

## CHAPTER 9

# SUPPORT EQUIPMENT

### INTRODUCTION

This chapter identifies support equipment (SE) used to handle, service, load, test, and maintain aircraft. As an Airman Apprentice, you will be required to operate SE. Some SE is used both ashore and afloat, while other SE is used only ashore or only afloat. The SE division of the AIMD is tasked with maintaining SE. Principal users of SE are the squadron line division, the base operations line division, and the air department aboard aircraft carriers.

### TYPES OF EQUIPMENT

**LEARNING OBJECTIVE:** Identify the purpose and function of the types of support equipment, to include operation, maintenance, hazards, and carrier air and shore-based operations.

There are two types of support equipment—aircraft handling equipment and aircraft servicing equipment. The following text discusses these various types of support equipment.

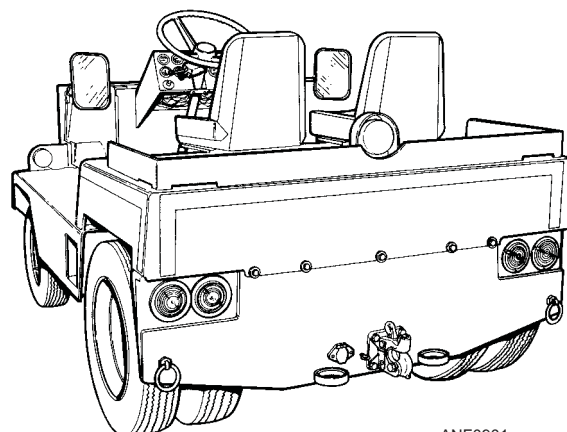
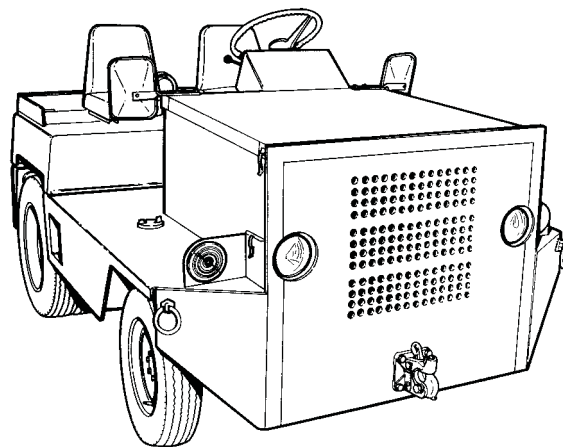
### HANDLING EQUIPMENT

Aircraft handling equipment consists of tow tractors; crash and salvage equipment, to include fire-fighting vehicles and maintenance cranes; forklift trucks; and flight deck scrubbers.

#### Tow Tractors

Various tow tractors in the Navy inventory are discussed in the following text.

**A/S32A-30 AIRCRAFT GROUND SUPPORT EQUIPMENT TOWING TRACTOR.**—The A/S32A-30 tow tractor (fig. 9-1) is a 6-cylinder, gasoline-powered, four-wheel, heavy-duty vehicle with a three-speed transmission. The tractor frame is a welded steel one-piece unit. It is equipped with hydraulically actuated front disc brakes and drum-type brakes on the rear wheels. A hydraulically assisted steering unit provides steering to the front wheels. The tractor employs a 12-volt electrical system to supply power for lighting, starting, horn, and instrument operation. It comes equipped with two seats—one driver and one passenger—mirrors, front and rear towing couplers (pintles), tie-down fittings and lifting

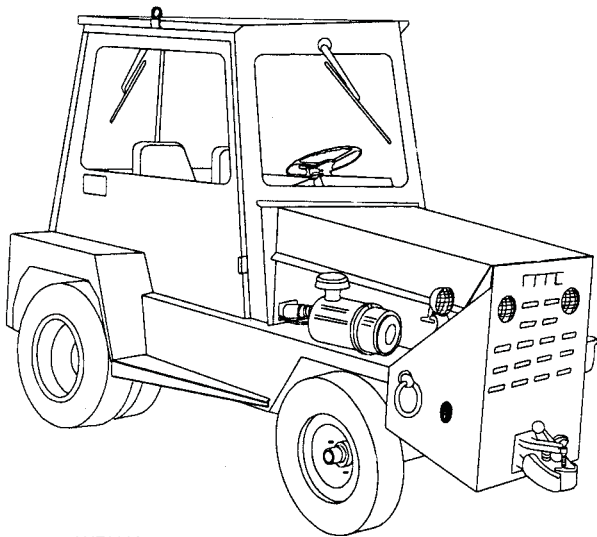


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Figure 9-1.—A/S32A-30 aircraft ground support equipment towing tractor.

attachments. It can be fitted with a fully enclosed cab. It is designed to tow aircraft servicing equipment, work stands, and armament handling equipment.

**A/S32A-30A AIRCRAFT GROUND SUPPORT EQUIPMENT TOWING TRACTOR.**—The A/S32A-30A tow tractor (fig. 9-2) is a 4-cylinder, diesel engine, (dual wheel) rear-wheel-drive tractor with a 40,000-pound towing capacity. It comes with a three-speed automatic transmission, hydraulic brakes on front and rear wheels, conventional power steering with power assist to the front wheels, and employs a conventional 12-volt electrical system with battery and alternator to supply power for the lights, horn, starter motor, ignition, and instruments.

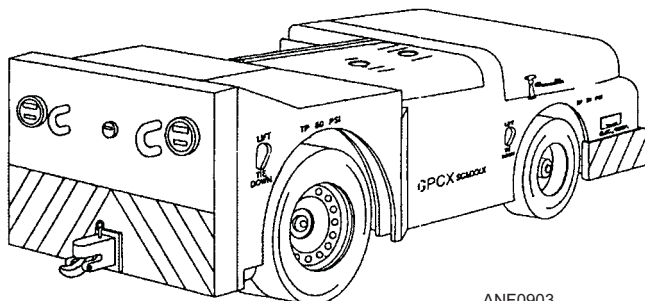
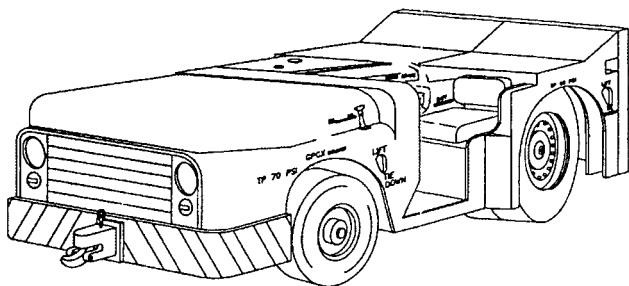


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Figure 9-2.—A/S32A-30A aircraft ground support equipment towing tractor.

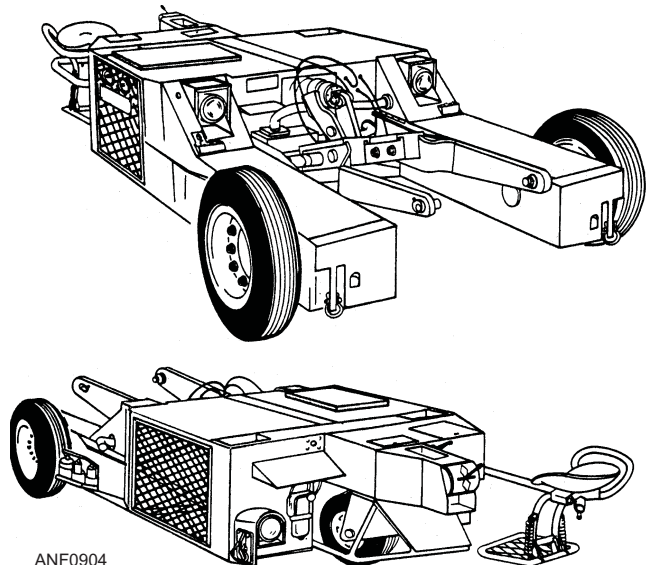
The tractor frame is a welded steel one-piece unit that is cross-braced to prevent misalignment. It also has front and rear towing couplers (pintles), tie-down and lifting attachments, and exterior lighting. The welded steel cab encloses the driver and one passenger seat, supports two flush-mounted doors with sliding glass windows, mirrors, front and rear windshield wipers, and dome light.

**A/S32A-31A AIRCRAFT TOWING TRACTOR.**—The A/S32A-31A aircraft towing tractor (fig. 9-3) is designed for towing aircraft aboard ship. The drive system consists of a three-cylinder diesel engine,



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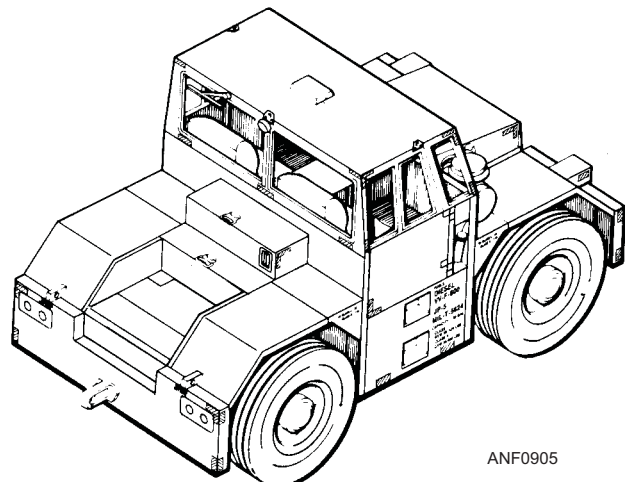
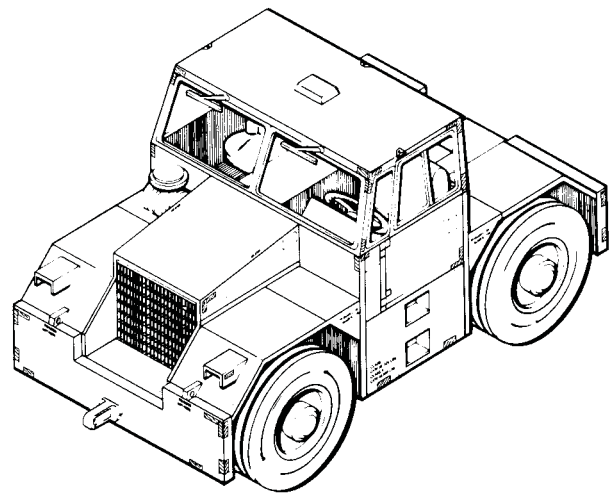
Figure 9-3.—A/S32A-31A aircraft towing tractor.



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Figure 9-4.—A/S32A-32 aircraft towing tractor.

automatic transmission, and rear wheel drive with dual wheels. Front wheel steering is power assisted and has seating for the driver only. Service brakes are hydraulic, power operated, wet disc type with a mechanical hand brake for the rear wheels. A 24-volt



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Figure 9-5.—A/S32A-37 aircraft towing tractor.

electrical system provides starting, lighting, and instrumentation. Front and rear mounted pintles are used for aircraft towing. A universal jet-engine start unit mounts to the rear of the tractor.

**A/S32A-32 AIRCRAFT TOWING TRACTOR.**—The A/S32A-32 Aircraft Towing Tractor (fig. 9-4), also called "The Spotting Dolly," is designed to tow, turn, and position aircraft within the confines of an aircraft carrier hangar deck. It is powered by a three-cylinder diesel engine, which drives two main hydraulic pumps. The hydraulic pumps supply fluid to drive motors that turn two open-chain reduction drives via two gearboxes at each main wheel, which operates independently. A mechanical wheel clutch handle is used to engage or disengage the drive wheels, enabling the tractor to pivot on a caster wheel around its center within a zero turning radius. A Joystick Control, next to the operator's seat, is an electromechanical device used to control the speed and direction of the spotting dolly's movement. The lift cylinder, which raises and lowers the lifting arms, and two spread cylinders, which keep the arms pinned against the aircraft nose gear, are powered by an auxiliary hydraulic pump. Several pairs

of axle pins that engage both sides of the nosewheel are carried on the tractor and fit a variety of aircraft.

**A/S32A-37 AIRCRAFT TOWING TRACTOR.**—The A/S32A-37 aircraft towing tractor (fig. 9-5) is an inline, 6-cylinder, diesel-powered, liquid-cooled, 4-wheel drive vehicle used to move heavy, shore-based aircraft. The full power shift transmission has six forward and three reverse speeds. The tractor's front wheels are steered by two hydraulic cylinders, and all wheels are equipped with hydraulically powered disc brakes. A two-seat, heated, enclosed cab with removable doors is provided for operator comfort in all weather. Two 12-volt batteries, 24-volt alternator, electrical system provides power for lighting, instrumentation, control panels, starter motor, transmission control, switches, wiper/washer motor, and heater/defroster. The tractor is capable of 35,000 pounds of drawbar pull with the traction ballast kit installed.

**A/S32A-42 AIRCRAFT MID-RANGE TOW VEHICLE.**—The A/S32A-42 aircraft mid-range tow vehicle (fig. 9-6) is a 4-cylinder, diesel-powered,

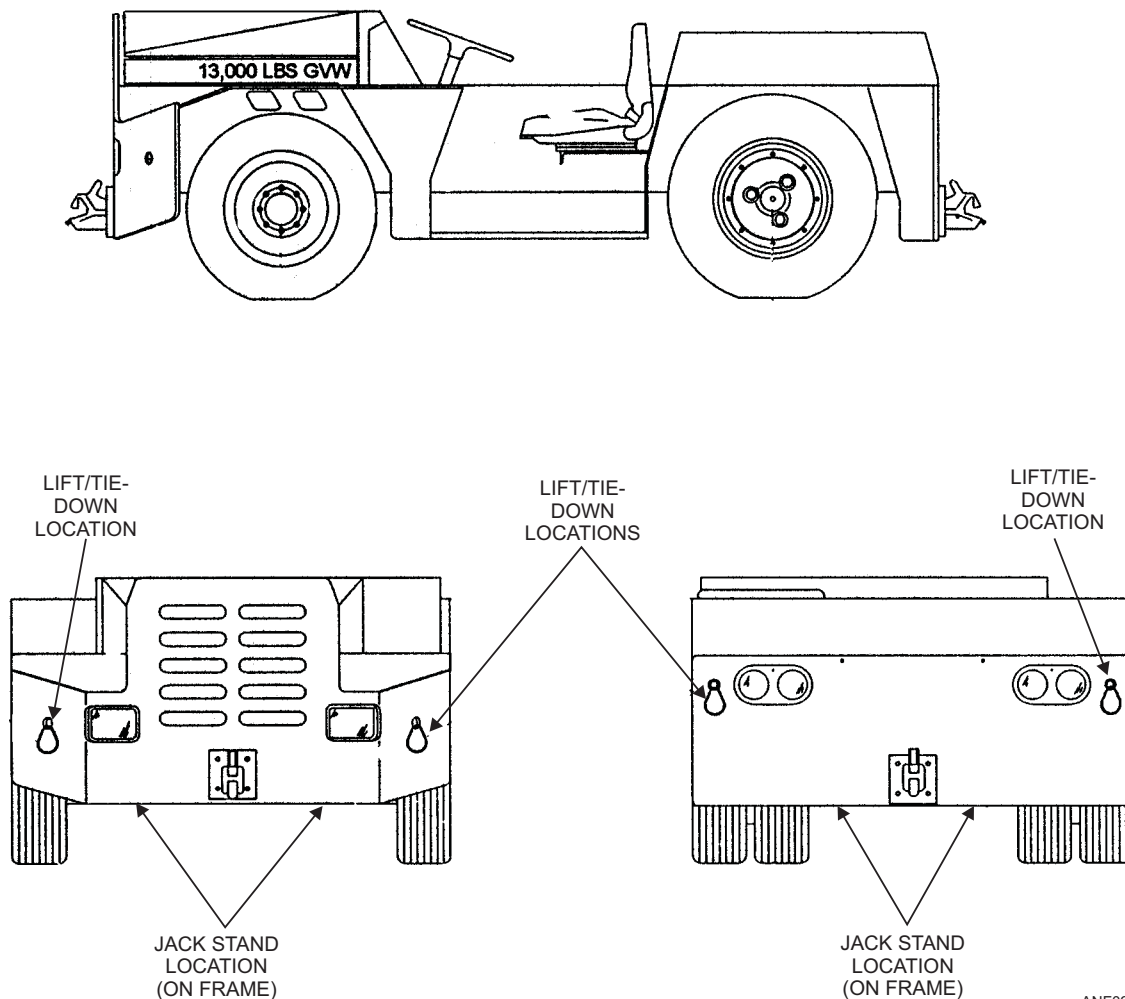


Figure 9-6.—A/S32A-42 aircraft mid-range tow vehicle.

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3-speed automatic transmission, liquid cooled, rear-wheel-drive tractor designed for towing aircraft weighing up to 100,000 pounds. The frame is a welded-steel one-piece unit, with cross brace, power assisted front wheel steering, hydraulic boost power disc brakes, and a conventional 12-volt electrical system, with alternator, to supply power for the lights and accessories, horn, starter motor, ignition, and instruments. Front and rear tow couplers (pintles) and tie-down attachments are provided.

### Crash and Salvage Equipment

Various salvage and maintenance cranes, fire-fighting vehicles, and Twinned Agent Unit (TAU-2H) extinguishers are discussed in the following text.

**A/S32A-35A (CVCC) AIRCRAFT CRASH HANDLING AND SALVAGE CRANE.**—The A/S32A-35A aircraft crash handling and salvage crane (fig. 9-7) is a self-propelled, four-wheel drive, six-cylinder, liquid-cooled, turbocharged, diesel electric-powered vehicle mounted on six pneumatic rubber tires. The ac generator is directly coupled to the engine and provides power to the drive motors, luff/hoist winch motor, auxiliary hoist/counterweight winch motor and motor control systems. A hydraulic

pump is directly coupled to the engine and provides fluid flow for steering, self-adjusting service brakes, and winch brake control. Vehicle steering is accomplished by hydraulic cylinders, which connect to the rear axle and main frame. The front and rear axles pivot in opposite directions, allowing significant turning capability. The crane main hoist has a static lift capacity of 75,000 pounds and the crane auxiliary hoist has a lift capacity of 10,000 pounds.

The crane is capable of operating aboard ship in inclement weather. It is designed to be stowed on the flight deck of an aircraft carrier, where it will be exposed to extreme weather and corrosive conditions. In service, the crane will lift crashed/damaged aircraft from various locations and attitudes and move loads on a rolling and pitching ship to a safe parking zone on the flight deck.

**A/S32A-36A (AACC) AIRCRAFT CRASH HANDLING AND SALVAGE CRANE.**—The A/S32A-36A aircraft crash handling and salvage crane (fig. 9-8) is a six-wheel, four-wheel drive, liquid-cooled, turbocharged, diesel, electric-powered, self-propelled vehicle. Steering is hydraulically controlled via the front and rear wheels. Mid and rear axle drive motors provide traction power and has a

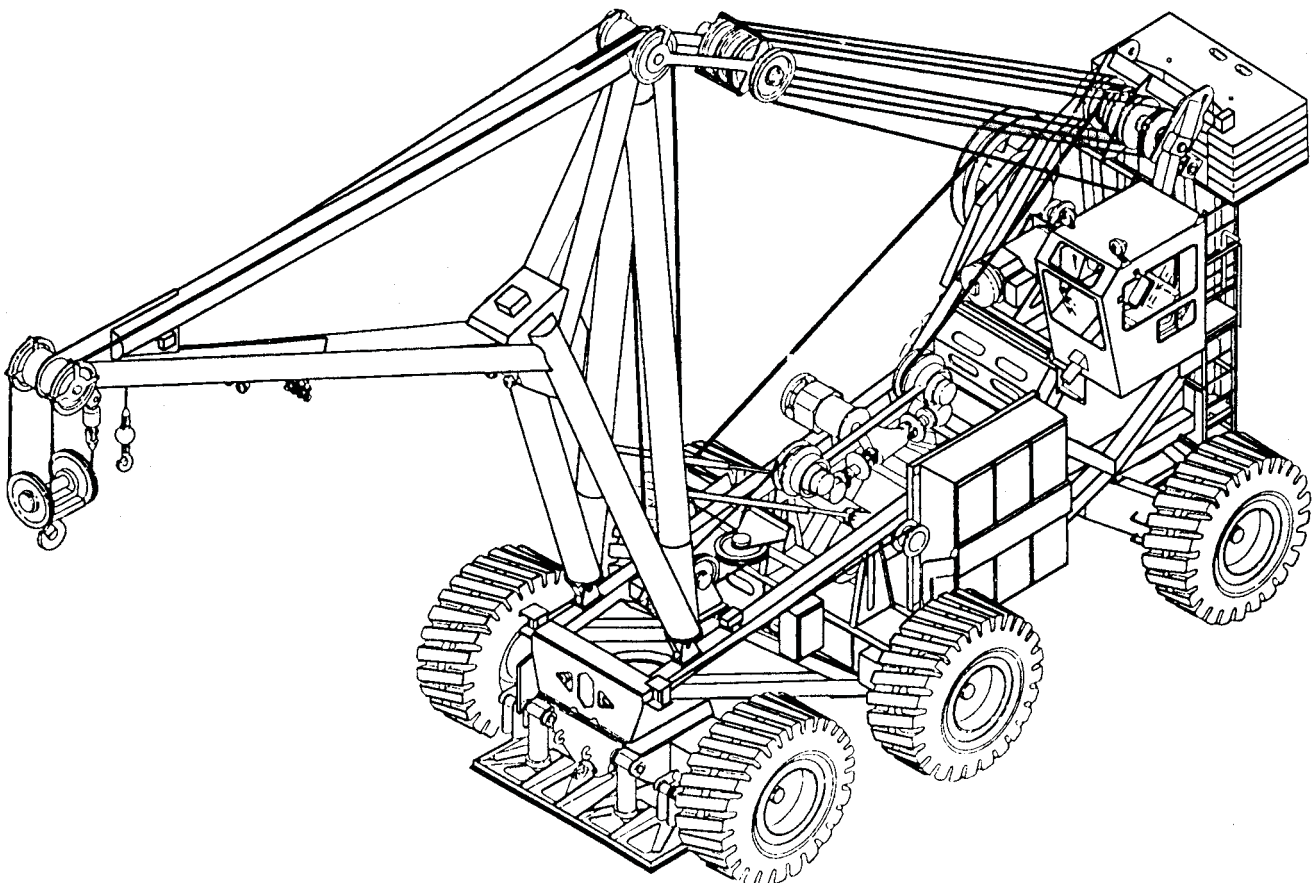


Figure 9-7.—A/S32A-35A (CVCC) aircraft crash handling and salvage crane.

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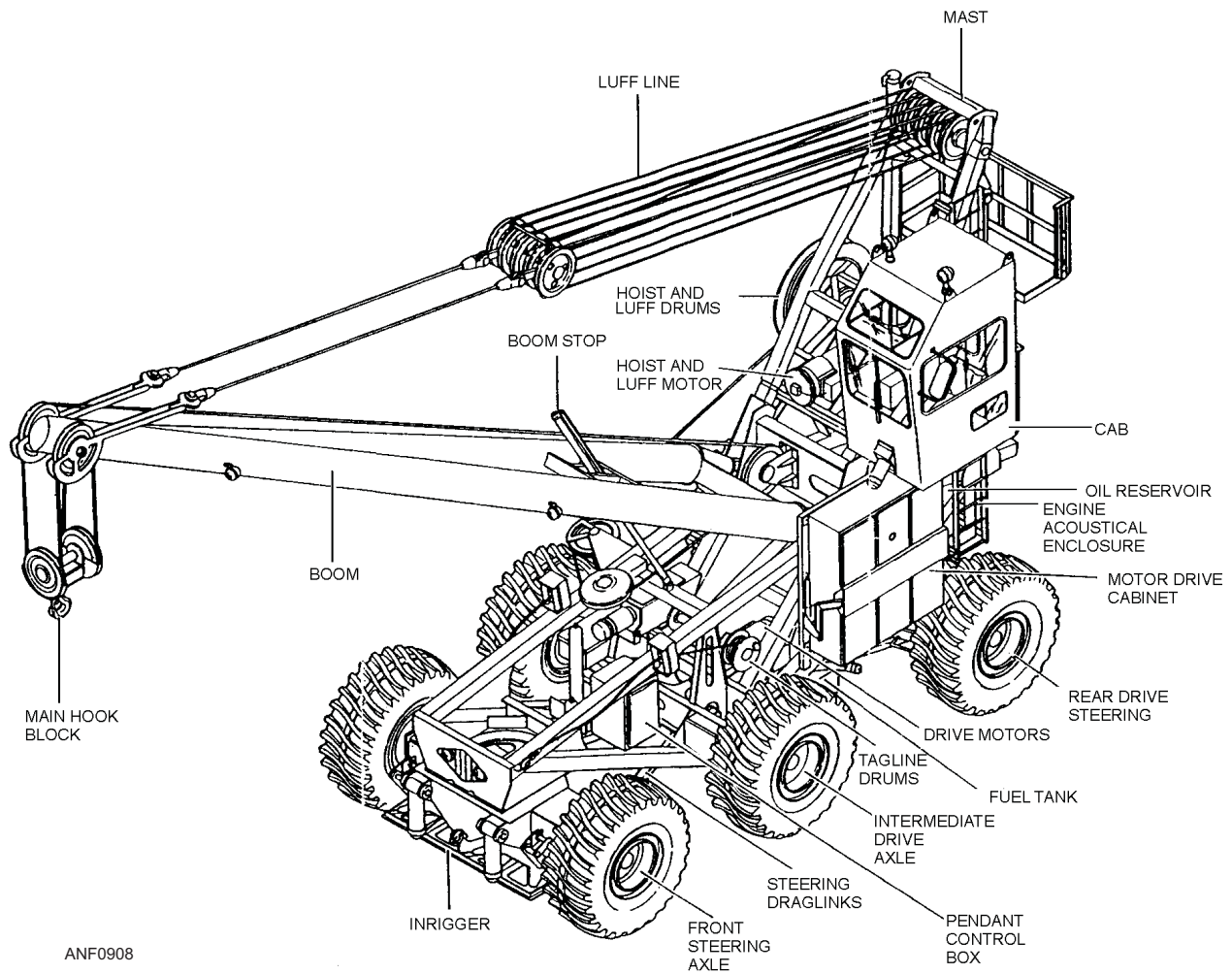


Figure 9-8.—A/S32A-36A (AAC) amphibious assault ship crane.

six-wheel, self-adjusting air/hydraulic brake system incorporated. Rear and mid dc electric drive motors provide power for crane travel, while a separate dc electric motor provides power to the main hoist control or boom luff control. The crane has a maximum lift capability of 70,000 pounds and can be operated from the cab or by a remote pendant control.

The crane is capable of operating aboard ship in inclement weather. It is designed to be stowed on the flight deck of an aircraft amphibious assault ship, where it will be exposed to extreme open-sea weather conditions and the corrosive effects of a saltwater atmosphere. In service, the crane will lift crashed/damaged aircraft from various locations and attitudes and move loads on a rolling and pitching ship to a safe parking zone on the flight deck.

**A/S32P-25 SHIPBOARD FIRE-FIGHTING VEHICLE.**—The P-25 shipboard fire-fighting vehicle (figs. 9-9 and 9-10) is a four-wheel (two-wheel drive), six-cylinder, turbocharged, liquid-cooled, 24-volt, diesel-powered vehicle with a hydrostatic drive system

that transmits power to the rear wheels. Steering is preformed by a single hydraulic cylinder and tie-rod assembly that controls the front wheels. Dynamic vehicle braking is provided by the hydrostatic drive system. When the accelerator is released, the brakes automatically engage. Separate tanks within the vehicle chassis carry 750 gallons of water and 55 gallons of AFFF (Aqueous Film-Forming Foam). Three 20-pound fire extinguishers containing Halon 1211 (halogenated extinguishing agent) are stored on the right side of the vehicle. One nursing line connection on each side of the vehicle provides AFFF mixture from the ship's system directly to the vehicle's water pump.

The vehicle has seating for a crew of two. The driver compartment is located at the left forward end of the vehicle and contains the main control panel for activating the fire-fighting systems. AFFF can be sprayed from both the forward turret nozzle and handline hose reel nozzle. These nozzles operate independently and can be used simultaneously to make this vehicle ready for fire-fighting duty.

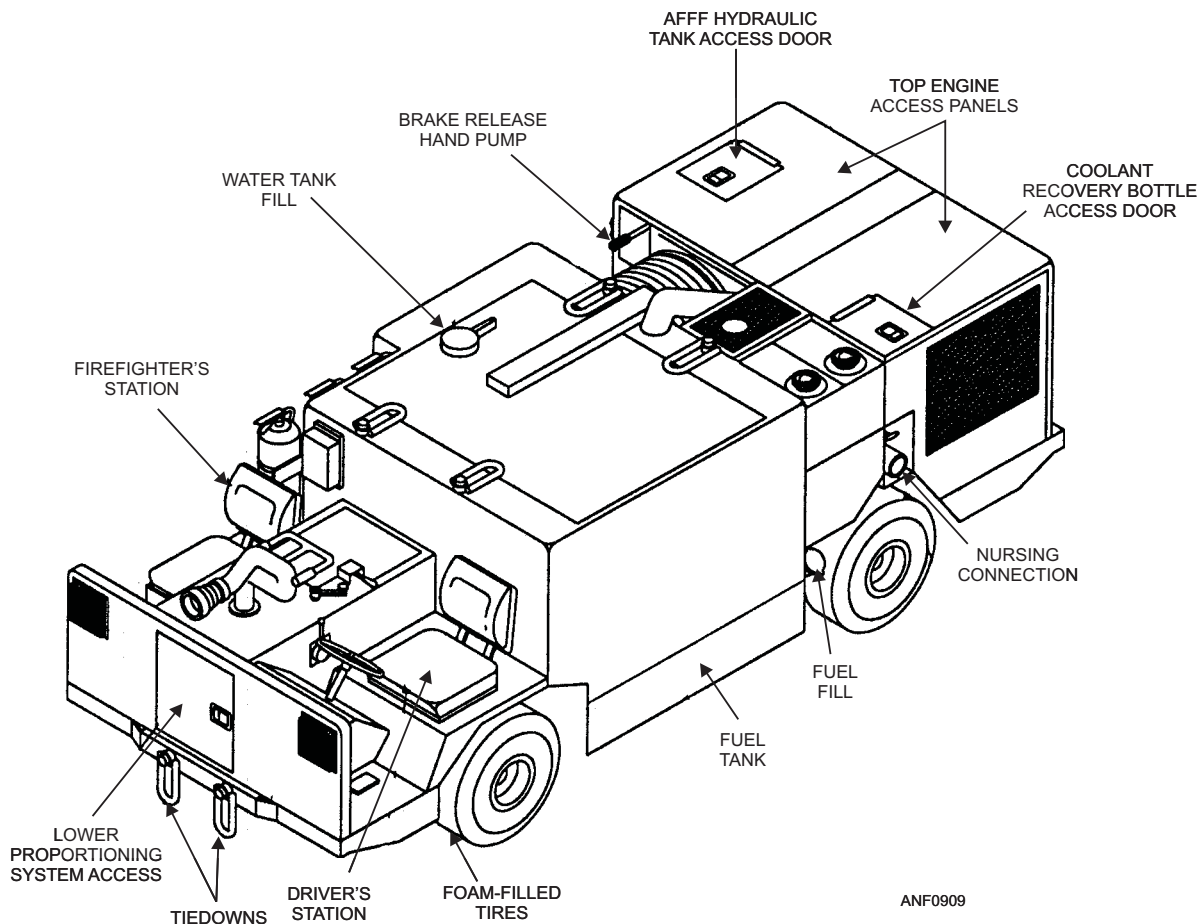


Figure 9-9.—A/S32P-25 shipboard fire-fighting and rescue vehicle—major assemblies and components (left side).

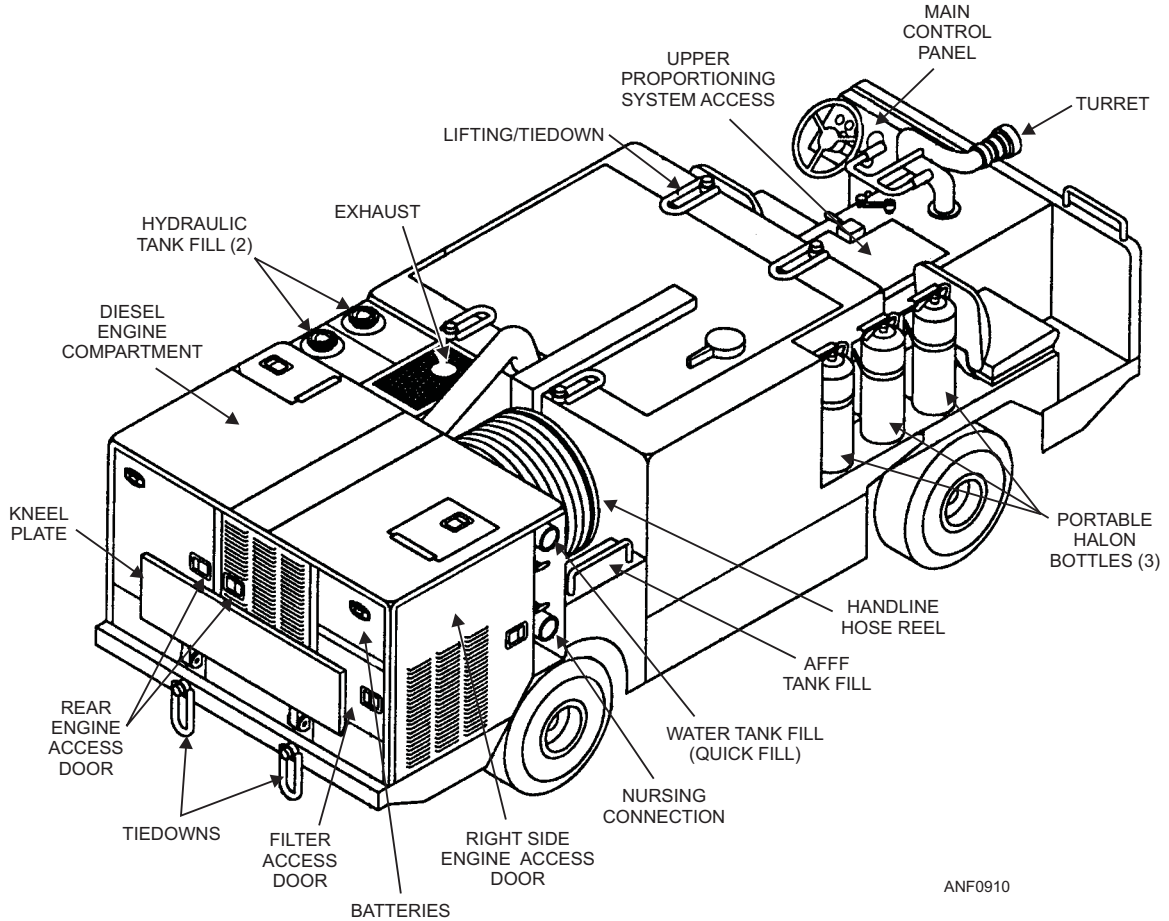
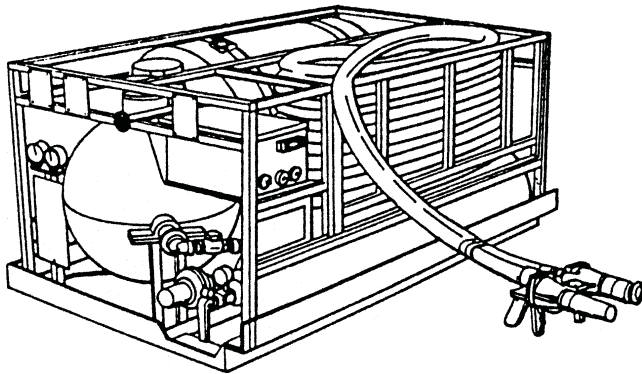


Figure 9-10.—A/S32P-25 shipboard fire-fighting and rescue vehicle—major assemblies and components (right side).



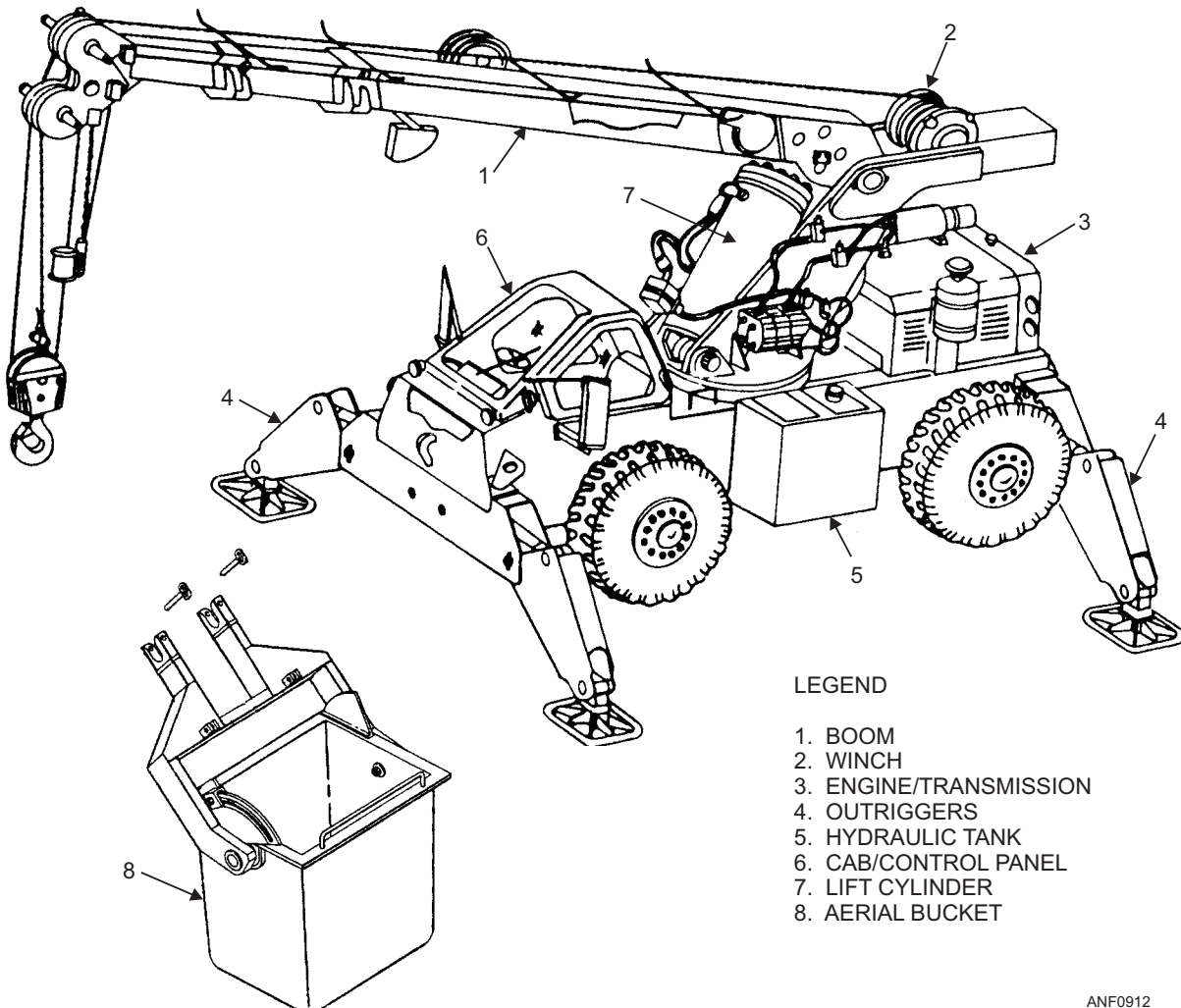
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Figure 9-11.—TAU-2H twinned agent unit.

**TWINNED AGENT UNIT (TAU-2H).**—The Twinned Agent Unit (TAU-2H) extinguisher (fig. 9-11) is a dual-agent apparatus that is designed primarily for extinguishing class B fires and is employed aboard ship and shore facilities normally located at hot refueling sites, or it can be vehicle-mounted. The TAU-2H is a self-contained unit with a framework with two agent tanks—one containing 86 gallons of AFFF premixed

solution and the other containing 200 pounds of Halon 1211. The system permits use of the fire-fighting agents either separately or simultaneously. The TAU-2H employs a noncollapsible dual hose line encased in a fire-resistant cotton jacket. The twinned hose line is normally stowed in a rack or mounted on a reel. The fire-extinguishing agents are propelled by nitrogen, which is supplied by one 2700 psi pressurized cylinder that is regulated to 200 psi and mounted on the framework. The twinned nozzles on the handline expel the fire-fighting agents. The Halon nozzle is equipped with a low-reaction discharge tip. The AFFF nozzle is equipped with an aspirating tip. Dual pistol grip handles and triggers operate the shutoff valves. Extinguishment is obtained by applying agents in a sweeping motion, using the chemical agent Halon 1211 to gain initial extinguishment, followed by application of AFFF to blanket the combustible liquid and preclude reignition.

**A/S32M-14, 8 1/2 TON AIRCRAFT MAINTENANCE CRANE.**—The A/S32M-14, 8 1/2 ton aircraft maintenance crane (fig. 9-12) is a four-wheel



LEGEND

- 1. BOOM
- 2. WINCH
- 3. ENGINE/TRANSMISSION
- 4. OUTRIGGERS
- 5. HYDRAULIC TANK
- 6. CAB/CONTROL PANEL
- 7. LIFT CYLINDER
- 8. AERIAL BUCKET

ANF0912

Figure 9-12.—A/S32M-14, 8 1/2 ton aircraft maintenance crane.

drive, four-wheel steering, four-cylinder, diesel powered vehicle with a main transmission, drive axles, and a hydraulic craning circuit. The hydraulic craning circuit consists of a hydraulic pump and motors, valves, cylinders, piping, and a superstructure that revolves 360 degrees and can lift and move loads from one location to another. A 24-volt electrical circuit provides power for starting, lighting, instrumentation, and electrohydraulics. The crane's primary purpose is to remove and replace aircraft components in support of scheduled and unscheduled maintenance. This includes engines, transmissions, propellers, engine modules, and rotor blades.

### **Forklift Truck**

The forklift truck (fig. 9-13) is a cantilever-type industrial truck, either gasoline, diesel (shipboard use), or electrically operated, and is used in the handling and lifting of palletized unit loads. It contains vertical uprights and an elevator backplate equipped with two or more forks of sufficient length and thickness for lifting pallets. The forklift truck is probably the most widely used power-driven piece of material-handling equipment for palletized loads aboard ship and in Navy industrial supply warehouses. When not on a hard surface, a forklift truck should have pneumatic tires to operate efficiently. Public works maintains forklifts on

shore stations. Aboard carriers, the support equipment division of AIMD performs the maintenance.

### **Flight Deck Scrubber**

The flight deck scrubber (fig. 9-14) is designed to spray a cleaning solution onto the flight and hangar decks, scrub the deck, and recover the residual solution and debris for disposal. It consists of the debris hopper housing, two opposed rotation cylindrical brushes, a solution and recovery tank, and a vacuum recovery system and rear squeegee. Those are mounted on a driver-operated, four-cylinder, two-wheel drive, diesel engine power drive train. The purpose of having flight deck scrubbers aboard ship is to achieve and maintain a high degree of deck cleanliness, which contributes to a reduction of aircraft engine Foreign Object Damage (FOD) and provides better traction, thereby improving personal safety during flight operations.

### **SERVICING EQUIPMENT**

Servicing equipment provides compressed nitrogen or air, electrical and hydraulic power, and air-conditioning for aircraft functions while the aircraft is on the ground. Mobile electrical power plants (MEPPs) supply electrical power for aircraft testing and maintenance and operate on shore stations and aboard aircraft carriers. MEPPs have high

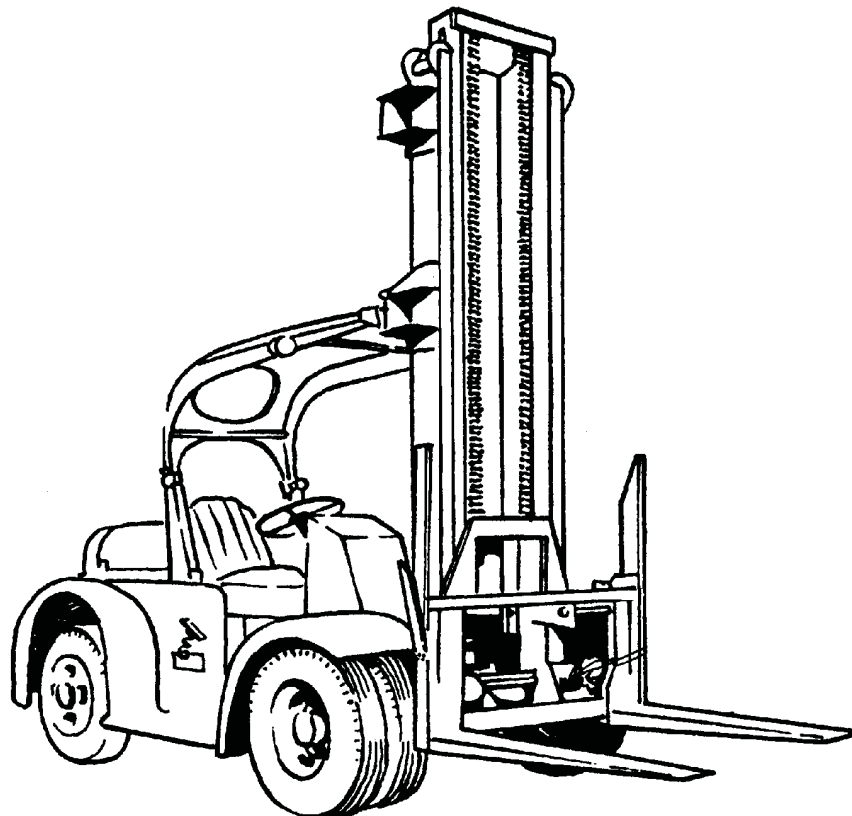
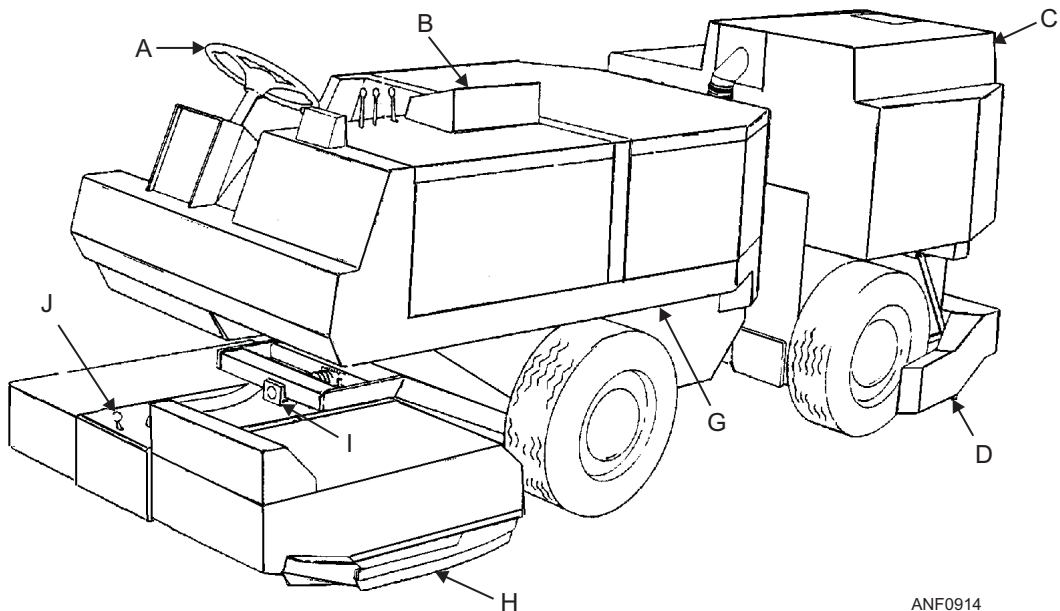


Figure 9-13.—Forklift truck.

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A. Steering wheel  
B. Instrument panel  
C. Solution tank

D. Rear squeegee  
E. Recovery tank  
F. Clean-out door

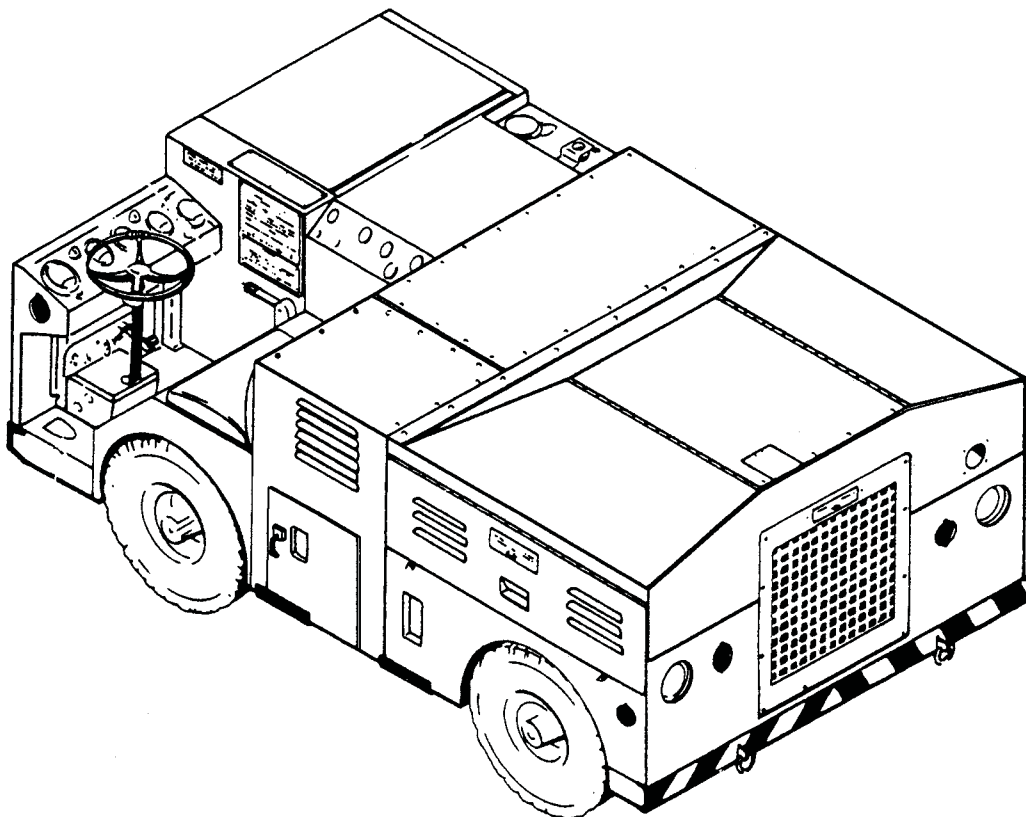
G. Articulated joint  
H. Side squeegee  
I. Head pivot  
J. Debris trough release lever

Figure 9-14.—Model 550DN flight deck scrubber.

maneuverability and mobility. On shore stations, MEPPs may be self-propelled or trailer-mounted and require towing. The following text describes some of the servicing units you will see in the aviation community.

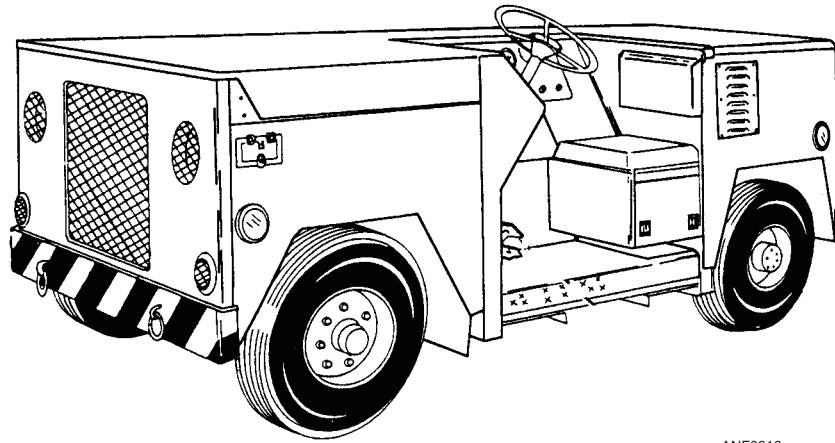
#### NC-2A Mobile Electric Power Plant (MEPP)

The NC-2A (fig. 9-15) is designed primarily for use aboard aircraft carriers. It is a four-wheel, self-propelled, three-cylinder diesel-engine-powered service unit. The three-cylinder engine drives the ac



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Figure 9-15.—NC-2A mobile electric power plant.



ANF0916

Figure 9-16.—NC-8A mobile electric power plant.

and dc generators through a speed increasing transmission. The front axle is driven by a 28-volt dc, reversible, variable speed motor and steered by the two rear wheels, and is easy to maneuver in congested areas. The ac and dc power cables are stored in a compartment near the driver. They deliver 115/200-volt, 3-phase, 400-hertz ac, and 28 volts of dc to the aircraft. All controls, both propulsion and electrical power, are located on three panels located in front and to the right of the operator's seat. The MEPP is designed for air transport and is provided with tie-down rings and forklift channels.

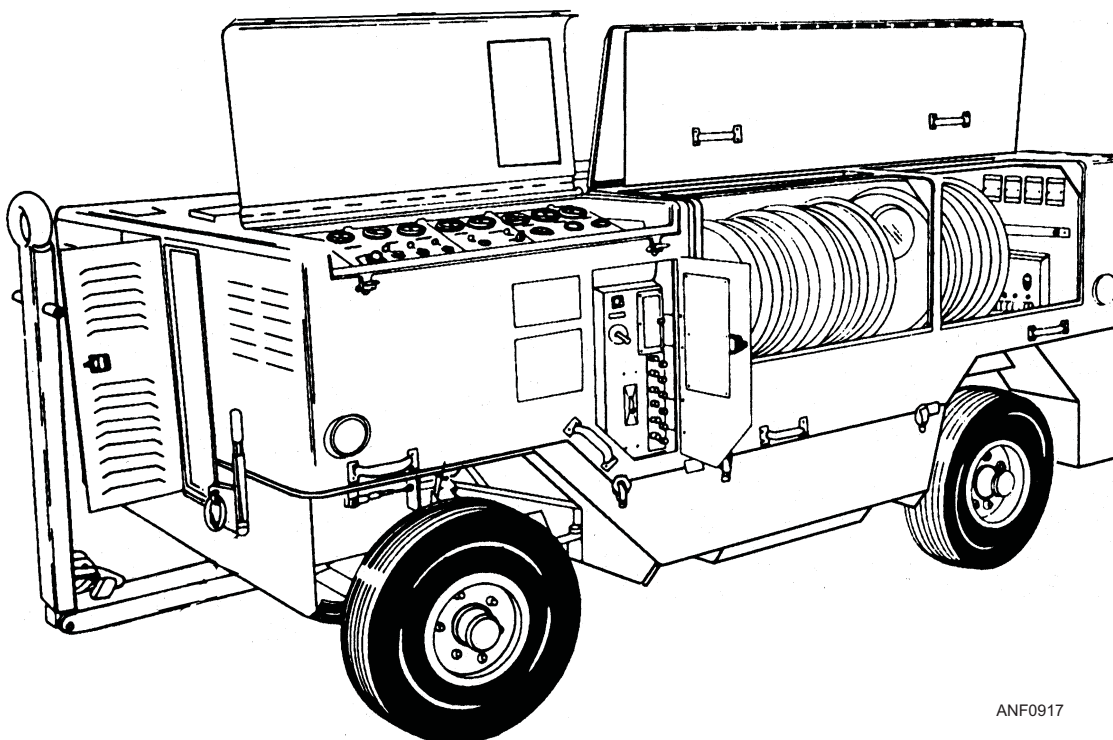
#### NC-8A Mobile Electric Power Plant (MEPP)

The NC-8A (fig. 9-16) is a four-wheel, electrically propelled, front-wheel steering, rear-wheel drive,

four-cylinder, liquid-cooled, diesel-engine-powered service unit. It provides 115/200-volt, 3-phase, 400-hertz ac and 28 volts of dc electrical power for starting, servicing, and maintenance of rotary and fixed-wing aircraft. The ac and dc power cables are located and stored on spring-loaded reels in a compartment in the rear of the vehicle. All propulsion and electrical controls are located on two panels in the driver's compartment. This MEPP is used primarily on shore stations, but it can also be operated aboard ship.

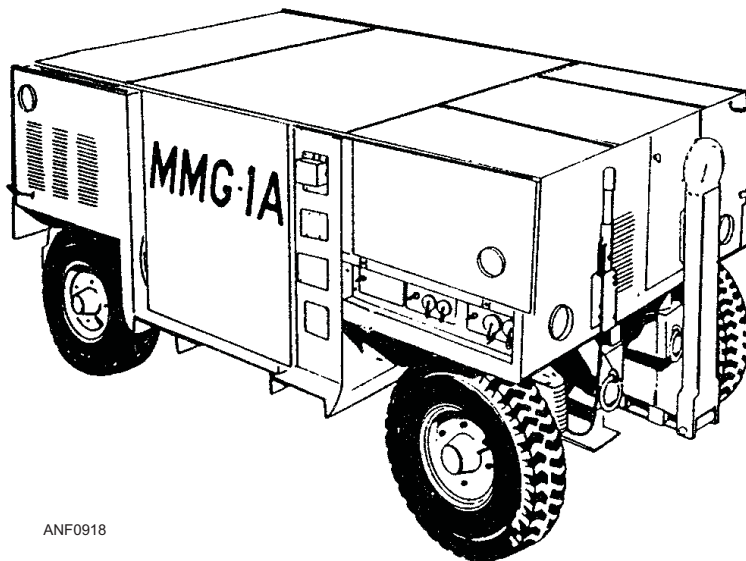
#### NC-10C Mobile Electric Power Plant (MEPP)

The NC-10C (fig. 9-17) is a trailer-mounted, self-contained power plant designed for shore-based facilities. It supplies electrical power for servicing, starting, and maintaining aircraft. The six-cylinder,



ANF0917

Figure 9-17.—NC-10C mobile electric power plant.



ANF0918

Figure 9-18.—MMG-1A mobile electric power plant.

two-cycle, water-cooled, diesel engine and components, ac and dc generators, are enclosed in a removable steel housing. The ac and dc power cables are stored on spring-loaded reels next to the control panel and deliver 115/200-volt, 3-phase, 400-hertz ac and 28-volt dc electrical power. A tow bar for towing and steering, tie-down rings, fire extinguisher, hinged doors for operation, and manual hand brake are provided.

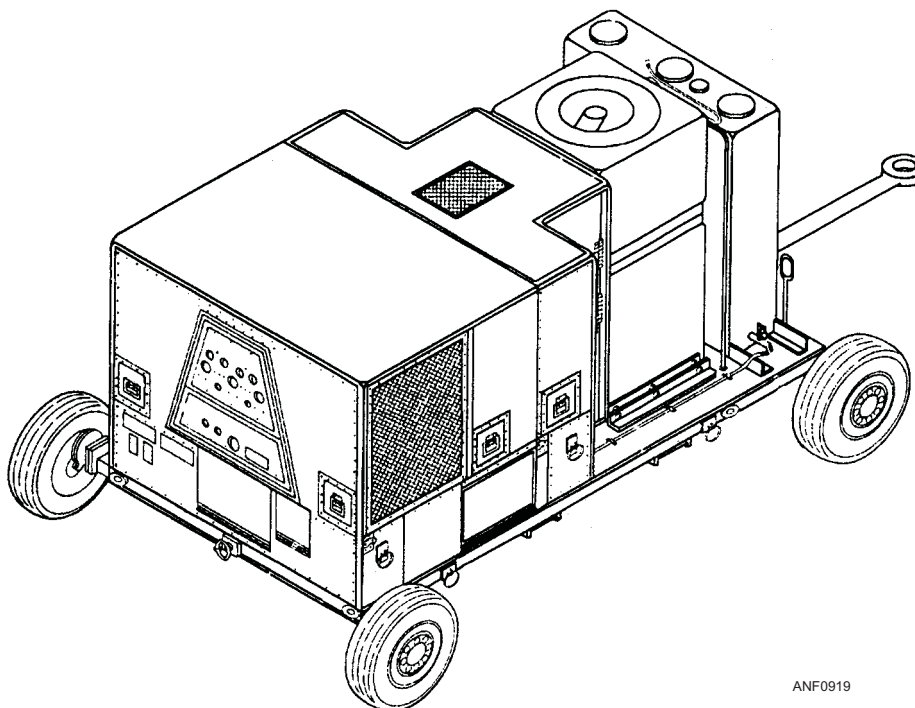
#### MMG-1A Mobile Electric Power Plant (MEPP)

The MMG-1A (fig. 9-18) is a small, compact, trailer-mounted, electric motor-driven generator set. It provides 115/200-volt, 3-phase, 400-hertz ac power,

and 28-volt dc power for aircraft maintenance, calibration, and support. Operation of the unit requires a 3-phase, 60-hertz, 220- or 440-volt external power source. The 30-foot input and output cables are stowed in compartments in the rear and left front side of the unit. It is used both aboard ship and ashore. The MEPP is not self-propelled and must be towed or manually moved. The 4-wheel trailer is equipped with tie-down rings, pneumatic tires, a mechanical hand brake, and a tow bar for towing and steering.

#### A/M47A-4 Jet Aircraft Start Unit

The A/M47A-4 jet aircraft start unit (fig. 9-19) is a 4-wheel, trailer-mounted, transportable gas turbine air



ANF0919

Figure 9-19.—A/M47A-4 trailer-mounted jet aircraft start unit.

compressor (GTC) used to provide air and electrical power for starting aircraft jet engines. The start unit contains all the components and fuel supply necessary for independent operation. The start unit requires manual start initiation/stop and manual air selection. Once started, an engine control system regulates start, acceleration, and engine operation. Air start hoses and electrical cables are provided. This unit is used aboard shore stations.

#### **A/S47A-1 Jet Aircraft Start Unit**

The A/S47A-1 jet aircraft start unit (fig. 9-20) is a tractor-mounted, self-contained, mobile aircraft turbine engine air start unit. The air start unit enclosure consists of a control panel, enclosure assembly, gas turbine air compressor (GTC), stowage rack for the air start hose, and turbine support and mounting assembly. Except for fuel and electrical power (supplied by the tractor), the enclosure contains all systems necessary for gas turbine engine operation. This unit is used aboard ship and on shore stations.

#### **WARNING**

Hot exhaust from a jet aircraft start unit is a serious hazard when operating in close proximity to aircraft, aircraft components, fuel, weapons, equipment, and personnel.

You must take extra special precautions as to where a gas turbine compressor (GTC) is positioned during

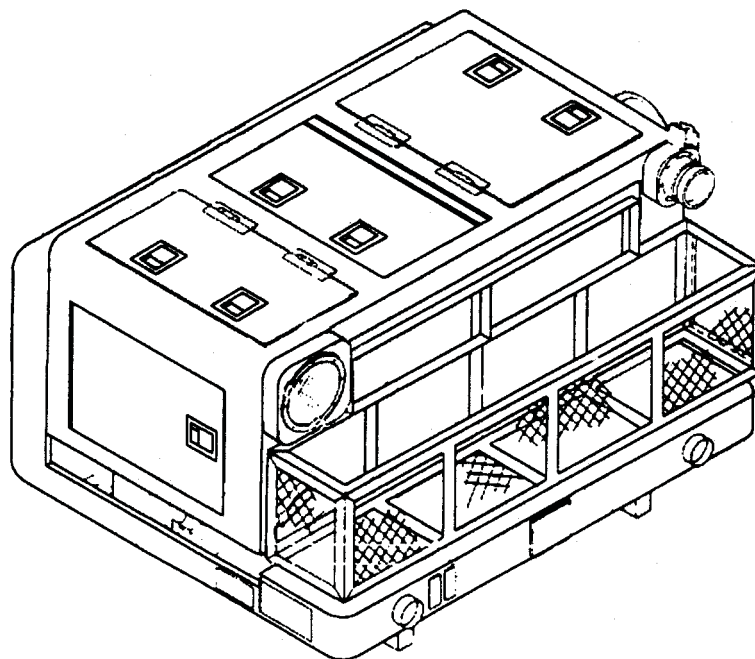
operation, especially aboard ship where aircraft are parked closely together. High volume air pressure, extreme exhaust temperatures, jet intake suction, high noise levels, and unqualified operator's are all potential hazards.

#### **A/M27T-5 Hydraulic Portable Power Supply**

The A/M27T-5 hydraulic portable power supply (fig. 9-21) is a self-contained, single-system, hydraulic pumping unit powered by a three-cylinder, two-cycle, diesel engine with a rated capacity of 20 gpm at 3,000 psi and 10 gpm at 5,000 psi. During normal operation the diesel engine runs at speeds up to 2,500 rpm. The A/M27T-5 engine operates on JP-5 (jet fuel) or diesel fuel, and the hydraulic reservoir holds 20 gallons. Pressure and return hydraulic hoses, a tow bar, tie-down rings, and a manual hand brake are provided.

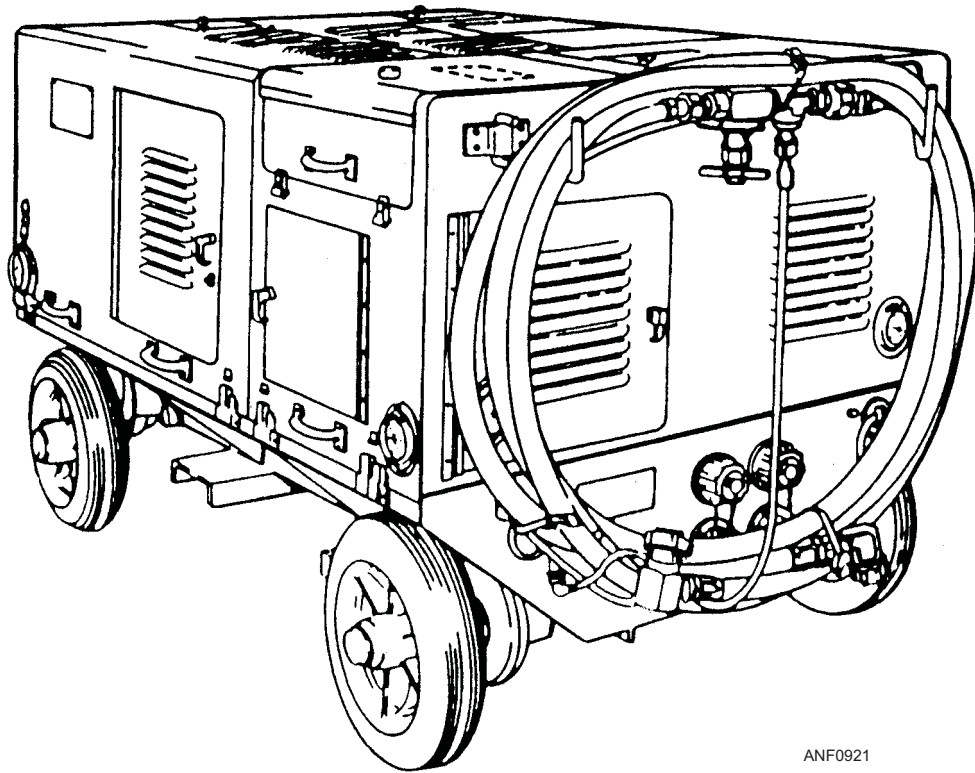
#### **A/M27T-7 Hydraulic Portable Power Supply**

The A/M27T-7 hydraulic portable power supply (fig. 9-22) is similar in operation to the A/M27T-5 except for its source of power. The A/M27T-7 is powered by a 50 horsepower electric motor. A 50-foot power cable is provided for connection to an external 440-volt, 3-phase, 60-hertz power source and can be set up to operate on a 220-volt source. The hydraulic reservoir holds 16 gallons and is equipped with a fluid level sight gauge. Pressure and return hydraulic hoses, a tow bar, tie-down rings, and a manual hand brake are provided.



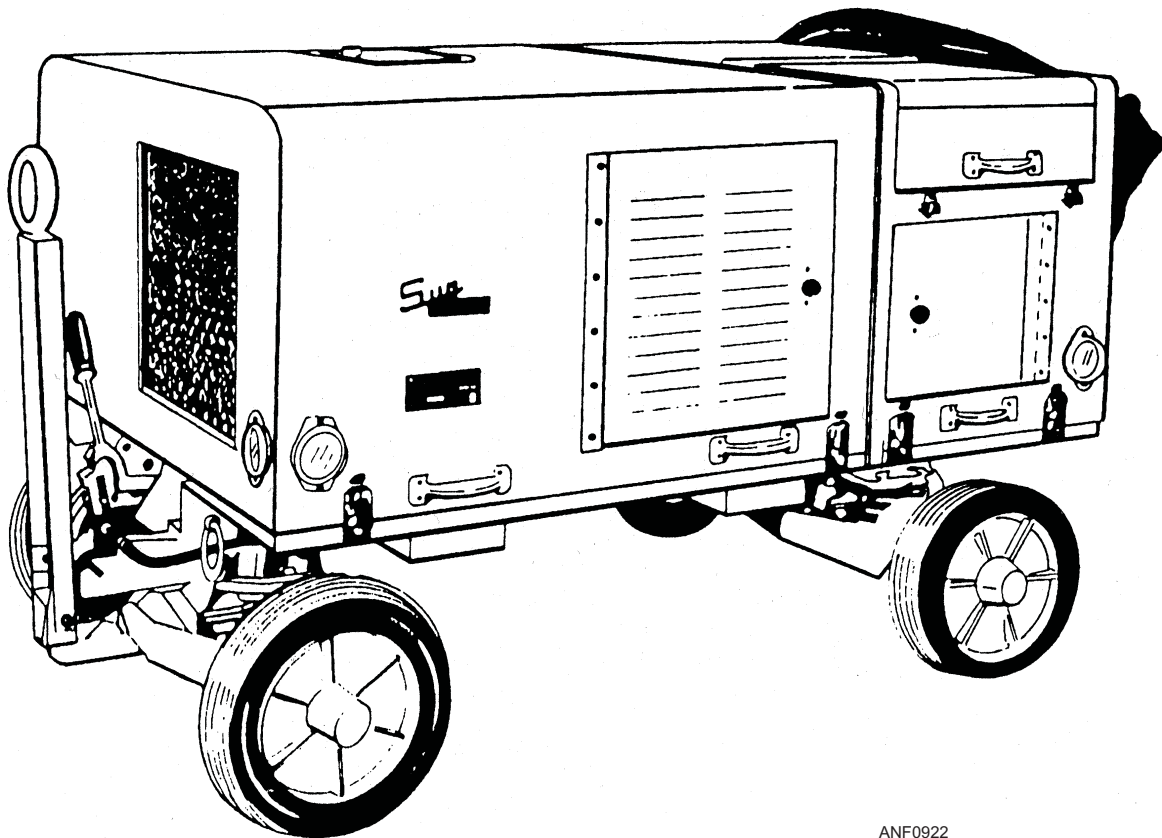
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Figure 9-20.—A/S47A-1 tractor-mounted jet aircraft start unit.



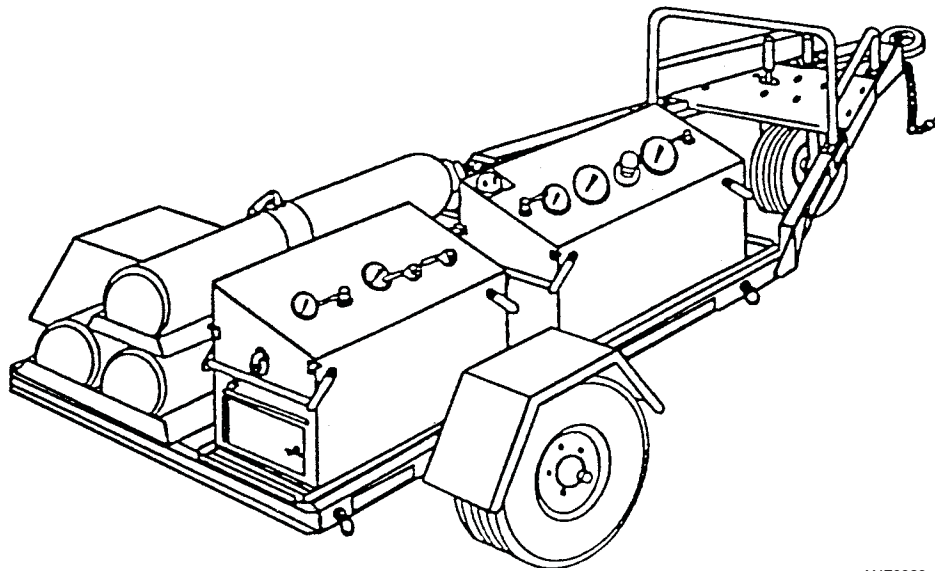
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Figure 9-21.—A/M27T-5 hydraulic portable power supply.



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Figure 9-22.—A/M27T-7 hydraulic portable power supply.



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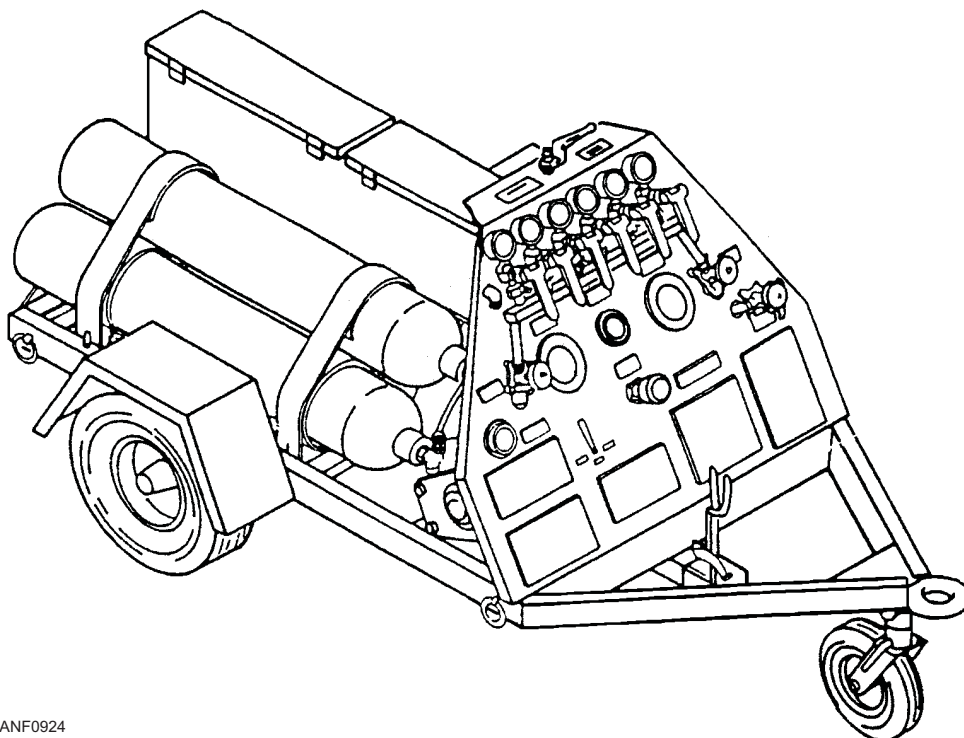
Figure 9-23.—A/U26U-1 oxygen servicing unit.

### A/U26U-1 Oxygen Servicing Unit

The A/U26U-1 oxygen-servicing unit (fig. 9-23) is used to replenish oxygen storage cylinders and emergency bailout oxygen systems, which are installed in aircraft. The trailer has two fixed wheels and a retractable, rotatable castor wheel for movement by hand or towed by a tow tractor. The unit contains a nitrogen module, oxygen module, and three cylinders of gas. Two cylinders of nitrogen are used to drive the boost pump and one cylinder of oxygen is used for servicing. The modules contain the gas pressure and flow controls, boost pump, connectors, and safety devices within a protective case.

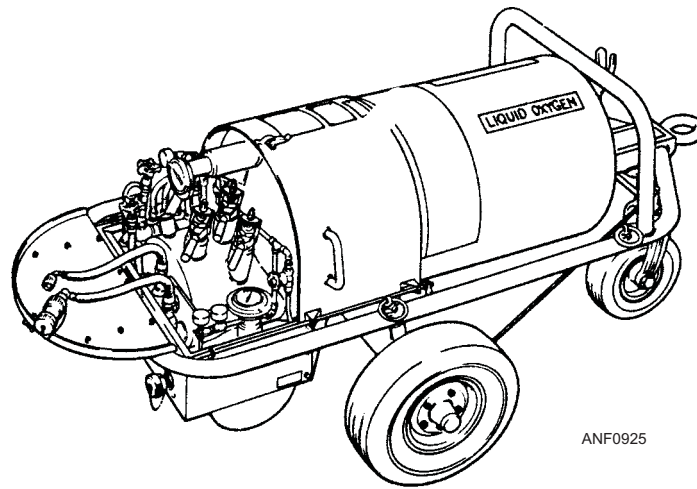
### A/M26U-4 (NAN-4) Nitrogen Servicing Unit

The A/M26U-4 (NAN-4) nitrogen-servicing unit (fig. 9-24) provides a mobile source of compressed nitrogen to recharge aircraft nitrogen systems. It consists of a welded steel frame, two-wheel axle, a front retractable castor wheel, draw bar coupler ring for towing, tool and storage boxes, six compressed gas cylinders, and a manual hand brake. Nitrogen under pressure is transferred from the NAN-4 to the aircraft through a series of gauges, valves, manifold, filters, pressure regulator, and hoses. It is equipped with a boost pump that is capable of boosting nitrogen supply pressure up to a maximum of 3,500 psi.



ANF0924

Figure 9-24.—A/M26U-4 (NAN-4) nitrogen servicing unit.



ANF0925

Figure 9-25.—TMU 70/M low-loss, closed-loop, liquid oxygen storage tank.

### TMU 70/M Oxygen Storage Tank

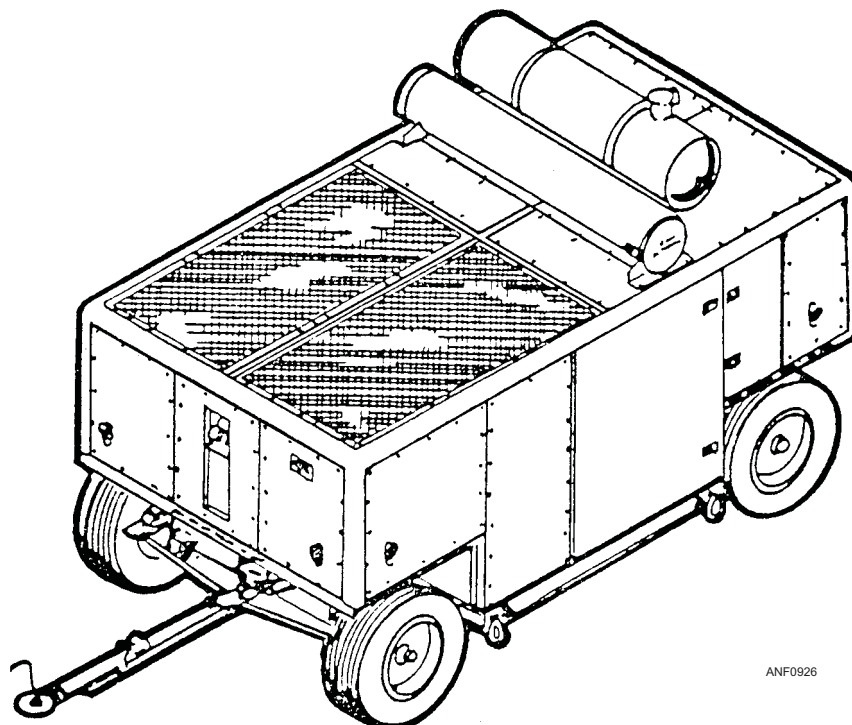
The TMU 70/M (fig. 9-25) is a completely self-contained unit composed of three major components: a 50-gallon storage tank, a 15-liter transfer tank, and a system of transfer lines and control valves. The three components are permanently mounted on a portable three-wheel trailer. The trailer is equipped with a manually operated parking brake system and retractable caster wheel. The storage and transfer tanks have liquid level, pressure gauges, and pressure relief devices.

### Mobile Air-Conditioning Units

Most modern aircraft are crammed with electronic equipment that generates tremendous amounts of heat and makes air conditioning a requirement in the air and

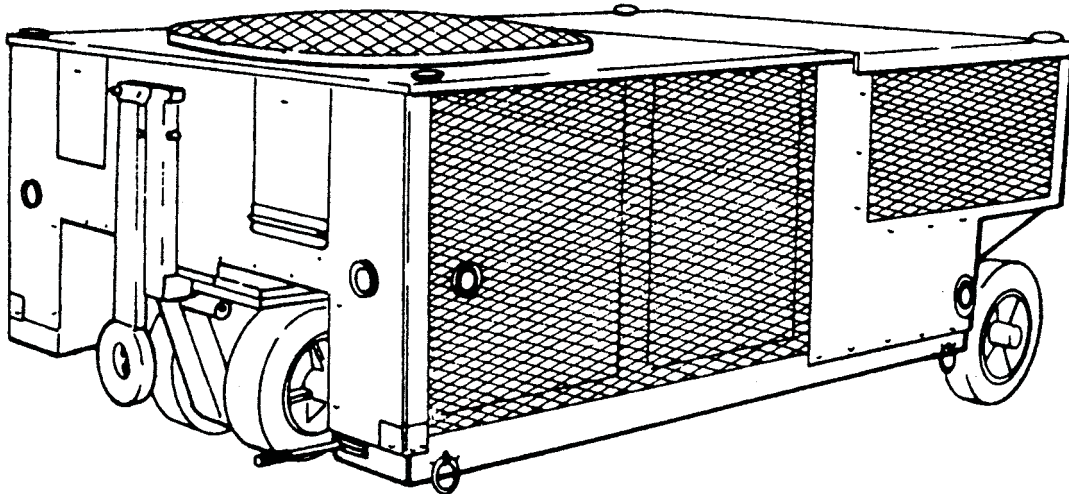
on the ground. Air conditioning is normally provided by an onboard system, but the aircraft engines must be operating for the system to work. When on the ground, electronic equipment must run for long periods of time for maintenance, testing, or calibration. Therefore, some other means of air conditioning is needed, and that is the purpose of mobile air-conditioning units.

**A/M32C-17 AIR-CONDITIONER.**—The A/M32C-17 air-conditioner (fig. 9-26) is a mobile, four-wheel, trailer-mounted, self-contained, six-cylinder diesel powered unit that provides filtered air for cooling, dehumidifying, or ventilating of aircraft electronic equipment or cockpit/cabin areas during ground maintenance. The air-conditioning components are contained in a metal panel housing and assembled into a refrigeration system, a ventilation system, a hydraulic



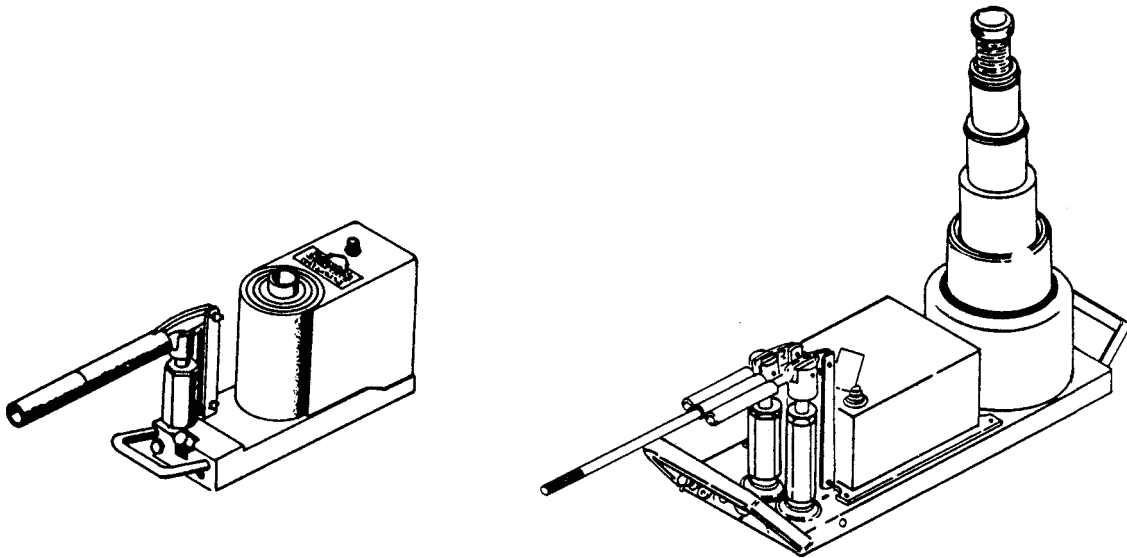
ANF0926

Figure 9-26.—A/M32C-17 air-conditioner.

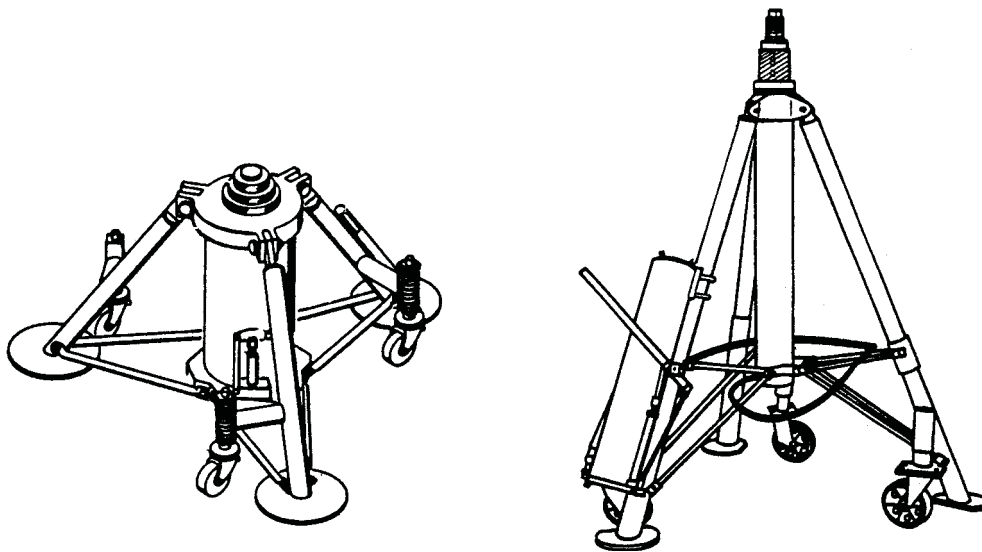


ANF0927

Figure 9-27.—A/M32C-21 air-conditioner.



VIEW(A). AIRCRAFT AXLE JACKS



VIEW(B). AIRCRAFT TRIPOD JACKS

ANF0928

Figure 9-28.—Hydraulic jacks, (A) Aircraft axle jacks; (B) Aircraft tripod jacks.



system, and associated sensing and control components. The trailer has towing and steering capabilities and its own braking system. A collapsible air ducting hose connects to the aircraft and provides conditioned air.

**A/M32C-21 AIR CONDITIONER.**—The A/M32C-21 air-conditioner (fig. 9-27) is a mobile, four-wheel, trailer-mounted, electrically powered, self-contained unit powered by a 30-horsepower, 440-volt, 3-phase, 60-hertz ac electric motor that is an integral part of the six-cylinder reciprocating type compressor. A 30- to 50-foot external power cable, a 30-foot collapsible duct hose for aircraft connection, a collapsible tow bar for towing and steering, tie-down rings, and a manual parking brake are provided.

### Hydraulic Jacks

Hydraulic jacks are frequently used in aircraft maintenance. Maintenance of the tires, wheels, brakes, and struts requires part or all of the aircraft to be lifted off the deck. The entire aircraft must be lifted off the deck to perform operational testing of the landing gear.

Different types and sizes of hydraulic jacks are needed. Some typical hydraulic jacks are described in the following paragraphs. The basic types are illustrated in figure 9-28.

**AIRCRAFT AXLE JACKS.**—The aircraft axle jack (fig. 9-28, view A) is a portable, self-contained,

hydraulically operated unit. These jacks are used to raise the landing gear wheels off the deck to perform maintenance operations. The lift, a component of the base of the jacks, consists of three rams and an outer cylinder. A rectangular tank welded to the base forms the fluid reservoir.

**AIRCRAFT TRIPOD JACKS.**—The aircraft tripod jack (fig. 9-28, view B) is a portable, self-contained, hydraulically operated jack. These jacks are used for raising the wing, nose, or tail of an aircraft. When used in sufficient numbers and at the required jacking points, this jack can lift the complete aircraft off the deck. The jack consists of three main assemblies—a hydraulic cylinder, a tubular steel tripod leg structure with caster wheels, and a hydraulic pump assembly. The cylinder and ram are raised by manually operating the hydraulic pump.

### Maintenance Platforms

Performing maintenance on aircraft does not always occur at ground level and often requires the use of a maintenance platform. There are several different models to use depending on type of aircraft, the maintenance requirement, and location. Two common maintenance platforms are the B-2 maintenance platform and the B-4 maintenance platform.

**B-2 MAINTENANCE PLATFORM.**—The B-2 maintenance platform (fig. 9-29) is a fixed height,

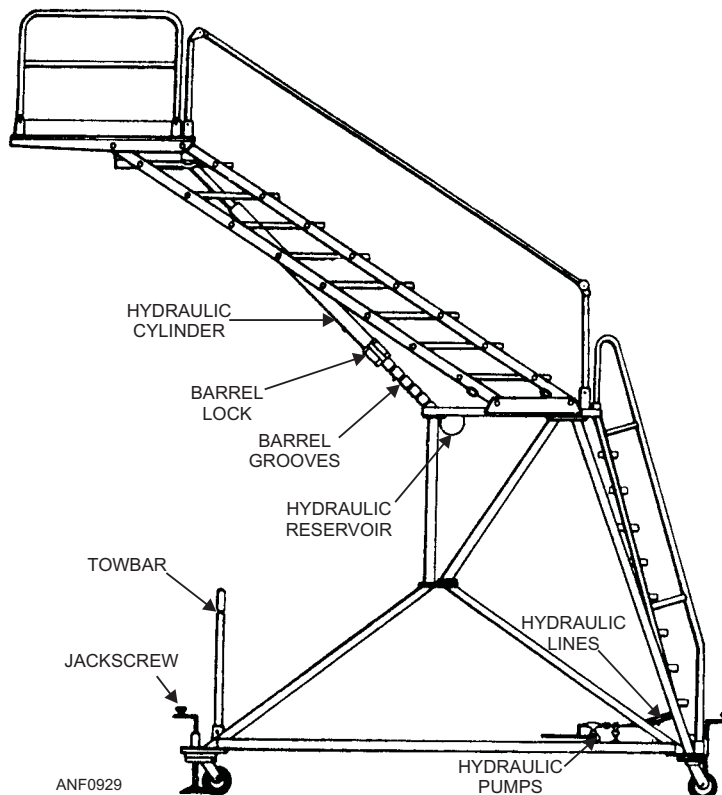


Figure 9-29.—B-2 maintenance platform.

10-foot lower structure, a variable height upper structure, and a manual pump actuated hydraulic system for raising and lowering the upper structure. The upper structure includes a work platform with guardrails and steps with handrails. The lower structure includes fixed steps and handrails, a towbar, and four free-swivel caster wheels with safety locking devices, four immobilizing jacks, and a hydraulic pump, lines, and reservoir. The height range for the B-2 work platform is from 13 feet to 20 feet, and it has a weight bearing capacity of 600 pounds.

**B-4 MAINTENANCE PLATFORM.**—The B-4 maintenance platform (fig. 9-30) is a moveable, hydraulically operated, adjustable platform with a ladder assembly. Four free-swivel caster wheels, each having a foot-lever actuated mechanical brake and swivel lock mechanism, are included. The platform is equipped with safety guardrails, handrails for the ladder, two safety lock pins, which are inserted into the frame to lock the extension scissors of the platform. A hydraulic hand pump with reservoir is provided for raising and lowering the platform. The adjustable height range for the B-4 work platform is from 3 to 7 feet and a weight bearing capacity of 600 pounds.

- Q9-1. What are the two types of support equipment?
- Q9-2. The primary function of the A/S32A-30 tow tractor is to tow what aircraft or equipment?
- Q9-3. What tow tractor is designed for towing aircraft aboard ship?
- Q9-4. What type of tow tractor is designed to tow, turn, and position aircraft within the confines

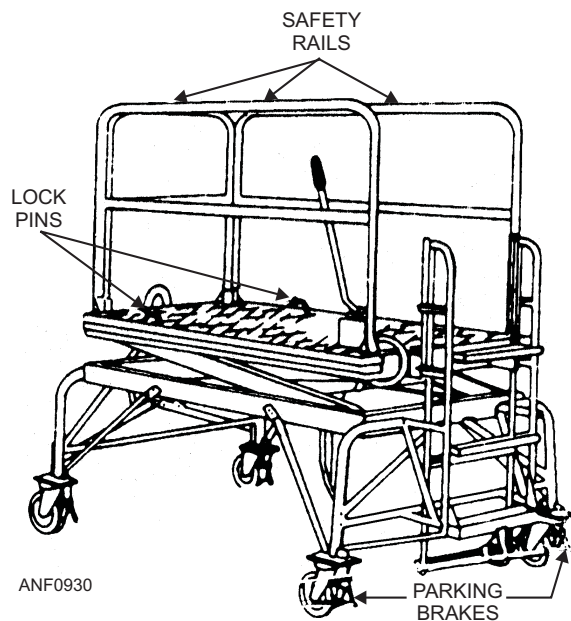


Figure 9-30.—B-4 maintenance platform.

of an aircraft carrier hangar deck and is often called "The Spotting Dolly"?

- Q9-5. What aircraft crash handling and salvage crane is used on amphibious assault ships?
- Q9-6. Aboard ship, what is the primary fire-fighting and rescue vehicle?
- Q9-7. What fire-fighting agents are contained in the twinned agent unit (TAU-2H)?
- Q9-8. What activity is tasked with maintenance of forklifts aboard naval stations?
- Q9-9. What mobile electric power plant is designed primarily for use on aircraft carriers?
- Q9-10. What type of motor propels the NC-8A mobile electric power plant?
- Q9-11. What is the danger associated with operating the NC-8A or NC-10C when aircraft are serviced?
- Q9-12. The A/M47A-4 jet aircraft start unit provides what support for starting aircraft?
- Q9-13. What are some of the dangers associated with operating a jet aircraft start unit?
- Q9-14. The A/M27T-5 is used to service what aircraft system?
- Q9-15. How many nitrogen gas cylinders are mounted on the A/M26U-4 (NAN-4) servicing unit?
- Q9-16. What are the major components on the TMU 70/M oxygen storage tank?
- Q9-17. What is the purpose of having mobile air-conditioning units?
- Q9-18. What type of aircraft jack is used to raise the entire aircraft off the deck?
- Q9-19. What is the weight bearing capacity of the B-4 maintenance platform?

## MAINTENANCE REQUIREMENTS

**LEARNING OBJECTIVE:** Identify the purpose for support equipment preoperational maintenance and the requirements for support equipment training, licensing, and misuse/abuse.

You, as an Airman Apprentice, are not responsible for maintaining support equipment, unless you are striking for Aviation Support Equipment Technician. You will, however, be required to operate support

equipment and perform preoperational maintenance. Preoperational maintenance is like checking your automobile before you drive it; that is, checking your oil, tire pressure, battery, radiator, and so forth.

The point is, if the support equipment unit has developed a problem, return it to the support equipment shop. Let the technicians work on it. They have had the training. Most support equipment is dangerous. The MEPPs, for instance, produce 1,000 amps, which is more than enough to electrocute you. Hydraulic units have working pressures as high as 5,000 psi. You do the operating and leave the maintenance to the technicians.

The three levels of naval aviation maintenance are organizational, intermediate, and depot. Organizational maintenance is the general upkeep of aircraft that is preformed by aviation squadrons. Intermediate maintenance is performed at AIMDs, and includes component inspection, disassembly, repair, reassembly, testing, and fabrication. Depot-level maintenance is normally the complete repair of the entire aircraft and systems. You will most likely be concerned with the organizational level.

## **PREOPERATIONAL MAINTENANCE**

Preoperational maintenance is performed by organizational and intermediate maintenance personnel. A preoperational card is used to inspect support equipment prior to its use. All support equipment you operate will have a preoperational card specific to the type of equipment. The card is easy to use and must be completed in the numerical sequence, and it must be accomplished prior to the first use of the day and any use thereafter. All types of support equipment require a preoperational check before each use. The preoperational card does not state how to repair, make adjustments, or correct defective conditions. These functions are performed in AIMD.

## **QUALIFICATIONS FOR OPERATING SE**

As a direct result of support equipment accidents, the Navy established a Support Equipment Operator Training and Licensing Program. The purpose of the program is to make sure you receive effective training in the safe and efficient operation of specific aircraft support equipment, as prescribed in the Naval Aviation Maintenance Program (NAMP), OPNAVINST 4790.2 (series). You cannot, without great risk, properly or safely move, secure, service, or maintain an aircraft using support equipment unless you are completely

trained and qualified on both the support equipment and the aircraft.

## **Training**

The SE Operator Training and Licensing Program has two distinct parts—Phase 1 and Phase 2. Phase 1 covers the support equipment, and Phase 2 covers the operation or use of the support equipment on a specific type of aircraft. You get your Phase 1 training from AS ratings at the support equipment school sponsored by AIMD. This school covers daily pre/post operational inspections, safety, appropriate gear, and operating procedures on each specific type of equipment. Phase 2 training is handled by your own squadron or unit. Usually, the program is managed by the line division and monitored by quality assurance (QA). This is practical on-the-job training, relating what you learn in support equipment school with actual aircraft handling, servicing, or maintenance. While in Phase 2 training, you are under the direct supervision of a qualified and licensed operator of the support equipment you are using.

## **Licensing**

Once you complete training, you are eligible for a USN Aviation Support Equipment Operator's License (OPNAV 4790/102), commonly known as a "yellow license." This license is required to check out certain types of support equipment from the AIMD support equipment division and/or to operate the support equipment. When you complete Phase 1, a certificate of completion is issued to your unit. It certifies completion of Phase 1 training **only** and **does not** authorize you to operate any given piece of support equipment. When you complete Phase 2 training in your unit, you are issued your "yellow license," which is signed by your commanding officer (or the aircraft maintenance officer if he/she is so authorized in writing by the commanding officer). Your "yellow license" is good for 3 years from the date issued for each specific type of support equipment and aircraft. After 3 years you must requalify. If you transfer to a new outfit with different types of aircraft, your license is not valid. You must requalify under Phase 2 training for the new types of aircraft and be issued a new license.

## **Misuse/Abuse**

Your commanding officer has the responsibility to revoke your yellow license under the following conditions:

- You display unsafe operator habits or behavioral traits that constitute unsafe or abusive use of support equipment.
- Your State Motor Vehicle Operator's License becomes invalid (applies to self-propelled support equipment only).
- You intentionally misuse or abuse support equipment. Once your yellow license has been revoked, you must go through the entire Phase 1 and Phase 2 training to requalify for a new license.

Local misuse or abuse forms are generally available and may be submitted by anyone witnessing misuse or abuse regardless of the command to which the person is attached. It is common practice aboard stations for the support equipment division to have roving patrols to observe and report misuse, abuse, and discrepancies in all areas and spaces where support equipment is used. Reports can, and do, result in disciplinary action for improper operation, negligence, or vandalism.

**NOTE:** For additional information concerning support equipment (SE) training, licensing, and misuse/abuse, refer to Naval Aviation Maintenance Program (NAMP), OPNAVINST 4790.2 (series).

*Q9-20. What is the purpose of a preoperational card for support equipment?*

*Q9-21. What total number of phases are there in the Support Equipment Training and Licensing Program?*

*Q9-22. What division is normally responsible for phase 2 training of support equipment?*

*Q9-23. How long is your support equipment "yellow license" good for from date of issue?*

*Q9-24. Who must sign your "yellow license" before you are allowed to operate support equipment?*

*Q9-25. Who can submit a misuse/abuse report?*

*Q9-26. What instruction contains all the information concerning support equipment (SE) training, licensing, and misuse/abuse?*

## **SUMMARY**

In this chapter you have identified the purpose and function of different types of support equipment, handling and servicing equipment, maintenance requirements, preoperational inspections, and the requirements for support equipment training, licensing, and misuse/abuse.

# ASSIGNMENT 9

Textbook Assignment: "Support Equipment," chapter 9, pages 9-1 through 9-20.

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- 9-1. Which of the following departments aboard ship are principal users of support equipment?
1. Deck
  2. Operations
  3. Air
  4. Supply
- 9-2. The Navy uses how many general types of support equipment?
1. One
  2. Two
  3. Three
  4. Four
- 9-3. Which of the following tow tractors is designed for towing aircraft servicing equipment, work stands, and armament handling equipment?
1. A/S32A-30
  2. A/S23A-30A
  3. A/S32A-31
  4. A/S32A-31A
- 9-4. What is the towing capacity of the A/S32A-30A tow tractor?
1. 10,000 pounds
  2. 20,000 pounds
  3. 30,000 pounds
  4. 40,000 pounds
- 9-5. Which of the following tow tractors is designed for towing aircraft aboard ship?
1. A/S32A-30
  2. A/S23A-30A
  3. A/S32A-31
  4. A/S32A-31A
- 9-6. What is another name for the A/S32A-32 tow tractor?
1. "Big Bertha"
  2. "Spotting Dolly"
  3. "Joystick"
  4. "Grappler"
- 9-7. Which of the following features of the A/S32A-32 tow tractor is NOT found on other tractors?
1. A diesel engine
  2. Pintle hook
  3. Lifting arms
  4. A drivers seat
- 9-8. What is the towing capacity of the A/S32A-42 mid-range tow vehicle?
1. 25,000 pounds
  2. 50,000 pounds
  3. 75,000 pounds
  4. 100,000 pounds
- 9-9. Which of the following letter identifiers apply to the aircraft carrier crash handling and salvage crane?
1. CVCC
  2. AACC
  3. AVCC
  4. AVCA
- 9-10. Which of the following letter identifiers apply to an amphibious assault ship crash handling and salvage crane?
1. CVCC
  2. AACC
  3. AVCC
  4. CVCA
- 9-11. What component provides dynamic vehicle braking on the A/S32P-25 shipboard fire-fighting vehicle?
1. Hydrostatic drive system
  2. Hydraulic reservoir
  3. Pneumatic pump
  4. Brake master cylinder
- 9-12. Which of the following fire-fighting agents are carried on the A/S32P-25 shipboard fire-fighting vehicle?
1. CO<sub>2</sub> and PKP
  2. AFFF and CO<sub>2</sub>
  3. AFFF and Halon 1211
  4. Water and AFFF

- 9-13. What class of fire is the Twinned Agent Unit (TAU-2H) primarily designed to extinguish?
1. Class A
  2. Class B
  3. Class C
  4. Class D
- 9-14. What propels the fire-extinguishing agents on the Twinned Agent Unit (TAU-2H)?
1. Carbon dioxide
  2. Oxygen
  3. Compressed air
  4. Nitrogen
- 9-15. How many degrees of rotation is provided for the superstructure on the A/S32M-14 aircraft maintenance crane?
1. 180°
  2. 270°
  3. 360°
  4. 375°
- 9-16. Which of the following activities is tasked with maintenance of forklifts aboard a naval station?
1. Supply department
  2. Base operations
  3. Public works
  4. AIMD
- 9-17. When operating the flight deck scrubber, how do you recover the solution and debris?
1. Rotating cylindrical brushes
  2. Vacuum recovery system
  3. Rear squeegee
  4. Debris hopper
- 9-18. The purpose of servicing equipment is to provide compressed nitrogen or air, electrical and hydraulic power, and air-conditioning for aircraft functions while the aircraft is on the ground.
1. True
  2. False
- 9-19. Which of the following electrical power plants is designed primarily for use aboard aircraft carriers?
1. MMG-1A
  2. NC-8A
  3. NC-2A
  4. NC-10C
- 9-20. Which of the following mobile or trailer mounted electrical power plants deliver 115/200-volt, 3-phase, 400-hertz ac and 28 volts of dc power?
1. NC-2A
  2. NC-8A
  3. NC-10C
  4. Each of the above
- 9-21. Which of the following types of motors or engines propel the NC-8A?
1. Electric motor
  2. Gasoline engine
  3. Diesel engine
  4. Hydraulic motor
- 9-22. Where are the ac and dc electrical cables stored on the NC-10C?
1. On two flaking hooks at the rear of the unit
  2. Spring-loaded reels next to the control panel
  3. In a wire mesh cage on top of the removable cowling
  4. Inside a hinged door compartment at the front of the unit
- 9-23. Which of the following mobile electric power plants is/are equipped with a tow bar for towing and steering?
1. NC-2A
  2. NC-10C only
  3. MMG-1A only
  4. NC-10C and MMG-1A
- 9-24. What does the A/M47A-4 jet aircraft start unit provide for starting jet aircraft engines?
1. Fuel and compressed air
  2. Hydraulic pressure and electrical power
  3. Compressed air and electrical power
  4. Fuel and hydraulic pressure
- 9-25. Which of the following hazards is associated with the operation of a gas turbine compressor (GTC)?
1. High volume air pressure and extreme exhaust temperatures
  2. Jet intake suction and high noise levels
  3. Unqualified operators
  4. Each of the above
- 9-26. What aircraft system is serviced using the A/M27T-5?
1. Pneumatic
  2. Nitrogen
  3. Hydraulic
  4. Oxygen

- 9-27. What is the rated capacity of the A/M27T-5 hydraulic portable power supply?
1. 10 gpm at 2,000 psi and 20 gpm at 3,000 psi
  2. 20 gpm at 3,000 psi and 10 gpm at 5,000 psi
  3. 30 gpm at 4,000 psi and 5 gpm at 5,000 psi
  4. 25 gpm at 2,500 psi and 5 gpm at 6,000 psi
- 9-28. The A/M27T-5 hydraulic portable power supply is powered by a diesel engine.
1. True
  2. False
- 9-29. The A/M27T-7 hydraulic portable power supply is powered by an electric motor.
1. True
  2. False
- 9-30. On the A/U26U-1 oxygen servicing unit, how many cylinders of nitrogen are used to drive the boost pump?
1. One
  2. Two
  3. Three
  4. Four
- 9-31. How many nitrogen cylinders are mounted on the A/M26U-4 (NAN-4)?
1. Two
  2. Four
  3. Six
  4. Eight
- 9-32. What is the maximum nitrogen supply boost pump pressure on the NAN-4?
1. 2,500 psi
  2. 3,500 psi
  3. 4,500 psi
  4. 5,500 psi
- 9-33. What are the major components on the TMU 70/M oxygen storage tank?
1. Control valves, storage tank, and transfer tank
  2. Gas cylinders, control valves, and transfer tank
  3. Control valves, storage tank, and pump
  4. Storage tank, control box, and pump
- 9-34. What is the purpose of using mobile air-conditioning units?
1. Cooling and ventilating aircraft electronic equipment
  2. Dehumidifying the cockpit and cabin during ground maintenance
  3. Alleviate the need for running the aircraft engines for long periods of time
  4. Each of the above
- 9-35. How many systems are contained in the A/M32C-17 mobile air-conditioner?
1. One
  2. Two
  3. Three
  4. Four
- 9-36. The A/M32C-21 mobile air-conditioner is powered by what source?
1. Electric motor
  2. Diesel engine
  3. Gasoline engine
  4. External power
- 9-37. Which of the following aircraft jacks is used to raise the landing gear wheels off the deck to perform maintenance operations?
1. Tripod jack
  2. Axle jack
  3. Fixed height jack
  4. Pneumatic jack
- 9-38. Which of the following aircraft jacks is used for raising the wing, nose, or tail of an aircraft?
1. Tripod jack
  2. Axle jack
  3. Fixed height jack
  4. Pneumatic jack
- 9-39. What operates the variable height upper structure on the B-2 maintenance platform?
1. Mechanical scissors
  2. Telescopic cylinders
  3. Manual pump-actuated hydraulic system
  4. Immobilizing jacks
- 9-40. What is the weight bearing capacity of the B-4 maintenance platform?
1. 200 pounds
  2. 400 pounds
  3. 600 pounds
  4. 800 pounds

- 9-41. As an Airman Apprentice, you are not responsible for maintaining support equipment unless you are striking for Aviation Support Equipment Technician.
1. True
  2. False
- 9-42. Which of the following dangers are associated with operating a MEPP?
1. High fluid pressure
  2. High voltage
  3. Hot exhaust temperatures
  4. Intake suction
- 9-43. What total number of levels of maintenance are available in naval aviation?
1. One
  2. Two
  3. Three
  4. Four
- 9-44. What level of aircraft maintenance is responsible for component inspection, disassembly, repair, reassembly, testing, and fabrication?
1. Organizational
  2. Intermediate
  3. Depot
- 9-45. Which of the following publications must you use to inspect support equipment prior to its use?
1. Maintenance manual
  2. Operations manual
  3. Maintenance requirements card
  4. Preoperational card
- 9-46. How often must a preoperational card be used when inspecting support equipment?
1. First thing in the morning only
  2. Every other day if the equipment has not been used
  3. Prior to the first use of the day and any use thereafter
  4. At the end of the day
- 9-47. Which, if any, of the following functions will be stated on the preoperational card?
1. How to make a minor repair
  2. Make adjustments
  3. Correct defective conditions
  4. None of the above
- 9-48. What publication governs the Support Equipment Operator Training and Licensing Program?
1. *Naval Aviation Maintenance Program (NAMP)*, OPNAVINST 4790.2
  2. *Aviation Support Equipment Technician 3 & 2*, Vols. 1 & 2, NAVEDTRA 12385
  3. *Aviation Support Equipment Basic Handling and Safety Manual*, NAVAIR 00-80T-96
  4. *Aviation Support Equipment General Operating Procedures Manual*, NAVAIR 17-1-128
- 9-49. What total number of training phases are there in the Support Equipment Operator Training and Licensing Program?
1. One
  2. Two
  3. Three
  4. Four
- 9-50. Where would you receive support equipment phase 1 training?
1. Aboard ship
  2. Squadron
  3. AIMD sponsored school
  4. Support equipment "A" school
- 9-51. Which of the following divisions has the responsibility for monitoring the Support Equipment Operator Training and Licensing Program?
1. Quality assurance
  2. Line
  3. Support equipment
  4. Maintenance
- 9-52. What is the Support Equipment Operator's License commonly known as?
1. White license
  2. SE card
  3. Yellow license
  4. Operator's license
- 9-53. Completion of support equipment Phase 1 training at an AIMD-sponsored school certifies completion of Phase 1 training only and does not authorize you to operate any given piece of support equipment.
1. True
  2. False



9-54. Which of the following persons authorizes and signs your "yellow license" upon completion of Phase 2 training?

1. Commanding officer only
2. Maintenance officer only
3. Commanding officer or maintenance officer
4. Quality Assurance Officer

9-55. From the date of issue, your yellow license is good for what total number of years?

1. One
2. Two
3. Three
4. Four

9-56. Upon witnessing a support equipment misuse or abuse violation, which of the following personnel may submit a misuse and abuse form?

1. Maintenance officer
2. Supply officer
3. Chief petty officer
4. Anyone witnessing misuse or abuse

