbilical cable (fig. 4–21) from the CSRL stowage bracket and the ejector cable from the stowage bracket at station 1. Use care to make sure you have the correct umbilical and ejector connector for the position you are mating.

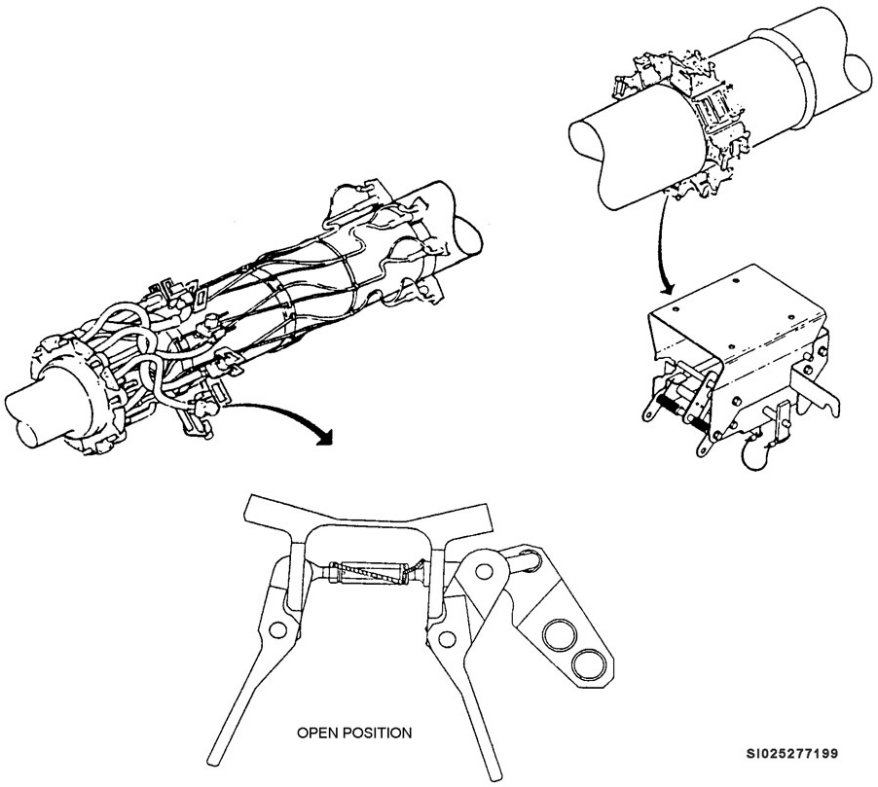


Figure 4–21. Launcher component location.

3. Align the missile under launcher and raise it to about 1 foot from the shaft (close enough to connect the cables).
4. Lubricate the launcher attach bolts with anti-seize compound.
5. Remove the umbilical receptacle protective cover and inspect the receptacle. Clean foreign material as necessary.
6. Connect the umbilical by aligning the airports and locking sleeve with the airports and filler ring on the umbilical receptacle.
7. Press the umbilical connector into the receptacle until you hear or feel a snap. This snap is from the spring fingers falling into position around the electrical connector portion of the receptacle.
8. Using the umbilical spanner wrench, turn the engaging nut until it is fully seated. The yellow ring on the engagement nut is flush with the top of the umbilical connector housing or partially covered by the connector housing shell.

9. Connect the ejector cable to the receptacle on the front of the ejector (J1).
10. Attach the engine air inlet seal lanyard loop to the launcher retention device using the quick-release pin.
11. While watching clearances on all sides, raise the missile until the PI fitting guide pins engage the launcher. Continue to raise the ALCM until the PI fittings are seated against the launcher.
12. Using a 12-point socket, install the four launcher attach bolts until they are hand tight. This is a very important step because the threads in the launcher attach bolt holes are machined at close tolerances. You must use care not to cross-thread the attach bolts during the installation process.
13. Torque the attach bolts to 1900 ±100 in-lb. You may need two people for this operation: one person to torque and one person to make sure the locking collars are depressed when torque is applied.
14. Verify the locking collars fully engage the launcher/ejector attach bolts. If they are not engaged, set the torque wrench to 2300 ±100 in-lb. and slowly torque the attach bolts, stopping immediately when the collar drops. If a locking collar does not fully engage after this final torque is reached, completely loosen the attach bolt and redo the torquing process for the bolt.
15. Lock the umbilical bracket arms and air engine inlet retention device bracket in the closed position.

Postmate procedures

1. Your team chief will verify that the locking collars are properly positioned.
2. Back off the lock nuts on the handling unit attach bolts.
3. Unthread the attach bolts from the drawbolts in the missile. Make sure the attach bolts drop free when they are unthreaded. The same caution applies here as we covered during the missile mate to pylon—make sure all the tension is removed from the attach bolts before they are loosened.
4. Disconnect the ground cables.
5. Move the handling unit and lift vehicle away from the missile and out of the work area.
6. Remove the drawbolts and alignment adapters from the bottom of the missile and inspect the inserts. Clean the inserts, if necessary.
7. Install the missile hardpoint plugs.

It is important to closely observe all clearances between missiles during this operation. You are now ready for the next missile. Once all the missiles are mated, you need to perform the final operational readiness inspection listed in TO 11N–L5001–1, Table 6–1. In addition, an ESTS loaded launcher test is required; turn the launcher over to the 2M0X1s to run the test.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

417. Ejector rack preparation, installation, and removal

1. What orifice designation is required for a gravity weapon ejector?

2. What additional safety component is installed on gravity weapon and missile ejectors mated to the launcher?

3. Where do you get the bolts for installing the safing mechanism?

4. Explain how to torque the safing mechanism bolts.

5. After torquing the nuts during PI fitting installation, what do you do if you *cannot* install the cotter pin?

6. How are the fins configured for gravity weapon mate to the launcher to ensure adequate clearances between adjacent weapons?

7. How do you check the sway brace pads for damage?

8. How do you *initially* adjust the sway braces when centering the ejector on the bomb?

9. What is the torquing and tightening sequence for the sway brace pads?

10. What do you do after the first ⅛-turn increment on the forward sway brace pads?

11. After you complete the ⅛-turn increment sequence, what steps are required to secure the sway braces?

12. What cartridges are used with gravity weapons?

13. What do you use to lubricate the cartridge retainer O-rings?

14. In which publication do you find the procedures for inspecting the cartridges?

15. How are the cartridge retainers secured?

418. Mate and demate procedures

1. Where do you find the operational readiness inspection requirements for bomb and missiles mate to the launcher?

2. Briefly list the items for preparing the launcher for bomb mate.

3. When transferring a bomb from a trailer onto a jammer where are spotters located?

4. When using the loading adapter assembly on a lift truck, where do you position the loading adapter support blocks to pick up a B83?

5. Explain how to connect the cables for bomb launcher mate.

6. What do you do if a locking collar does not fully engage after the second torque is reached?

7. What umbilical preparation procedures are required to prepare the launcher for ALCM mate?

8. Before attaching the lift vehicle to the handling unit for missile transfer, what must you do?

9. When doing missile mate procedures, how do you secure the handling unit to the lift truck?

10. How do you position the engine air inlet during missile mate doing missile mate procedures?

11. Where do you attach the engine air inlet seal lanyard loop doing missile mate procedures?

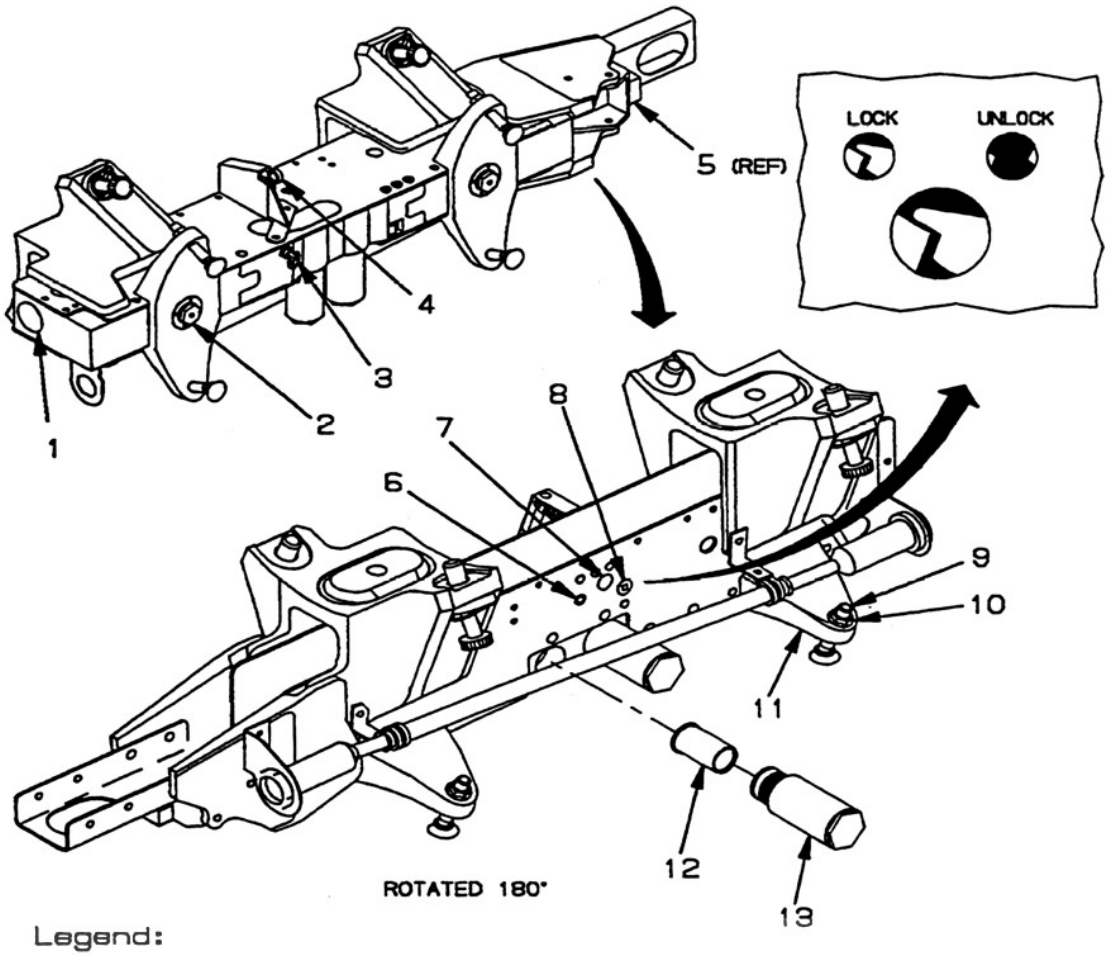
12. After the missile mate is complete, how do you position the umbilical bracket arms?

4–3. Rotary Launcher Assembly Mate Procedures

This section covers mating/demating gravity weapons to the RLA. Eight gravity weapons can be mated to the RLA. Depending on the type of bomb to be loaded determines the position or “D” ring location on the launcher. Bombs can also be loaded in a partial configuration. Refer to the TM for detailed loading positions. In this section, we cover installing and removing the BRU–44/A ejector rack and cartridges, bomb mating to launcher, installing/removing launcher in the SLCF.

419. Ejector rack preparation, installation, and removal

Weapons are mated to the launcher using the BRU–44/A (fig. 4–22). A bomb pullout extension cable and a bomb lanyard attachment assembly are installed on an ejector for gravity weapons. Ejector preparation consists of ejector inspection and ejector build-up very similar to MAU–12D/A ejector mentioned in an earlier lesson.



Legend:

1. J1
2. Piston foot (2 places)
3. Store away/ store present switch
4. Ejector safing mechanism
5. Shear fitting
6. INFLIGHT LOCK MANUAL RELEASE socket
7. INFLIGHT SAFETY LOCK
8. HOOK MANUAL RELEASE socket
9. Sway brace (4 places)
10. Locknut (4 places)
11. Sway brace arm (4 places)
12. Cartridge (2 places)
13. Cartridge retainer (2 places)

Figure 4–22. BRU–44/A ejector rack.

Installing and removing ejector

The RLA differs from the CSRL in the fact that there are two different methods you can use to install/remove the BRU–44/A:

1. The ejector rack can be installed/removed on the bomb and then the bomb and ejector mated to the launcher.
2. The ejector can be mated to the launcher and the bomb mated to the ejector.

Installation/removal of ejector on bomb

The following procedures cover installation of the BRU–44/A on the bomb. Make sure there are no ejector cartridges installed in the ejector before installing. You need to ensure the ejector is configured for the bomb with correct gas orifices: not applicable (N/A) for B61s and –25A for B83s. Next, ensure the piston feet are fully retracted and make sure the top of the sway brace to the top of sway brace arm is preset as follows: B61 = 1⅜ inches or B83 = 1¾ inches. Remove the cap from stores away switch and disengage the ejector safing mechanism. Rotate the IN-FLIGHT LOCK MANUAL RELEASE socket to UNLOCK the ejector and rotate the HOOK MANUAL RELEASE socket CCW to open the ejector shackles.

WARNING: The assembled ejector weighs approximately 130 pounds. Use sufficient personnel/equipment to safely lift, support, and position the ejector or equipment damage or personnel injury may result.

Position the ejector over the bomb with J1 forward and rotate the HOOK MANUAL RELEASE socket CW to close shackles. Once closed, verify the IN-FLIGHT SAFETY LOCK indicates LOCK. Engage the ejector safing mechanism and ensure the lockpin protrudes through the ejector. Center the ejector shackles in the bomb suspension lugs and extend the sway braces until they contact bomb. Next, tighten the forward sway braces one-half turn and then tighten the aft sway braces one-half turn. Next, tighten the aft sway braces one-fourth turn and then tighten the forward sway braces one-fourth turn. The final torque is to torque the locknuts to 250 ±50 in-lb. Adjust the piston feet until they contact the bomb and connect the bomb pullout cable. Finally connect the bomb pullout wire rope and bomb pullout cable bail to the bomb lanyard support using quick-release pin. Removal procedures are basically the reverse of installation procedures.

Ejector rack installation/removal from RLA

Now let's look at installing the BRU–44/A onto the RLA (fig. 4–23). The first step in installation is to clean the launcher/ejector attach bolts and apply dry film lubricant. Once this is completed, position the ejector under the launcher in the index position. Remove the protective cap plugs from the launcher/ejector attach bolt holes of launcher and inspect the threads for serviceability. Using isopropyl alcohol, clean the launcher/ejector attach bolt holes of the launcher. Once the holes are cleaned, raise and align the ejector until the PI fittings evenly contact launcher. You must ensure the PI fittings remain in firm contact with the launcher until the attach bolts are torqued. Using the weapon suspension attachment tool, hand tighten the bolts. When torquing the attach bolts, ensure the locking collars are depressed and torque each bolt to 1,920 in-lb. Visually check that locking collars engage the launcher/ejector attach bolts. If the locking collars or retainers do not engage, set torque to 3,000 in-lb. and torque the attach bolts only as required to engage the locking collars. Finally, connect the launcher bomb cable assembly to the ejector. Removing the BRU–44/A from the RLA is basically the reverse procedures of installation.

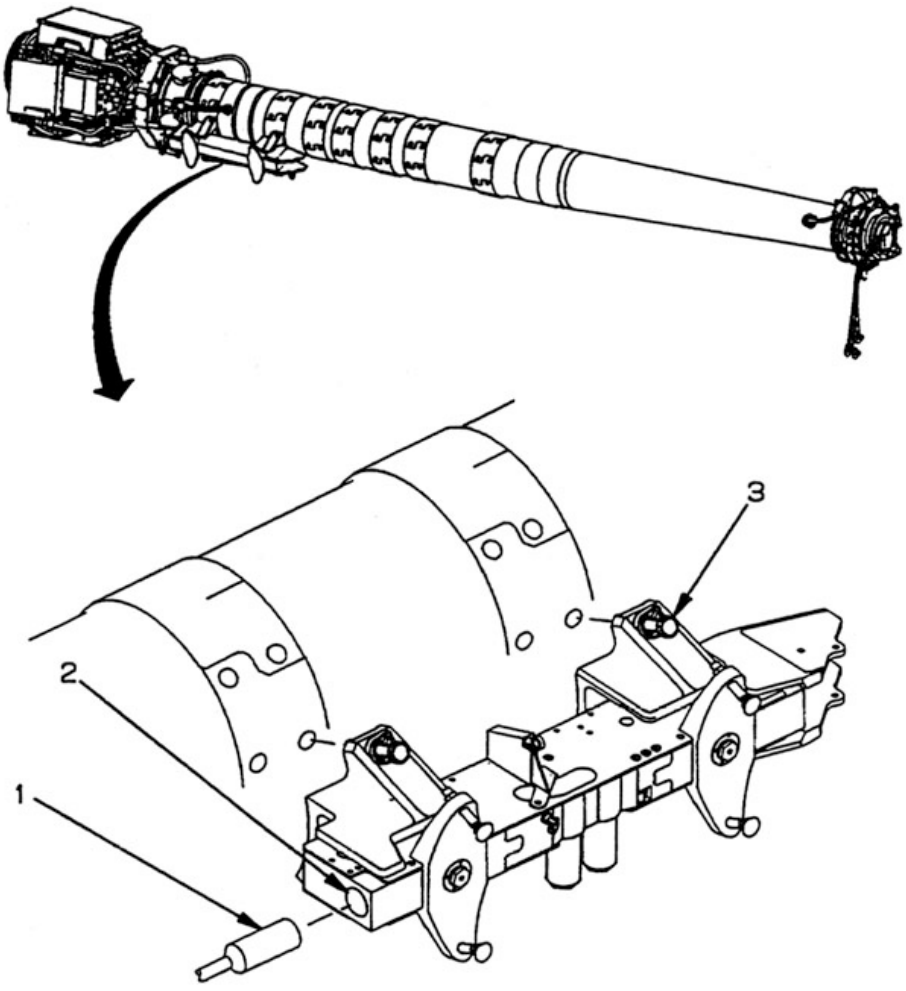


Figure 4–23. Ejector on RLA.

Installing and removing BRU–44/A ejector cartridge

The first step for installation is to perform a visual monitor and ejector safety check of the bomb and rack. Ejector cartridges must not be installed if the ejector receptacle cover is not installed. Ensure the cover is installed on the ejector rack. You must also ensure the ejector safing mechanism is engaged prior to installing the ejector cartridges. Ensure the ejector safing lockpin protrudes through the ejector. Remove the cartridge containers from the ejector. Two BBU–63/B ejector cartridges are used with the BRU–44/A. During cartridge installation, personnel shall grasp the ejector to discharge static electricity. Remove the cartridges from the storage containers. Check the cartridges for serviceability per TO 11A18–7–7. During cartridge installation, do not stand in front of cartridge breeches or orifices. Install the cartridges and retainers in the ejector and torque the retainers to 500 in-lb. to secure them.

Removal

The first step for ejector cartridge removal is to perform a visual monitor and ejector safety check. Make sure the ejector safing mechanism is engaged and that the lockpin protrudes through ejector. You must ensure the ejector receptacle cover is installed on the J1 before you remove the cartridge. Do not stand in front of cartridge breeches and orifices when removing cartridges. Grasp the ejector to discharge static electricity. Remove the retainers and cartridges from the ejector. Remove the cartridges from the retainers. Place the cartridges in an authorized storage container. Reinstall the cartridge retainers hand tight.

420. Bomb mate and demate

You need to ensure the launcher is in the correct position. You can do this either manually or with the power drive unit controller (PDUC) (fig. 4–24). You also need to make sure the launcher has had an operational readiness inspection prior to bomb loading.

Manually rotating launcher

If you cannot rotate the launcher with the PDUC, you can rotate it manually with the power drive unit (PDU) manual rotation tool (pneumatic drill). The PDU can be rotated with or without the launcher installed. Manually rotate the PDU by first setting the directional control valve handle on the SLCF to the neutral position. Then, install the pneumatic drill (PDU manual rotation tool) in the manual drive input and using a pneumatic drill (PDU manual rotation tool), turn the manual drive input CW or CCW until the PDU or launcher reaches the desired position. The TO lists maximum input speeds, continuous operating times, and cool down times when rotating the PDU manually. Do not exceed the operational limitations or damage to equipment may result. After you have reached the desired position, remove the pneumatic drill (PDU manual rotation tool) from manual drive input and set the directional control valve handle of SLCF to the SECONDARY position.

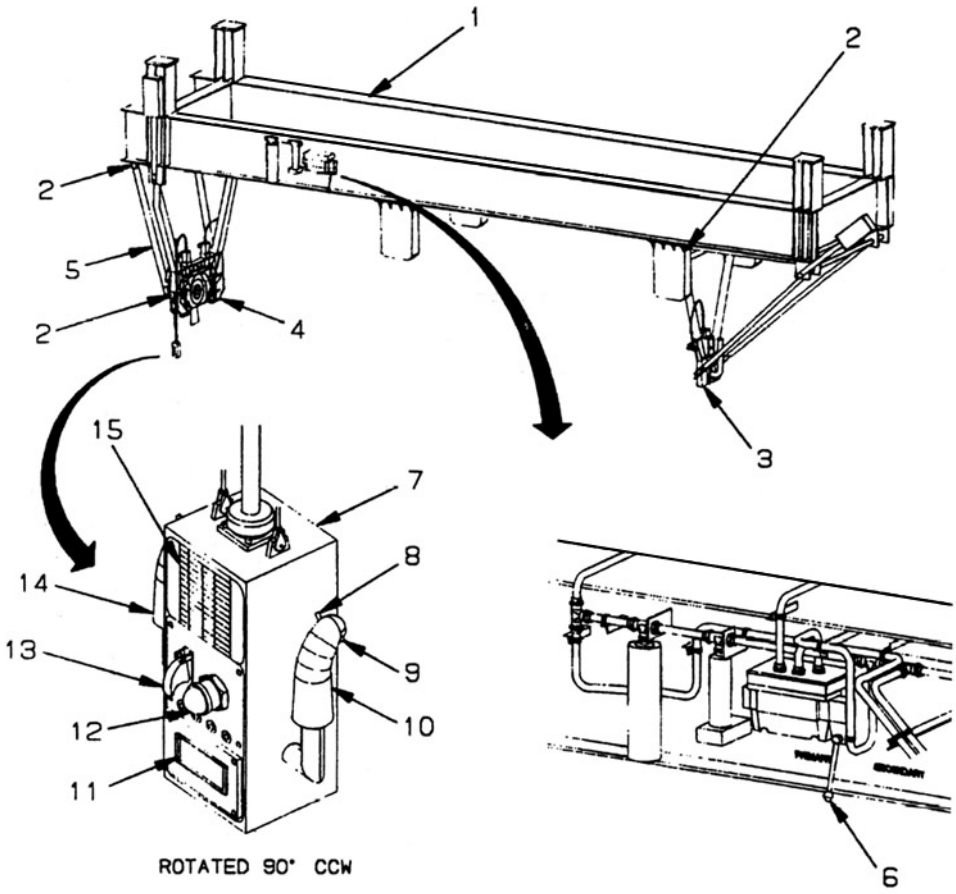
RLA rotation with the PDUC

Use the following procedures to rotate the launcher to the desired position:

1. Set the directional control valve handle of the SLCF to the SECONDARY position. Next, set the hydraulic power supply of the SLCF to a pressure of 2,950 to 3,050 psi and the flow rate of at least 10 gallons per minute (gpm). On the PDUC, set the POWER switch to ON.

WARNING: All personnel and equipment must remain clear of the launcher during rotation.

2. Rotate the launcher to the index position by pulling the trigger and pushing the button on either handle of the interface control remote (INCR). Once the launcher is in the desired position, set the PDUC POWER switch to OFF and stow the PDUC. Finally remove the SLCF hydraulic power.



Legend:

1. Suspended frame
2. Quick-release pin (6 places)
3. Aft yoke
4. Forward yoke
5. Forward drag link (2 places)
6. Directional control valve handle
7. Power Drive Unit Controller (PDUC)
8. Button (2 places)
9. Trigger (2 places)
10. INCR control handle
11. ANGULAR POSITION indicator
12. POWER light
13. POWER switch
14. DECR control handle
15. Data plate

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Figure 4–24 PDUC and SLCF.

Operational readiness inspections

TO 11N–L5006–1, Table 5–1 lists the items, conditions, and inspection requirements for bomb/launcher operational readiness inspections. These tables make the inspection process easy to understand because you check only the items identified by an “X” under the type of inspection. There are four types of operational readiness inspections:

- Preload—performed before mating a weapon.
- Final—performed after completing the weapon mating.
- Post download—performed on a weapon-loaded launcher following download from the aircraft before going into storage.
- Cross load—performed on a weapon-loaded launcher following download from an aircraft before upload on another aircraft without returning the launcher to a maintenance facility.

Special tools and test equipment

The government-approved special tools and test equipment is listed in Table 2–1 of TO 11N-L5006–1. The CSRL and RLA are very similar and use many of the same pieces of equipment. Listed below are some examples of the special tools and test equipment used with the RLA: nitrogen charging adapter set, forklift adapter, weapon suspension tool, tester interface simulator, jammer, MHU–141 trailer, and gravity weapon load adapters. Due to the quantity of equipment used, refer to the specific TOs for further information.

Launcher/bomb preparation for mating/demating

Before beginning the mate operation, the launcher must be prepared to receive the weapons. There will be times when your maintenance team will not be the team that prepares the launcher for the mate operation. If your team did not prepare the launcher, it is a good idea to verify the steps have been completed. Perform launcher preparation and inspection prior to mating as follows:

1. Install launcher in SLCF.
2. Verify launcher is configured for bombs to be mated per applicable procedures.
3. Perform launcher operational readiness inspection per applicable procedures.
4. Rotate launcher to index (6 o'clock) position.

Bomb visual monitor/safety checks and bomb preparation

Before bombs can be loaded onto the launcher, perform bomb visual monitor checks per applicable procedures. If the ejector rack is installed, ensure the ejector safing mechanism is engaged and the lockpin protrudes through the ejector and make sure the SAFETY LOCK indicates LOCK. Prepare the bomb for strike and inspect the bomb prior to mating per applicable TO. Ensure B61 fins are in the "X" configuration; for the B83, ensure the fins are in the "three" or inverted "Y"configuration. If necessary, refer to the applicable bomb TO to reconfigure the fins. You need to perform bomb transfer procedures. These procedures were discussed in the earlier lesson for CSRL bomb mate procedures.

B61/B83 bomb mating/demating procedures to RLA

We will cover mating the B61 or B83 to the RLA launcher with a BRU–44/A already installed on the launcher. Bomb mate/demate procedures are as follows:

1. Ensure operational readiness inspection has been performed per applicable procedures.
2. Ensure ejector cartridges are installed.
3. Position bomb under launcher at index position.
4. Slowly raise bomb until bomb lugs are approximately 4 inches from ejector.
5. Remove cap from stores away switch.
6. Disengage ejector safing mechanism.
7. Rotate IN-FLIGHT LOCK MANUAL RELEASE socket to unlock ejector.
8. Rotate HOOK MANUAL RELEASE socket CCW to open ejector shackles.
9. Raise and align bomb suspension lugs with ejector shackles so hooks can be closed. Rotate HOOK MANUAL RELEASE CW to close ejector hooks. Check IN-FLIGHT SAFETY LOCK inspection hole to verify IN-FLIGHT SAFETY LOCK indicates LOCK.
10. Engage ejector safing mechanism and ensure it protrudes through ejector.
11. Remove safety straps from bomb.
12. Lower lift truck table approximately 4 inches from bomb.
13. Extend sway braces until finger tight on bomb surface.
14. Tighten forward sway braces one-half turn.

15. Tighten aft sway braces one-half turn.
16. Tighten aft swat braces one-fourth turn.
17. Tighten forward sway braces one-fourth turn.
18. Torque lock nuts to 250 ±50 in-lb.
19. Adjust piston feet until feet contact bomb surface.
20. Move ejector safing mechanism up and down, it should move freely.
21. Connect bomb pullout cable to bomb.
22. Connect bomb pullout wire rope and bomb pullout cable bail to bomb lanyard support using quick release pin.
23. Remove lift truck from area.
24. Perform final operational readiness inspection per applicable procedures.

The alternate method for bomb mating is with the ejector already installed on the bomb. It is very similar to CSRL bomb mate procedures with the following exceptions:

- Ejector bolt torque procedures.
- Bomb position on launcher.
- Bomb pullout cable routing.

Bomb demating is basically the reverse procedures as mating. Refer to the applicable TM for the specific procedures.

Postmate procedures

Your team chief will verify that the locking collars are properly positioned. Next, remove the straps from the weapon and remove the lift truck from of the immediate work area.

It is important to closely observe all clearances during this operation. You are now ready for the next weapon. Finally, perform a final operational readiness inspection.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

419. Ejection rack preparation, installation, and removal

1. What are the two methods of installing/removing the BRU–44/A to/from the RLA?

2. At what distance is the top of the sway brace to the top of the sway brace arms preset for installation?

3. What is the *first* step in installing an ejector on the RLA?

4. Briefly explain torquing the ejector attach bolts to the RLA?

5. What is the torque of the retainers when installing ejector cartridges of the BRU–44/A?

6. What must you ensure prior to removing ejector cartridges from the ejector rack?

420. Bomb mate and demate

1. How do you rotate the RLA?

2. To what pressure and flow rate does the hydraulic power supply need to be set for launcher rotation?

3. What is the position of the fins for a bomb mate to the RLA?

4. How do you verify the IN-FLIGHT SAFETY LOCK indicates LOCKED?

5. How far do you lower the lift truck table after the ejector hooks are closed and the ejector safing mechanisms are engaged?

6. How do you adjust the piston feet of the ejector when mating it to a bomb?

Answers to Self-Test Questions

415

1. The “inspection completion date” and “next inspection due date” is annotated on AFTO Form 350 and is attached to the ejector.
2. “No. 10.”
3. Torque the nuts to 16 to 20 in-lb. so the nut and bolt are aligned for cotter pin insertion.
4. By an audible click or by feeling the D-ring snap in place.
5. Torque the four sway brace foot pads to 10 in-lb. using the following sequence: Left Rear, Right Front, Left Front, and Right Rear. Torque them again to 20 in-lb. in the same sequence as before and then check the rack alignment using the ALCM ejector rack alignment template.
6. Less than .020 inch.
7. To the sway brace threads, locknuts, and sway brace arms.
8. ARD 446–1 forward and aft.

9. The cartridges are electrically primed and very susceptible to static electric discharges and contain explosives.
10. Touch the facility ground long enough to discharge any static electricity.
11. While installing and torquing the cartridges into the breech.

416

1. (1) Preload—performed before mating missiles to the pylon.
   (2) Final—performed after completing the mate operation.
   (3) Post download—performed following download from the aircraft before going into storage.
   (4) Cross load—performed following removal from a carrier aircraft before it can be reloaded on the same or another carrier aircraft.
2. Because they are angled.
3. ADU–468/E.
4. If more than three bent and missing tines are evident in any quarter or a total of 12 tines are bent and missing.
5. By taking a second safing pin and while inserting it through the opposite or ‘correct’ side of the ejector rack, *push* the incorrectly positioned pin out of the rack. In this way, a safing pin is always installed in the rack internal linkage.
6. With four quick-release pins, the same way it mates to the lift truck.
7. The engaging nut is fully seated when the yellow ring on the nut is flush with the top of the housing assembly or partially covered by the connector housing shell.
8. Torque the attach bolts to 800 in-lb. to engage the locking collars.
9. If you reach 800 in-lb. before the locking collar drops.
10. Team chief.
11. If there is any “sideways” pressure on the bolts as you unthread them from the missile, the MHU–159/E stand can jump away from the missile as the bolts pop free, possibly injuring personnel or damaging equipment.
12. After you remove the alignment adapters and drawbolts from the missile and after you inspect and clean the missile mounting holes.

417

1. “No. 6.”
2. Safing mechanism.
3. They are provided in the bomb suspension kit.
4. Lock the safing mechanism and torque the top bolt to 240 ±24 in-lb. and the bottom bolt to 150 ±15 in-lb. Unlock the safing mechanism, then torque the center bolt to 80 ±8 in-lb.
5. Back the nuts off a maximum of one flat and install the cotter pins.
6. B61s mated in the forward stations must have the fins in the “+” position while those mated in aft stations must be configured in the “X” position.
7. Attempt to separate the foot pad from the threaded stud by pulling the pad with moderate hand pressure.
8. Count the number of threads exposed below the sway brace arms. The number of threads under each arm should be approximately the same. Make adjustments as necessary.
9. Left forward, right forward, right aft, left aft.
10. Retorque the aft sway brace pads to 20 in-lb.
11. Remove the protractors and torque the sway brace pad locknuts to 250 ±50 in-lb.
12. Two ARD 863–1s.
13. A light coat of breakfree.
14. TO 11A18–7–7.
15. Torqued to 275 ±25 in-lb.

418

1. TO 11N-L5001–1, Table 5–1 for bombs; Table 6–1 for missiles.
2. (1) Install the launcher in the SLCF.
   (2) Make sure the empty ESTS check has been performed
   (3) Verify the launcher is configured for bombs; perform the launcher preload readiness inspection.
   (4) Rotate the launcher bomb position to be mated to the index (6 o'clock) position.
   (5) Clean the launcher/ejector attach bolt holes in the launcher and inspect the threads for serviceability.
3. On both ends of the bomb to watch clearances.
4. Position the support blocks at outer holes of loading adapter assembly.
5. Connect the launcher bomb power cable to the ejector bomb pullout extension receptacle (J91); connect the bomb pullout cable to the ejector bomb pullout extension cable receptacle (J30); and connect the launcher ejector cable connector to the ejector receptacle (J1).
6. Completely loosen the attach bolt and redo the torquing process for the bolt.
7. Inspecting the missile umbilical connectors for dirt, grease, corrosion, bent contacts, missing pins, and damaged shells. Make sure the connector collar is not torn or damaged. Locking umbilical bracket arms in the open position.
8. Connect a ground cable between the lift truck and facility ground; connect a ground cable between the handling unit and the lift truck.
9. Four quick-release pins.
10. Lower it carefully.
11. To the launcher retention device.
12. Lock them in the closed position.

419

1. (1) The ejector rack can be installed/removed on the bomb and then the bomb and ejector are mated to the launcher.
   (2) The ejector can be mated to the launcher and the bomb mated to the ejector.
2. B61= 1⅜ inches and B83 = 1¾ inches.
3. Clean launcher/ejector attach bolts and apply dry film lubricant.
4. When torquing the attach bolts, ensure locking collars are depressed and torque each bolt to 1,920 in-lb. Visually check that locking collars engage launcher/ejector attach bolts.
5. 500 in-lb.
6. Receptacle cover J1 is installed.

420

1. By using the PDUC or PDU manual rotation tool.
2. 2,950–3,050 psi and a flow rate of at least 10 gpm.
3. "X" for B61 and "three" or inverted "Y" for B83.
4. Through the IN-FLIGHT SAFETY LOCK inspection hole.
5. Approximately 4 inches.
6. Until the piston feet contacts the bomb surface.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

52. (415) How are the ejector rack pylon interface (PI) fittings used?
    a. Physically bolting the ejector rack to the pylon.
    b. Mechanically linking avionic components.
    c. Electrically charging the ejector rack.
    d. Physically mating cables to the pylon.

53. (415) What orifice designation is used with the air-launched cruise missile (ALCM) ejector?
    a. 11.
    b. 10.
    c. 6.
    d. 5.

54. (415) If the cartridge retainers on the ejector assembly are safety wired, this tells you
    a. explosive cartridges are installed; ejector is in extended storage configuration.
    b. explosive cartridges are installed; ejector is in ready storage configuration.
    c. someone incorrectly installed the explosive cartridges.
    d. explosive cartridges are *not* installed.

55. (415) Which ejector rack is the *only* device we use to attach an air-launch cruise missile (ALCM) to a pylon?
    a. MAU–12D/A.
    b. MAU–44.
    c. BRU–12.
    d. BRU–44/A.

56. (415) Which procedure is *not* part of final ejector rack installation?
    a. Ensure ground safety pin moves freely.
    b. Verify shackle linkage is latched.
    c. Screw down ejector piston feet.
    d. Proof load test the ejector rack.

57. (415) Which cartridges do you use in the air-launched cruise missile (ALCM) ejector?
    a. ARD 446–1 in the aft and forward breech.
    b. ARD 863–1 in the aft and forward breech.
    c. ARD 863–1 in the aft breech; ARD 446–1 in forward breech.
    d. ARD 446–1 in the aft breech; ARD863–1 in the forward breech.

58. (416) The easiest pylon positions to mate are centerline, located at position
    a. 1 or 3.
    b. 2 or 5.
    c. 3 or 6.
    d. 4 or 6.

59. (416) What piece of equipment allows you to position a missile at an angle for a pylon shoulder position mate?
    a. H410A restraint tool.
    b. MHU–512/E munitions positioner.
    c. ADU–468/E positioning and restraint adapter.
    d. ADU–708/A restrictor plate adapter assembly.

60. (416) When inspecting the umbilical radio frequency interface (RFI) rings, replace the umbilical if
    a. more than two tines are bent and missing in any quarter.
    b. more than one tine is bent and missing in any quarter.
    c. a total of 12 or more tines are bent or missing.
    d. any tines are bent or missing.

61. (416) When mating an air-launched cruise missile (ALCM) to a pylon shoulder position, what *must* you install on the handling unit?
    a. One roll block in the center.
    b. Two roll blocks on the aft beam.
    c. Four roll blocks; 2 forward, 2 aft.
    d. Three roll blocks on the forward beam.

62. (416) When connecting the umbilical connector to the missile, how do you know the engaging nut is fully seated?
    a. The red ring is partially covered by the connector housing shell.
    b. The yellow ring on the nut is flush with the top of the housing.
    c. The white ring on the nut is flush with the top of the housing.
    d. The blue ring is below the connector housing shell.

63. (416) What do you do if the locking collar does not drop after you torque the attach bolt to 800 inch-pounds (in-lb.) during a missile mate to a pylon?
    a. Nothing, it is acceptable as is.
    b. Increase torque to 900 inch-pounds.
    c. Increase the torque in intervals of 150 inch-pounds.
    d. Back off the bolt and start the torquing process over again.

64. (417) Which item is *not* part of ejector preparation for a *gravity weapon* mate to launcher?
    a. Lanyard attachment assembly.
    b. Bomb pullout extension cable.
    c. Safing mechanism.
    d. Number “10” orifice.

65. (417) During pylon interface (PI) fitting installation on the ejector for launcher mate, if you can’t install the cotter pin after the 20 inch-pound (in-lb.) torque,
    a. tighten the nut a maximum of one flat.
    b. back the nut off a maximum of one flat.
    c. torque a second time to 40 in-lb.
    d. replace the nut; torque to 30 in-lb.

66. (417) How do you tighten the sway brace pads for the B61?
    a. Seven ⅛-turn increments.
    b. Six ¼-turn increments.
    c. Three ¼-turn increments.
    d. Three ⅛-turn increments.

67. (417) When installing cartridges in the ejector, do all of the following *except*
    a. install the ground safety pin in the ejector.
    b. touch the facility ground to discharge static electricity.
    c. hold the retainers so they point away from other people.
    d. stand in front of the orifice openings during installation and torquing.

68. (418) When do we perform the post download operational readiness inspection on a launcher?
    a. Before mating a weapon.
    b. Following download from an aircraft and before going into storage.
    c. Following download from an aircraft and before upload to another aircraft.
    d. After completing weapon mate and before downloading the launcher from the suspended loading and checkout frame (SLCF).

69. (418) When using the gravity weapon loading adapter for a B61 mate operation, how do you position the gravity weapon loading adapter support blocks?
    a. In the inner holes.
    b. In the outer holes.
    c. Either in the inner or outer holes.
    d. One in the inner hole and one in the outer hole.

70. (418) How do you secure the missile-handling unit to the lift truck table manipulator head during missile transfer?
    a. Two bolts and four washers.
    b. Three captive bolts.
    c. Two quick-release pins.
    d. Four quick-release pins.

71. (419) How many different methods can you use to install or remove the BRU–44/A ejector rack to or from the rotary launcher assembly (RLA)?
    a. One.
    b. Two.
    c. Four.
    d. Five.

72. (419) What ejector cartridges are used with the BRU–44/A ejector rack?
    a. ARD–22.
    b. DRA–99.
    c. BBU–63/B.
    d. CCU–121.

73. (420) What do you use to rotate the launcher if you *cannot* rotate it with the power drive unit controller (PDUC)?
    a. H566 rotator.
    b. T1563 tester.
    c. Automatic spline controller.
    d. Manual rotation tool (pneumatic drill).

74. (420) To what position do you set the suspended loading and checkout frame (SLCF) directional control valve for launcher rotation with a power drive unit controller (PDUC)?
    a. Primary.
    b. Secondary.
    c. Forward.
    d. Backward.

75. (420) When is a cross-load operational readiness inspection performed on a launcher?
    a. After mating a weapon.
    b. Before mating a weapon.
    c. Following download from aircraft before going into storage.
    d. Following download from aircraft before upload on another aircraft.

76. (420) You close the hooks of the ejector rack when mating a bomb to the launcher by turning the
    a. hook manual release clockwise (CW).
    b. hook manual release counterclockwise (CCW).
    c. in-flight safety lock CW.
    d. in-flight safety lock CCW.

77. (420) Approximately, how far do you lower the lift truck from the bomb after the ejector hooks are closed and you see the safing mechanism installed for a bomb mate to the rotary launching assembly (RLA)?
    a. 2 inches.
    b. 4 inches.
    c. 8 inches.
    d. 2 feet.

Glossary of Abbreviations and Acronyms

°	degree
AFMAN	Air Force manual
AFSC	Air Force specialty code
AFTO	Air Force technical order
AGE	aerospace ground equipment
AGM	air-to-ground missile
AGMBRL	aircraft guided missile and bomb rotary launcher
ALCM	air-launched cruise missile
BSRA	bomb status relay assembly
CAE	carrier aircraft equipment
CALCM	conventional air-launched cruise missile
CCU	component cooling unit
CCW	counterclockwise
CDS	command disablement system
CPC	corrosion preventative compound
CSRL	common strategic rotary launcher
CTA	cartridge test adapter
CW	clockwise
DR	decoder-receiver
ECS	environmental control system
eIRC	electronic inspection record card
EMP	electromagnetic pulse
EOD	explosive ordnance disposal
ERA	ejector relay assembly
ERTT	electrical resistance temperature transmitter
ESTS	electrical system test set
FPDC	frame power drive controller
ft-lb.	foot-pound
gpm	gallons per minute
HCP	hardness critical procedure
Hz	hertz
ICT	igniter circuit tester

ILS	integrated logistic support
IMF	integrated maintenance facility
INCR	interface control remote
INE	internal navigation element
in-lb.	inch-pound
JTA	joint test assembly
k	thousand
LES	launch enable switch
LLA	launcher loader adapter
LLC	limited life component
LLCE	limited life component exchange
MCCS	multiple code coded switch
MHE	munitions-handling equipment
MHT	munitions handling trailer
MLT	munitions lift trailer
mph	miles per hour
MSRA	missile status relay assembly
N/A	not applicable
NTIK	nontactical test instrumentation kit
NucSLU	nuclear station logic unit
NWCM	nuclear weapons control monitor
PAL	permissive action link
PCU	portable control unit
PDU	power drive unit
PDUC	power drive unit controller
PI	pylon interface
PLA	pylon loader adapter
psi	pounds per square inch
psig	pounds per square inch gauge
RFI	radio frequency interface
RLA	rotary launcher assembly
SAF	safe, arm, and fuzing
SLCF	suspended loading and checkout frame
SRAM	short-range attack missile

SRU	shop replaceable unit
TFP	tactical ferry payload
TM	technical manual
TO	technical order
TRU	transformer rectifier unit
UR	unsatisfactory report
VAC	volts alternating current
VDC	volts direct current
WAD	warhead-arming device
WES	warhead electrical system
WR	war reserve
WSA	weapons storage area

Student Notes

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