

## CHAPTER 9

# AMMUNITION HANDLING EQUIPMENT

How you handle aviation ammunition depends on the time, place, and situation. The ammunition and explosives handling task is hazardous. Equipment is designed so you can safely handle ammunition in any given situation. This includes railroad, industrial, and automotive equipment used for transporting ammunition. It also includes equipment used to manually handle ammunition, such as skids, pallets, carriers, and aircraft loading equipment.

Often, the equipment you use to handle ammunition afloat and ashore are the same. However, differences in stowage accommodations, fixed installations, working areas, and space limitations require the use of equipment and techniques especially designed for the job. Regardless of the situation, only use the equipment designed for a particular task and approved by NAVSEASYSKOM or NAVAIRSYSKOM.

You can identify the command that has control over a particular item of ammunition handling equipment by the item designation. If Mark and Mod number designations identify the item, NAVSEASYSKOM controls it. If the item is identified by designations,

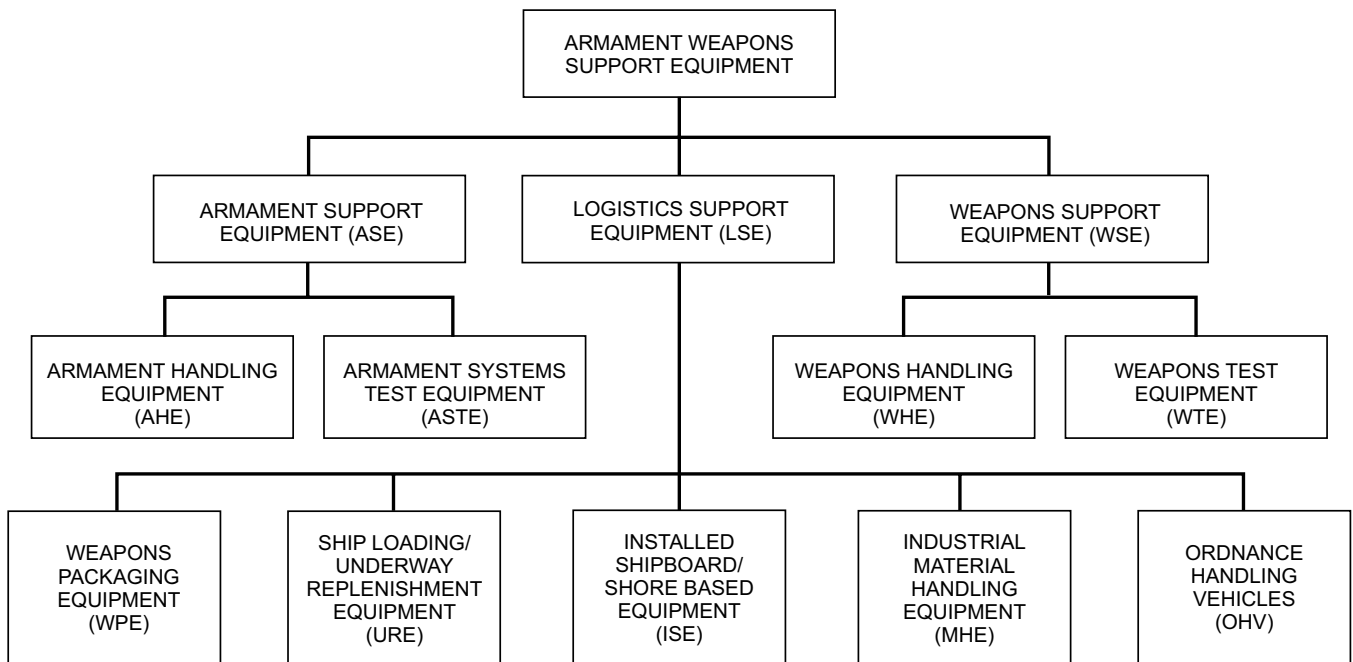
such as Aero, ADU, ADK, and HLK, NAV-AIRSYSKOM controls it.

The number and availability of different ammunition handling equipment configurations are extremely large. The equipment that is routinely used by most of the operating units (ashore and afloat) is discussed in the following paragraphs. You can find a complete listing and description of approved handling equipment in *Approved Handling Equipment for Weapons and Explosives*, NAVSEA OP 2173, Volume 1 (NAVAIR 19-100-1.1) and Volume 2 (NAVAIR 19-100-1.2).

### ARMAMENT WEAPONS SUPPORT EQUIPMENT

**LEARNING OBJECTIVE:** *Identify the categories and subcategories of armament weapons support equipment.*

Armament weapons support equipment (AWSE) is support equipment required on the ground. The AWSE is classified as either common or peculiar and may be avionics or nonavionics. There are three subcategories (fig. 9-1), armament support equipment (ASE),



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Figure 9-1.—Armament weapons support equipment breakdown.

weapons support equipment (WSE), and logistics support equipment (LSE).

## ARMAMENT SUPPORT EQUIPMENT

The ASE includes all equipment whose primary function is to support the installed aircraft systems and is used primarily by an aircraft intermediate maintenance department or squadron.

**Armament Handling Equipment** includes special tools used to support the aircraft in providing handling, movement, installation, configuration, arming, loading and downloading of air-launched weapons, airborne armament systems, or weapon related components. Armament handling equipment includes bomb hoists, single hoist loading systems, weapon loaders, boresights, and special tools used to remove, replace, repair, test, assemble, or service aircraft bomb racks, missile launchers, installed machine guns, or gun pod units.

## WEAPONS SUPPORT EQUIPMENT

The WSE includes all equipment whose primary function is to support explosive ordnance components or weapons. The WSE is divided into two categories, weapons handling equipment and weapons test equipment.

**Weapons Handling Equipment** includes both peculiar and common ordnance handling and transportation equipment, as well as tools used for canning and decanning, magazine handling, and assembly of weapons or ordnance-related commodities. The WSE includes hoisting beams, weapons carriers, strongbacks, handlift trucks, weapon skids, trailers, bomb trucks (nonself-powered), and their associated weapons assembly tables, maintenance stands, and other weapon-related equipment. The WSE supports both air- and surface-launched weapons.

## LOGISTICS SUPPORT EQUIPMENT

The LSE consists of equipment used for packaging, bulk handling storage, or stowage and transportation of weapons and weapon components within the weapon logistics cycle. LSE includes weapons packaging equipment, ship loading or underway replenishment equipment, installed shipboard or shore-based equipment, and industrial materials handling equipment.

**Weapons Packaging Equipment** consists of missile containers, pallets, boxes, and fleet-issue unit loads that contain ordnance and ancillary equipment.

**Ship Loading and Underway Replenishment Equipment** consists of connected replenishment slings, vertical replenishment pole pendants, spreader bars, beams, missile transfer dollies, etc.

**Installed Shipboard or Shore-Based Equipment** includes dunnaging, C-grabs, birail or monorail hoist, tie-downs, davits, bomb elevators, conveyors, and other fixed or moveable handling equipment.

**Industrial Material Handling Equipment** includes forklifts, warehouse tractors, pallet trucks, platform trucks, etc.

## PALLETS

**LEARNING OBJECTIVE:** *Identify the purpose and use of pallets to include safe loads.*

A pallet is a wood or metal platform used to stack material for movement from one area to another. You use pallets to store and handle bombs, cartridge tanks, projectiles, rocket containers, rocket heads, rocket motors, and unit loads. When live ammunition and explosives are involved, use metal pallets. Metal pallets are more durable than wood pallets, are not subject to warping, and do not present a fire hazard.

## STANDARD FOUR-WAY WOOD PALLET

The standard four-way pallet (fig. 9-2) is a nine-post wood pallet that provides four-way entry for forklift and pallet trucks. The wings (overhang) at each end allow sling installations. The slots in the two top-deck members are used to install steel strapping, which provides load restraint. The pallet measures 48 inches in length and 40 inches in width. It has a safe working load (SWL) of 4,000 pounds. It is a general-purpose pallet used primarily for shipment of domestic unit loads of ordnance.

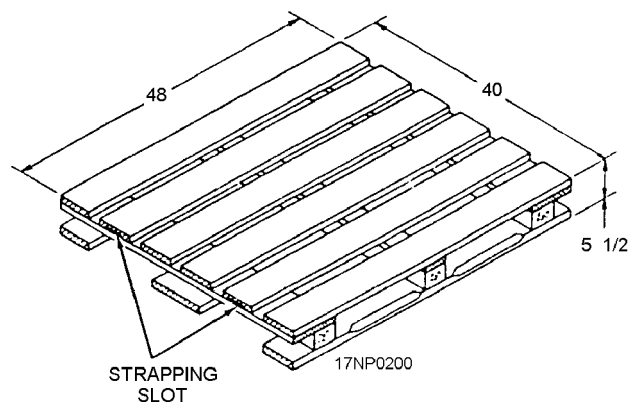


Figure 9-2.—Standard four-way pallet.

### MK 3 MOD 0 PALLET

The Mk 3 Mod 0 pallet (fig. 9-3) is a steel wire weldment. The deck is made of steel wire, formed into a grid pattern of 2-inch squares, and is welded to the deck supports. Nine steel deck supports are welded to the bearing plates and to the deck. The complete pallet is galvanized. The pallet measures 48 inches in length and 40 inches in width. It has an SWL of 4,000 pounds.

The Mk 3 Mod 0 pallet is a general-purpose, four-way pallet used to handle unit loads aboard ship and at shore stations. A forklift or pallet truck is used to transport and stack loads. It is also used to hoist loads, by using pallet slings. The Mk 3 Mod 0 pallet is used for fleet issue unit loads.

### MK 12 MOD 1 PALLET

The Mk 12 Mod 1 pallet (fig. 9-4) is a steel wire and formed sheet steel weldment. It consists of a deck, supports, and runners. The deck is made of steel wire bent and assembled into a grid pattern of 2.5-inch squares. The deck is welded to supports and runners. Steel edge strips protect the wire endings. The pallet measures 45.5 inches in length and 35 inches in width. It has an SWL of 4,000 pounds.

The Mk 12 Mod 1 pallet is a four-way pallet used to palletize weapon components and containers for storage, handling, and shipping. This pallet is used to transport and stack loads, by using a forklift or pallet truck and to hoist loads by using pallet slings. The Mk 12 Mod 1 pallet is used for fleet issue unit loads.

### AMMUNITION PALLET CRATE

The ammunition pallet crate (fig. 9-5) comes in four sizes with a capacity of 4000 pounds each. It consists of a steel four-way pallet on which steel wire sides and ends are attached to form an open-top container. One end of the pallet crate is removable. A hinge is located in the center so the top half folds down over the lower half for loading and unloading

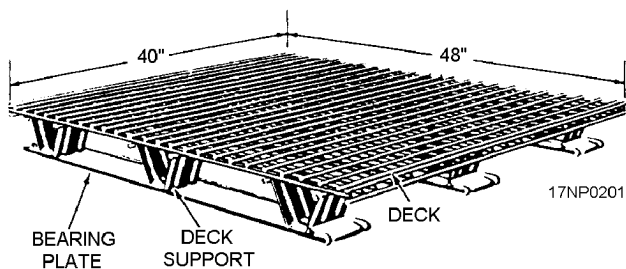


Figure 9-3.—Mk 3 Mod 0 pallet.

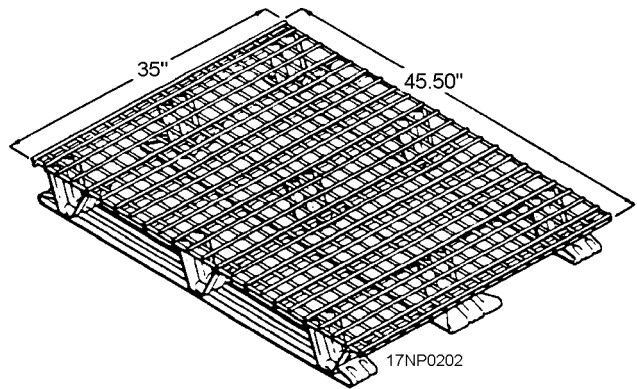


Figure 9-4.—Mk 12 Mod 1 material handling pallet.

operations. Twelve locks secure the sides and ends, and four lifting eyes allow it to be used with hooks on appropriate slings. The deck supports are designed for stacking.

The ammunition pallet crate is used at naval shore activities to handle loose ammunition and inert items during on-station handling and transportation. This pallet is particularly useful in combatant ship loadouts or offloads at dockside or anchorage where palletization is either impractical or inefficient. Projectiles, cartridges, and powder tanks up to 6 inches in diameter, boxed ammunition, and various inert loads are typical of the items handled with this pallet crate.

### REVIEW NUMBER 1

- Q1. For a complete listing and description of approved handling equipment, you should look in \_\_\_\_\_.

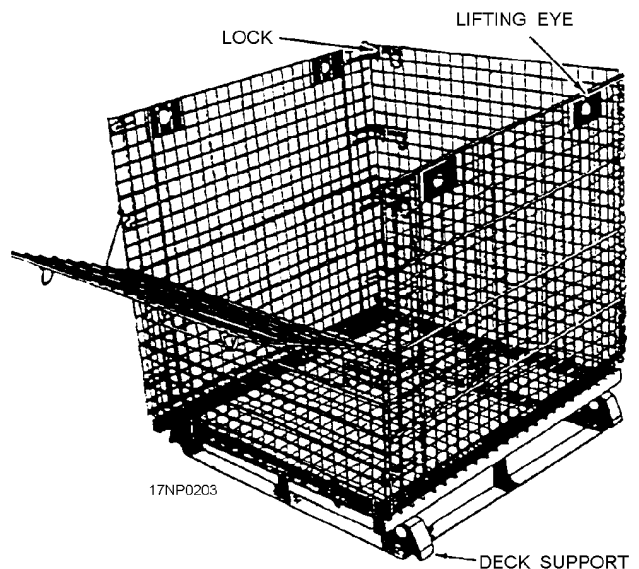


Figure 9-5.—Ammunition pallet crate.

- Q2. What is the general purpose of the standard, four-way, wood pallet?
- Q3. What is the safe working load (SWL) of the Mk 3 Mod 0 and Mk 12 Mod 2 pallets?
- Q4. What is the purpose of ammunition pallet crates?

## CARRIERS

**LEARNING OBJECTIVE:** *Identify weapons carriers and recognize their purpose and use.*

Carriers are a quick and safe means of attaching a crane cable or other hoisting device to ammunition for movement from one area to another. Some carriers are designed for horizontal lifting and some for vertical lifting. Others are used for both horizontal and vertical lifting. Vertical carriers are used for surface-employed ammunition; therefore, only horizontal carriers are discussed in the following paragraphs.

### MK 43 MOD 1 WEAPONS CARRIER

The Mk 43 Mod 1 weapons carrier (fig. 9-6) is made of a 5/8-inch steel plate with two safety hooks attached by shackles. The carrier has two sets of holes for attaching the safety hooks, one set spaced at 16 7/8 inches and the other at 14 inches. It is used in conjunction with two Mk 49 Mod 1 weapons carriers to lift Mk 82 bombs (500 pounds) in tandem off different skids and trailers.

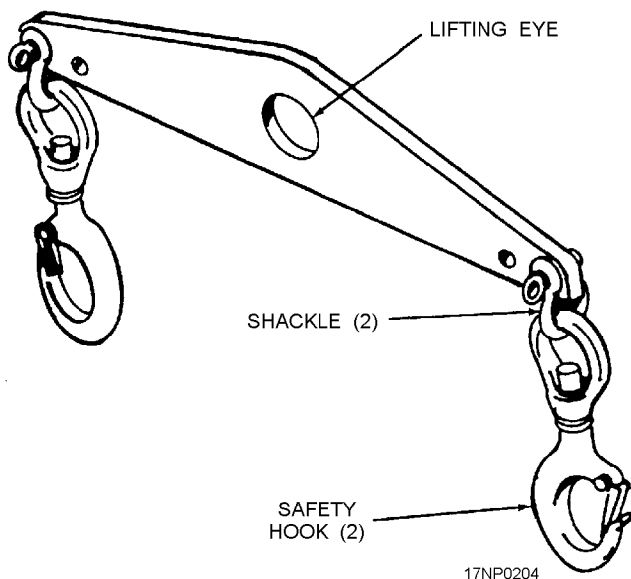


Figure 9-6.—Mk 43 Mod 1 weapons carrier.

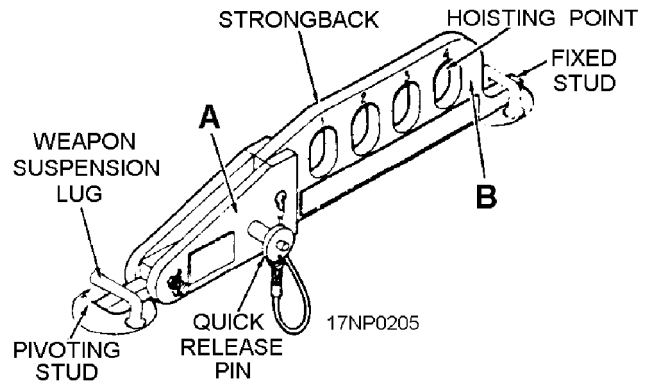


Figure 9-7.—Mk 49 Mod 1 weapons carrier.

### MK 49 MOD 1 WEAPONS CARRIER

The Mk 49 Mod 1 weapons carrier (fig. 9-7) is constructed of two steel plates welded together. It has four hoisting points and two attaching studs. A fixed stud at the B end of the strongback is engaged in one of the weapon suspension lugs. Then, the pivoting stud at the A end is engaged in the remaining lug and locked in place with a quick-release pin. The Mk 49 Mod 1 weapons carrier is used for horizontal lifting of weapons with 14-inch suspension lugs and it has an SWL of 2,500 pounds.

### MK 51 MOD 1 WEAPONS CARRIER

The Mk 51 Mod 1 weapons carrier (fig. 9-8) is an aluminum channel that is plate-carrier fitted with two steel hooks. A fixed position hook with a spring-loaded pinned latch is located at the aft end of the carrier. The forward hook is adjustable to let you attach the carrier

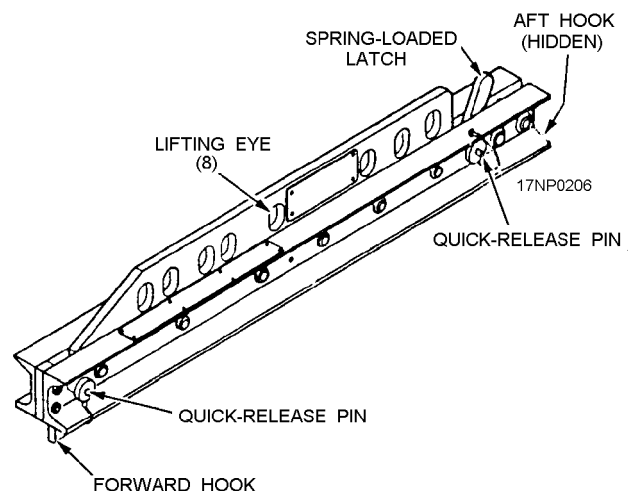


Figure 9-8.—Mk 51 Mod 1 weapons carrier.

to weapons or stores with 14- or 30-inch suspension lugs. The forward hook is held in place by a quick-release pin. Eight lifting eyes allow you to handle weapons with different centers of gravity.

Before you attach the carrier to the load, put the adjustable hook in the appropriate suspension placement hole, which is held in place by a quick-release pin. With the spring-loaded latch unpinned and depressed, the carrier hooks are engaged with the weapon lugs. Release the spring-loaded latch and pin the latch in place with a quick-release pin to secure the load. An instruction plate, mounted on the carrier, makes it easier for you to match the correct lifting eye to the load. The Mk 51 Mod 1 weapons carrier is used for horizontal lifting. It has an SWL of 4,000 pounds.

### REVIEW NUMBER 2

- Q1. What is the purpose of a carrier?
- Q2. The Mk 49 Mod 1 weapons carrier is constructed of \_\_\_\_\_.
- Q3. The Mk 49 Mod 1 and Mk 51 Mod 1 weapons carriers are used to \_\_\_\_\_.
- Q4. What is the SWL of the Mk 51 Mod 1 weapons carrier?

### STANDS

**LEARNING OBJECTIVE:** Recognize the purpose and use of stands to include the A/E32M-4 maintenance and reconfiguration stand, the A/F 32K-1/1A bomb assembly stand, and the A/F32K-10 small bomb assembly platform stand.

Stands are metal frameworks used to support a weapon that is being assembled or maintained. Stands may be immobile or equipped with pivoting casters. The stands discussed in the following paragraphs are of the immobile type.

### A/E32M-4 MAINTENANCE AND RECONFIGURATION STAND

The A/E32M-4 maintenance and reconfiguration stand (fig. 9-9) is made of steel and aluminum. The stand consists of maintenance ring assemblies MXK-663/E32M-4 (forward), MXK-664/E32M-4 (aft), and deck post assembly MXK-665/E32K-4 that supports each ring assembly. The ring assemblies can

be rotated 180 degrees for convenient load accessibility.

The A/E32M-4 maintenance and reconfiguration stand is used to hold the F-14 aircraft weapons rail during general maintenance. It is also used for configuring the F-14 weapons rail with associated bomb racks.

### REVIEW NUMBER 1 ANSWERS

- A1. For a complete listing and description of approved handling equipment, you should refer to NAVSEA OP 2173, Volume 1.
- A2. The general purpose of the standard four-way wood pallet is for use when shipping domestic unit loads of ordnance.
- A3. The safe working load (SWL) of the Mk 3 Mod 0 and Mk 12 Mod 2 pallets is 4,000 pounds.
- A4. Ammunition pallet crates are used at naval shore activities to handle loose ammunition and inert items during on-station handling and transportation.

### REVIEW NUMBER 2 ANSWERS

- A1. A carrier is used as a quick and safe way of attaching a crane cable or other hoisting device to ammunition for movement from one area to another.
- A2. The Mk 49 Mod 1 weapons carrier is constructed of two steel pallets welded together.
- A3. The Mk 49 Mod 1 and Mk 51 Mod 1 weapons carriers are used to lift weapons with 14-inch suspension lugs. The Mk 51 Mod 1 carrier can also lift weapons with 30-inch suspension lugs.

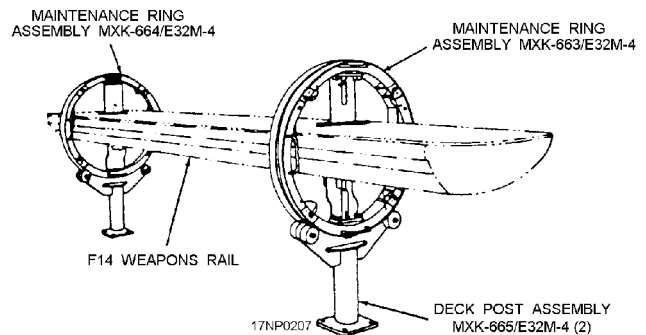


Figure 9-9.—A/E32M-4 maintenance and reconfiguration stand.

A4. The SWL of the Mk 51 Mod 1 weapons carrier is 4,000 pounds.

### A/F 32K-1/1A BOMB ASSEMBLY STAND

The A/F 32K-1/1A bomb assembly stand (fig. 9-10) consists of three interchangeable and interlocking 49-inch sections. The stand must be secured to the deck. It has four trays that are placed on top of conveyor rollers to permit a 360-degree rotation of the weapon. Stops are located at each end to prevent the trays from moving beyond the end of the conveyor. Each of the sections is collapsible for stowage purposes.

The stand is designed to support Mk 80 series general-purpose bombs during the assembly process. However, the stand may be used to support various other weapons during the assembly process.

### A/F32K-10 SMALL BOMB ASSEMBLY PLATFORM STAND

The A/F32K-10 small bomb assembly platform stand (fig. 9-11) consists of two table assemblies, a

center insert, and three tray assemblies. Rollers are permanently affixed to the tables. Folding legs located at both ends of each table assembly provides support, which are unfolded and pinned into position. An insert is placed in the gap between the tables and secured with four bolts. There are also three tray assemblies with rollers on top. When placed on the main stand assembly, the trays ride on the permanent rollers, allowing them to be pushed along the length of the stand. The top-mounted rollers actually contact the skin of the weapon and support its weight, permitting a 360-degree rotation of any weapon and allowing access to screws and other parts.

The A/F32K-10 is primarily designed for use on amphibious assault ships (LPH/LHA/LHD). It is used in a predesignated magazine or bomb assembly area in conjunction with an overhead rail and hoist system for assembling bombs of various weights and sizes.

### HOISTING BARS

LEARNING OBJECTIVE: *Recognize the purpose and use of hoisting bars.*

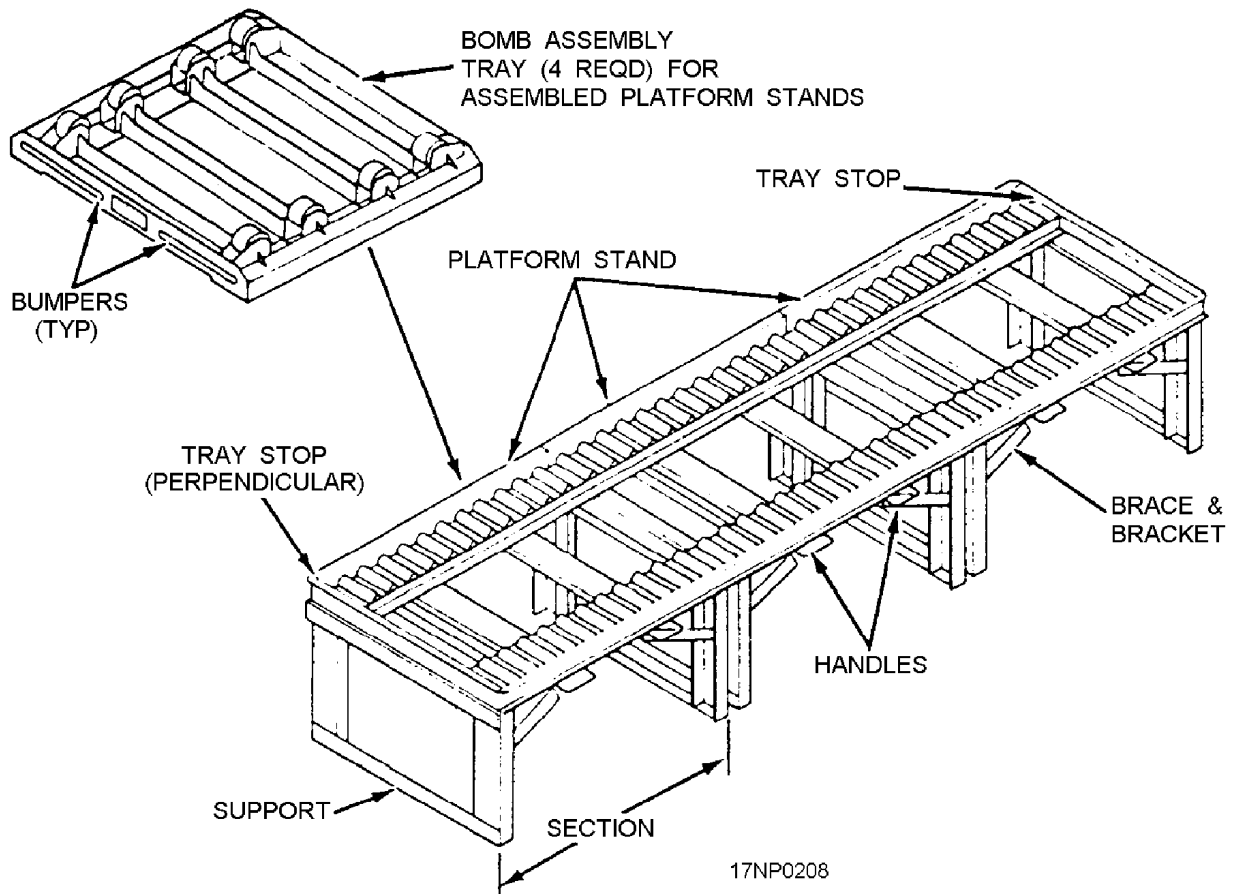


Figure 9-10.—A/F 32K-1/1A bomb assembly stand.

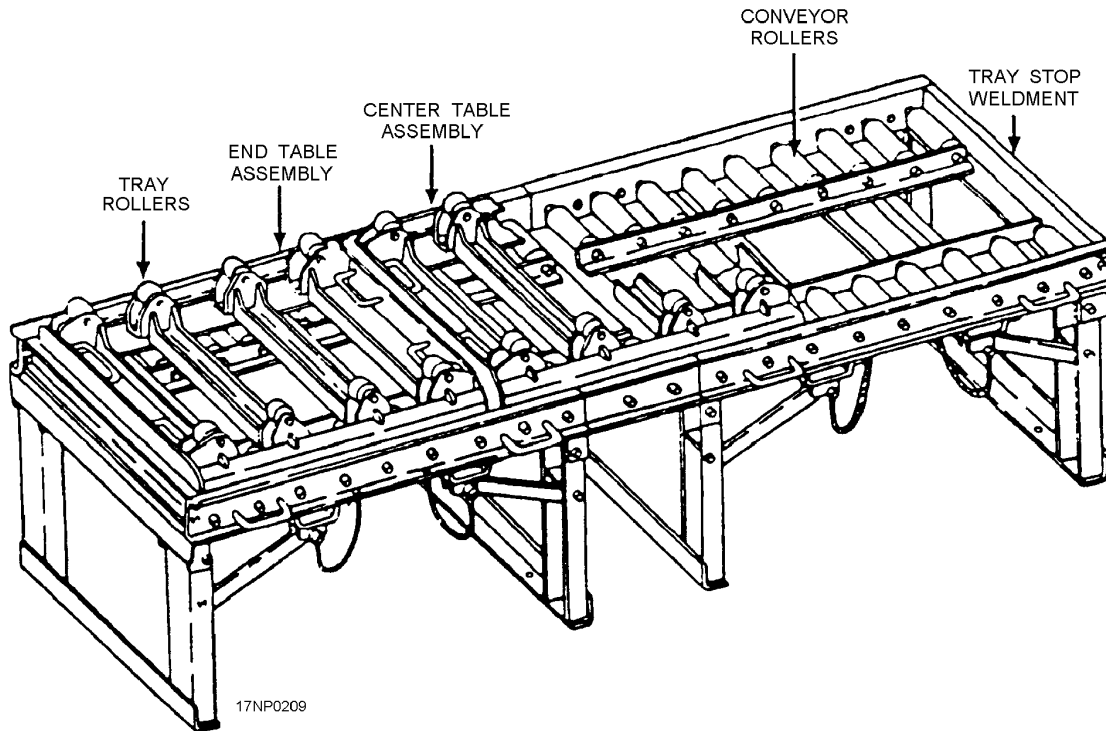


Figure 9-11.—A/F32K-10 small bomb assembly platform stand.

Hoisting bars are used for carrying, lifting, and handling weapons. They are normally used during weapons handling and loading evolutions.

#### AERO 64A1 HOISTING BAR

The Aero 64A1 hoisting bar (fig. 9-12) consists of a cradle, strap, and two carrying handles. The cradle is a

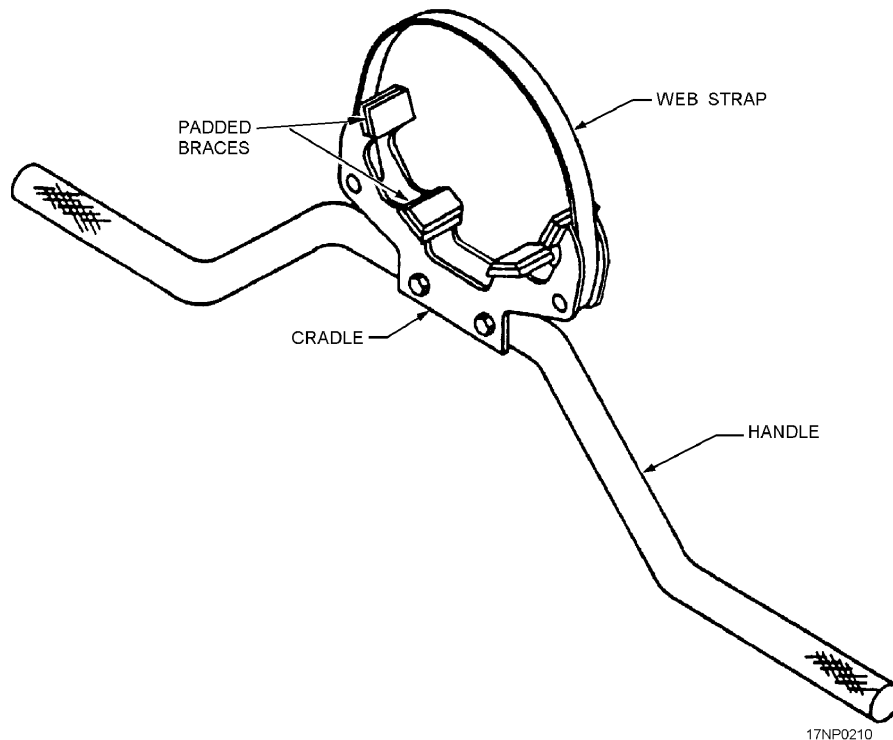


Figure 9-12.—Aero 64A1 hoisting bar.

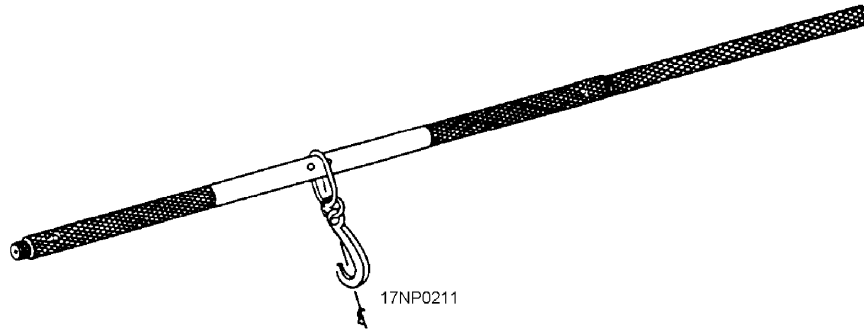


Figure 9-13.—Aero 68A hoisting bar.

weldment frame that has four padded braces. The handles have knurled gripping surfaces. A missile is secured in the cradle by a web strap attached to the tie-down assembly and the bar buckle.

Two Aero 64A1 hoisting bars must be used to manually lift a Sparrow missile from a missile skid to an aircraft wing or fuselage-mounted launcher.

### AERO 68A HOISTING BAR

The Aero 68A hoisting bar (fig. 9-13) is a bar within a bar that has a hook assembly attached. Extending the internal bars 15 7/8 inches each can increase the length of the bar.

To manually lift the weapon, you must hook the Aero 68A hoisting bar into the weapon lugs. This bar is used to handle or transport any weapon having standard lugs. Weapons weighing up to 1,000 pounds can be lifted if two bars are used.

### HLU-256/E MANUAL HOISTING BAR

The HLU-256/E manual hoisting bar (fig. 9-14) consists of a round steel bar with a removable bomb nose plug connector and tail stop plates on one end. A quick-release pin secures the nose plug connector to the bar. When a tee configuration is desired, the nose plug can be relocated to a position at the bar's midpoint. The opposite end of the bar can be used as a lift point in the bomb's tail end. A tail stop is situated 18 inches from this end of the bar.

The HLU-256/E manual hoisting bar is used to manually lift Mk 80 series general-purpose bombs that weigh up to 1,000 pounds during aircraft loading/unloading operations. It is also used for weapons assembly purposes.

### REVIEW NUMBER 3

Q1. What is the purpose of stands?

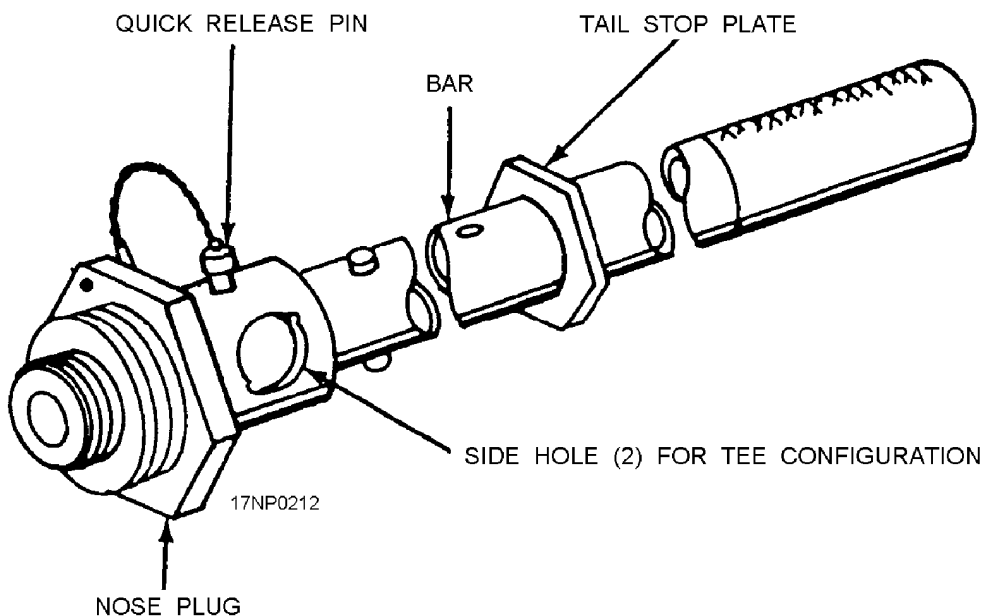


Figure 9-14.—HLU-256/E manual hoisting bar.

- Q2. What maintenance ring assembly is used with the A/E32M-4 maintenance and reconfiguration stand?
- Q3. What is the purpose of the A/E32M-4 maintenance and reconfiguration stand?
- Q4. What is the maximum rotation of the A/F 32K-1/1A bomb assembly stand?
- Q5. The Aero 64A1 hoisting bar is used to \_\_\_\_\_.
- Q6. When you use two Aero 68A hoisting bars, what is the maximum weight that can be lifted?
- Q7. What hoisting bar is used to manually lift Mk 82 bombs?

### BEAMS

**LEARNING OBJECTIVE:** Recognize the purpose and use of beams and identify the loads that each carries.

A beam is a rigid metal item that has an I, H, T, or circular cross section. The rigid portion is fitted with a lifting eye, a sling or sling attaching points, and devices for attaching a load.

### MK 18 MOD 1 HANDLING BEAM

The Mk 18 Mod 1 handling beam (fig. 9-15) is a structural steel weldment that consists of a cylindrical beam with a lifting eye at its center of gravity and hook-extender assemblies with safety hooks at each end. The Mk 18 Mod 1 is used during connected underway replenishment operations for transferring palletized unit loads. The beam is designed for coupling with cargo hoisting assembly Mk 20 Mod 0, and normally it is used with adjustable pallet slings for making the transfer.

### REVIEW NUMBER 3 ANSWERS

- A1. Stands are used to support a weapon being assembled or maintained.
- A2. The MXK-663/E32M-4 (forward) maintenance ring assembly is used with the A/E 32M-4 maintenance and reconfiguration stand.
- A3. The A/E 32M-4 maintenance and reconfiguration stand is used to hold the F-14 aircraft weapons rail during general maintenance.

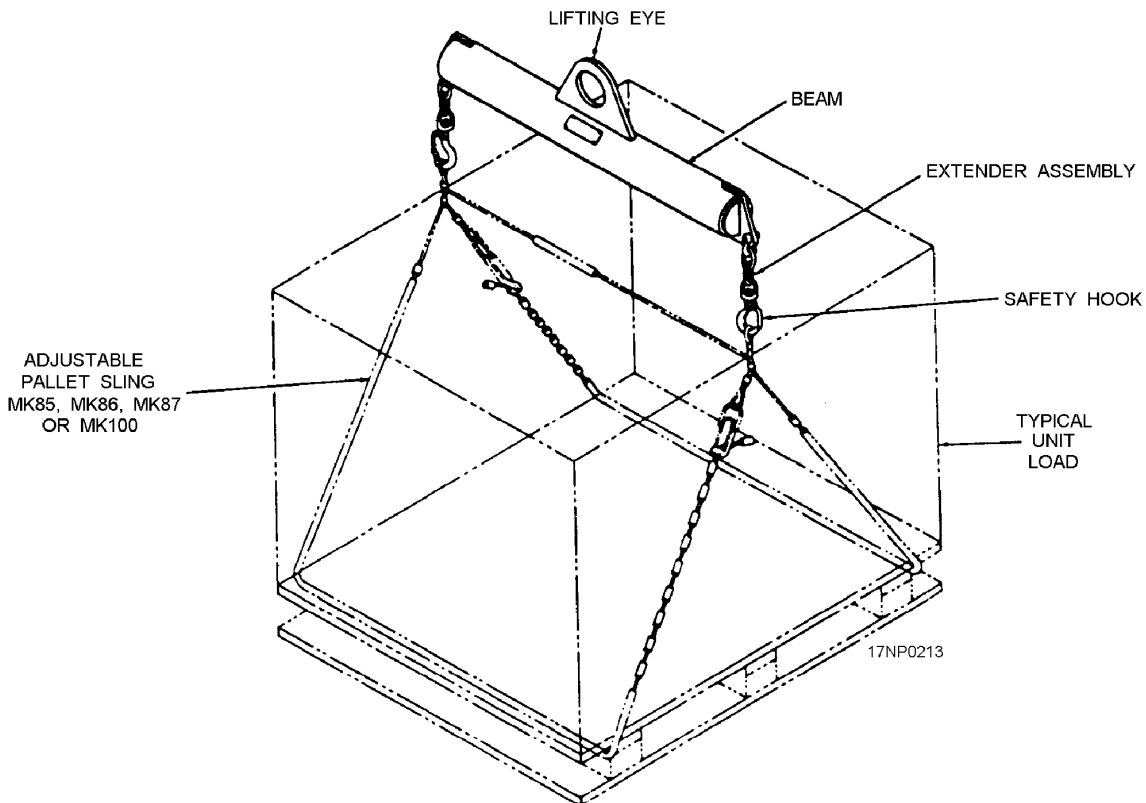


Figure 9-15.—Mk 18 Mod 1 handling beam.

- A4. *The maximum rotation of the A/F 32K-1/1A bomb assembly stand is 360 degrees.*
- A5. *The Aero 64A1 hoisting bar is used to manually lift Sparrow missiles.*
- A6. *When using two Aero 68A hoisting bars, 1,000 pounds is the maximum weight that can be lifted.*
- A7. *The HLU-256/E hoisting bar is used to manually lift Mk 82 bombs.*

**ADU-399/E GUIDED MISSILE HOISTING BEAM**

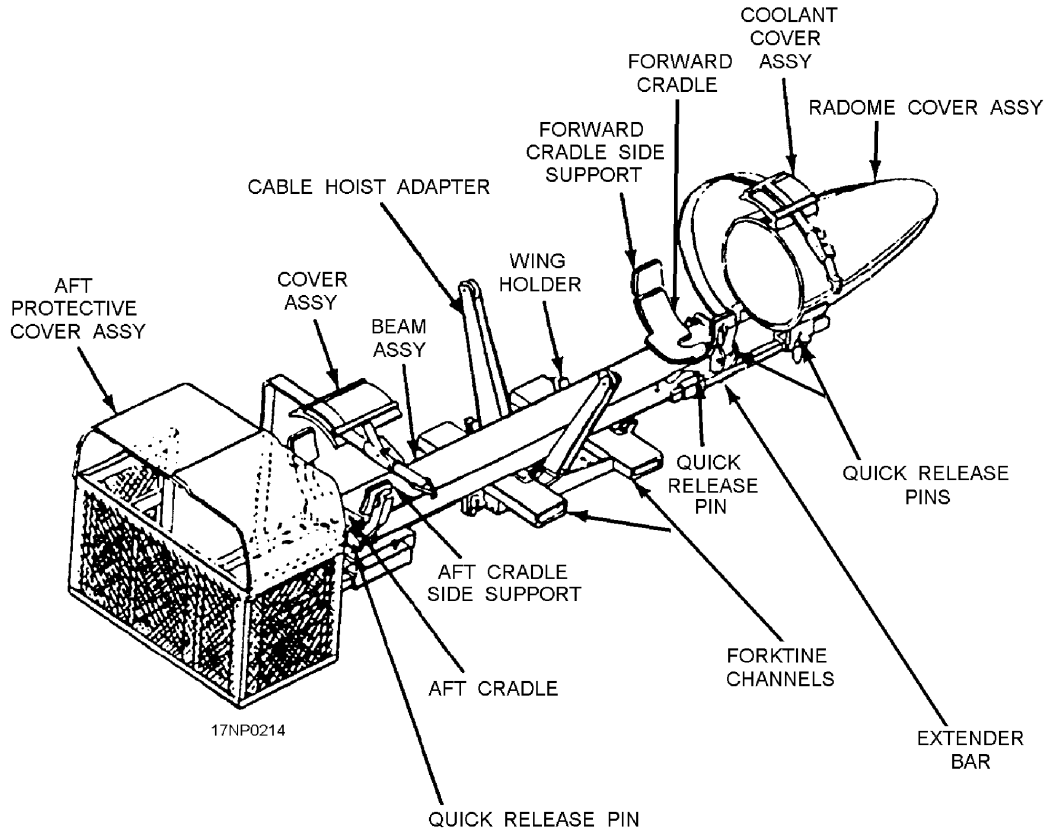
The ADU-399/E guided missile hoisting beam (fig. 9-16) is an aluminum weldment that consists of a beam supported on forklift channels and structural members. These components form the base assembly. Rubber-lined cradles mounted fore and aft on the beam prevent metal-to-metal contact. The cradles have side supports held in position by quick-release pins. When you are loading or unloading the beam, remove the quick-release pins to let the side supports swing down out of the way. There are two adjustable tubular extenders on the fore end of the beam that support a vinyl-covered housing. The housing protects the

weapon's radome. Quick-release pins secure the extenders to the beam and the radome protector to the extenders. There are cable hoists mounted on the base assembly and held in the hoisting position by quick-release pins. When the pins are removed, the hoists swing down and forward into the stowed position.

The ADU-399/E guided missile hoisting beam is used for ground support handling of the Phoenix missile during aircraft loading/unloading operations. This beam may be used in conjunction with the HLU-196B/E bomb hoist, the A/M32K-1A/1B/1C SATS loader, or the ADU-400/E weapon skid loading adapter.

**MHU-129/E GUIDED MISSILE HOISTING BEAM**

The MHU-129/E guided missile hoisting beam (fig. 9-17) is aluminum I-beam with a lifting eye mounted on the top of two removable lifting-shoe assemblies. The shoe assemblies are secured to the lower flange of the beam with quick-release pins designed to engage the forward and aft launch lugs of the Phoenix guided missile. The safety latches in the shoe assemblies secure the beam to the missile.



**Figure 9-16.—ADU-399/E guided missile hoisting beam.**

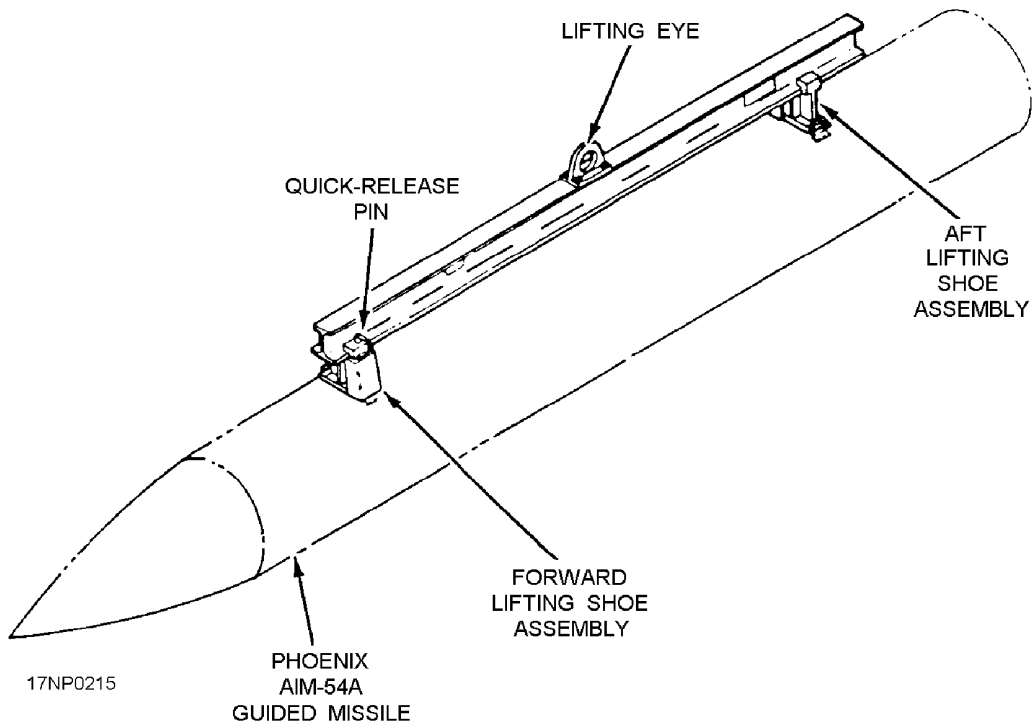


Figure 9-17.—MHU-129/E guided missile hoisting beam.

The MHU-129/E guided missile hoisting beam is used aboard ship (aircraft carriers) to handle a previously assembled Phoenix guided missile.

#### MK 37 MOD 0 LIFT BEAM

The Mk 37 Mod 0 lift beam (fig. 9-18) is an aluminum alloy beam with an adjustable lifting eye

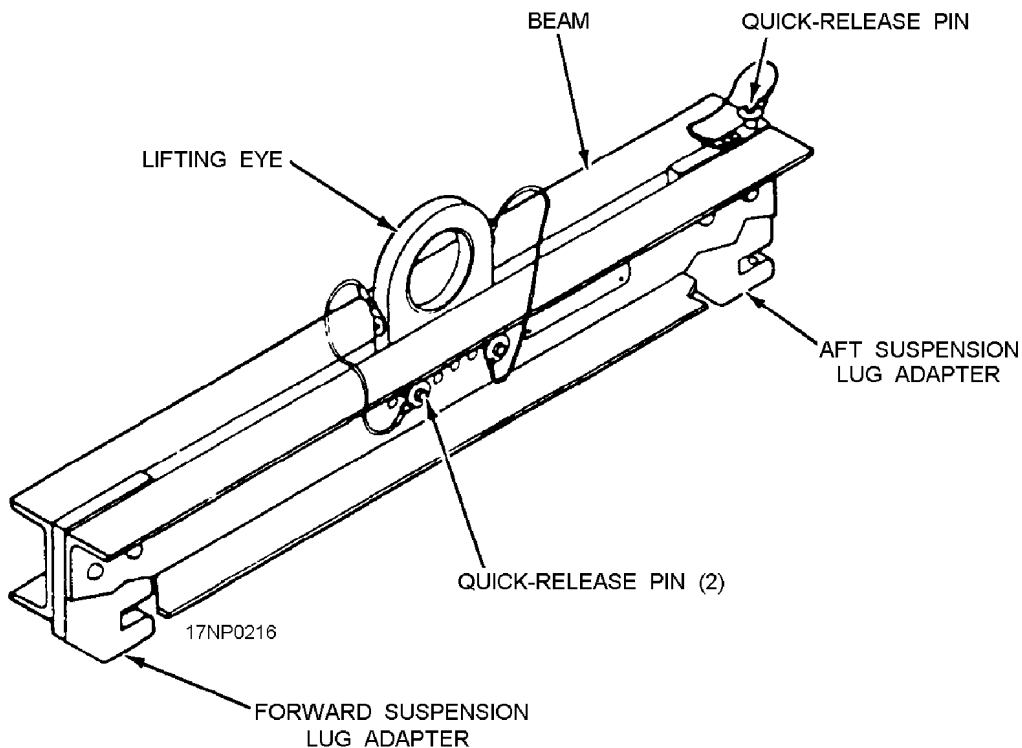


Figure 9-18.—Mk 37 Mod 0 lift beam.

secured to it by two quick-release pins. The suspension lug adapters at each end of the lift beam are used to engage the forward and aft suspension lugs on the Harpoon air-launched missile. A quick-release pin in the aft suspension lug adapter is used for securing the beam to the missile.

The Mk 37 Mod 0 lift beam is used with an overhead crane or hoist to lift the Harpoon air-launched missile from the container to the missile assembly stand, or from the missile assembly stand into the container.

#### REVIEW NUMBER 4

- Q1. What is the shape of a beam?
- Q2. What beam is used during ground support handling of the Phoenix missile during aircraft loading/downloading operations?
- Q3. When you move a Harpoon missile from its container to the missile assembly stand, you would use \_\_\_\_\_.

## SLINGS

**LEARNING OBJECTIVE:** *Recognize the purpose and use of ammunition handling slings.*

Slings are lifting devices used to handle weapons. They are made up of various materials, reinforced nylon and heavy cotton mesh, steel cables, welded rings, and safety devices.

### MK 85 MOD 0, MK 86 MOD 0, MK 87 MOD 0, AND MK 100 MOD 1 PALLET SLINGS

The Mk 85, Mk 86, Mk 87, and Mk 100 pallet slings (fig. 9-19) are wire rope basket slings that are adjustable for load height. These slings accommodate a full range of load heights (13 to 70 inches) on 40-inch by 48-inch pallets. A section of colored tubing on the cross bridle indicates the sling type. Table 9-1 lists physical data for the separate types of slings.

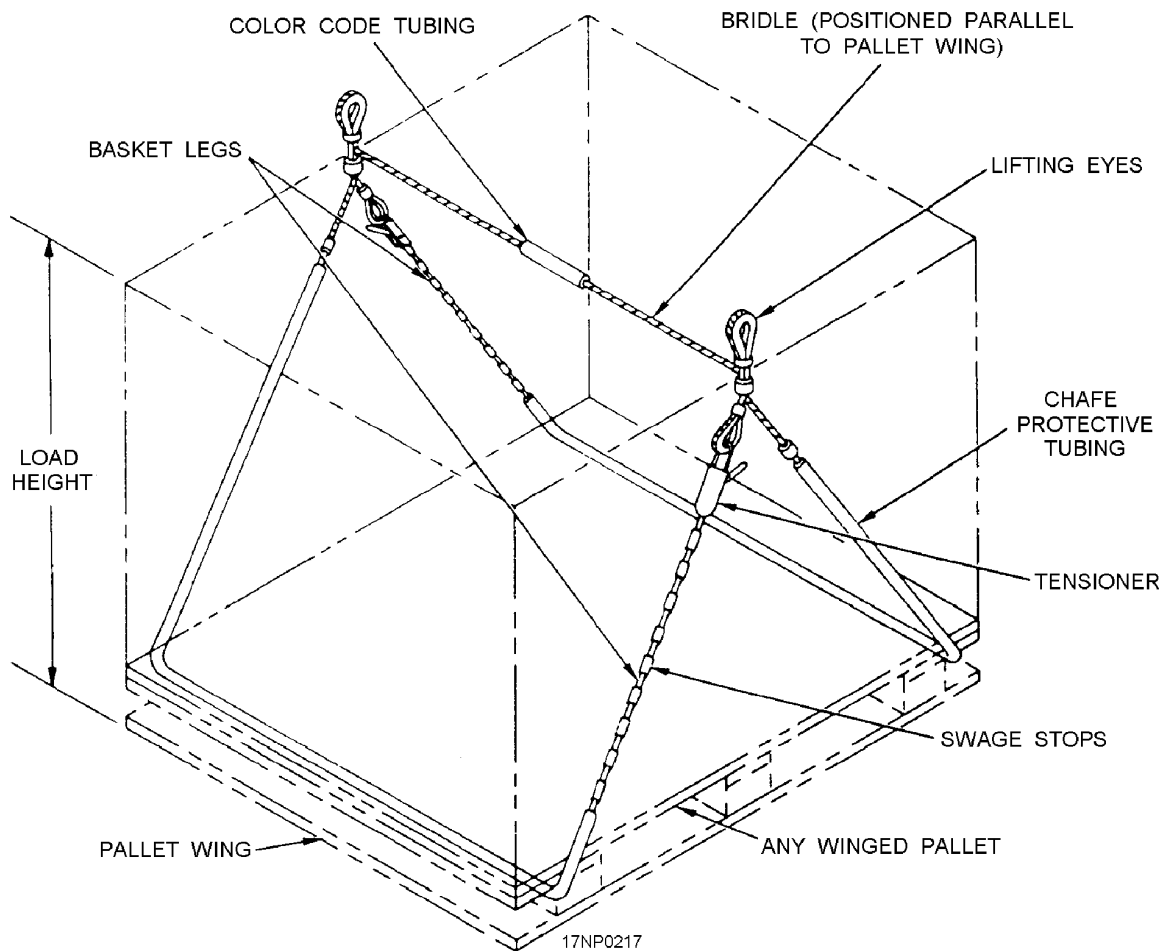


Figure 9-19.—Mk 85, Mk 86, Mk 87, and Mk 100 pallet slings.

Table 9-1.—Physical Data for Pallet Slings

Mk/Mod	Color of Coded Tubing	Load Height (in.)	Capacity (lb)	Weight (lb)
85/0	Red	13	2,200	13
		16	2,800	13
		20	3,400	13
		24	3,950	13
		26 to 31	4,000	13
86/0	Black	29 to 40	4,000	13
87/0	Green	36 to 50	4,000	14
100/1	Yellow	48 to 70	4,000	15

**MK 105 MOD 0 HOISTING SLING**

The Mk 105 Mod 0 hoisting sling (fig. 9-20) is a braided nylon rope that consists of a pendent and a leg assembly. Each end of the pendent has a spliced eye, one for the helicopter hook and one for the legs. Legs

are rated at 3,000 pounds; with two or more legs, the assembly is rated at 6,000-pound capacity. Longer legs (122 inches) also are available for long or stacked containers. The shorter legs are orange in color; the longer legs are green.

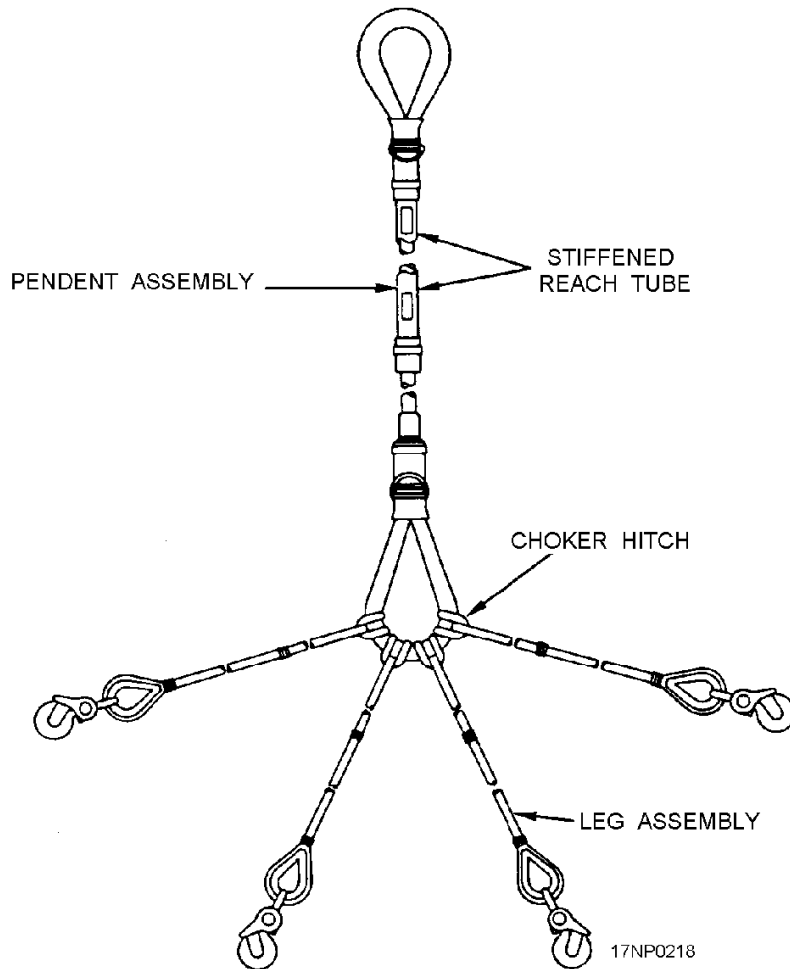


Figure 9-20.—Mk 105 Mod 0 hoisting sling.

## MK 109 MOD 1 CONTAINER LIFTING SLING

The Mk 109 Mod 1 container-lifting sling (fig. 9-21) consists of an adjustable wire rope and chain assembly fitted with a lifting eye and spreader bars. The spreader bars are modified turnbuckles that permit adjustment of sling-leg width within the range of 25 inches to 41 inches. Height adjustment of the bars is provided by the swage stops. The Mk 109 is designed to fit most of the containers and cradles currently in the system.

### REVIEW NUMBER 4 ANSWERS

- A1. *A beam is a rigid metal item that has an I, H, T, or circular cross section.*
- A2. *The ADU-399/E guided missile hoisting beam is used during ground support handling of the Phoenix missile.*
- A3. *When you move a Harpoon missile from its container to the missile assembly stand, you would use the Mk 37 Mod 0 lift beam.*

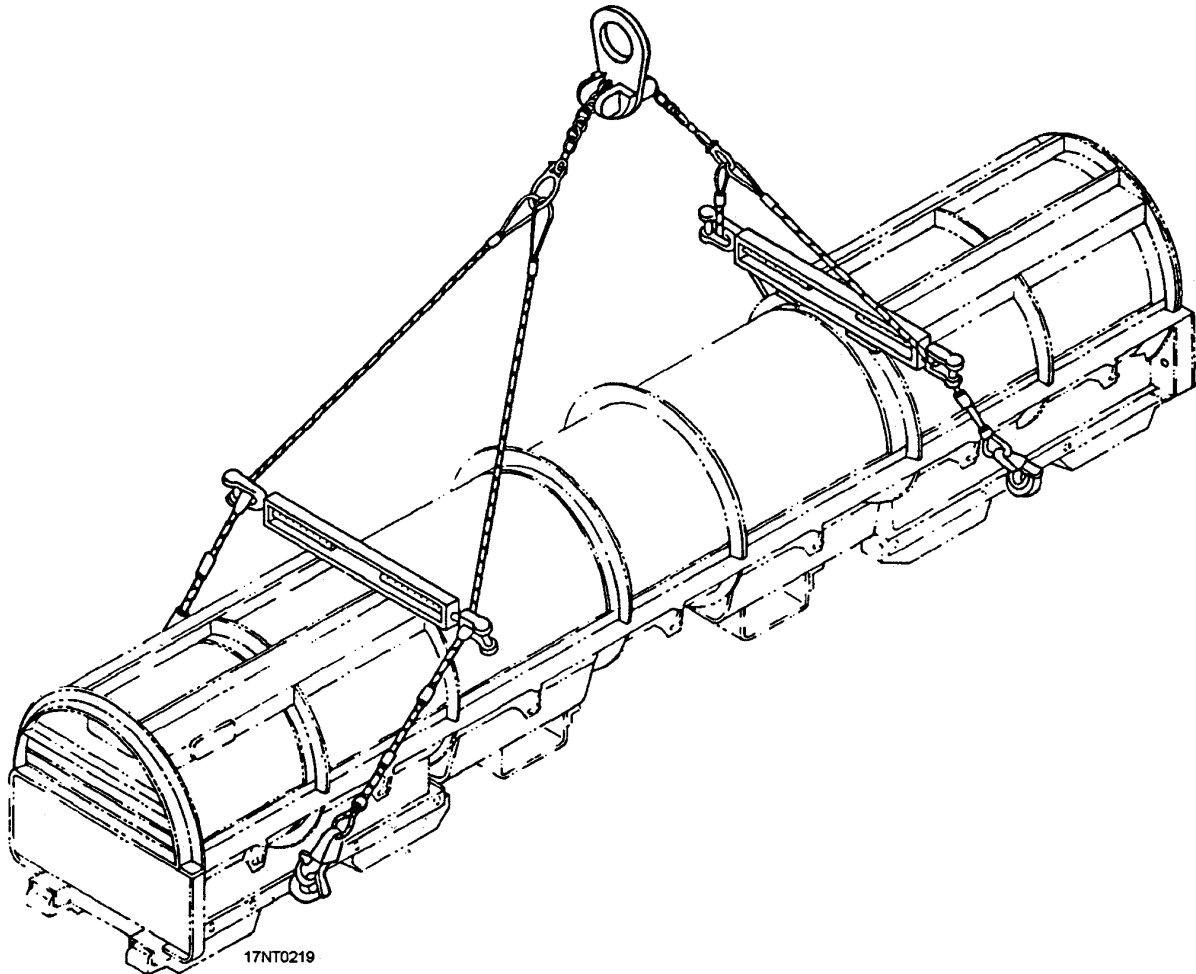


Figure 9-21.—Mk 109 Mod 1 container lifting sling.

## BOMB HOISTS

**LEARNING OBJECTIVE:** *Recognize the purpose and use of bomb hoist and identify the loads for each.*

A hoist is a mechanism that provides a mechanical advantage when raising or lowering heavy loads, such as bombs, mines, and torpedoes.

### HLU-288/E BOMB HOIST

The HLU-288/E bomb hoist (fig. 9-22) consists of a gear train, drum and cable, brake mechanism, fishing pole type of extension tube, a ratchet crank, and a brake crank. The cable drum rotates in the direction opposite to that of the cranks. The ratchet crank is used to help hoist the load, and it can be disengaged from the gear train by latching the ratchet pawl. The brake crank is used to hoist and lower the load. After a load is lifted, a clutch-type brake locks the gear train.

The HLU-288/E bomb hoist is used with single hoist ordnance loading system (SHOLS) adapters to

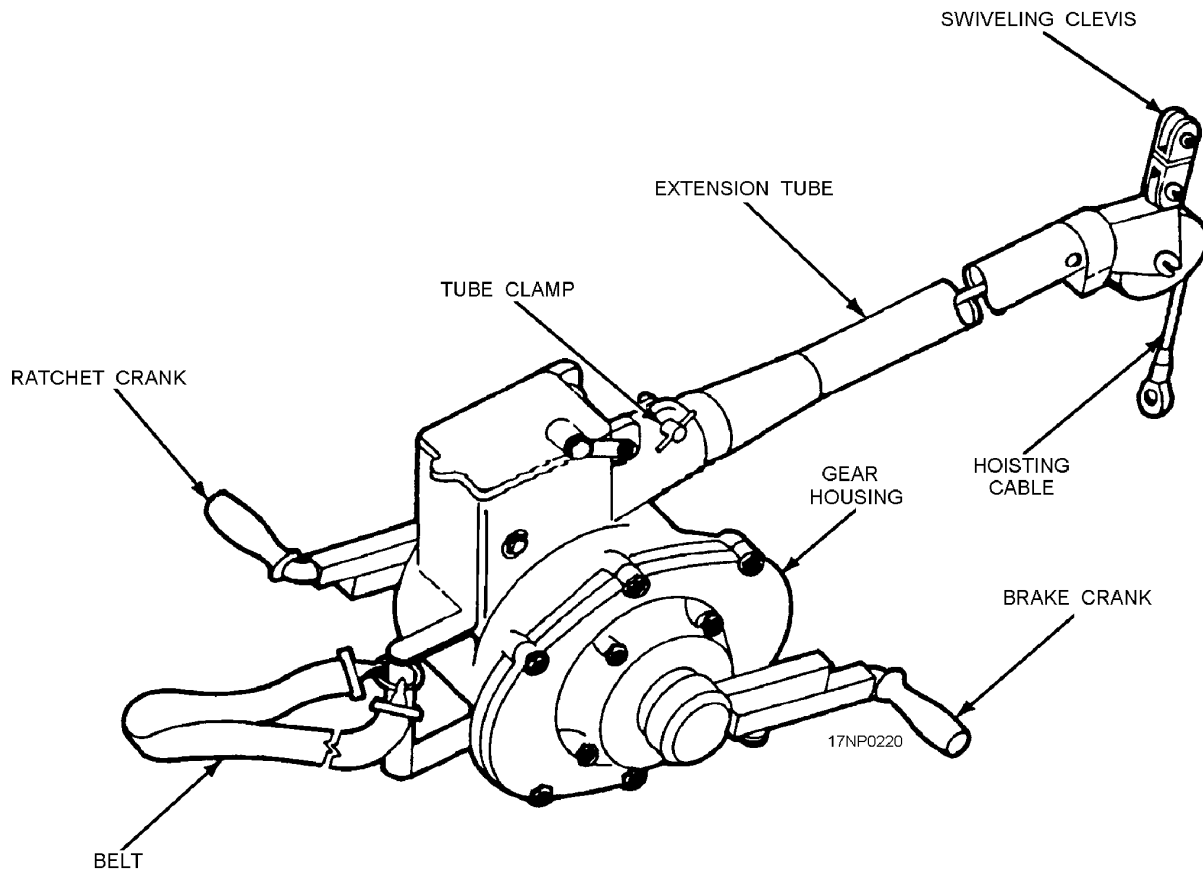


Figure 9-22.—HLU-288/E bomb hoist.

load various weapons onto a variety of aircraft. The hoist can use a short or long cable for loading onto wings, fuselage, and bomb bay stations. The HLU-288/E replaces the Aero 14C bomb hoist, which is obsolete.

### HLU-196B/E BOMB HOISTING UNIT

The HLU-196B/E bomb-hoisting unit (fig. 9-23) is a lightweight, portable, gasoline, engine-driven unit. It consists of a gasoline engine, speed-reducing gearbox and brake, and a cable assembly and storage drum that incorporates a clutch and a boom. All components and controls are mounted on a two-wheeled frame assembly. The entire unit weighs 75 pounds. It has a direct, single-cable lift capacity of 2,000 pounds. A double-cable lift capacity of 4,000 pounds is obtainable by using various trolleys and rack adapters that are available. You can extend the cable by disengaging the clutch and manually pulling it until the necessary length is withdrawn. To reel the cable in, you must start the engine, engage the clutch, and carefully throttle the engine to control the reel-in speed of the cable.

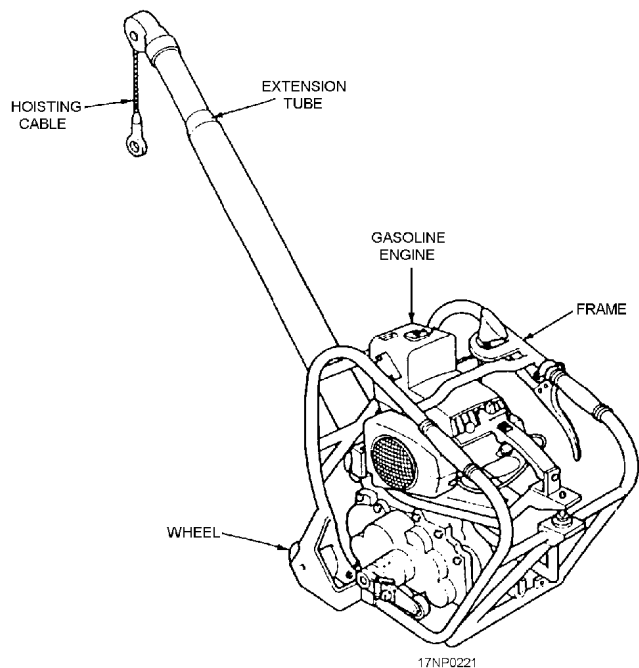


Figure 9-23.—HLU-196B/E bomb hoisting unit.

Maximum reel-in speed of the cable is 15 feet per minute.

The HLU-196B/E unit is used to single or, by the use of various trolleys and adapters, double hoist various weapons and stores.

### REVIEW NUMBER 5

- Q1. List the components of the HLU-288/E bomb hoist.
- Q2. What component of the HLU-288/E bomb hoist is used to hoist or lower the load?
- Q3. List the components of the HLU-196B/E bomb-hoisting unit.
- Q4. List the types of available hoisting bands.

### SKIDS, WEAPONS TRANSPORTERS, AND ASSOCIATED ADAPTERS

**LEARNING OBJECTIVE:** *Identify the purpose and use of skids, weapons transporters, and associated adapters. Recognize the safe loads for each.*

A skid or weapon transporter is a mobile piece of equipment with a welded frame-type construction mounted on two or four rubber-tired wheels. It is used with various adapters to support a load for movement from one area to another.

Wheeled skids or weapons transporters are generally equipped with a brake mechanism so the skid won't move when unattended. Handles are attached to all mobile skids and weapons transporters to provide a means of moving and controlling the units. The units are not self-propelled and require either manpower or power equipment to move them. They are used for handling various weapons and miscellaneous ammunition items during the aircraft rearming process aboard aircraft carriers and at shore stations.

You can't use skids and weapons transporters without adapters. Adapters are an interface between the skid or weapon transporter and the weapon or store to be supported. They provide a support surface and a means of securing the weapon or store to the skid or transporter. This prevents any inadvertent movement. There are many different types of adapters available for any one particular skid or weapon transporter, or an adapter may be compatible with several different skids or weapons transporters. Adapters are attached to the skids or weapons transporters by quick-release pins or other types of quick-change devices.

### AERO 12C BOMB SKID

The Aero 12C bomb skid (fig. 9-24) is a wheelbarrow skid. It consists of a cradle frame mounted on two rubber-tired wheels and equipped with two supporting legs. The skid has two tubular steel

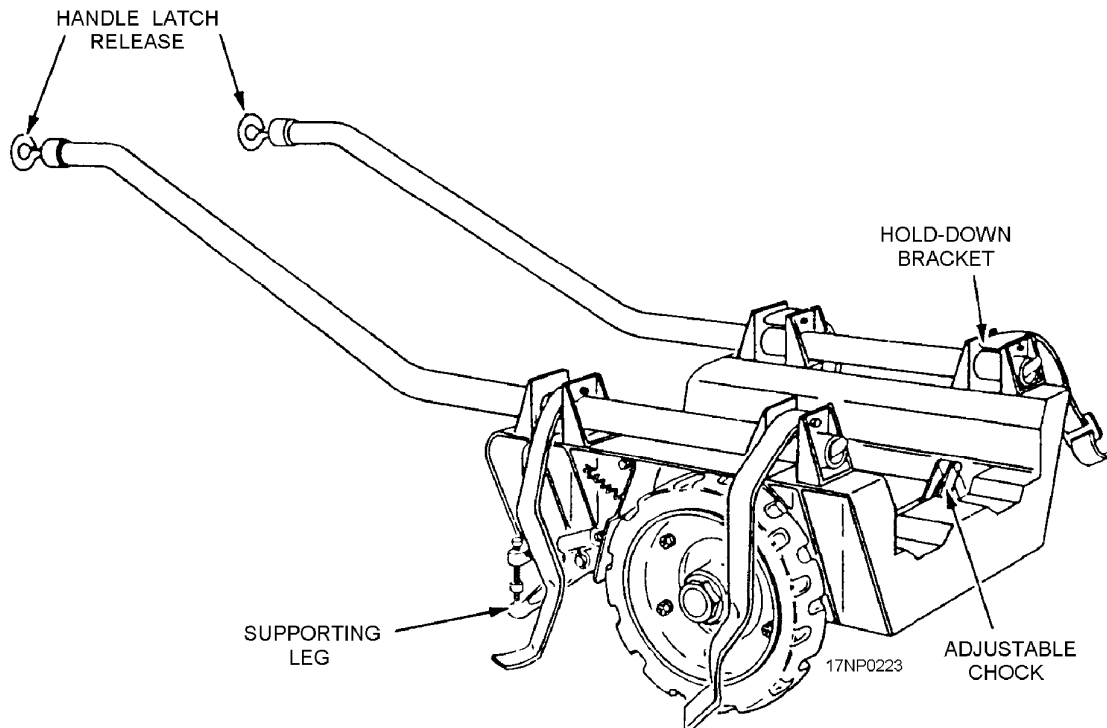


Figure 9-24.—Aero 12C bomb skid.

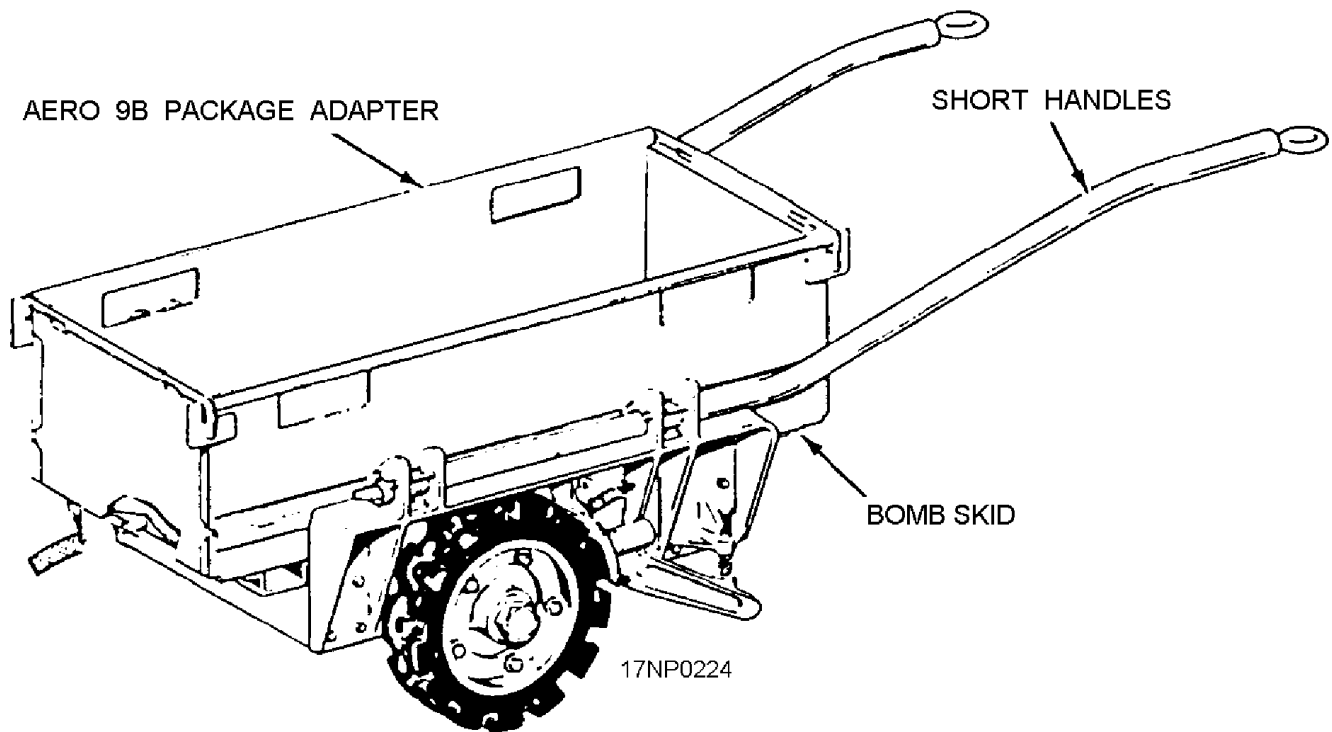


Figure 9-25.—Aero 9B/C bomb skid adapter mounted on an Aero 12C bomb skid.

handles that you can quickly latch or unlatch. You can reposition or remove the handle by using the handle release on the aft end of each handle.

The wheels are braked by two brake shoes applied to the wheels by the support legs. Apply the brakes by lowering the skid so the supporting legs come in contact with the deck or runway. The brakes are released when the skid is raised high enough for the supporting legs to clear the deck or runway.

The skid is equipped with adjustable chocks on the bed of the frame. These chocks let you properly position the load on the skid. Each side of the skid is equipped with two hold-down brackets. One set of brackets accommodates the long or short handles. The other set of brackets is used for attaching tie-down straps.

The Aero 12C bomb skid is used to transport weapons that have a diameter between 4 and 18 inches. With the exception of Mk 81 bombs, weapons are transported singly or in pairs. The skid has an SWL of 1,250 pounds.

### Aero 9B/C Bomb Skid Adapter

The Aero 9B/C bomb skid adapter (fig. 9-25) consists of an aluminum box like frame with

collapsible walls. It is constructed with stiffeners at the sides and bottom. The adapter is secured to the skid by two spring-loaded latches. Hand holes are provided in the sides of the adapter for manual handling.

The Aero 9B/C bomb skid adapter is used with the Aero 12C bomb skid to handle and transport miscellaneous ammunition items. The adapter has an SWL of 1,000 pounds.

### Aero 39B Bomb Skid Adapter

The Aero 39B bomb skid adapter (fig. 9-26) consists of seven hexagonal aluminum tubes welded

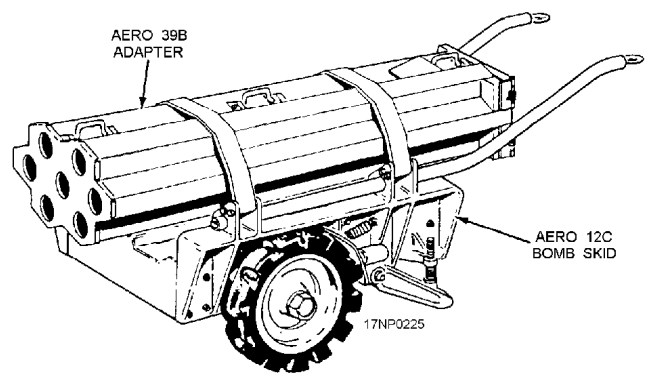


Figure 9-26.—Aero 39B bomb skid adapter mounted on an Aero 12C bomb skid.

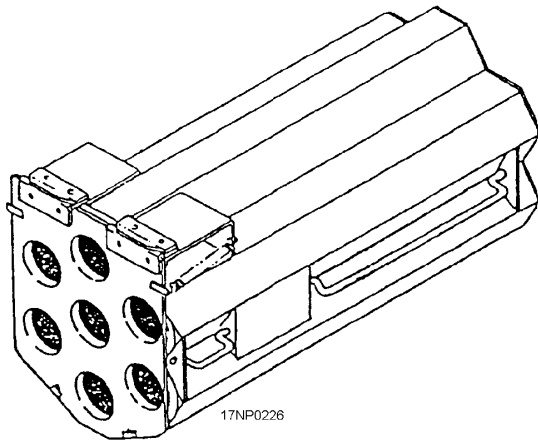


Figure 9-27.—ADU-729/E nitrogen receiver adapter.

together. It is flat on one side and contoured around the hexagonal tubes on the other three sides. The assembly has three handles mounted on it for lifting and a hinged door at one end for loading.

The Aero 39B bomb skid adapter is used with the Aero 12C bomb skid to transport and store nitrogen-filled bottles used as a coolant on the LAU-7A guided missile launcher. The adapter has an SWL of seven nitrogen bottles.

#### ADU-729/E Nitrogen Receiver Adapter

The ADU-729/E nitrogen receiver adapter (fig. 9-27) is an aluminum container with seven hexagonal tubes. A welded plate is fitted with contoured urethane pads to fit the nitrogen bottles of the LAU-127 launcher.

The hinged plate is spring loaded and dual clasped for security. Two handles located on the side aid in lifting and carrying.

#### Aero 64B Soft-Belt Adapter

The Aero 64B soft-belt adapter (fig. 9-28) consists of a flexible, neoprene-covered, woven-wire sling. The adapter has slots at the ends for attaching tie-down straps. The adapter is also equipped with brackets for attaching it to the skid.

Two Aero 64B soft-belt adapters support or store a soft-skin weapon up to 20 inches in diameter on the Aero 12C bomb skid. SWL not to exceed 1250 pounds. Each Aero 64B adapter has an SWL of 2,500 pounds.

#### REVIEW NUMBER 5 ANSWERS

- A1. *The components of the HLU-288/E bomb hoist include a gear train, drum and cable, brake mechanism, fish pole extension tube, and two cranks.*
- A2. *The break crank of the HLU-288/E bomb hoist is used to hoist or lower the load.*
- A3. *The components of the HLU-196/E bomb-hoisting unit include gasoline engine, speed-reducing gearbox and brake, a cable assembly, and storage drum.*
- A4. *The single cable-lift capacity of the HLU-196/E bomb hoist is 2,000 pounds.*

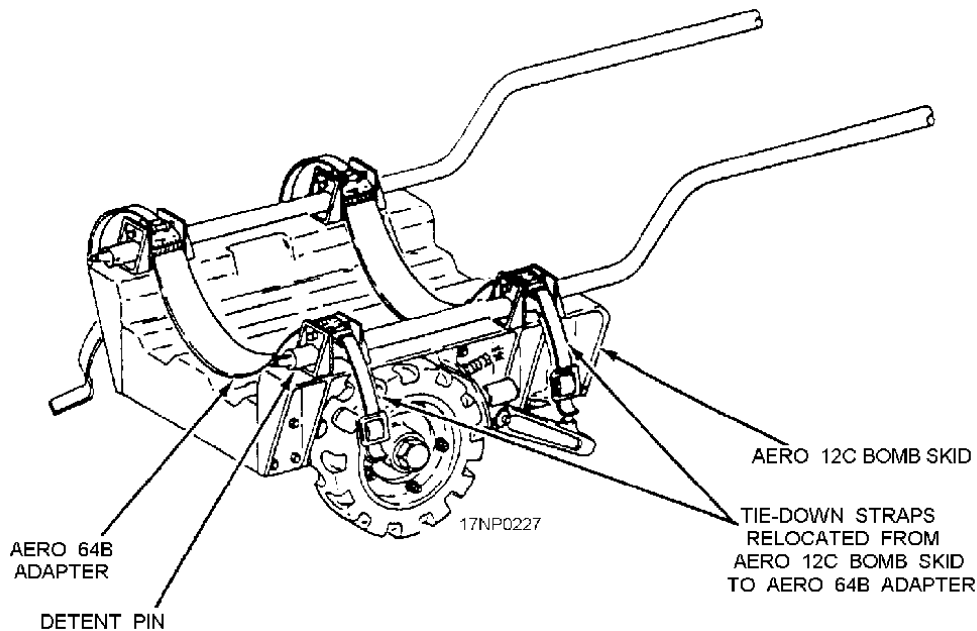


Figure 9-28.—Aero 64B soft-belt adapter mounted on an Aero 12C bomb skid.

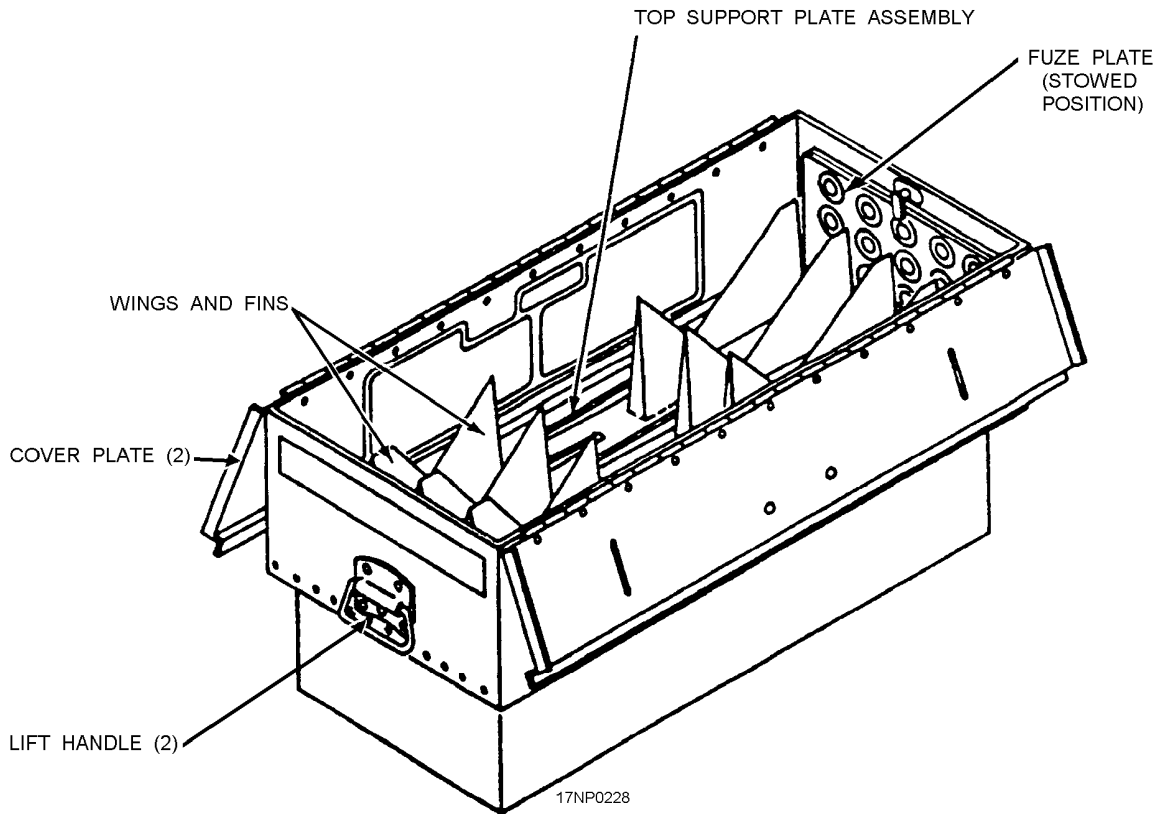


Figure 9-29.—ADU-488/E wing, fin, and fuze adapter.

#### ADU-488/E Wing, Fin, and Fuze Adapter

The ADU-488/E wing, fin, and fuze adapter (fig. 9-29) is an aluminum container that contains different features to transport a variety of ordnance components. Preformed urethane channels that provide protection for wings and fins are installed in the base. Above the base are two hinged plates, which are lowered onto the wings and fins to hold them in place. There are two cushioned plates that are lowered from their stowed position and that provide holes for fuzes.

The ADU-488/E wing, fin, and fuze adapter is used by ordnance personnel to transfer different ordnance and ordnance components from weapons breakout areas to the flight deck/flight line.

#### MHU-191/M MUNITIONS TRANSPORTER

The MHU-191/M munitions transporter (fig. 9-30) is a welded tubular frame equipped with a box section of drilled steel bars, which provide the mounting holes for attaching various adapters. It has two axles and four

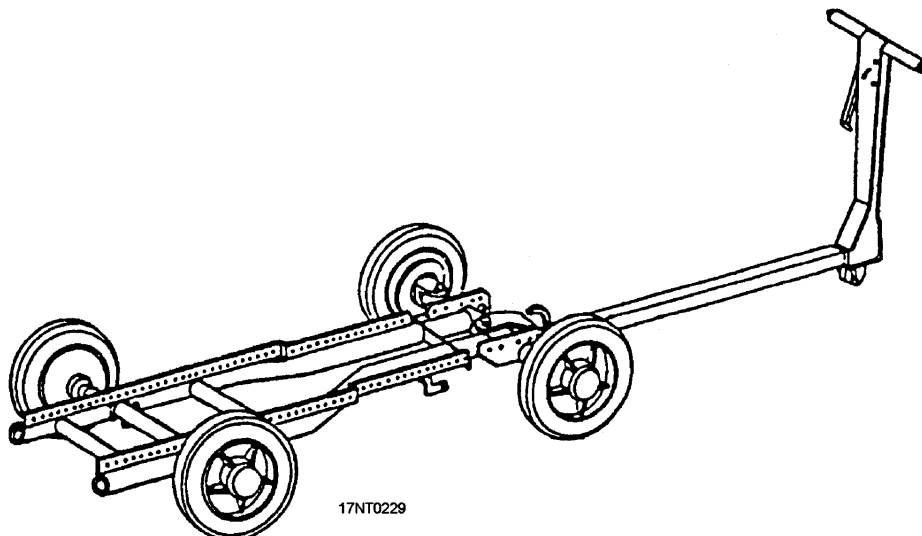


Figure 9-30.—MHU-191/M munitions transporter.

rubber wheels. The two front wheels are equipped with drum brakes. The brake lever located on the draw bar actuates the brakes. The brakes are applied automatically when the spring-loaded brake lever is in the down position. To release the brakes, pull the brake lever upward toward the T on the draw bar. The brakes shoes are actuated through the mechanical linkage located inside the draw bar. The brake lever is continually held in the upward position so the skid can move. Be careful when you release the brake lever; it is spring-loaded and can cause the lever to snap downward. This may result in damage to the mechanical linkage system. The draw bar is attached to the skid by a quick-release pin. This pin also connects the brake linkage between the skid and the brake lever on the draw bar.

Two drawbars are available for use with the MHU-191/M munitions transporter. Use the short draw bar to transport short weapons or when working in an area where long handle cannot be used. Use the long draw bar to transport long weapons, such as missiles, flare dispensers, or rocket launchers. The skid has an SWL of 5,000 pounds. It is used with various adapters to transport or load weapons, stores, and equipment.

### Aero 58A Skid Adapter

The Aero 58A skid adapter (fig. 9-31) has a front and rear section. These sections are similar in design. The primary difference is the base—the front section has a 10-inch base and the rear section has a 15-inch

base. These front and rear sections fit on the rails of the skid. Each adapter section has two removable rubber rollers supporting the weapon. These rollers are adjustable from one to six positions to accommodate weapons of different diameters. Nylon straps hold the weapon in place.

One set of Aero 58A skid adapters has an SWL of 5,000 pounds. It holds a single weapon up to 30.5 inches in diameter. This adapter can also be used with the MHU-125/E platform skid and MHU-126/M munitions trailer.

### ADU-483/E SKID ADAPTER ASSEMBLY.—

The ADU-483/E skid adapter assembly (fig. 9-32) consists of one steel upper-frame section with two removable rubber rollers and a nylon tie-down strap with a buckle. A quick-release pin is used to attach and secure the two adapter assemblies together at the top. This forms a complete load-bearing assembly that supports two cylindrical weapons side by side. The position of the outboard roller is fixed. The inboard roller can be positioned in either of two positions to hold weapons of different diameters.

The ADU-483/E skid adapter assembly is used in pairs with the Aero 58A skid adapters. When mounted on the top of two Aero 58A skid adapters (front and rear) and secured with quick-release pins, the ADU-483/E skid adapter assembly supports two weapons from 9 to 16 inches in diameter. Two pairs (total four) of the ADU-483/E skid adapters have an SWL of 4,000 pounds. When the skid adapter

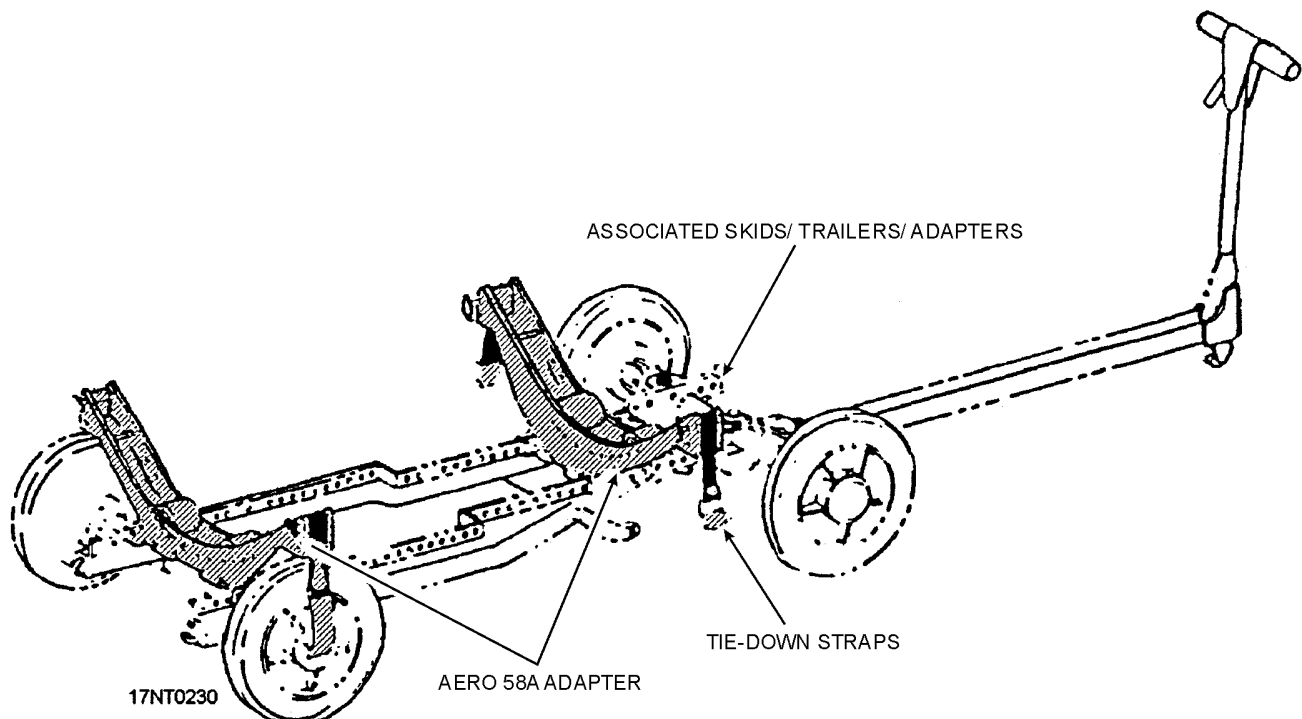


Figure 9-31.—Aero 58A skid adapter mounted on an MHU-191/M munitions transporter.

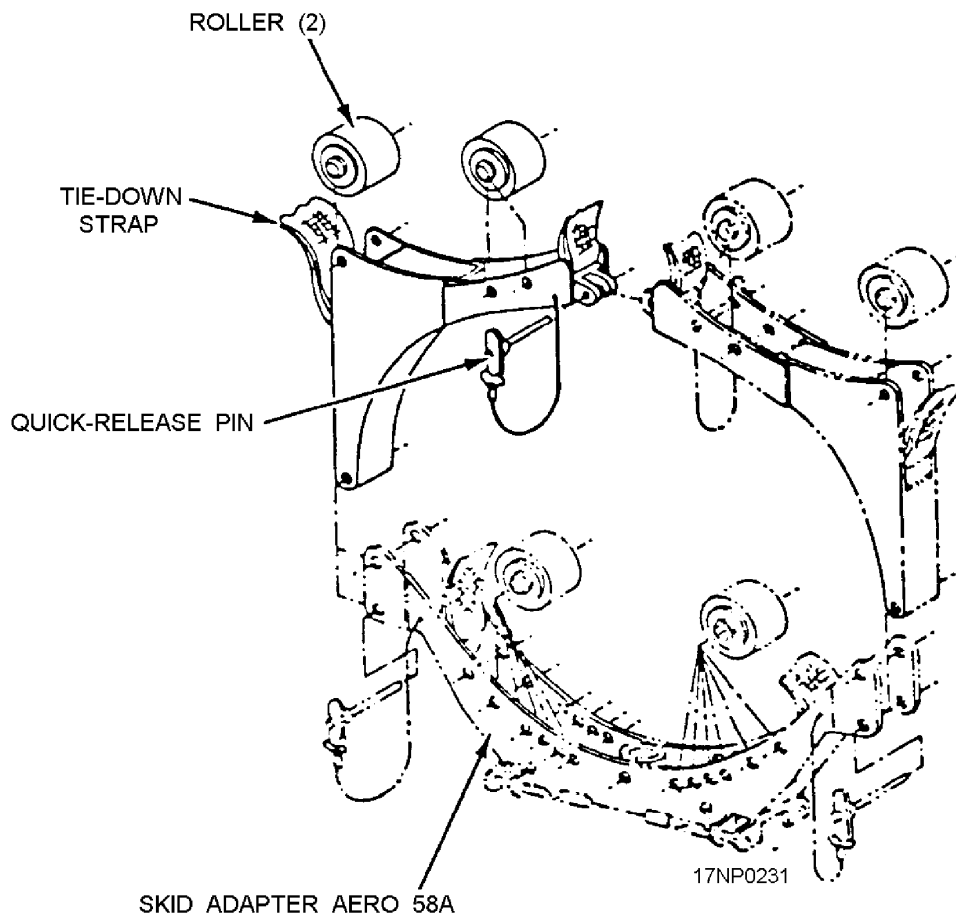


Figure 9-32.—ADU-483/E skid adapter assembly.

assemblies are installed, the Aero 58A skid adapter is limited to weapons with a maximum diameter of 16 inches.

**ADU-496A/E SINGLE STORE ADAPTER.—**The ADU-496A/E (fig. 9-33) consists of a steel body and urethane pad bonded together to form a single unit.

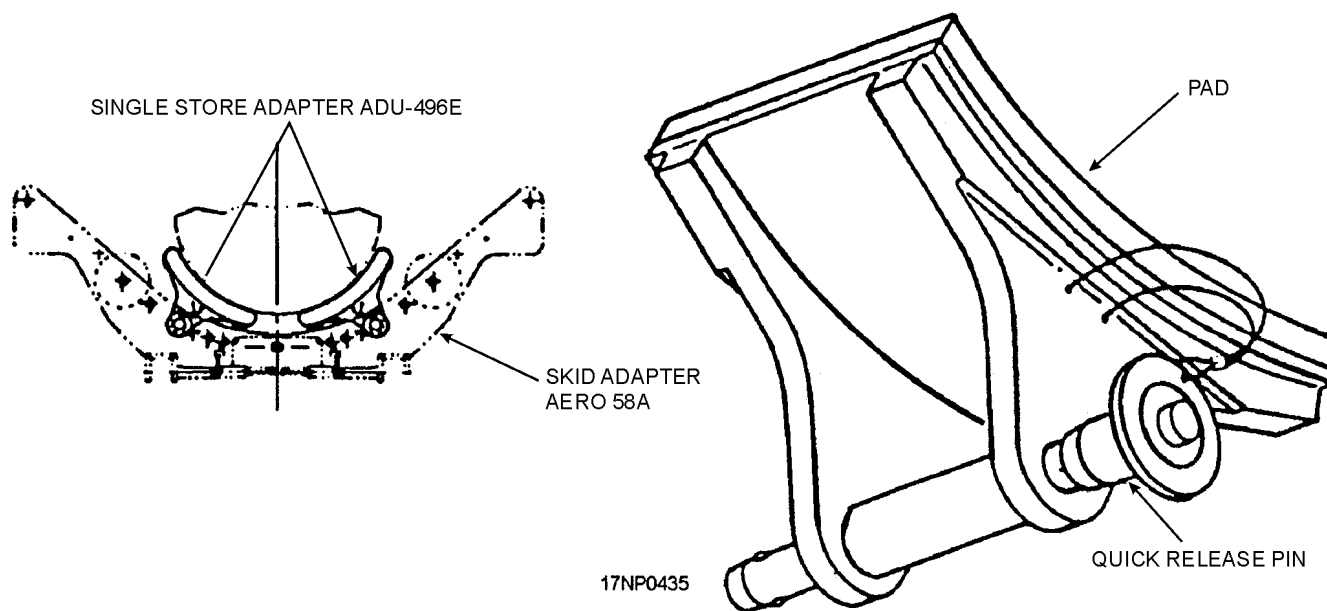


Figure 9-33.—ADU-496A/E single store adapter.

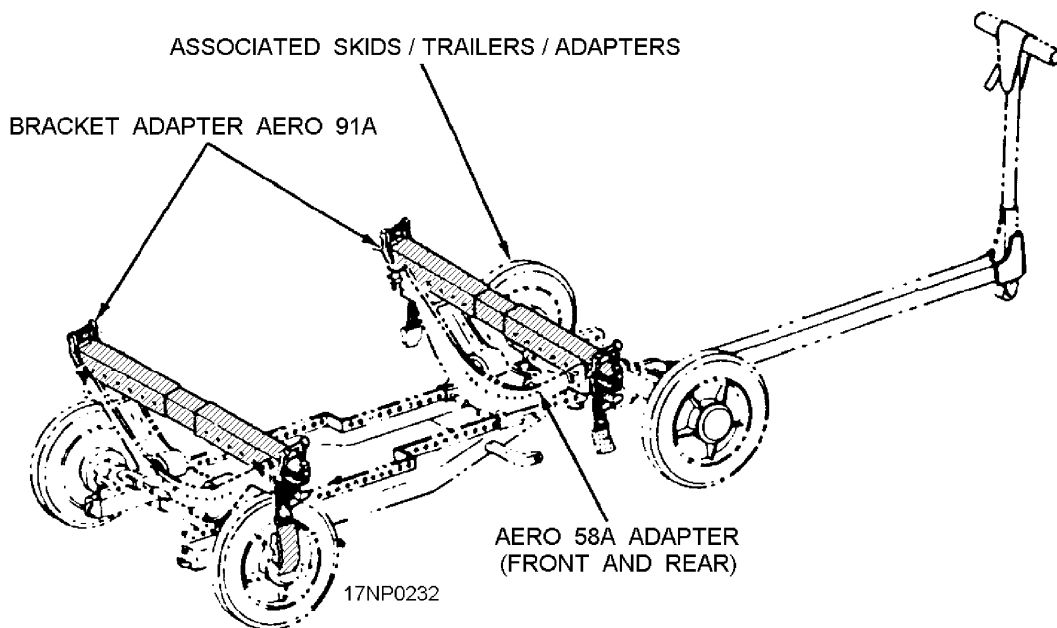


Figure 9-34.—Aero 91A bracket adapter mounted to Aero 58A skid adapters/MHU-191/M munitions transporter.

The adapter is used in sets of four to support a single weapon, and 10-inch diameter and larger weapons/stores during handling and transport on the MHU-191/M munitions transports. The adapter attaches to the AERO-58A, ADU-483/E, and ADU-397/E Skid and cradle adapters.

The ADU-496A/E is used to support the AGM-88 HARM missile and 10-inch diameter and larger stores.

**AERO 91A BRACKET ADAPTER.**—The Aero 91A bracket adapter (fig. 9-34) consists of an arm weldment, two sleeve weldments, connecting pins, hooks, T bolts, and clamp weldments. You can adjust

the bracket to hold loads varying between 28 and 40 inches in width.

The Aero 91A bracket adapter is attached to the Aero 58A skid adapters to convert the MHU-191/M munitions transporter into a flatbed vehicle capable of handling weapon pallets, cradles, and containers. Two bracket adapters are required for each skid. A set of two Aero 91A bracket adapters has an SWL of 4,000 pounds.

**AERO 71A SKID ADAPTER.**—The Aero 71A skid adapter (fig. 9-35) consists of a welded aluminum angle frame, sheet aluminum deck, and steel tube

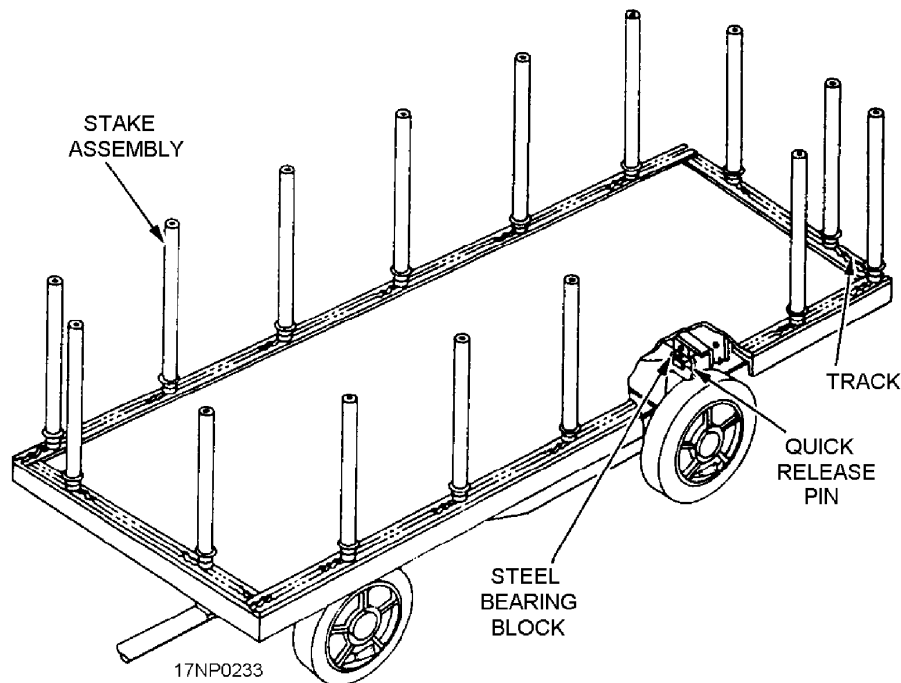


Figure 9-35.—Aero 71A skid adapter mounted to Aero 58A skid MHU-191/M munitions transporter.

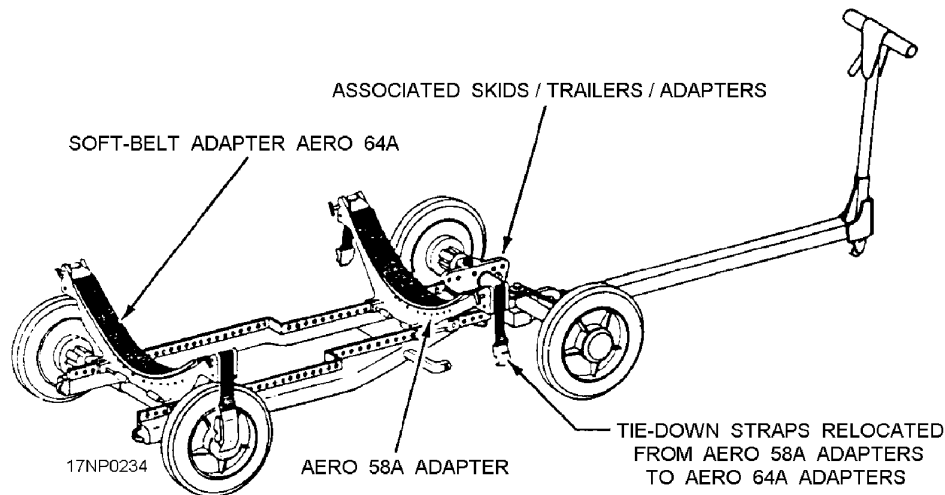


Figure 9-36.—Aero 64A soft-belt adapter mounted to Aero 58A skid adapters/MHU-191/M munitions transporter.

stakes. The adapter is secured to a weapon skid by quick-release pins. An extruded aluminum track around the edges of the flatbed allows the attachment of the steel tube stakes.

When using the Aero 71A, you must use two Aero 58A skid adapters in order to form a flatbed conveyance for transportation of the weapon component containers and a variety of other materials. The Aero 71A can be used with various skids, transporters, and trailers. The adapter has an SWL of 4,000 pounds.

**AERO 64A SOFT-BELT ADAPTER.**—The Aero 64A soft-belt adapter (fig. 9-36) consists of a

flexible neoprene-covered, woven-wire sling. The adapter has slots at the ends for attaching tie-down straps. The adapter is also equipped with brackets for attaching it to the skid.

Two soft-belt Aero 64A adapters support a soft-skin store up to 30 inches in diameter. Each adapter has an SWL of 2,500 pounds. The Aero 64A is designed for use with Aero 58A skid adapters, and is used with various skids, transporters, and trailers.

**AERO 83A TRANSPORT ADAPTER.**—The Aero 83A transport adapter (fig. 9-37) consists of a tubular aluminum frame with a system of movable

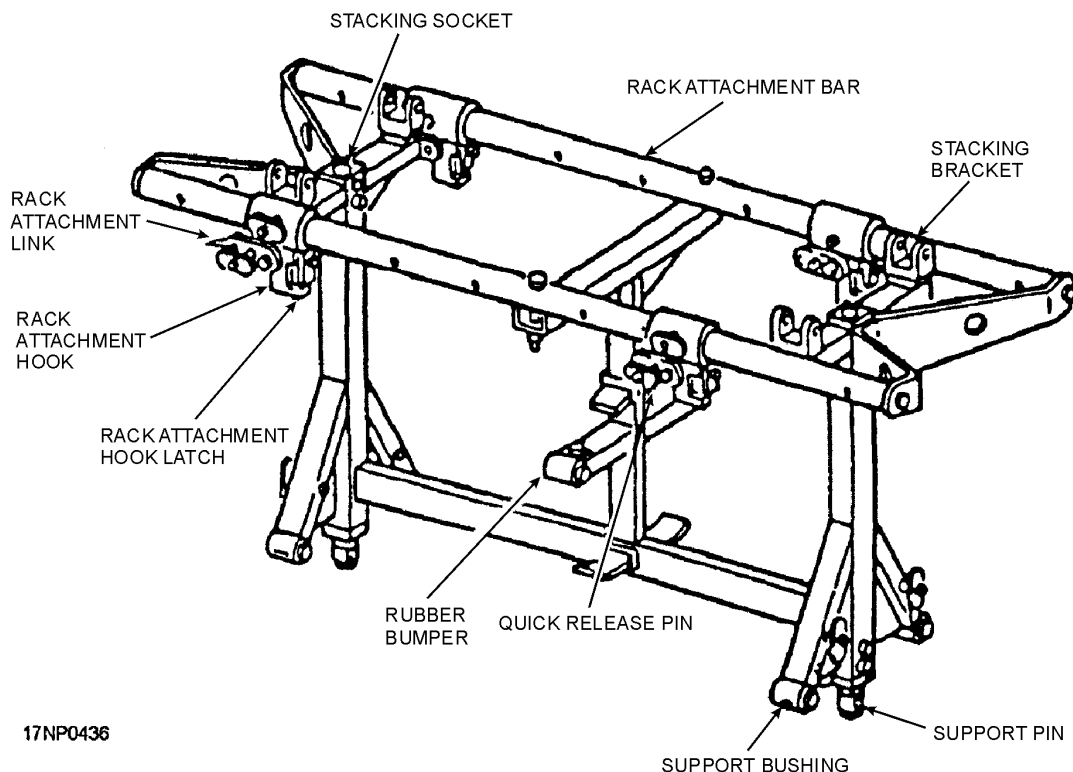


Figure 9-37.—Aero 83A transport adapter.

suspension assemblies. The adapter is equipped with four rack-attachment hooks adjusted to accept 14- or 30-inch suspension lugs. The adapter is equipped with two tie-down straps to secure the load against the rubber bumpers.

The Aero 83A transport adapter is used with the Aero 58A skid adapter on the MHU-191/M munitions transporter for transporting empty improved multiple ejector racks (IMERs) and improved triple ejector racks (ITERs). One adapter can handle two IMERs or two ITERs. The adapters can be stacked two high so four racks can be transported. Stack the adapters by inserting the support pins of the upper adapter into the stacking sockets of the lower adapter. Then mount the adapter on the skid by inserting the Aero 83A transport adapter support pins into the front and rear sockets of the Aero 58A. The Aero 83A has an SWL of 5,000 pounds.

**MXU-661/E SKID PLATFORM ADAPTER ASSEMBLY.**—The MXU-661/E skid platform adapter assembly (fig. 9-38) consists of an aluminum platform weldment, two side brackets with straps and buckles, and four stud assemblies. Two skid platform adapter assemblies are fastened to the side frames of the Aero 71A skid adapter. One MXU-661/E skid platform adapter assembly is located at each end of the Aero 71A skid adapter and attached by means of a platform stud assembly.

The MXU-661/E adapter is used on the Aero 71A. It is mounted on the front and rear parts of the Aero 58A skid adapter. This forms a flatbed on the MHU-191/M munitions transporter capable of holding and transporting up to 32 sonobuoys in containers.

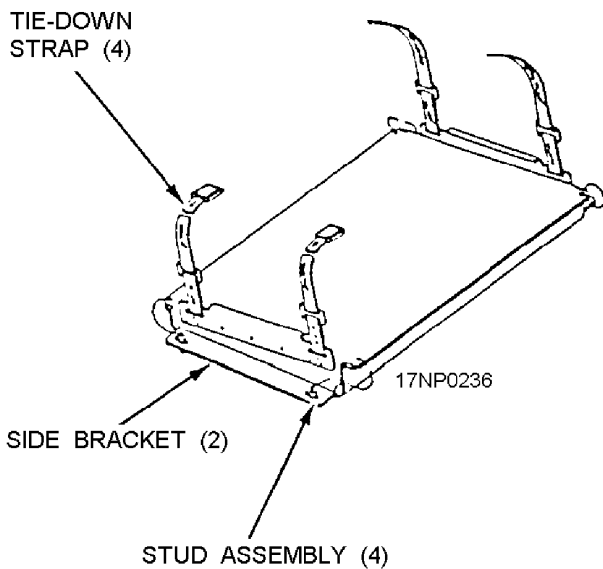


Figure 9-38.—MXU-661/E skid platform adapter assembly.

### ADU-514A/E Small Missile Adapter

The ADU-514A/E small missile adapter (fig. 9-39) is an aluminum weldment that consists of upper and lower frames with support pads, two side blocks, and buckle and strap. The adapter is used in pairs and features a three-tier design. The missile support pads are gel filled to provide contoured cradling of missiles and weapons.

The ADU-514A/E small missile adapter is used on a variety of weapon skids, transporters, and trailers for transporting up to six each of the following missiles: AIM-7 series, AIM-120 series, AMRAAM, AIM-9 series, and AGM-114B.

### ADU-567/E Wing/Fin Guard Adapter

The ADU-567/E adapter (fig. 9-40) consists of a tube extension, pivot tube, two guards, main tube weldment, and retractable spring-locking plungers. The tube extension can be retracted and locked into the main tube weldment, and the two guards can be pivoted and locked in a flat position to create a compact shipping and stowage package.

The ADU-567/E adapter provides protection for Sidewinder AIM-9 wings and fins when attached to the ADU-514A/E small missile adapter during transporting and handling.

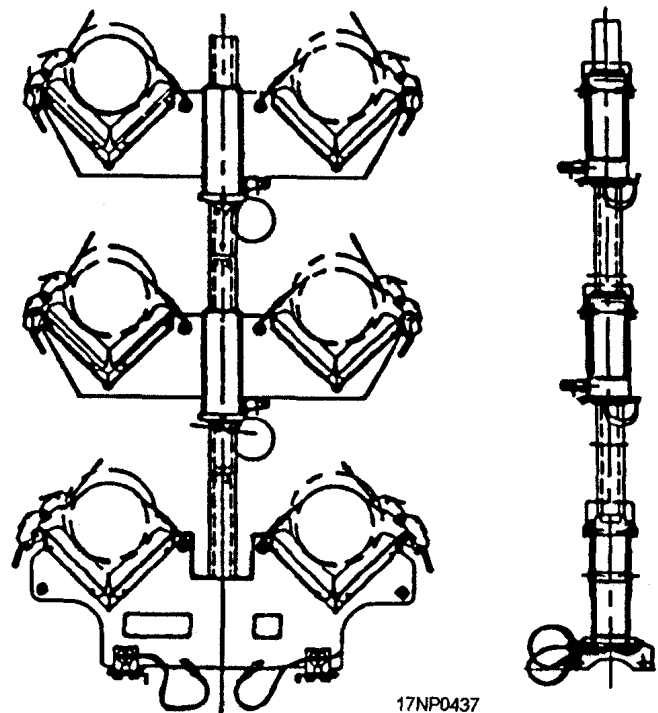


Figure 9-39.—ADU-514A/E small missile adapter.

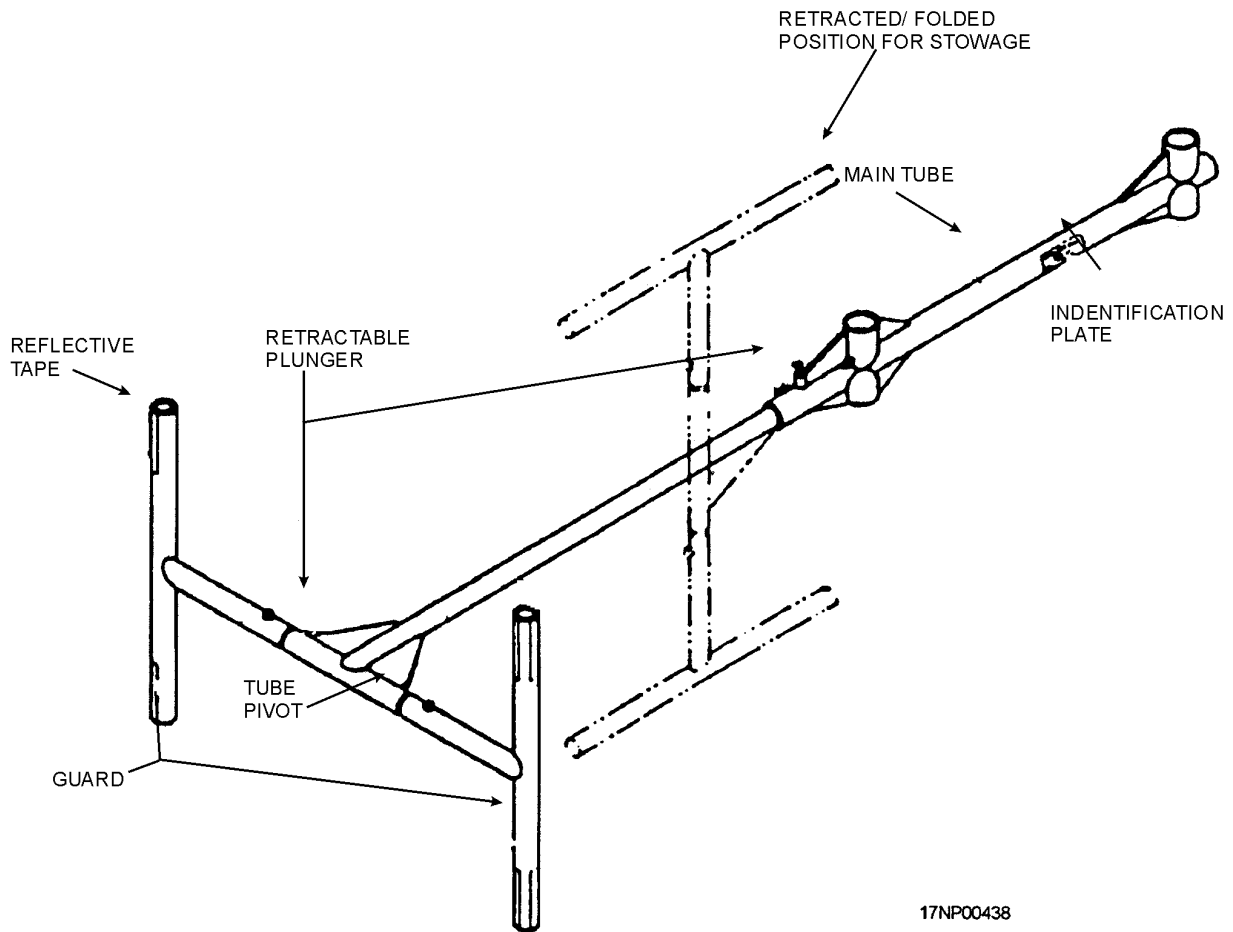


Figure 9-40.—ADU-567/E wing/fin guard adapter.

### ADU-511A/E Adjustable Weapons Adapter

The ADU-511A/E adapter (fig. 9-41) has adjustable chocks that can be configured for different

diameter weapons. Designed to carry two stores side by side, the adapter may also be configured to carry single stores.

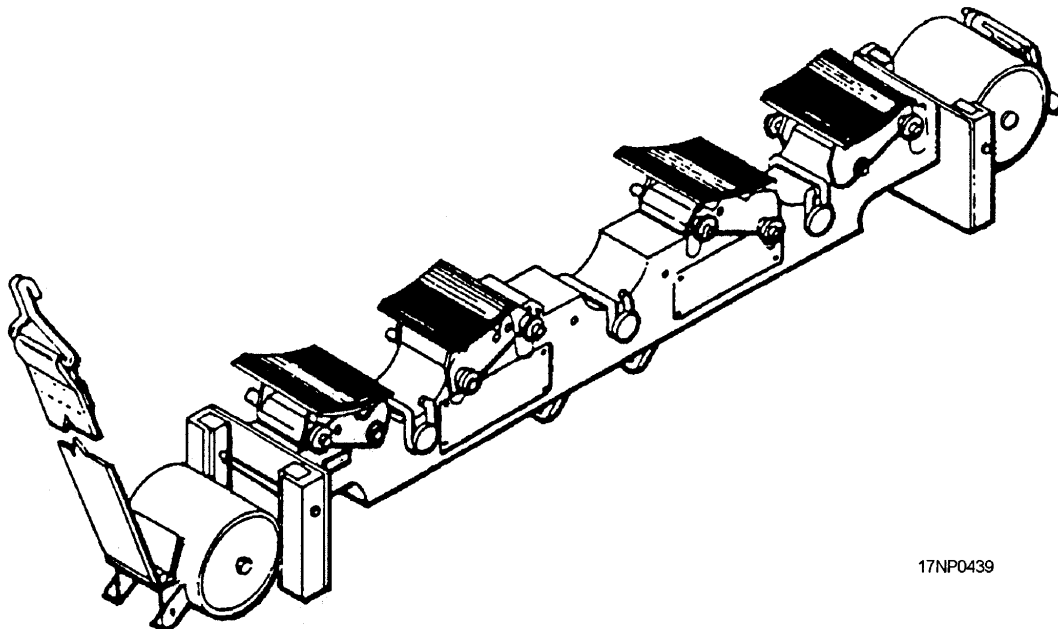


Figure 9-41.—ADU-511A/E adjustable weapons adapter.

The ADU-511A/E adapter is used in support of the AIM-7, AIM-120, ARMAAM, AGM-88, and the AGM-65 missiles for transporting and loading operations.

### ADU-400/E Weapon Skid Loading Lift Adapter

The ADU-400/E weapon skid loading lift adapter (fig. 9-42) consists of a hydraulically controlled steel lift frame that supports a drilled steel tubular beam. The hydraulic system includes a fluid tank, hand lever, cylinder, and pressure gauge. There are extendable outriggers with height adjustment handles to provide stability when the adapter is mounted on the appropriate transporter.

The ADU-400/E adapter is mounted on the MHU-191/M munitions transporter. It is used with a variety of adapters to lift and position armament and maintenance devices on the aircraft. This adapter has an SWL of 2,500 pounds.

### REVIEW NUMBER 6

- Q1. What is the purpose of adapters when used with skids and weapons transporters?
- Q2. Describe how the brakes work on the Aero 12C bomb skid.
- Q3. What is the SWL of the Aero 12C bomb skid?
- Q4. List the adapters used with the 12C bomb skid.

- Q5. What adapter should you use to store a soft-skin weapon on an Aero 12C bomb skid?
- Q6. What is the SWL of the MHU-191/M munitions transporter?
- Q7. List the adapters/adapter assemblies used with the Aero 58A skid adapter.
- Q8. When mounted on the Aero 58A skid adapter, the ADU-483/E skid adapter assembly can support two weapons of what diameter?
- Q9. What weapon skid loading lift adapter consists of a hydraulically controlled steel lift frame?

### TRUCKS

**LEARNING OBJECTIVE:** Identify trucks used for ordnance handling to include ammunition handling, forklift, pallet, and Aero 33D/E bomb trucks. Recognize the safe loads for each.

The term *truck* applies to either a manually propelled or self-propelled vehicle. Gasoline engines, diesel engines, or electric motors power self-propelled trucks.

Gasoline- or diesel-powered trucks are equipped with exhaust system spark arresting devices. These devices help ensure safe operation of the trucks in areas where there is danger of fire or explosion caused by sparks. These vehicles must meet rigid mechanical and

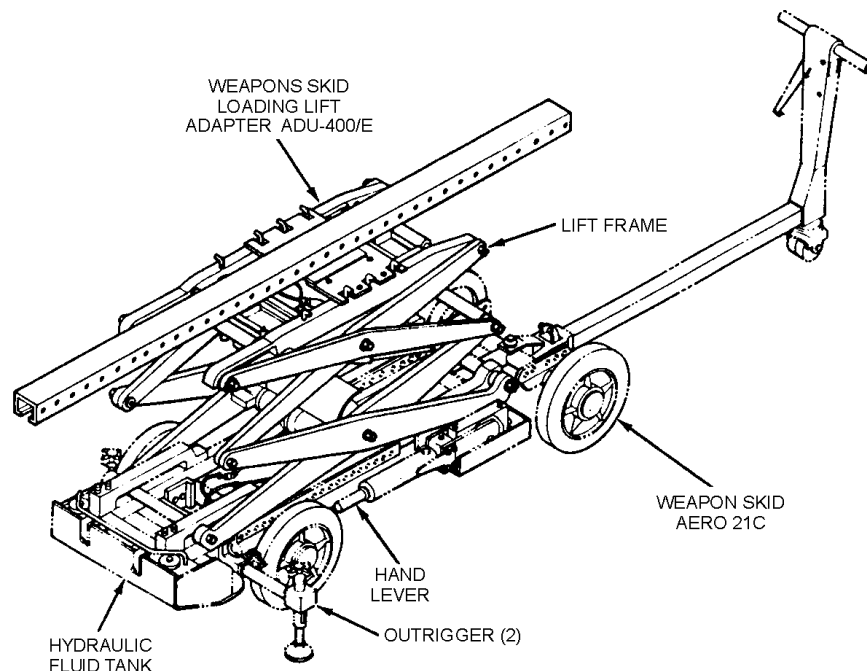


Figure 9-42.—ADU-400/E weapon skid loading lift adapter mounted to an MHU-191/M munitions transporter.

safety inspections. **Do not use vehicles that don't meet the minimum established inspection and safety criteria in ordnance handling evolutions.**

## **FORKLIFT TRUCKS**

The forklift truck is a mobile four-wheel or three-wheel unit that lets one person pick up, transport, and lift the load to different heights. The forklift truck is designed on the cantilever principle. The front wheels act as a fulcrum. The load is counterbalanced because the weight of the truck is directly behind the front wheels.

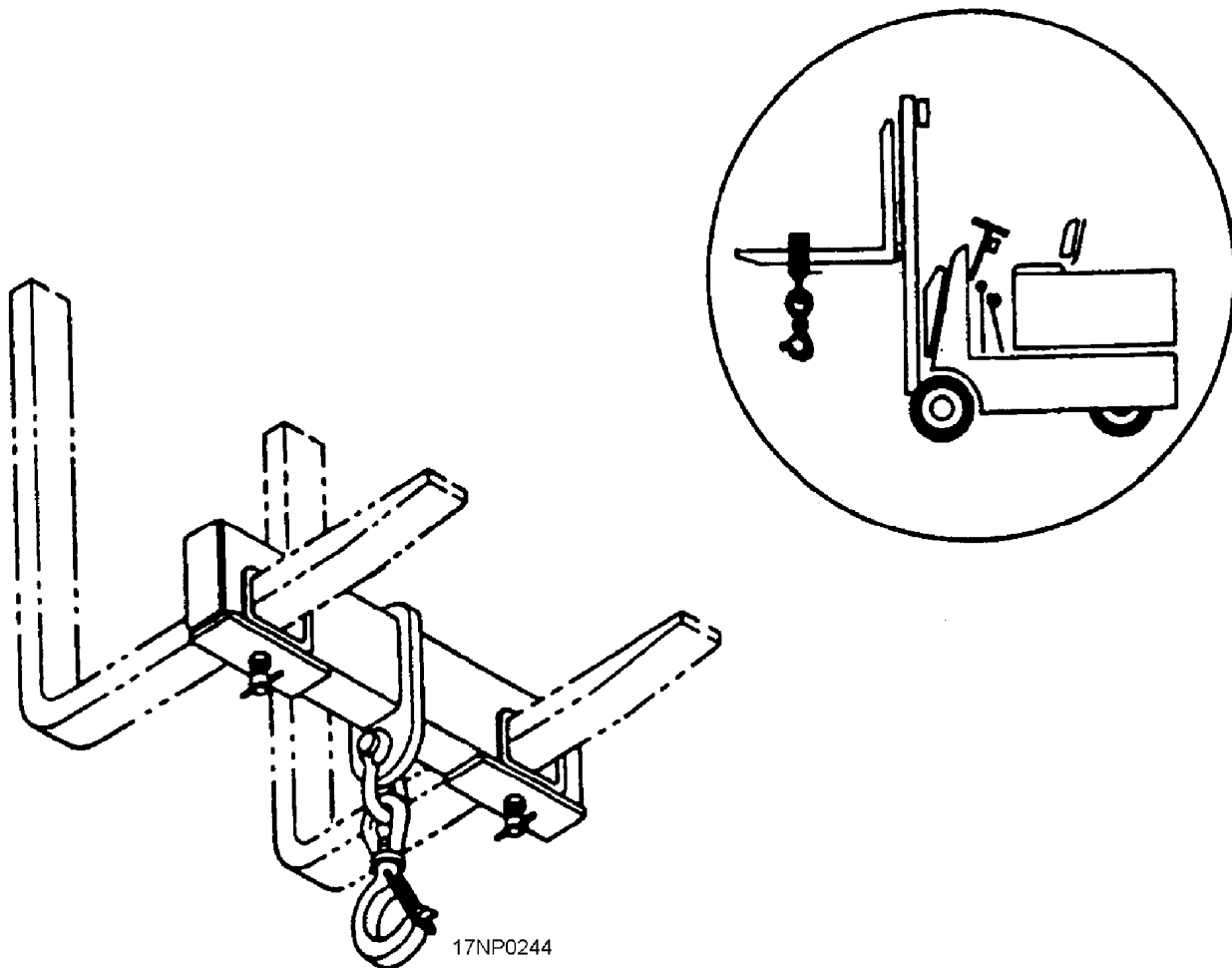
The forklift truck has two fork tines secured to the supporting frame. Both tines and the supporting frame are located in the front of the truck. The tines are moved vertically on the supporting frame by a hydraulic lift. The supporting frame may be either telescoping (to provide greater lift) or nontelelescoping. The tines and supporting frame can be tilted forward from the vertical position to pick up the load. The frame can be tilted

backward from a vertical position to help balance the load. The tines can also be fitted with an adapter hook, Mk 91 Mod 0 (fig. 9-43), which converts a forklift truck tine assembly into a fork/boom assembly, for lifting and transporting various loads.

Gasoline engines, electric motors, or diesel engines power forklift trucks. The electric motor or diesel engine forklift trucks are normally used during ordnance evolutions. Forklift trucks are equipped with braking systems and with either automobile- or lever-type steering mechanisms. Forklift trucks have solid rubber cushion tires for use over smooth and hard surfaces, such as paved roads, magazine and warehouse floors, and piers. Pneumatic tires are used for rough and uneven terrain, in mud, or over soft, sandy ground.

### **Diesel Engine Forklift Trucks**

A wide variety of diesel engine forklift trucks are available for use throughout the Navy. They range from a 4,000-pound capacity to a 20,000-pound capacity



**Figure 9-43.—Mk 91 Mod 0 adapter hook.**

(fig. 9-44). It shows a typical 6,000-pound capacity forklift truck. This truck has a diesel engine and four pneumatic rubber tires. It is typical of the size and capacity ordnancemen usually use. A number of different models of this forklift truck are used at naval activities. Every model has an adjustable two-tine fork. The tines are secured to a vertical supporting frame that can be telescoped and tilted. The lifting and tilting mechanisms are hydraulically operated. An overhead

guard is also provided for the operator's safety. Forklift trucks have either dual or single front wheels, diesel engines, power-shifted transmissions, and either pneumatic or cushion tires. The main difference between the 4,000- and 6,000-pound trucks is in load-carrying capacity and in overall truck dimensions and weight. The exhaust systems of these trucks have spark-arresting devices that are used even when handling ammunition in the open.

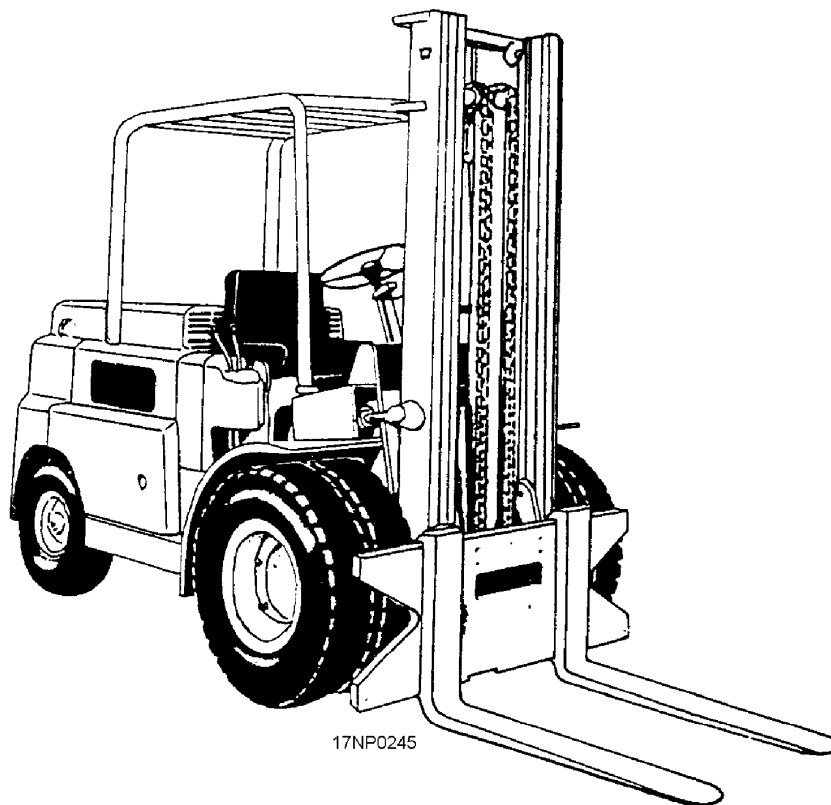
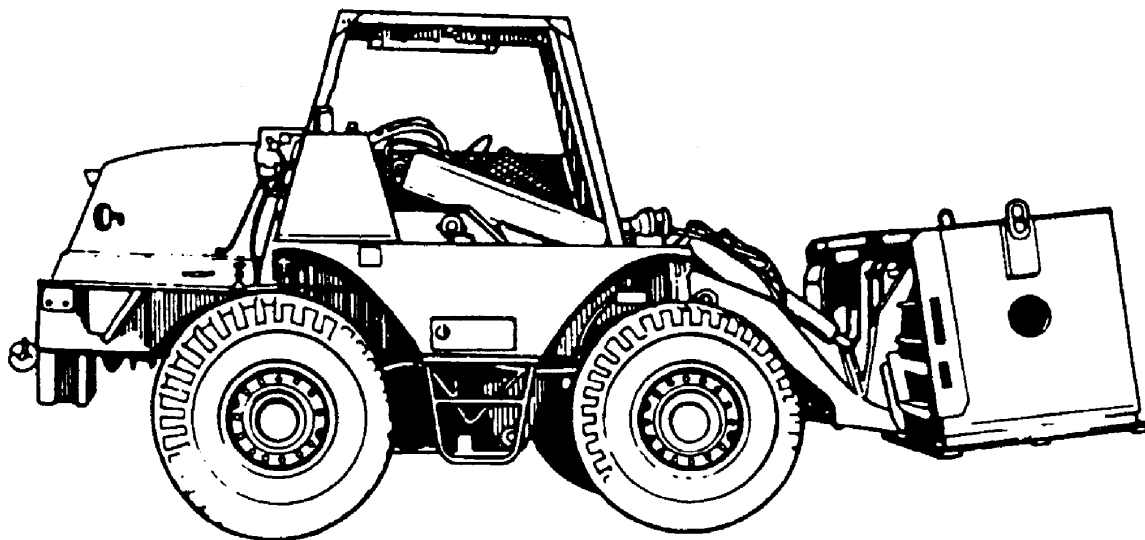


Figure 9-44.—Typical 6,000-pound capacity diesel forklift trucks.

## REVIEW NUMBER 6 ANSWERS

- A1. When used with skids and weapons transporters, adapters are used to support a load for movement from one area to another.
- A2. The brakes on the Aero 12C bomb skid are applied by lowering the aft end of the skid to the deck.
- A3. The SWL of the Aero 12C bomb skid is 1,250 pounds.
- A4. The adapters used with the 12C bomb skid include the Aero 9B/C bomb skid adapter, Aero 39B bomb skid adapter, and Aero 64B soft-belt adapter.
- A5. You should use a 64B soft-belt adapter to store a soft-skin weapon on an Aero 12C bomb skid.
- A6. The SWL of the MHU-191 munitions transporter is 5,000 pounds.
- A7. The adapters/adapter assemblies used with the Aero 58A skid adapter include the 58A skid adapter, ADU-483/E skid adapter assembly, Aero 91A bracket adapter, Aero 71A skid adapter, Aero 64A soft-belt adapter, 83A transport adapter, and MXU-661/E skid platform adapter.
- A8. When mounted on the Aero 58A skid adapter, the ADU-483/E skid adapter assembly can support two weapons between 9 and 16 inches in diameter.
- A9. The ADU-400/E weapon skid loading lift adapter is a hydraulically controlled steel lift frame.

## Electric Forklift Trucks

Electric forklift trucks are used frequently by Ordnancemen. They are discussed in the following paragraphs.

**ELECTRIC FORKLIFT TRUCK, 4,000-POUND CAPACITY.**—A typical 4,000-pound capacity electric forklift truck is shown in (fig. 9-45). Many different models are currently used at naval

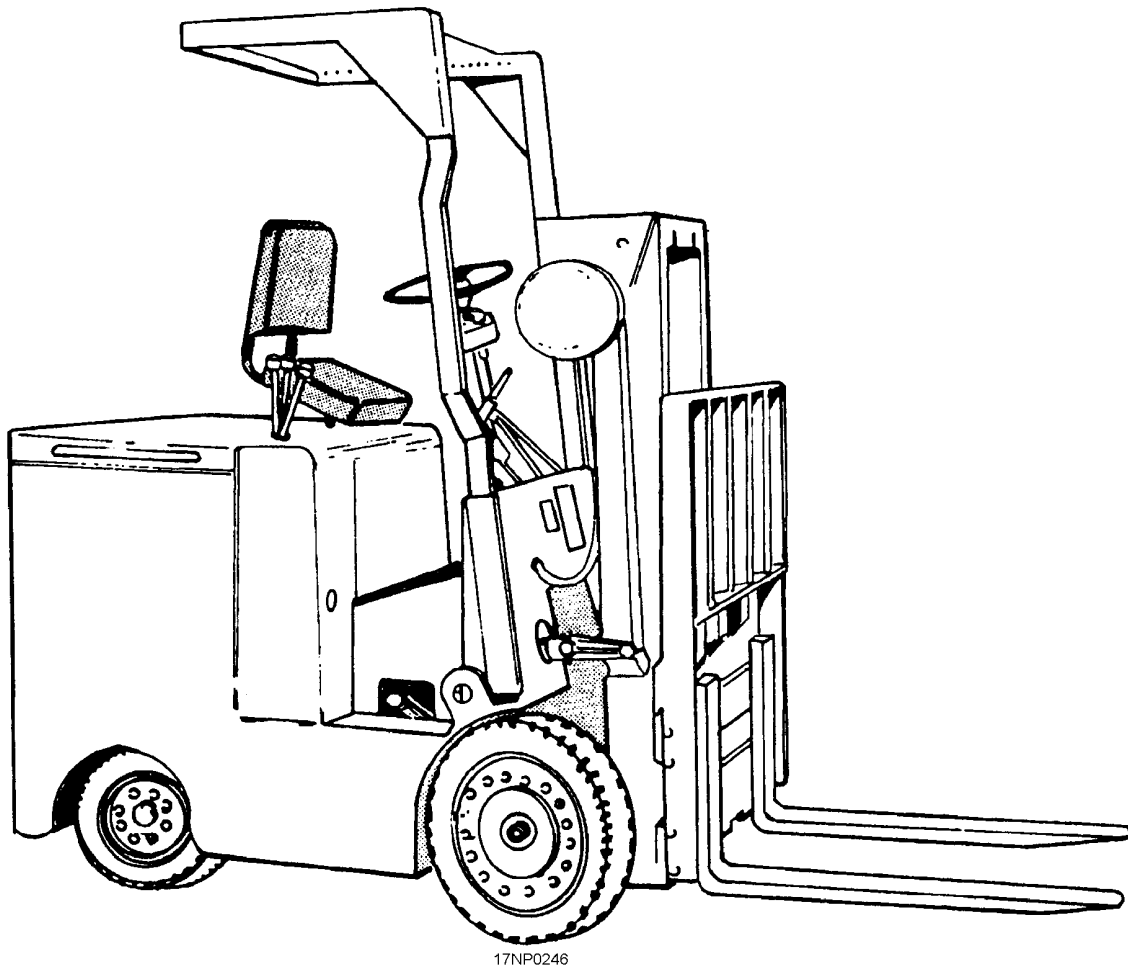


Figure 9-45.—Typical 4,000-pound capacity electric forklift truck.

activities. Every model has an adjustable two-tine fork secured to a vertical-supporting frame, which can be telescoped and tilted. An overhead guard may be provided for the operator's safety.

A rechargeable battery provides power for the operation of the truck and its hydraulic lift and tilt mechanisms. This type of forklift truck can pick up, transport, and lift loads weighing up to 6,000 pounds. It can also handle boxes of ammunition and other hazardous materials that can be properly supported across the fork tines. When you handle ammunition, the truck is spark-enclosed or explosive proof.

**ELECTRIC FORKLIFT TRUCK (REACHING AND TIEING, CONTINUOUS DUTY, NARROW AISLE), 4,000-POUND CAPACITY.—**

A typical 4,000-pound electric (reaching and tieing, continuous duty, narrow aisle) forklift truck is shown in (fig. 9-46). Several different models of this type of truck are in use at naval activities. Every model has an adjustable two-tine fork. The tines are secured to a vertical-supporting frame that can be telescoped and tilted. The tines are elevated by a hydraulic-mechanical

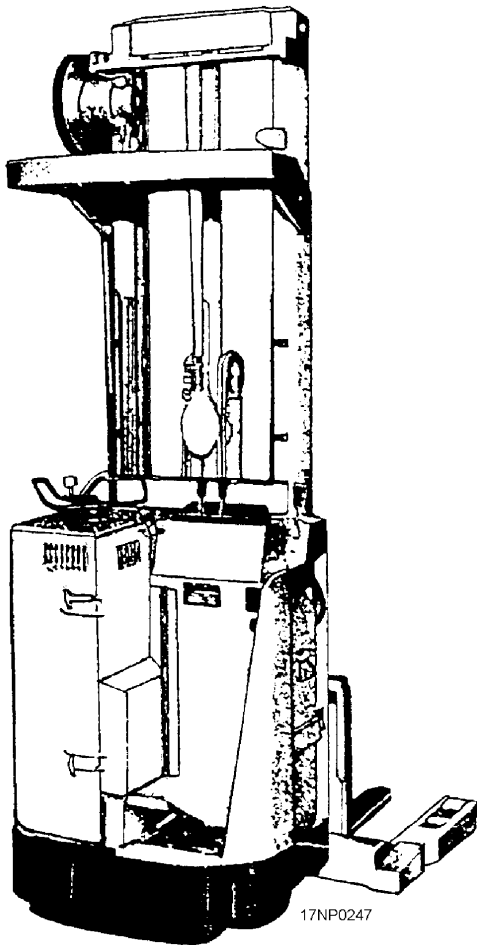


Figure 9-46.—Typical 4,000-pound capacity (reaching and tieing continuous duty, narrow aisle) electric forklift truck.

lift mechanism. An overhead guard is provided for the operator's safety. All models of this truck have outriggers to provide a rigid structure. A rechargeable battery provides the power for the operation of the truck and its hydraulic lift and tilt mechanisms. The forklift truck has mechanical or hydraulic brakes that the operator applies by using a foot pedal.

This truck is used to pick up, transport, stack, and unstack palletized unit loads weighing up to 4,000 pounds. It is intended for use in warehouses that have narrow aisles, low floor-load ratings, and aboard aircraft carriers. When you use the truck to handle ammunition, it is spark-enclosed.

**PALLET TRUCKS**

The pallet trucks used most frequently by Ordnancemen are discussed in the following paragraphs.

**Electric Pallet Truck (Low Lift)**

A typical 6,000-pound capacity electric (low lift) pallet truck is shown in (fig. 9-47). Several different models of this pallet truck are used at naval activities.

Each model of the pallet truck has a two-tine fork that supports a palletized load. The tines are raised or lowered by a hydraulic lift mechanism. Depending upon the model, the lift mechanism is either electrically or manually operated. The power source for truck traction is a rechargeable battery. It is steered by using the steering handle, with a possible right-angle turn in either direction. The truck is equipped with mechanical brakes, which, when applied, automatically shut off the electrical power.

The pallet truck is used to pick up, transport, and deposit palletized loads that do not exceed 6,000

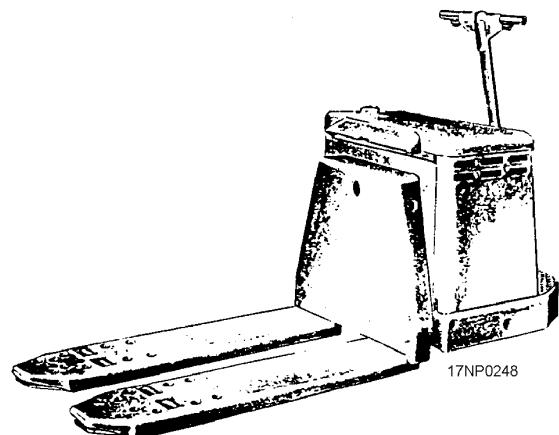
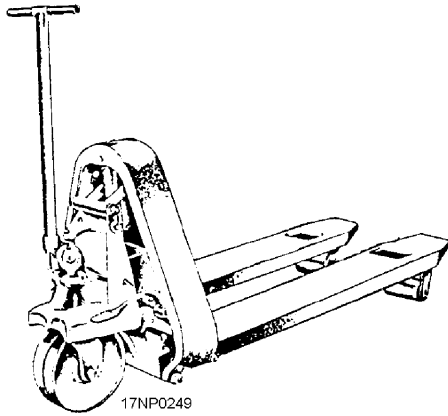


Figure 9-47.—Typical 6,000-pound capacity, low lift, electric pallet truck.



**Figure 9-48.—Typical 4,000-pound capacity, low lift, hand pallet truck.**

pounds. This truck is used on hard and smooth surfaces, such as warehouse and magazine floors. The pallet truck is spark-enclosed when used to handle ammunition.

### Hand Pallet Truck (Low Lift)

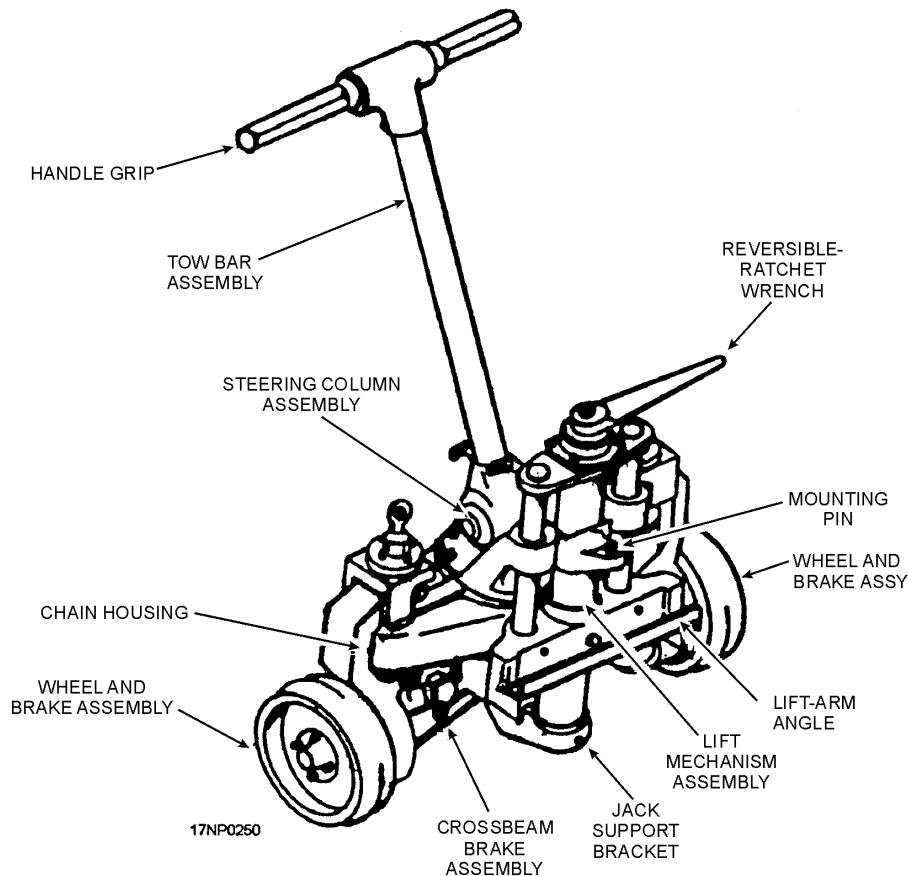
A typical 4,000-pound capacity (low lift) hand pallet truck is shown in (fig. 9-48). Many different models of this pallet truck are used at naval activities. Since the trucks all operate in the same way, the following general description applies to all models.

The 4,000-pound hand pallet truck has a two-tine fork that supports a palletized load. The tines are raised or lowered by a hydraulic or mechanical lift mechanism. The height of lift differs from model to model but is generally in the range of 2 to 4 inches. Depending upon the model, the lift mechanism is operated by the tow handle, a foot pedal, or a hand lever. The truck is not self-propelled and requires manpower for locomotion. It is steered by the tow handle. A right-angle turn is possible in either direction without moving the truck. The drive wheel is located directly beneath the tow handle. It is usually one solid rubber tire. The load wheels, located approximately 6 inches from the ends of the fork tines, can be arranged in a single or double (tandem) fashion under each tine.

The hand truck is used to pick up, transport, and deposit palletized unit loads on single- or double-faced pallets that don't exceed 4,000 pounds in weight. This truck is particularly useful and economical for moving loads a short distance. It must be used in areas that have hard and smooth surfaces.

### MK 45 MOD 2 HANDLIFT TRUCK

The Mk 45 Mod 2 handlift truck (fig. 9-49) body is mounted on two wheels equipped with polyurethane



**Figure 9-49.—Mk 45 Mod 2 handlift truck.**

tires. The lifting mechanism, which includes a lift arm and a mounting pin for engaging the load, is manually operated by using a reversible, ratchet-type, cranking lever to raise or lower the lift arm assembly. A handlebar is connected to the axle for steering the truck.

The Mk 45 Mod 2 is intended for use in lifting and maneuvering long, heavy containers and cradles within the weight capacity of two trucks (5,000 pounds). These trucks are used in pairs, with one truck positioned at each end of the container being handled.

### REVIEW NUMBER 7

- Q1. What type of tires should you use on the forklift truck when using it in rough terrain?
- Q2. The electric forklift truck has rigid structures, which allow it to carry off-balance loads. What are these structures?
- Q3. What is the maximum capacity of the hand pallet truck?

### TRAILERS

LEARNING OBJECTIVE: Identify trailers used for ordnance handling to include the

*small munitions, SATS rough terrain, and Aero 51C munitions trailers.*

A trailer is a transport vehicle towed by another vehicle, such as a truck or tractor. All trailers are equipped with load-supporting bodies or frames and with wheels for locomotion. Trailers may be divided into three categories—weapon trailers, weight handling trailers, and warehouse trailers. Only trailers within the weapon trailer category are discussed in this TRAMAN because they directly support aircraft weapon loading operations ashore.

A weapon trailer consists of a heavy channel or tubular frame mounted on two axles and wheels that are equipped with four pneumatic tires. The frame is supported by automotive leaf-type springs. The front axle is steerable and the rear axle is fixed. The trailer is equipped with a tow bar or tow handle that has a towing eye on its end. Use the towing eye to couple the trailer to the towing vehicle. Some trailers have draw heads at the rear to couple the towing eye of another trailer.

A weapon trailer has cradles or brackets that fit the contours of the weapon being transported. The cradles or brackets on the trailer can be removed or adjusted for carrying loads of various sizes. Hold-down devices, such as chains or straps, secure the load during

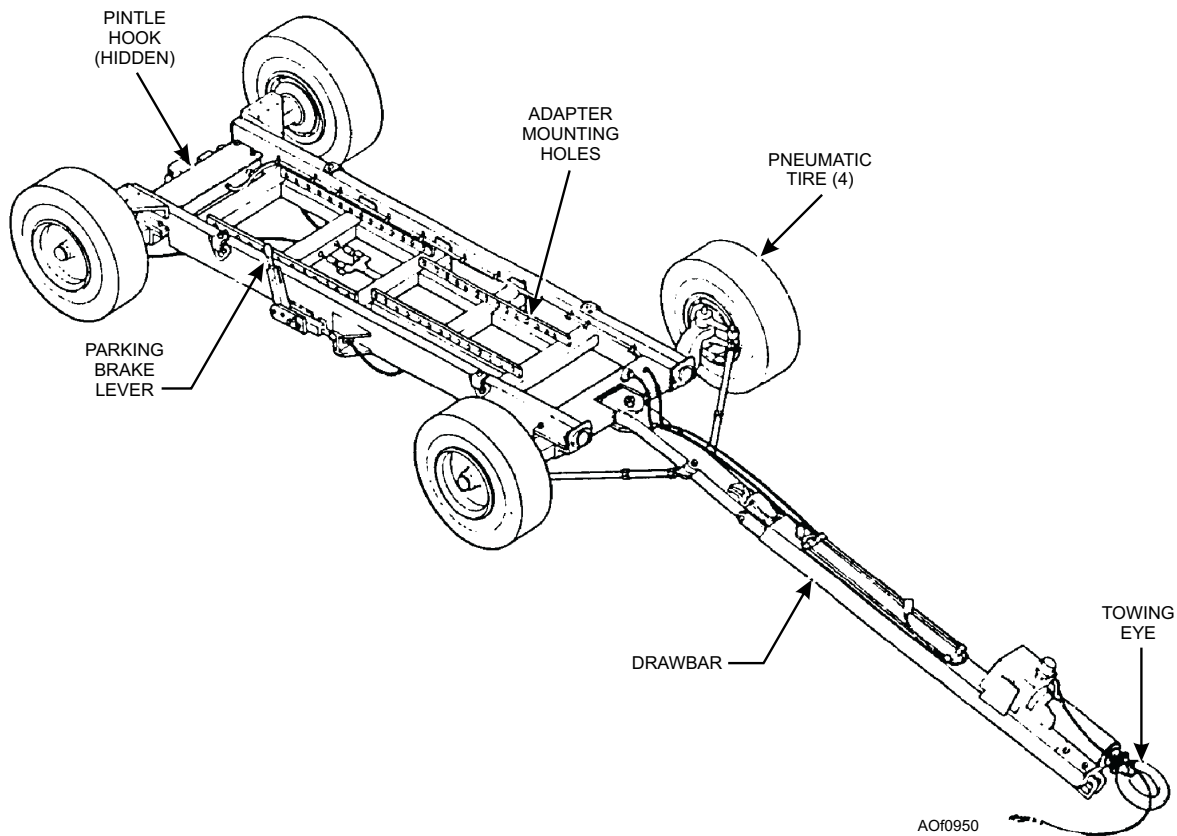


Figure 9-50.—MHU-126/M small munitions trailer.

transport. Some weapon trailers have hydraulic systems to load weapons on aircraft, or for similar uses.

Weapon trailers are used to transport weapons, such as bombs, mines, missiles, and torpedoes of various sizes. In general, the trailers are capable of operating over moderately soft or moderately rough terrain. The short airfield tactical site (SATS) trailers operate over very rough terrain. Vehicles such as the cargo truck (pickup) tow these trailers.

### MHU-126/M SMALL MUNITIONS TRAILER

The MHU-126/M small munitions trailer (fig. 9-50) has a low-slung, channel steel frame and four wheels with pneumatic rubber tires. Lengths of drilled steel bars welded to crossmembers of the frame provide mounting holes for the various adapters. The front axle is steerable and equipped with a draw bar that has a towing eye on its end to couple the trailer to a towing vehicle. A pintle hook on the rear of the frame permits coupling with another trailer. The wheels are equipped with hydraulic service brakes. Mechanical parking brakes are provided on two of the four wheels.

When it is equipped with adapters, you can use the MHU-126/M small munitions trailer to transport and load various weapons, stores, and equipment. The recommended maximum towing speed is 15 miles per hour for a single trailer and 5 miles per hour for multiple trailers being towed in a train. The MHU-126/M has an SWL of 5,000 pounds.

### A/M 32K-4A SATS ROUGH TERRAIN TRAILER

The A/M 32K-4A SATS rough terrain trailer (fig. 9-51) is a transport vehicle that consists of a chassis and a lightweight, flatbed, aluminum body. The chassis has two axles and four single wheels that are equipped with pneumatic tires. A torque box provides strength and rigidity to the body. You can remove two sections of the nonskid flatbed to use a forklift truck to load and unload the trailer. The trailer is equipped with a tow bar, multiple leaf springs, service brakes, and parking brakes. The trailer has 12 cradle tie-down fittings to hold the weapon cradles securely on the bed.

The A/M 32K-4A SATS rough terrain trailer is used to transport air-launched weapons from an ammunition dump to a SATS airstrip. You can operate it over very rough terrain. It is normally used at advanced bases. The trailer holds weapons in cradles that are two tiers in height when equipped with increased load-density weapon cradles. The cradles are secured to the trailer bed by quick-release, positive-locking clips. The SATS trailer can also be equipped with stake sides and used as a utility vehicle for transporting weapon components. The A/M 32K-4A has an SWL of 8,000 pounds.

### REVIEW NUMBER 7 ANSWERS

- A1. *When using the forklift truck in rough terrain, pneumatic tires should be used.*

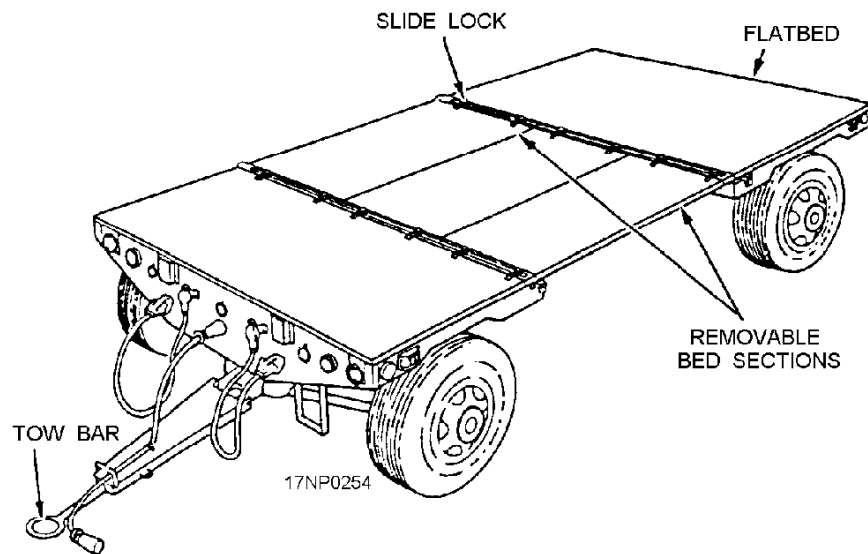


Figure 9-51.—A/M 32K-4A SATS rough terrain trailer.

- A2. The electric forklift truck has outriggers, which are rigid structures allowing it to carry off-balance loads.
- A3. The maximum capacity of the hand pallet truck is 4,000 pounds.

**AERO 51C MUNITIONS TRAILER**

The Aero 51C munitions trailer (fig. 9-52) is a transport vehicle that has an automotive chassis and a flat-deck body. The chassis has two axles and four single wheels equipped with pneumatic tires. The center section of the nonskid flat deck is hinged. It can be opened to provide a hatchway across the full width of the vehicle. It also has hinged deck panels that have double rails with holes at intervals to provide a mounting base for cradles and adapters.

The trailer has hydraulic surge brakes and mechanical parking brakes, a tow bar, and cable harness. The cable harness electrically connects the trailer to the towing vehicle for operation of the trailer lights. Accessory items (chocks, tie-down straps, interconnecting electrical harness, etc.) are stored in toolboxes mounted underneath the forward and aft decks.

The Aero 51C munitions trailer is used with a towing vehicle to transport and hold a variety of weapons in ready storage. Adapters or cradles support the weapons on the trailer. This trailer is used to transport stores and cargo. The Aero 51C munitions trailer is not used aboard ship. The Aero 51C has an SWL of 8,500 pounds.

**REVIEW NUMBER 8**

- Q1. What is the maximum recommended towing speed of the MHU-126/M small munitions trailer when towed alone and in a train?
- Q2. At what location should you use the Aero 51C munitions trailer?
- Q3. What is the SWL of the Aero 51C munitions trailer?

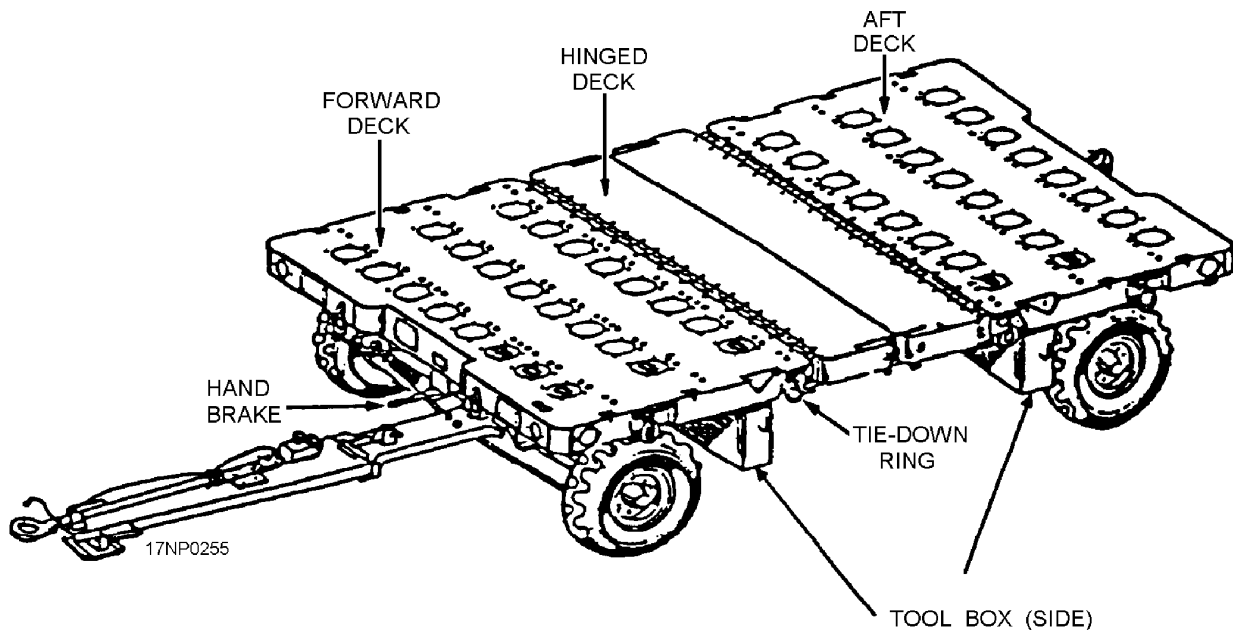
**LOADERS**

**LEARNING OBJECTIVE:** *Identify the purpose and use of the SATS weapon loader.*

Loaders are generally used to handle a variety of loads, such as weapons, ammunition, JATO bottles, rockets, pylons, or fuel tanks, during naval aircraft loading operations. Some loaders are capable of operating over rough terrain while others are built for smooth surfaces. The types of loaders used to handle ammunition and explosives are equipped with flame- and spark-arresting mufflers.

**A/S 32K-1A/1B/1C SATS WEAPON LOADERS**

Each A/S 32K-1A/1B/1C SATS weapon loader (fig. 9-53) is a self-propelled vehicle with a low, heavy-duty frame supported by six small, high capacity wheels. Each vehicle has two main functional components. The lifting mechanism has a lift boom, hydraulic system, and manipulating head. A piston-type hydraulic cylinder mounted in the midsection of



**Figure 9-52.—Aero 51C munitions trailer.**

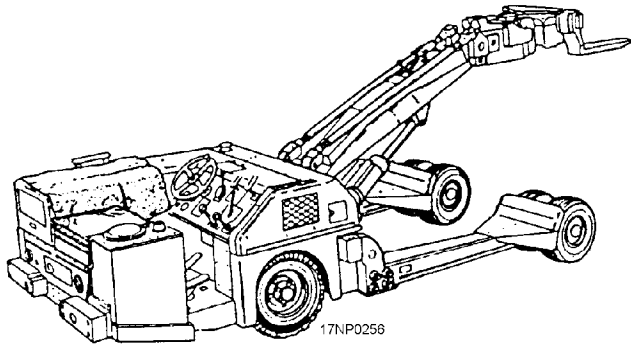


Figure 9-53.—A/S 32K-1A/1B/1C SATS weapon loader.

the boom support operates the lift boom. The manipulating head is located at the upper end of the lift boom, and is capable of limited lateral and longitudinal motions, as well as tilting and yawing motions. The head is equipped with lifting forks attached with quick-release pins and mounted in three positions—normal, inverted forward, and inverted rear.

The drive mechanism includes a hydrostatic drive system powered by a power-splitter gearbox, drive shaft with universal joints, limited-slip differential, axle/wheel disconnect hubs, and steerable drive wheels with power-assisted steering.

The power to operate the lift and drive mechanisms is supplied by a four-cylinder, air-cooled gasoline engine. The weapon loader is equipped with four-wheel hydraulic brakes, electric/hydraulic operated parking brakes, and a spark- and flame-arresting muffler. It is also equipped with nylon tie-down straps to hold the load securely during handling, a utility chain to lift items directly off the ground, and lights for night loading operations.

Each A/S 32K-1A/1B/1C SATS weapon loader has an SWL of 4,500 pounds. It is used to load externally carried munitions, weapons, and stores onto an aircraft. Each SATS weapon loader is used with a variety of adapters and cradles.

### REVIEW NUMBER 8 ANSWERS

- A1. *The maximum recommended towing speed of the MHU-126/M small munitions trailer when towed alone is 15 mph and 5 mph when towed in a train.*
- A2. *You should use the Aero 51C munitions trailer with a towing vehicle to transport and hold a variety of weapons in ready storage.*

- A3. *The SWL of the Aero 51C munitions trailer is 8,500 pounds.*

### REVIEW NUMBER 9

- Q1. *The A/S 32K-1A/1B/1C SATS weapon loader is used to load \_\_\_\_\_.*
- Q2. *What is the SWL of the A/S 32K-1A/1B/1C SATS weapon loaders?*

### SAFETY PRECAUTIONS FOR HANDLING EQUIPMENT

LEARNING OBJECTIVE: *Recognize the safety precautions to follow when using ordnance handling equipment.*

You must observe the safety precautions and instructions that pertain to the safe operation and use of ammunition and explosives handling equipment, both afloat and ashore. The task of ammunition and explosives handling is hazardous. Accidents involving ammunition and explosives handling kill and injure personnel, destroy essential supplies, and damage valuable equipment and property. These accidents don't *just happen*. They are caused by carelessness or unfamiliarity with the use and limitations of handling equipment, as well as relaxation or failure to observe safety precautions, orders, and regulations pertaining to the handling and stowage of ammunition and explosives. You can prevent accidents caused by misuse of handling equipment if you take the time to understand the use and limitations of the handling equipment.

Many technical manuals and instructions contain information about safety, inspection, and tests for ordnance handling equipment. For general information, refer to the following publications:

- *Approved Handling Equipment for Weapons and Explosives*, NAVSEA OP 2173, Volume 1 (NAVAIR 19-100-1.1) and Volume 2 (NAVAIR 19-100-1.2)
- *Ammunition Afloat*, NAVSEA OP 4
- *Ammunition and Explosives Ashore, Safety Regulations for Handling, Storing, Production, Renovation, and Shipping*, NAVSEA OP 5, Volume 1

Use approved handling equipment to handle explosive ordnance. Approved handling equipment is described in NAVSEA OP 2173. Before you can be

assigned to operate any explosive ordnance handling equipment, you must receive a thorough indoctrination in general safety precautions applicable to explosive ordnance. You must also be indoctrinated in the specific precautions applicable to the equipment you will be operating. Additionally, you must be qualified and certified under OPNAVINST 8023.2 (series) and other appropriate command directives.

To assure reliability, explosive handling equipment must be inspected and periodically tested. Equipment, such as slings, bands, beams, strongbacks, and spreader bars, is static tested at 200 percent to 215 percent of SWL. If the date and the results of the latest static test are not marked on the equipment or the test is out of date, don't use the equipment.

You must possess a valid explosives drivers license before operating industrial material handling equipment, such as forklift trucks, pickup trucks, platform trucks, crane trucks, and tractors and trailers.

You must never exceed the SWL of the equipment being used. If adapters are being used, you cannot exceed the **lowest** SWL of the equipment-adapter configuration. For example, if an Aero 12C bomb skid (SWL of 1,250 pounds) is used with an Aero 9C bomb skid adapter (SWL of 1,000 pounds), the maximum capacity of the skid-adapter configuration is limited to 1,000 pounds.

#### **REVIEW NUMBER 10**

- Q1. What is the primary cause of accidents involving handling equipment?*
- Q2. To operate handling equipment that carries explosives, you must be qualified and certified according to what instruction?*

- Q3. Equipment, such as slings, bands, beams, and strongbacks, is weight tested at what percentage of its SWL?*
- Q4. If the date and results of the latest static test are not current or not marked on the equipment, what should you do?*

#### **REVIEW NUMBER 9 ANSWERS**

- A1. The A/S 32K-1A/1B/1C SATS weapon loader is used to load externally carried munitions, weapons, and stores onto aircraft.*
- A2. The SWL of the A/S 32K-1A/1B/1C SATS weapon loaders is 4,500 pounds.*

#### **REVIEW NUMBER 10 ANSWERS**

- A1. The primary cause of accidents involving handling equipment is carelessness or unfamiliarity with the use and limitations of handling equipment, failure to observe safety precautions, orders, and regulations about handling and stowing ammunition and explosives.*
- A2. To operate handling equipment that carries explosives, you must be qualified and certified according to OPNAVINST 8023.2 (series).*
- A3. Equipment, such as slings, bands, beams, and strongbacks, is weight tested at 200 to 215 percent of its SWL.*
- A4. If the date and results of the latest static test are not current or not marked on the equipment, don't use it.*