

CHAPTER 5

PORTABLE FIRE-FIGHTING AND DEWATERING EQUIPMENT

Learning Objectives: To recall the characteristics and operation of various types of portable fire extinguishers, oxygen breathing apparatus for fire fighters, shipboard dewatering equipment and portable fans and blowers.

Aboard ship, Sailors use portable fire extinguishers to extinguish fires in compartments or in the galley. A fire-fighter's ensemble provides protection for fire fighters, and the ensemble is enhanced by various types of oxygen breathing apparatus (OBA) for use when fire fighting or conducting gas-free testing or inspection. Additionally, dewatering equipment, which includes pumps and eductors, may have to be used when fighting fires along with other portable equipment, such as fans and blowers. The characteristics and operation of these types of equipment are presented in this chapter.

PORTABLE FIRE EXTINGUISHERS

Learning Objective: To recall the basic characteristics and operation of various types of portable fire extinguishers.

Portable fire extinguishers are used aboard all Navy ships, and the three types most often used are as follows:

- Dry chemical
- Carbon dioxide (CO₂)
- Aqueous film-forming foam (AFFF)

DRY CHEMICAL EXTINGUISHER

Portable dry chemical extinguishers (fig. 5-1) are used primarily on class BRAVO fires. Purple-K-Powder (PKP) is the chemical most often used in these extinguishers. The dry chemical dispensed from the extinguisher interrupts the chemical reaction producing a fire and this action stops combustion.

Dry chemical is also safe and effective for use on class CHARLIE fires; however, carbon dioxide is preferred because PKP fouls electrical and electronic components. Also, PKP should not be used on internal

fires of gas turbines or jet engines unless absolutely necessary because it also fouls engines. PKP is not effective on class ALPHA fires and can only be used to knock down flames and keep the fire under control until an appropriate extinguisher can be used.

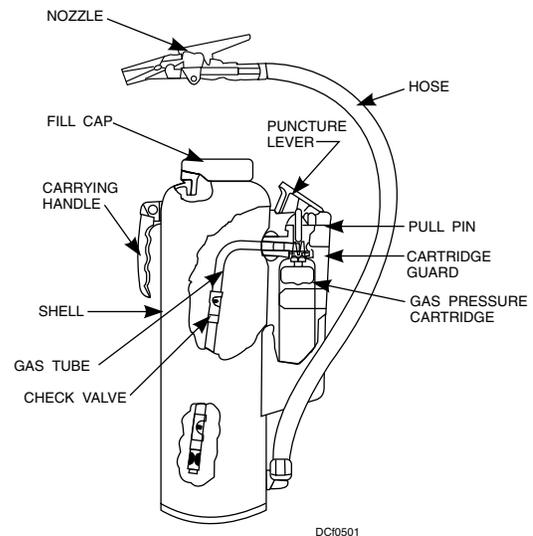


Figure 5-1. Portable dry chemical fire extinguisher.

PKP extinguishers come in an 18-pound and a 27-pound size. Most PKP extinguishers have a small CO₂ cartridge mounted on the outside of the extinguisher shell. This cartridge provides the propellant charge for the extinguisher. Do NOT pressurize the PKP extinguisher until you are ready to use it.

The steps of the procedure you should adhere to when operating a dry chemical extinguisher are as follows:

- Step 1. Carry the extinguisher to the scene of the fire.
- Step 2. Remove the seal and pull the locking pin from the puncture lever marked PUSH.
- Step 3. Push the puncture lever down to penetrate the seal of the CO₂ cartridge. The extinguisher is now ready to use.
- Step 4. Approach the fire from the windward side, if possible. Hold the extinguisher in one hand and the nozzle in the other hand.

Step 5. Discharge the dry chemical by squeezing the squeeze grip on the nozzle. Hold the nozzle firmly and direct the dry chemical at the base of the fire. Use a wide-sweeping motion from side to side. This will apply a dense, wide cloud of dry chemical over the area. Remember that the 27-pound extinguisher has a 21-foot range and the 18-pound extinguisher has a reach of 19 feet.

Step 6. Be certain that all of the fire in the area in which you are working is extinguished before you move in farther. If the fire appears to be too large or if there is a possibility of being outflanked or surrounded by flames, attack the fire with the assistance of two or more personnel using extinguishers.

Step 7. Do not try to economize on the dry chemical. Use as much as necessary (and as many extinguishers as necessary) to extinguish the fire completely.

Step 8. Always back up dry chemical with water or foam.

Step 9. After a dry chemical extinguisher has been used, invert the cylinder, squeeze the discharge lever of the nozzle, and tap the nozzle on the deck. This will release any pressure left in the cylinder and cartridge and any dry chemical left in the hose and nozzle. By inverting the cylinder, you prevent further discharge of dry chemical and conserve the powder. Make sure that dry chemical does not remain in the hose and nozzle; it will cake up and clog them.

The steps of the procedure you should adhere to when recharging a dry chemical extinguisher are as follows:

Step 1. Invert the extinguisher and tap the side of the cylinder with the nozzle to knock down any loose dry chemical. Then bleed off the pressure.

Step 2. Remove the fill cap.

WARNING

Do NOT lean over the top of the extinguisher when you remove the fill cap. If dry chemical splashes on you, it could cause severe injury to your skin and eyes.

Step 3. Fill the cylinder with dry chemical only to the bend in the tube. The extra space allows the powder to be aerated when the cylinder is pressurized. This ensures that the powder will not be caked when it is applied.

Step 4. Remove any dry chemical from the internal threads of the bottle and from the threads of the cap.

Step 5. Replace the fill cap.

The steps of the procedure you should adhere to when installing a new CO₂ cartridge are as follows:

Step 1. Lift the lever cutter assembly and insert the locking pin.

Step 2. Reseal the locking pin and cutter lever.

Step 3. Remove the guard covering the CO₂ cartridge.

Step 4. Unscrew the expended CO₂ cartridge.

Step 5. Remove the cap and gasket from a new CO₂ cartridge.

Step 6. Thread the new cartridge, which has left-hand threads, into the fitting of the cutter assembly.

Step 7. Replace the CO₂ cartridge guard.

AQUEOUS FILM-FORMING FOAM FIRE EXTINGUISHER

Portable aqueous film-forming foam (AFFF) fire extinguishers are used to provide a vapor seal over a small fuel spill, extinguish small class BRAVO fires (such as deep fat fryers), and for standing fire watch during hotwork.

The portable AFFF fire extinguisher (fig. 5-2) is a stainless steel cylinder containing 2 1/2 gallons of premixed AFFF concentrate and water. It is pressurized with air to 100 psi at 70° and weighs approximately 28 pounds when fully charged. The mixture will expand about 6.5 to 1 and will produce about 16 gallons of foam. The AFFF extinguisher has a 55-65 second continuous discharge time and an initial range of 15 feet, which decreases during discharge.

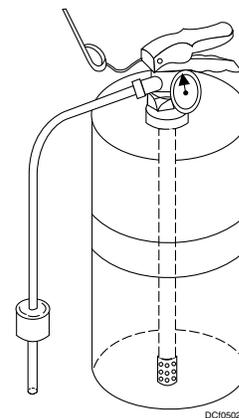


Figure 5-2. Portable aqueous film-forming foam fire extinguisher.

Some important facts you should remember about the operation and use of an AFFF extinguisher are as follows:

1. The AFFF extinguisher is designed for use on class BRAVO pool fires; however, it may also be used on class ALPHA fires. AFFF is NOT recommended for use on class CHARLIE fires (energized electrical components).

2. Before attacking a fire, ensure the pressure within the cylinder is within the proper range, and remove the locking pin. To operate, squeeze the operating lever above the carrying handle. The extinguisher is capable of continuous operation or multiple bursts.

3. AFFF extinguishes class ALPHA fires by cooling. It is superior to water because AFFF has added wetting and penetrating ability. For small class ALPHA fires, apply AFFF to the base (source) of the fire.

4. AFFF extinguishes a class BRAVO fire or protects an unignited fuel spill by floating on the flammable liquid and forming a vapor seal. One AFFF extinguisher will effectively extinguish 20 square feet (4 1/2 feet by 4 1/2 feet) of flammable liquid fire. To apply, start from 15 feet away and sweep the AFFF from side to side at the base of the fire. One AFFF extinguisher can be used to vapor seal a fuel spill to prevent a fire up to 40 square feet (about 6 feet by 6 feet) in size. Larger fuel spills, or spills which are not fully accessible or visible, should be covered using 1 1/2-inch AFFF hose or by the installed bilge sprinkling system.

5. Deep fat fryer fires often require special procedures to extinguish them. Combinations of AFFF and PKP may be needed to put out these fires and prevent their spread throughout the space or into ventilation ducting. AFFF should only be directed at the back wall of the fryer, allowing the stream to flow onto the surface of the burning oil. This technique does not disrupt the cooking oil and allows the fire to be put out and a layer of foam to be developed over the oil.

WARNING

Do not direct AFFF directly into hot cooking oil because doing so can result in immediate boiling of the AFFF. This violent boiling may result in hot cooking oil splashing out of the fryer onto fire fighters.

CARBON DIOXIDE FIRE EXTINGUISHER

The standard Navy CO₂ fire extinguisher (fig. 5-3) has a rated capacity (by weight) of 15 pounds of CO₂. Removing the locking pin and squeezing the release valve built into cylinder valve operates it. CO₂ extinguishers are primarily used on small electrical fires (class CHARLIE) and have limited effectiveness on class BRAVO fires.

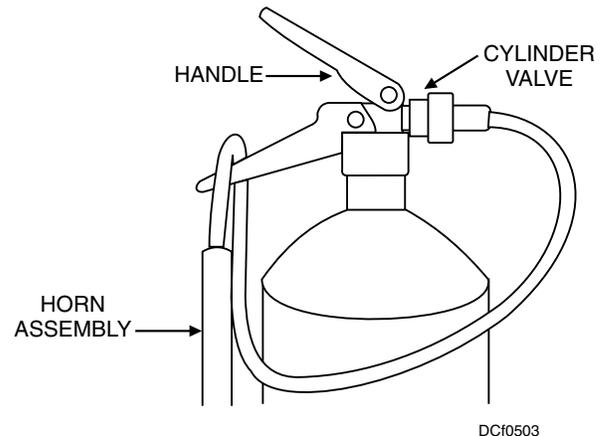


Figure 5-3. 15-pound carbon dioxide fire extinguisher.

The steps of the procedure you should adhere to for operating the CO₂ extinguisher are as follows:

Step 1. Carry the extinguisher in an upright position and get as close to the fire as possible.

Step 2. Place the extinguisher on the deck and remove the locking pin from the valve.

Step 3. Grasp the insulated handle of the horn. Rapidly expanding CO₂ causes the horn to become quite cold.

Step 4. Squeeze the operating lever to open the valve and release CO₂. Direct the CO₂ toward the base of the fire. The maximum range of a 15-pound CO₂ extinguisher is 4 to 6 feet from the outer end of the horn. In continuous operation, the 15-pound CO₂ extinguisher will be expended in approximately 40 seconds.

WARNING

Shock from static electricity can be avoided if you ground the cylinder to the deck when discharging CO₂.

Many ships have a CO₂ transfer unit to recharge the 15-pound cylinders from 50-pound CO₂ cylinders in a well-ventilated space. The CO₂ transfer unit (fig. 5-4) consists of an electric motor, a pump, a high-pressure hose, a control valve, adapters, and fittings. The transfer

unit is maintained according to the Planned Maintenance System (PMS) and with the manufacturer's instructions.

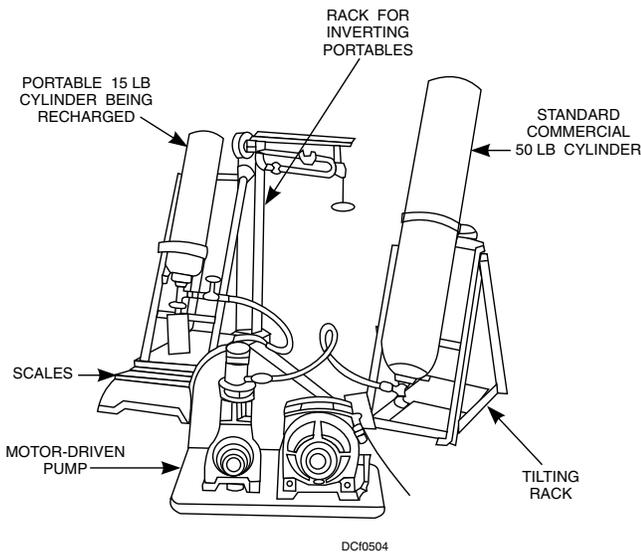


Figure 5-4. CO₂ transfer unit.

As a Damage Controlman, you may be required to clean, inspect, and lubricate the CO₂ transfer unit. You may also be involved in replacing components of the unit, testing as required, and in recharging CO₂ bottles.

Before operating the CO₂ transfer unit, you must ensure the switch on the side of the motor is in the OFF position. Check the circuit from which the motor is to be energized and make certain it is the same as that indicated in the nameplate on top of the motor. If a 220-volt, 60-cycle, single-phase current is available, the hookup of the motor leads should be arranged so the motor will operate in this circuit. A wiring diagram for operation on 220 volts is located on the motor nameplate. Check all CO₂ connections on both the inlet hose and outlet hose. (The 6-foot-long hose is the pump outlet hose.) Make certain that all connections between the fittings are tight. This is very important, because the CO₂ is stored under high pressure.

The steps of the procedure you should adhere to when operating the CO₂ transfer unit are as follows:

Step 1. With the transfer unit, scale, and tilt racks in place, check the supply cylinder. Use only the 50-pound commercial cylinders. The cylinder shall be inverted.

Step 2. Connect the pump inlet hose to the supply cylinder outlet. The connection adapter of the hose is fitted with a screen to prevent the entrance of any

foreign matter into the transfer unit or into the cylinder being recharged. Do not open the supply cylinder valve.

Step 3. Place the empty cylinder on the scale. If a rack is used, invert the cylinder in a near vertical position; otherwise set it horizontally.

Step 4. Connect the pump outlet hose to the recharging adapter. The pump outlet hose is fitted with a shutoff valve. Check all connections to ensure that they are correct and secure. All connections should be made with a wrench, using a slow, steady pulling motion. Do not jerk the wrench and do not hit it with a hammer.

Step 5. After making certain that the shutoff valve in the pump outlet hose is tightly closed and the valve of the cylinder to be recharged is in the OPEN position, completely open the valve of the supply cylinder.

Step 6. Balance the scale and note the weight of the cylinder being recharged. When using beam-type scales, set the scale to the weight of the empty cylinder plus the desired charge.

Step 7. Open the shutoff valve in the pump outlet hose and allow the CO₂ in the supply cylinder to flow under its own pressure into the cylinder being recharged.

Step 8. When the weight of the cylinder being recharged stops increasing, the CO₂ has stopped flowing under its own pressure. At this point, start the transfer unit and watch the scale carefully. The transfer pump should be started only when all valves are verified correctly aligned; otherwise, overpressurization in the transfer system may rupture the neoprene seal.

CAUTION

Do not close the valve of the cylinder being recharged or the shutoff valve in the pump outlet hose while the transfer unit is pumping.

Step 9. When the full capacity of the cylinder being recharged has been reached, perform the following operations in rapid succession.

- a. Stop the transfer unit motor.
- b. Tightly close the shutoff valve in the pump outlet hose.
- c. Close the valve of the cylinder being recharged.

Step 10. Disconnect the hose from the cylinder being recharged. Do this very slowly to allow the escape

of the CO₂ that is trapped between the shutoff valve and the cylinder being recharged.

Step 11. Weigh the recharged cylinder carefully. Note the charged weight on the cylinder record card.

Step 12. After recharging is complete, close the supply cylinder valve tightly. Open the shutoff valve in the pump outlet hose very slowly and allow all the CO₂ in the unit to be discharged to the atmosphere.

REVIEW QUESTIONS

- Q1. What type of fire-fighting agent is known to foul electrical and electronic components, as well as the internal parts of turbines and engines?
1. Water
 2. Halon
 3. AFFF
 4. PKP
- Q2. What type of fire-fighting agent may be used to vapor seal a small fuel spill?
1. Water
 2. Halon
 3. AFFF
 4. PKP
- Q3. Before using a portable CO₂ fire extinguisher, you should ground the cylinder to the deck.
1. True
 2. False

PROTECTIVE EQUIPMENT

Learning Objective: Recall the purpose and operation of protective equipment used in fire fighting.

The Navy uses a wide variety of special fire-fighter's protective equipment. It includes the oxygen breathing apparatus (OBA), the self-contained breathing apparatus (SCBA), the fire-fighter's ensemble, and antflash clothing. Other equipment includes gloves, fire-fighter's helmet, antflash hood, and voice amplifiers. You will need to know what equipment is available, how to operate it, and how to maintain it in top condition.

OXYGEN BREATHING APPARATUS

The type A-4 oxygen breathing apparatus (OBA) is used throughout the Navy. The OBA is an entirely self-contained breathing apparatus. It enables the wearer to breathe independently of the outside atmosphere. It produces its own oxygen from chemical reaction and allows the wearer to enter compartments, voids, or tanks that contain smoke, dust, or fire, or those that have a low oxygen content.

Major OBA Components

You will be required to wear and operate the type A-4 OBA and to maintain it in perfect condition. To do so, you must know the various components of the OBA and their functions. Figure 5-5 shows the components and identifies them. As you read about the various components, refer to this figure as well as to the additional figures pertaining to the individual components.



- | | |
|-----------------------------|------------------------------|
| 1. Facepiece | 7. Bail assembly handle |
| 2. Breathing tubes | 8. Canister release strap |
| 3. Breathing tube couplings | 9. Relief valve and pull tab |
| 4. Body harness and pad | 10. Timer |
| 5. Breathing bag | 11. Plunger assembly |
| 6. Breastplate assembly | 12. Valve assembly |

Figure 5-5. Components of the OBA.

FACEPIECE.—The OBA facepiece (fig. 5-6) contains the eyepiece, the speaking diaphragm, and the head straps. The eyepiece is a one-piece clear lens. A spectacle kit is provided that may be installed in the facepiece. Corrective lenses may be installed in the kit

for individuals who require glasses. However, once the lenses are installed, only the person that the lenses are made for can use that spectacle kit. The speaking diaphragm allows you to talk to others and to use communication devices, such as sound-powered telephones. The head straps hold the facepiece snug against your face. If the straps are adjusted properly, no outside gases can get inside of the facepiece.

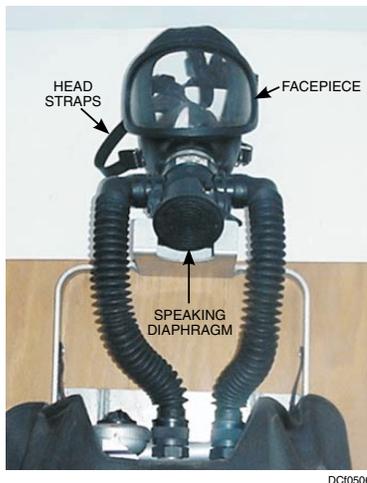


Figure 5-6. Facepiece with spectacle kit installed.

BREATHING BAG AND TUBES.—The OBA has a breathing bag and two breathing tubes to control the oxygen. The breathing bag contains the oxygen that is generated by the canister for you to breathe. One breathing tube transports the oxygen from the breathing bag to the facepiece (fig. 5-7); the other transports the exhaled air back to the canister. Both tubes are made of corrugated rubber. They control the flow of air and help cool the air for your comfort when you wear the OBA. The tubes are a quick-disconnect type. The tube couplings are color coded, and the supply tube is of a different size than the exhaust tube. This prevents the possibility of connecting the tubes to the wrong couplings.

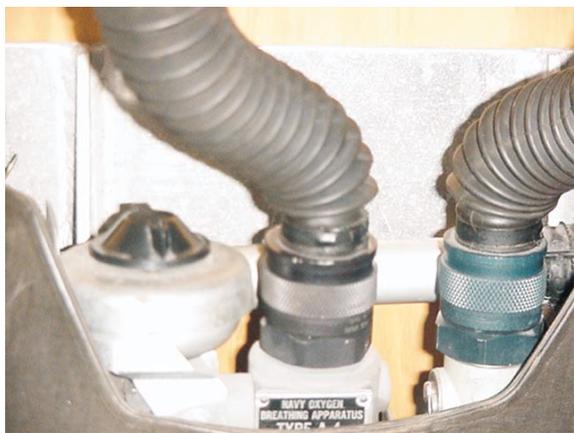


Figure 5-7. Breathing tubes.

TIMER.—The timer (fig. 5-8) is located at the top of the breastplate assembly so that you can check the amount of time remaining as you go about your duties. The bell of the timer is made to ring for 8-10 seconds continuously.

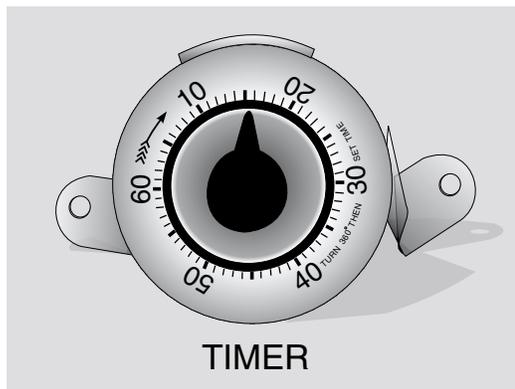


Figure 5-8. Timer.

BREASTPLATE ASSEMBLY.—The breastplate assembly (fig. 5-5) houses the plunger assembly, the canister guard and holder, and the handle. The plunger pierces the copper foil seal of the canister when the canister is seated in place. The handle actuates the seating mechanism that positions the canister in its housing. The outside of the breastplate assembly is insulated to protect you from the heat produced by the oxygen canister.

COMBINATION VALVE ASSEMBLY.—The combination valve assembly is shown in figure 5-9. It directs the flow of air through the canister to the breathing bag.

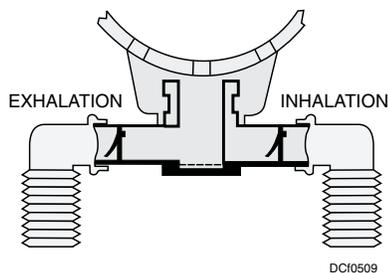


Figure 5-9. Combination valve assembly.

OBA QUICK-STARTING CANISTER.—The quick-starting canister (fig. 5-10, views A and B) is painted green. This is the only canister that you will use aboard ship. The rubber gasket provides an airtight seal when the canister is in the operating position in the OBA. The copper foil seal protects the chemicals from moisture until the canister is ready for use. The chlorate candle, which is built into the canister, produces oxygen for about 5 minutes until normal oxygen generation begins. You will be able to breathe

in the oxygen and exhale it just as if you were not wearing an OBA. The moisture and carbon dioxide from your exhaled breath activate the chemicals in the canister. The chemicals in the canister cleanse your exhaled breath of the moisture and carbon dioxide and return the cleansed air to you as you inhale.



Figure 5-10. View A, front view of quick-starting canister for use with Type A-4 oxygen breathing apparatus.

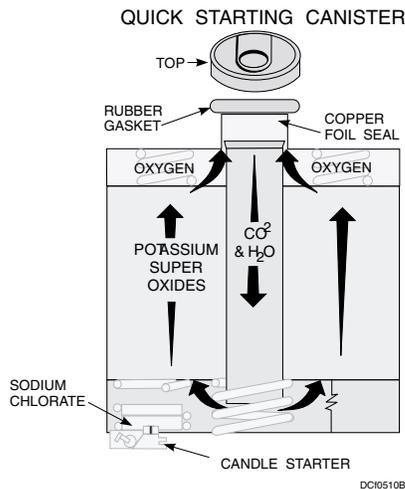
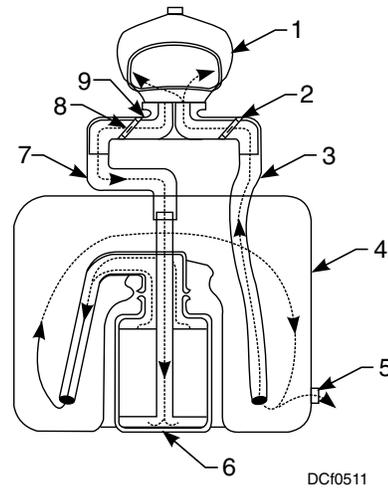


Figure 5-10. View B, cross-sectional view of quick-starting canister.

The amount of your exertion will determine how long the canister produces oxygen. The more active you are, the faster the chemicals will be expended. The canister will last longer when you are doing mild work, such as investigating shipboard damage. When you are involved in hard work, such as fighting a fire, the canister will last for about 30 minutes. Your normal breathing habits will also effect the length of time the canister will last. When you replace an expended canister with a new canister, do so only in fresh air.

Airflow System

At this point, you should know and understand the use of each component of the OBA. Figure 5-11 shows an OBA with a canister installed. The arrows indicate the airflow through the OBA.



- | | |
|-------------------------------|--------------------------|
| 1. Facepiece | 5. Pressure relief valve |
| 2. Inhalation valve | 6. Canister |
| 3. Inhalation tube | 7. Exhalation tube |
| 4. Breathing bag | 8. Exhalation valve |
| 9. Combination valve assembly | |

Figure 5-11. Airflow diagram.

As you exhale, moist breath passes through the exhalation tube (7), through the valve housing to the bottom of the canister (6), and upward through the chemical. The carbon dioxide is absorbed, and the moisture present reacts with the chemical to give off oxygen. This oxygen passes into a breathing bag (4) (part of the breastplate group) from which the inhalation tube (3) allows the breathable mixture to be drawn into the facepiece (1) by your normal intake of breath.

Check valves (2 and 8) are used in the inhalation and exhalation passages. An automatically operated pressure-relief valve (5) in the breathing bag relieves excess pressure in the breathing bag. The speaking diaphragm, as described earlier, is built into the facepiece.

OBA Operating Procedures

Damage Controlmen use the OBA on a regular basis for fire-fighting and training purposes. It will protect you; however, improper use of the OBA could make you a personnel casualty. The following topics

discuss the type A-4 OBA operating procedures. It is very important that you learn to use them properly. You should practice the operating procedures under the supervision of a leading petty officer who is qualified in the use of the OBA.

DONNING THE OBA.—The steps of the procedure for donning the OBA are as follows:

Step 1. With one hand, grasp the facepiece at the combination valve housing and the apparatus at the operating handle. With the other hand, grasp the straps of the body harness and the body pad D ring. Bring the pad and harness over your head while positioning the OBA on your chest. See figure 5-12.



Figure 5-12. Step 1, donning the OBA.

Step 2. Find the two straps hanging free in back (fig. 5-13, view A). Attach the end of each strap to the ring on each side of the breastplate (fig. 5-13, view B).

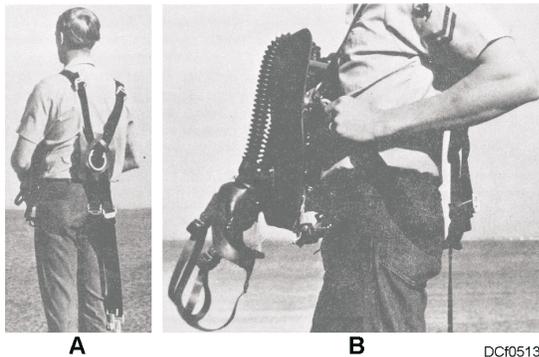


Figure 5-13. Step 2, donning the OBA.

Step 3. Position the breastplate on your chest so that the breathing tube connections are slightly below your shoulders. Your head movement should not be restricted when you don the facepiece. While holding the apparatus in this position, adjust the two underarm straps and then adjust the two shoulder straps (fig. 5-14) until the apparatus fits comfortably. The harness pad should be located in the center of your back, down from the neck for a comfortable fit.

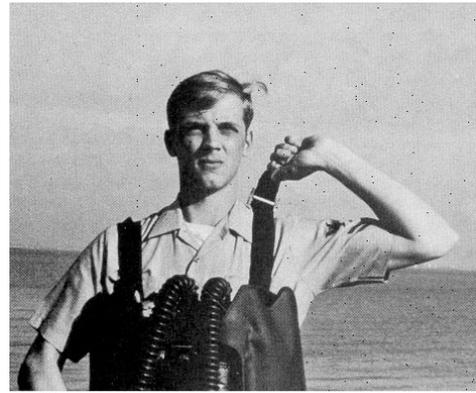


Figure 5-14. Step 3, donning the OBA.

Step 4. Place the facepiece over your head in the standby position (fig. 5-15) until you are ready to activate the canister.



Figure 5-15. Step 4, donning the OBA.

Step 5. Install the canister in the following manner:

a. Remove the tear-off cap of the canister by pulling the tab backward and downward to expose the copper-foil seal (fig. 5-16). Discard the cap.



Figure 5-16. Step 5, removing the tear-off cap.

b. Remove the canister candle cover by rotating the swivel plate 180°. Push it down toward the center of the canister, as shown in view A of figure 5-17.

Leave the cover dangling by the lanyard, as shown in view B of figure 5-17. When you remove the candle cover, do NOT pull the lanyard so that the cotter pin is removed. The removal of the cotter pin fires the candle, and the canister starts generating oxygen. If this happens while the copper-foil seal is intact, internal pressure in the canister will build up. This pressure will cause the copper foil seal or the canister seam to rupture.

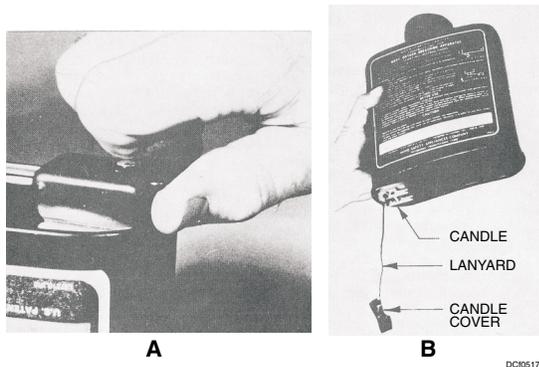


Figure 5-17. Removing the candle cover, views (A) and (B).

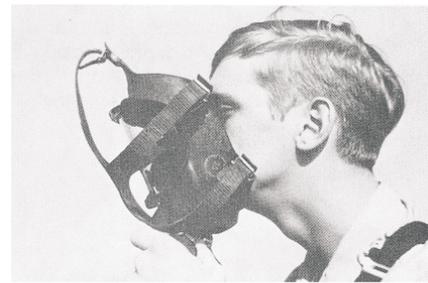
c. Hold the canister with the neck up and the concave, or ribbed side, toward your body. Insert the canister upward into the guard and breastplate assembly (fig. 5-18) until the canister is firmly in place. The canister is now locked in a standby position with the copper-foil seal still intact. If the copper-foil seal is pierced when the canister is placed in the standby position, the standby stop will need to be adjusted. An OBA that pierces the copper-foil seal in the standby position is NOT to be used until the adjustments are made.



Figure 5-18. Inserting the canister.

Step 6. Don and adjust the facepiece as follows:

- a. Place the head harness straps over the front of the facepiece.
- b. Insert your chin into the chin stop of the facepiece (fig. 5-19, view A).



A



B

DC10519

Figure 5-19. Step 6, donning the facepiece, views (A) and (B).

- c. Pull the head straps from the front of the facepiece over your head (fig. 5-19, view B). Be sure your hair is not under the facepiece shield.
- d. Make sure the straps lie flat against your head.
- e. Tighten the lower straps (neck straps) first.
- f. Tighten the side straps.
- g. Place both hands on the head harness pad (on the back of your head) and push it down toward your neck.
- h. Repeat steps e and f.
- i. Tighten the forehead or front strap, if needed.

Step 7. Test the facepiece for a good seal by squeezing the corrugated breathing tubes tightly to prevent the passage of air (fig. 5-20). Inhale gently so the facepiece collapses slightly, and hold your breath for 10 seconds. The facepiece will remain collapsed while your breath is held if the assembly is gas tight. If you detect any leakage around the face seal, readjust your head harness straps. If you detect other than face-seal leakage, investigate the condition and correct it. You **MUST** test the facepiece for a seal before each use.

Step 8. Make final adjustments on all four body harness straps. You should be able to look up or down without having the facepiece shift or catch on the timer or the main valve housing.



Figure 5-20. Step 7, checking the airtightness of the facepiece.

Step 9. If you are going into a standby or ready condition, loosen only the lower facepiece straps and then remove the facepiece. Place the facepiece over your head and out of the way until ready to start the canister and put the OBA into operation. In an emergency, eliminate this step.

STARTING THE CANISTER.—When ordered to enter the contaminated area, you start the canister in the following manner:

Step 1. If your facepiece is in the standby position, put it on before starting the canister. Retighten the lower straps and retest your facepiece for a proper seal.

Step 2. Unlock the bail assembly handle of the OBA by using both hands to depress the tabs from the bottom lock. Swing the handle upward until it snaps. Test the handle to see if it is locked by lightly pushing the handle forward without depressing the tabs.

Step 3. Pull the lanyard on the canister straight out and away from your body. This removes the cotter pin (fig. 5-21), fires the candle, and inflates the breathing bag with oxygen. After you pull the lanyard, always check to ensure that the cotter pin is still attached to the lanyard. A slight amount of harmless smoke may be present in the facepiece while the candle is burning.

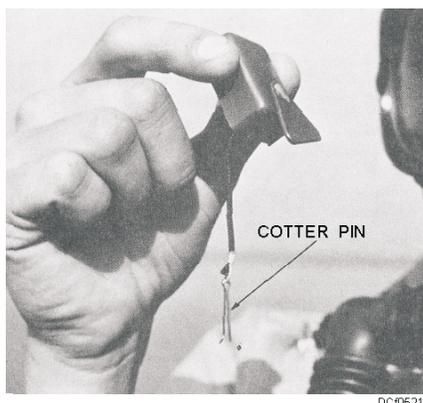


Figure 5-21. Checking for the cotter pin.

Step 4. Now, test the tube connectors, canister, and breathing bags for tightness. While the candle is filling the breathing bag, depress the breathing bag at the pull tab with your left hand. Grasp and seal off both breathing tubes with your right hand, while pressing against the right side of the breathing bag with your right elbow (fig. 5-22). The bag must be compressed at the pull tab so that the relief valve does not vent during this test. The bag must remain inflated; otherwise, there may be a leak in the OBA, which you must correct before use.

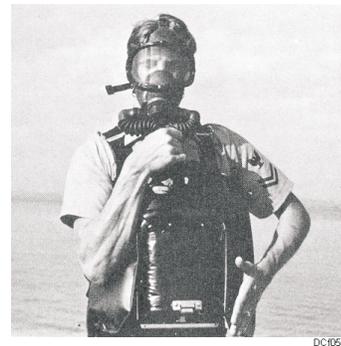


Figure 5-22. Testing the OBA.

Step 5. Breathe normally. The chemical reaction of the canister will generate more oxygen than you require. If too much oxygen is produced, the extra oxygen will be vented automatically by the relief valve in the bag when the bag reaches full capacity. A manual relief pull tab on the valve (fig. 5-23) is provided in case the valve sticks in the closed position during a long period of storage. Do NOT pull the breathing bag tab during normal use. If you do, you will vent your breathing oxygen from the breathing bag to the atmosphere.



Figure 5-23. Manual relief valve tab.

In the event of a malfunction of the candle, you can activate the canister manually. The manual starting of the canister is not recommended. The procedures listed here are to be used only when the chlorate candle has misfired and sufficient time is available to start the

canister manually or if there is a shortage of available canisters. Under no circumstances should you save the chlorate candle to use for an emergency exit of the space. Such practice is dangerous, and the candles have been known to misfire.

When manually starting the canister, you should be in a clean atmosphere and must adhere to the following procedure:

Step 1. Work one finger under the edge of your facepiece, stretching the mask slightly to break the seal.

Step 2. Inhale while grasping and squeezing both breathing tubes with your other hand. This will allow you to draw external air from outside the facepiece.

Step 3. Release the breathing tubes, remove your finger to reseal the mask, and exhale into the facepiece.

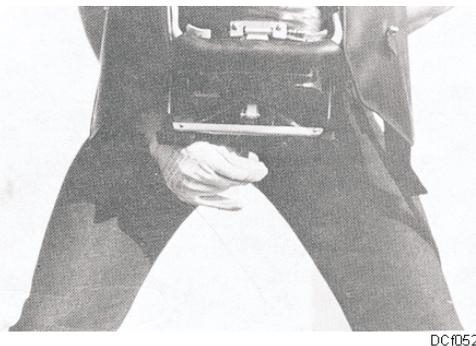
Step 4. Continue this cycle until your breathing bag is fully inflated. Exhaust the air in the breathing bag by exerting pressure on the right-hand side until the bag on the right is deflated. In this process, your moist breath passes through the canister to start the chemical reaction. One filling of the bag is not usually sufficient to activate the canister fully.

Step 5. Repeat steps 1 through 4 to reinflate and deflate the breathing bag at least five times. Now, without gloves, cautiously feel the bottom of the canister. If the entire bottom of the canister is warm, oxygen is being generated. The apparatus is then ready for setting the timer and for the operational check. If the canister is not warm, repeat steps 1 through 4. In cooler temperatures, several cycles of inflation and deflation of the bag may be required to start oxygen production.

SETTING THE TIMER.—To set the timer, grasp the knob on the timer. Turn the knob clockwise to 60 minutes, and then turn it counterclockwise to 30 minutes. By setting the timer to 60 first, you fully wind the alarm bell spring. When 30 minutes have expired, the warning bell will sound continuously for 10 or more seconds. When you have set the timer, you are ready to enter a hazardous atmosphere.

REMOVING AN UNUSED CANISTER.—If the copper-foil seal of the canister has not been punctured, remove the canister by placing one hand on the bottom of the canister and pulling the canister releasing strap. You do not need to wear gloves in this situation. The handle must also be in the load and standby positions. Once the canister is removed, protect the copper-foil seal by installing an aluminum cap. These caps are designed for this purpose and are maintained in repair lockers.

REMOVING A USED CANISTER.—When you remove a hot canister, you need to protect your hands with approved protective gloves. Once the canister has been used, remove the facepiece and put it over your head in the standby position. Then release the bail from the operation position and swing it down to the load and standby positions. Next spread your feet apart and lean the upper part of your body slightly forward. To release the used canister, pull the canister release strap (fig. 5-24). The canister will drop out of the apparatus (fig. 5-25). Drop the canister **ONLY** on a clean, dry deck.



DC10524

Figure 5-24. Releasing the canister.

WARNING

You must be careful when removing used canisters from the OBA. The canisters are hot, and the chemicals inside of the canister are similar to caustic soda and can cause serious chemical burns if they get on your skin. Also, the chemicals will cause a violent explosion if they come into contact with a petroleum-based substance.



DC10525

Figure 5-25. Dropping the canister.

DISPOSAL OF USED CANISTERS.—You must dispose of an OBA quick-starting canister as soon as possible after it has been used or when the copper-foil seal has been punctured. If your ship is more than 25 nautical miles from shore, the OOD may

grant permission to dispose of the canister overboard. Once permission has been granted, ensure that the canister cap is removed and the copper-foil seal is fully punctured. This will allow water to enter the canister. DO NOT puncture holes in the bottom or sides of the canister. Make sure there is no oil in the water. Then throw the canister overboard. If oil gets inside of the canister, a violent explosion will occur. If you are within 25 nautical miles of shore, do not throw the canister overboard. Instead, let it cool down for at least 30 minutes. (If a canister was not used but the copper-foil seal has been punctured, place the canister in a clean bucket. Light off the canister and let it set for 15 minutes to cool.) When the canister is cool enough to handle, place a new metal cap on the neck to cover the punctured copper-foil seal. Then double wrap the canister in a poly bag. The wrapped canister should then be stored in a dry, oil-free area until it can be disposed of at sea or turned over to a shore facility for disposal. When the ship is in port, contact the department ashore that is responsible for hazardous waste. Make arrangements with that department to turn all canisters over to them for disposal.

REMOVING THE OBA.—The steps of the procedure for removing the OBA are as follows:

Step 1. Remove the facepiece by releasing the head straps at the buckles with your fingertips before pulling the headpiece off. If the canister is still in the OBA, place the facepiece over your head in the standby position and remove the canister. NEVER remove the OBA with a canister in place.

Step 2. If the facepiece is in standby position, you should remove it and let it hang in front of the OBA.

Step 3. Loosen the waist strap; then unhook it.

Step 4. Loosen the shoulder straps and unhook the harness at the upper corners of the breastplate assembly. Grasp the facepiece and operating handle with one hand and the shoulder harness (preferably at the D-ring connector) with your other hand. Lift the OBA over your head.

Step 5. If the OBA is wet or moist, wipe it down.

Step 6. Always clean the outside body of the OBA after each use with a mild solution of soap and warm water.

Step 7. Disinfect the inside of the facepiece. Mix the disinfectant according to the manufacturer's instructions, as stated on the container label. Use a sponge that is moist, but not dripping, with the disinfectant solution.

OBA Equipment Stowage

Before the OBA is stowed, the facepiece should be protected to prevent scratches and abrasions. All OBA equipment and canisters must be stored in a cool, dry place. The life of an OBA will be lengthened if it is stored under these conditions. The term *cool* denotes temperatures ranging from above freezing to 110°F (43°C) when storage is out of direct sunlight. The term *dry* usually denotes a storage area where condensation does not come in contact with the equipment.

The OBA is normally stowed in repair lockers or in OBA lockers. These lockers have provisions for stowing the OBA in a flat position. You should ensure that the facepiece is properly protected to prevent scratching or scarring of the lens. The flash hood may be used to protect the lens of the facepiece. The canisters should be stowed with the concave side down. Additional information on cleaning, inspecting, and testing of the type A-4 OBA can be found in the *Naval Ships' Technical Manual (NSTM)*, chapter 079, volume 2, and the appropriate PMS.

SELF-CONTAINED BREATHING APPARATUS

The self-contained breathing apparatus (SCBA) is now being phased aboard ship as a replacement for the OBA. The SCBA is designed to be used for fire fighting and is entirely self-contained, allowing the wearer to breathe independently of the outside atmosphere. It provides clean breathable air from a tank carried on the back that allows the wearer to enter spaces in much the same manner as an OBA.

The SCBA operates using a demand-pressure system. When the wearer inhales normally, the regulator opens, allowing air to flow into the mask. When the wearer exhales, a simple one-way valve (known as an exhalation valve) vents the exhaled air without allowing contaminants from the outside atmosphere to enter the mask. This operation is also known as an open-circuit system.

There are several different models of SCBA in use, both aboard ship and at shore facilities. All SCBAs have four basic component assemblies and operate in a similar manner. The assemblies are as follows:

1. Harness/backpack assembly
2. Air tank assembly
3. Regulator assembly (including low-pressure alarm and high-pressure hose)
4. Facepiece assembly

The SCBA is an important piece of protective equipment and personnel must be given proper training on its safe operation. This training will be conducted according to the manufacturer's technical manuals, and maintenance will be accomplished according to the associated PMS and with the manufacturer's technical manual. The training will include but not be limited to the following: cleaning, inspection, and replacement of components.

SUPPLIED AIR RESPIRATOR WITH SELF-CONTAINED BREATHING APPARATUS

The supplied air respirator (SAR) with self-contained breathing apparatus (SCBA) is commonly referred to as the SAR/SCBA. It is designed primarily to support gas-free testing and inspections. The SAR/SCBA can be used to inspect tanks and voids, including those suspected of having flammable, explosive, or toxic atmospheres. The SAR/SCBA cannot be used for a fire-fighting breathing apparatus. Additionally, it cannot be used as a diving apparatus for investigating flooded or submerged spaces.

The SAR/SCBA provides breathing air for compartment or void inspections from portable cylinder systems through air hoses and a facepiece (fig. 5-26). The primary air supply pack (PASP) is a lightweight assembly containing one high-pressure air cylinder and a control panel assembly. Figure 5-27 (views A and B) shows the top control panel and the front control panel. The air cylinder contains 87 standard cubic feet (scf) of air at 4,500 pounds per square feet gauge (psig). A reserve air supply pack (RASP) (fig. 5-28) provides two additional cylinders and is connected to the control panel assembly on the PASP. The control panel assembly allows the operator to select and shift air cylinders as necessary to ensure constant airflow to personnel inside a space or void. One air cylinder can support one SCBA user for up to 55 minutes.

Two gauges and an audible alarm monitor air pressures. An air regulator reduces the air pressure to 60-80 psig for delivery to the air distribution system. The manifold has four quick disconnects to allow up to four SCBA users to simultaneously connect to the PASP. A bleed valve allows a means to depressurize the

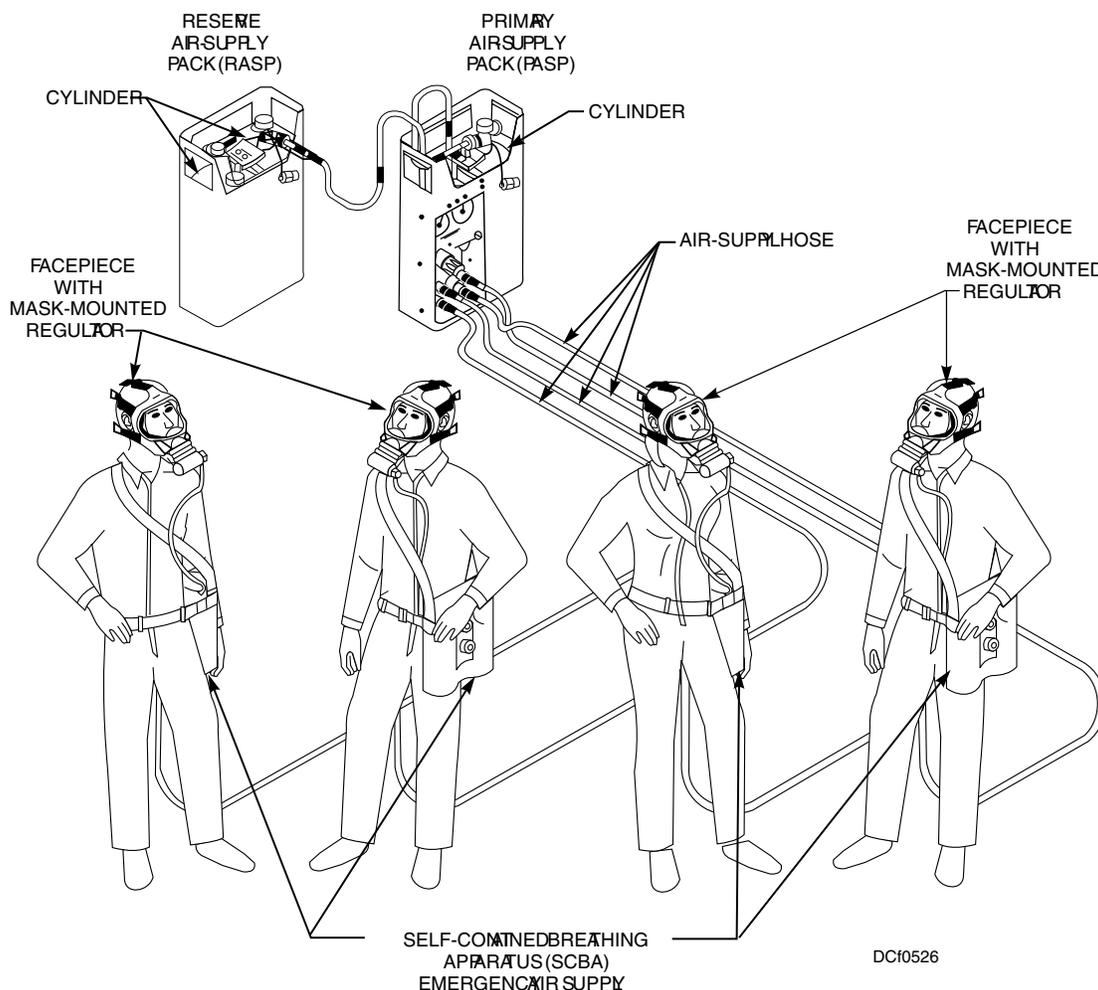


Figure 5-26. SAR/SCBA component interrelationship diagram.

system. No more than four lengths of air supply hoses may be used in making up a maximum working length of hose. Each hose is 75 feet in length.

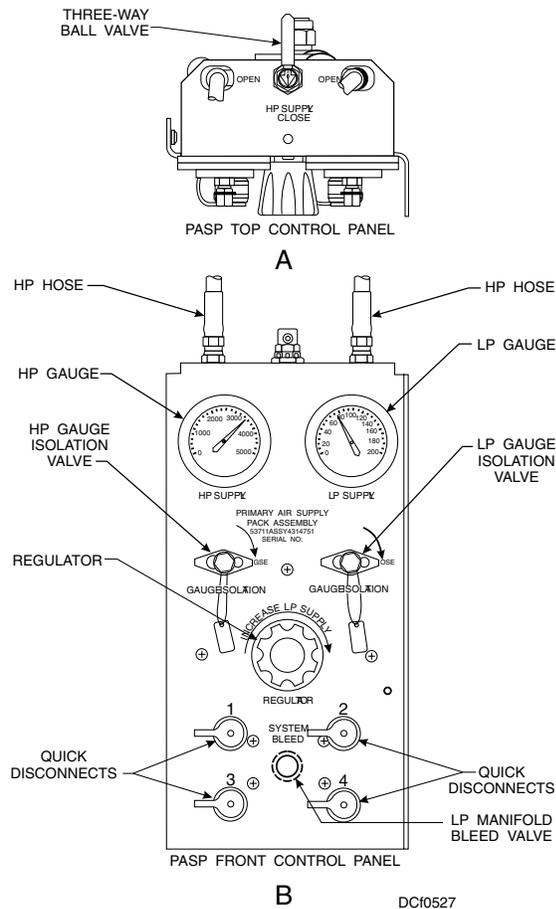


Figure 5-27. PASP controls and indicators, (view A) top and (view B) front panels.

The self-contained breathing apparatus (SCBA) provides a source of backup air if the PASP/RASP airflow is interrupted or fails. It consists of two lightweight escape cylinders, a full facepiece with a mask-mounted pressure demand regulator, a first stage regulator, an alarm, and other associated components. A harness and carry pouch is provided to carry and protect the cylinders. The SCBA provides an emergency air supply of 15 minutes. Proper techniques to don and remove the SCBA will vary slightly due to different styles of SCBA, and you will learn and practice these techniques either aboard ship or at a Fleet Training Center, during fire-fighting team trainer evolutions.

WARNING

Properly performed scheduled maintenance is essential to safe, dependable operation of the supplied air respirator (SAR) with the self-contained breathing apparatus (SCBA). Omission or lax performance of prescribed maintenance procedures could result in equipment failure, injury, or death to personnel.

Cleaning, inspections, and scheduled maintenance of the SAR/SCBA is vital for personnel safety and must be completed according to scheduled PMS and the manufacturer’s technical manual.

FIRE-FIGHTER’S ENSEMBLE

The fire-fighter’s ensemble is designed to protect the fire fighter from short duration flame exposure, heat, and falling debris. Your safety during actual casualties and training evolutions may depend on proper wearing of the ensemble. Your hose team will practice donning and removing the ensemble (as well as the OBA or SCBA), and you will be expected to become proficient at donning your equipment in a rapid, safe, and correct manner.

The components of the fire-fighter’s ensemble include the following:

- Fire-fighter’s coveralls
- Fire-fighter’s antflash hood
- Damage control/fire-fighter’s helmet
- Fire-fighter’s gloves
- Fire-fighter’s boots

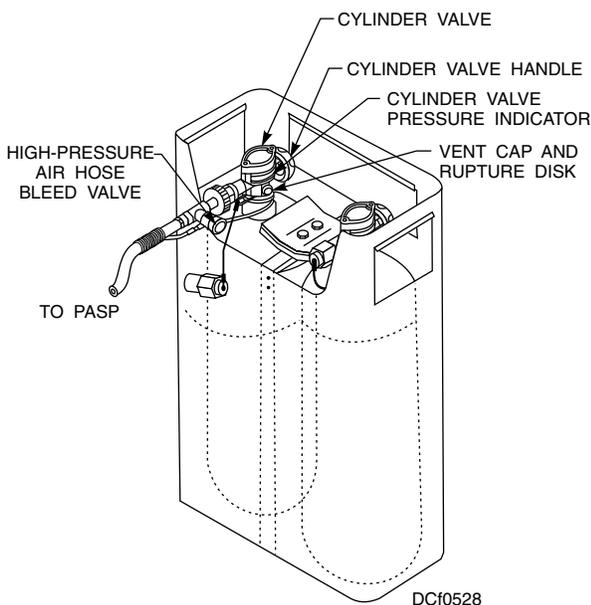


Figure 5-28. RASP controls and indicators.

WARNING

The fire-fighter's ensemble is not a proximity suit, nor is it designed to wear to make a crash fire rescue. Prolonged contact with flames may cause the clothing to transmit dangerous heat to the body, or may cause the clothing itself to burn, which could result in serious injury or death to the fire fighter. The ensemble does not offer complete protection against chemical, biological, or radiological effects.

Fire-fighter's Coveralls

The fire-fighter's coveralls is a one-piece jump suit style. The coveralls consists of an outer shell, a vapor barrier, and an inner fire-retardant liner. The knees, bottoms of the thigh pockets, and bottoms of the legs are reinforced with leather for extra protection. Reflective marking strips around the upper arms, the lower legs, and the torso highlight the outline of the fire fighter so that he or she can be seen in dense smoke or dim light.

Fire-fighter's Antiflash Hood

The fire fighter's antiflash hood provides protection to the head, neck, and face (except the eyes). The hood can be worn with the breathing apparatus, over the straps of the facepiece. It has an elastic face closure and is available in a single size which fits all.

Damage Control/Fire-fighter's Helmet

The fire-fighter's helmet is designed to protect the head, neck, and face from short duration flame exposure, heat, and falling objects. The helmet shell material is heat-resistant fiber glass. The helmet is a long, rear brim, face shield with a chin strap, adjustable suspension, reflective markings, and ear flaps that cover the side of the head and neck. High-intensity battery-powered helmet lights are provided in the repair locker and may be attached to the helmet.

Fire-fighter's Gloves

Fire-fighter's gloves are provided to protect against abrasion, short duration flame exposure, and heat. They are made of leather, aluminized fabric with a waterproof vapor barrier and a fire-retardant liner.

Fire-fighter's Boots

The fire-fighter's rubber boots have steel safety toes and puncture-proof steel insoles. They are provided in two models, knee high and hip length, and in a variety of sizes. The knee-high version are the most

commonly used boots. The hip boots provide protection from deeper levels of hot or boiling water.

ANTIFLASH CLOTHING

Antiflash clothing is intended to protect personnel from transient high temperatures that may occur from the use of high explosive weapons and from being burned in a fire. Antiflash clothing consists of an antiflash hood and antiflash gloves. The hood is the same one used with the fire-fighter's ensemble. The antiflash gloves are made from fire-retardant cotton and one size fits all.

REVIEW QUESTIONS

- Q4. What piece of fire-fighter's equipment produces its own oxygen and allows entry into otherwise uninhabitable areas?
1. MCU-2P protective mask
 2. Protective overgarment
 3. MOPP oxygen generator
 4. Oxygen breathing apparatus (OBA)
- Q5. The chlorate candle of an OBA quick-starting canister can produce oxygen for approximately what maximum length of time, in minutes?
1. 9
 2. 8
 3. 6
 4. 5
- Q6. Why must you turn an OBA timer to 60 minutes before turning it back to 30 minutes?
1. To release the lock on the clock
 2. To clear the timer of any impurities
 3. To wind the timer fully
 4. To activate the timer alarm
- Q7. What person can grant permission to dispose of used OBA canisters when your ship is at sea?
1. OOD
 2. DCA
 3. XO
 4. LCPO

- Q8. The self-contained breathing apparatus (SCBA) is a piece of fire-fighter's equipment that provides air from a tank carried on your back that allows you to enter spaces in much the same manner as an OBA.
1. True
 2. False
- Q9. The primary purpose of the SAR/SCBA is to support gas-free testing and inspections.
1. True
 2. False
- Q10. The emergency air supply of the SAR/SCBA is stored in two lightweight cylinders in a harness and carry pouch.
1. True
 2. False

PORTABLE EMERGENCY PUMPS

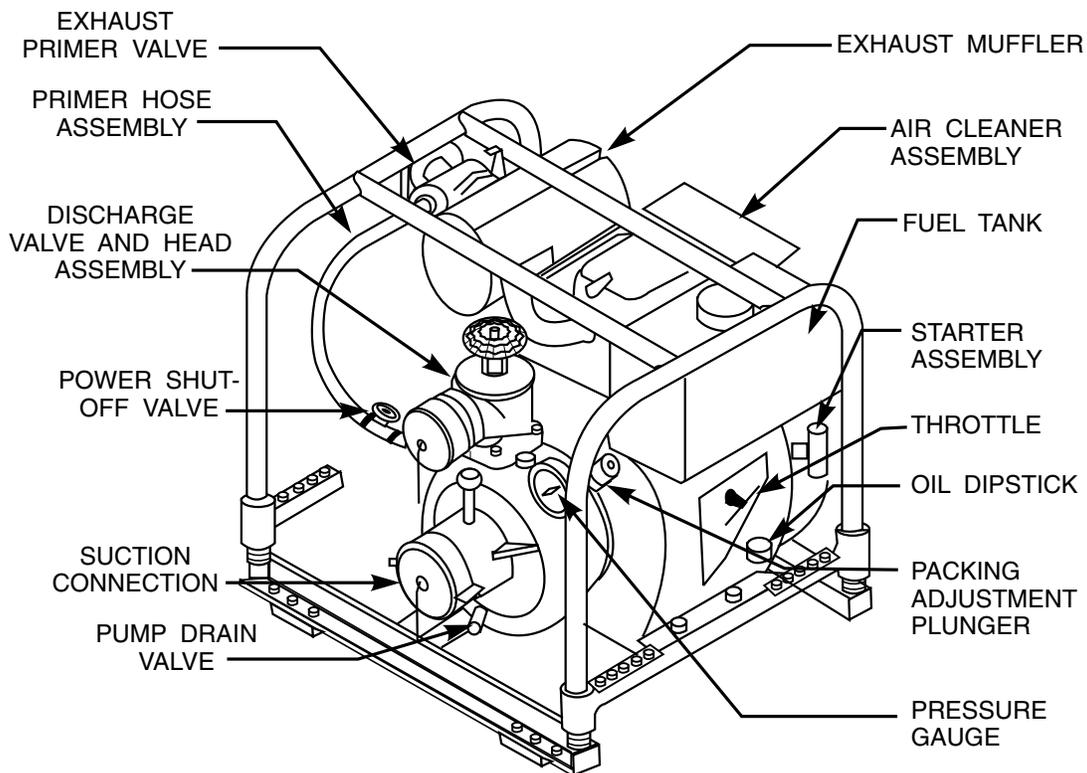
The P-100 portable pump is a diesel engine-driven centrifugal pump assembly, used aboard ship for fire fighting and dewatering (fig. 5-29). When used for fire fighting, the P-100 pump draws water from the sea and pumps the water through hoses to supply the firemain or individual fire hoses. When used for dewatering, the P-100 takes suction on a flooded compartment and discharges it into the sea. The P-100 is designed to provide 100 gpm at 83 psi with a suction lift of 20 feet. Other configurations may be rigged to create a greater suction lift; these are discussed in *NSTM*, chapter 555, volume 1 (series).

The P-100 pump is a single-suction, one-stage centrifugal pump. The suction and discharge connections have male threads, which are 3 inches and 2 1/2 inches, respectively. The suction hose is a 3-inch-hard rubber hose and may be fitted with a foot valve assembly. The foot valve consists of a flapper valve (to keep the engine primed) and a strainer to keep large foreign matter out of the pump.

Two examples of fire-fighting hookups are shown in figures 5-30 and 5-31. A dewatering configuration is shown in figure 5-32. (Shown on the following pages.)

DEWATERING EQUIPMENT

Learning Objective: To recall general information about various types of emergency dewatering equipment located aboard ship.



DCf0529

Figure 5-29. P-100 portable diesel engine-driven centrifugal pump.

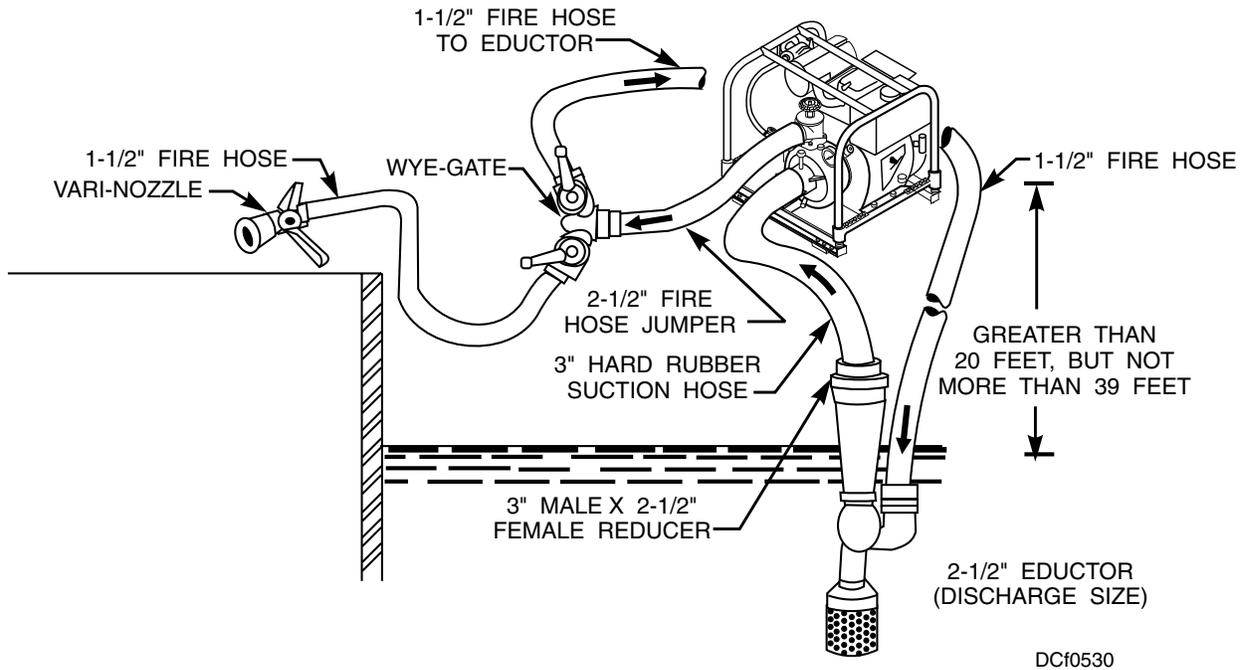


Figure 5-30. Fire-fighting hookup.

An air-cooled single-cylinder, four-cycle diesel engine rated at 10 horsepower powers the P-100 pump. A mechanical governor is used to control the speed of the engine. It contains a 1.45 gallon fuel tank that will allow up to 2.75 hours of operation. The engine exhaust muffler is constructed to receive an exhaust hose. (See warning.)

WARNING

The diesel engine exhaust contains poisonous carbon monoxide. Never use the pump unit in poorly ventilated locations, such as enclosed spaces. If such operation is unavoidable, provide proper ventilation and use an approved exhaust hose routed to the weather decks.

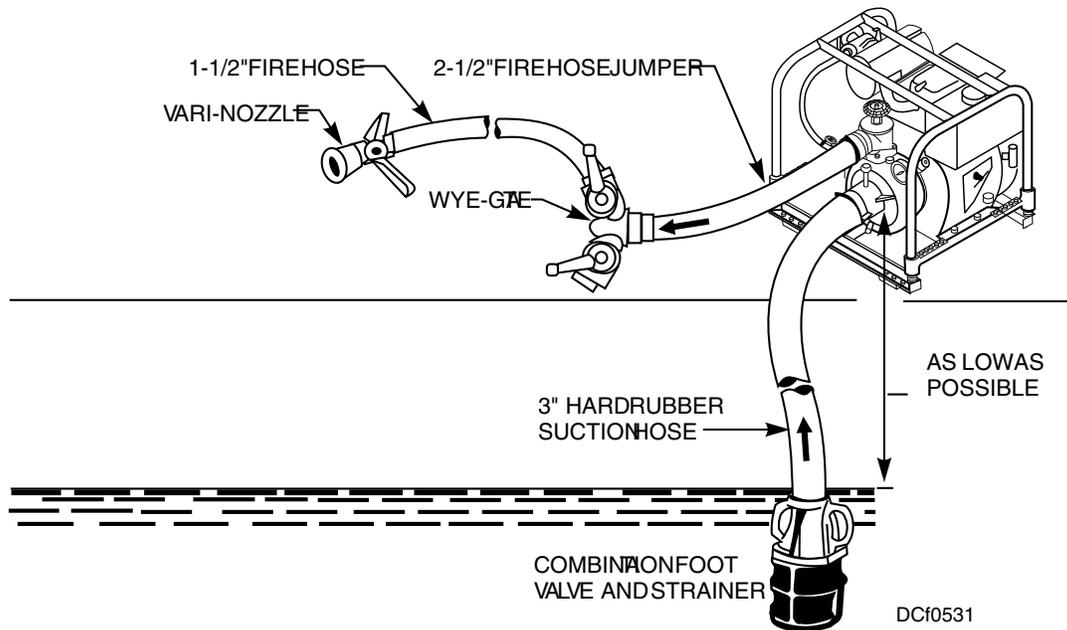


Figure 5-31. Fire-fighting hookup for suction lifts greater than 20 feet.

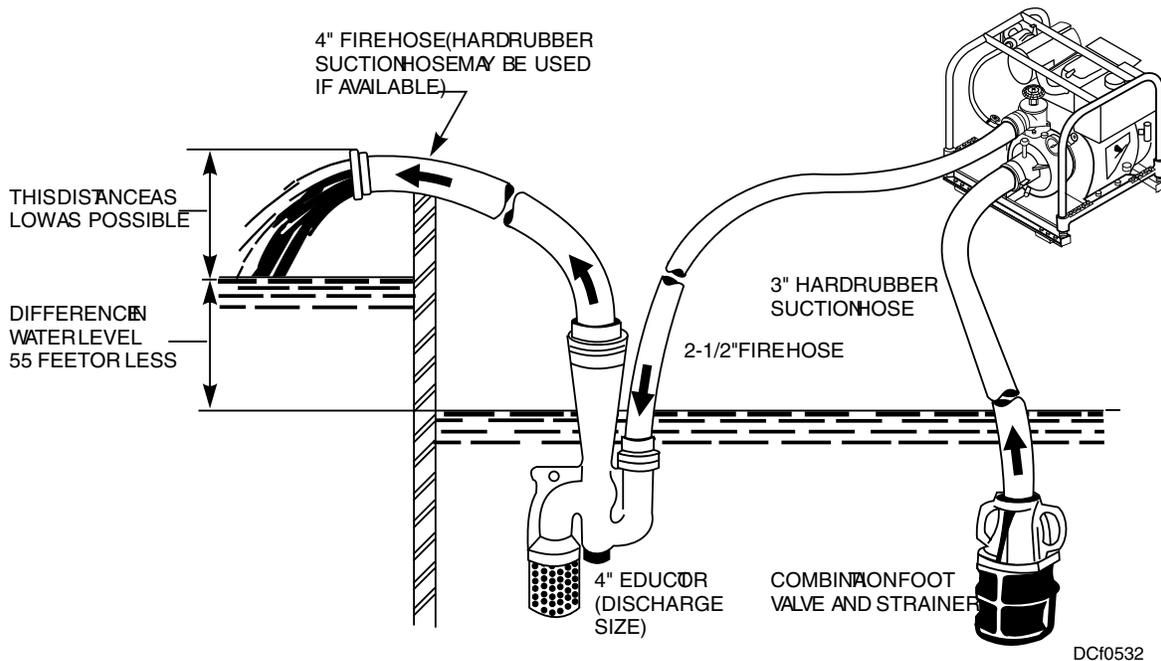


Figure 5-32. A typical P-100 dewatering configuration.

The P-100 pump should be stowed on the damage control deck or above. No more than one single pump will be stored within a single main watertight division. One pump, complete with all accessories, will be stowed for ready transfer off the ship for rescue and assistance use. The P-100 pump has a total dry weight of 106.9 pounds; therefore, one person should not attempt to move it alone.

Various types of maintenance will be required to maintain the P-100 pump in operating condition, such as cleaning, inspection, lubrication, and testing. Maintenance will be accomplished according to PMS. Repairs may also be necessary and should only be accomplished by trained personnel, using approved procedures from the manufacturer's technical manual.

PORTABLE SUBMERSIBLE PUMPS

The portable submersible pump (fig. 5-33) used aboard naval ships is a centrifugal pump driven by a water-jacketed constant speed ac electric motor and may be designed to operate as single or three phase at 120, 240, or 440 volts. This design is rated to deliver 140 gallons per minute against a maximum head of 70 feet and 180 gallons per minute at a 50 foot static head. This output is variable and will increase with a decrease in head pressure. Strainers are always used

with submersible pumps when floodwater is being pumped. Some pumps of this type are mounted semipermanently with the discharge connected to a drainage system.

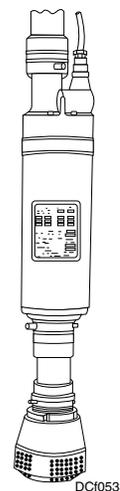


Figure 5-33. Ac portable electric submersible pump.

To dewater a compartment with a submersible pump, lower the pump into the water using the attached nylon handling line and lead the 2 1/2-inch discharge hose to the nearest point of discharge. This may be an emergency overboard discharge connection, found on the damage control deck. The amount of water taken from a flooded space increases as the discharge head decreases. Therefore, dewatering is accomplished

most efficiently if the water is discharged at the lowest practicable point and if the discharge hose is short and free from bends and kinks. When it is necessary to dewater against a high discharge head, you can use two submersible pumps in tandem (series), as shown in figure 5-34. The pump at the lower level lifts water to the suction side of the pump at the higher level. A multiple outlet connection box is used to make the necessary electrical connections and will allow concentration of multiple pumps in a single location.

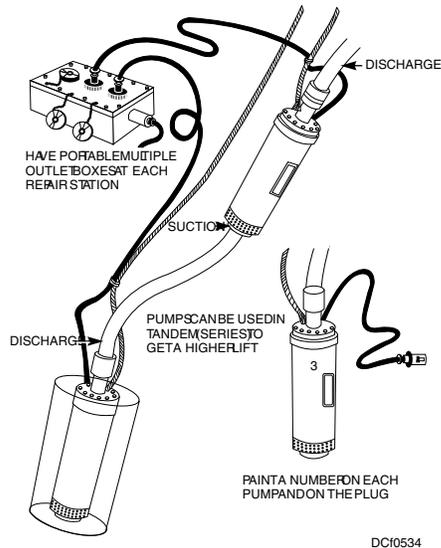


Figure 5-34. Tandem connections for submersible pumps.

When using a submersible pump, always lower it and raise it by the nylon handling line and NOT by the electric cable. Handling the pump by the electric cable could break the watertight seal where the cable enters the housing. The handling line is secured to the pump housing through an eye installed for that purpose. It may be married to the power cable (tied together), provided considerable slack is left in the cable at the pump end.

Submersible pumps are not designed to pump gasoline or heavy oil. Since the pumped liquid circulates around the motor as a coolant, gasoline can leak into the motor and cause an explosion. If you use a submersible pump to pump heavy oil, the motor will burn out because the viscous liquid will impose a heavy load on the motor. Also, a heavy, viscous liquid will not dissipate heat rapidly enough to keep the motor cool.

An electrical submersible pump must be carefully checked out by an electrician before use; do not wait until a casualty develops to discover a malfunctioning pump. All repairs, testing, and maintenance must be

accomplished according to PMS and the manufacturer's technical manual.

PORTABLE AND FIXED EDUCTORS

Eductors (fig. 5-35) are jet-type pumps that contain no moving parts. An eductor contains jets (sometimes called nozzles), as shown in figure 5-36, through which water flows under pressure. The fireman (or the P-100 fire-fighting pump) supplies the actuation water that enters the eductor through the supply connection. The velocity (speed) of the water increases while flowing through these nozzles and creates a vacuum in the suction area of the eductor. The suction side of the eductor is connected to a noncollapsible hose or may be submerged into a flooded space to remove the water.

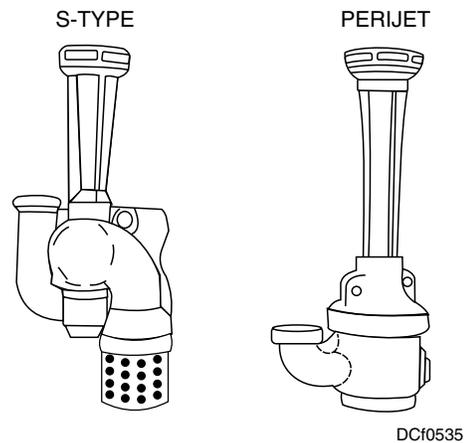


Figure 5-35. Portable eductors.

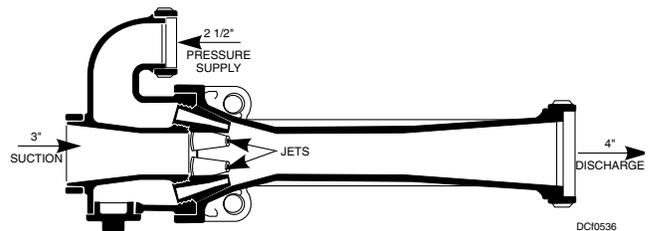


Figure 5-36. Cross-sectional view of a perijet eductor.

Eductors are used to pump liquids that cannot be pumped by other portable pumps (such as heavy oils and flammable liquids) and are able to remove liquids that contain small particles of foreign matter. The rate of dewatering will depend on actuation pressure (from

the firemain) and the discharge head (how far above the eductor the water has to rise to be removed). When observing the eductor operation, you must be aware that not all of the eductor discharge is supplied from the compartment being dewatered. A large percentage of this discharge is the actuation water supplied by the firemain

NOTE

Oils and flammable liquids are not normally permitted to be discharged overboard and should be disposed of according to environmental regulations.

There are other factors, which may affect eductor operation. The condition of the suction piping must be inspected periodically for deterioration, and all joints and flanges should be tight. Air entering the suction piping will prevent the eductor from operating properly. Drainage valve misalignment in other spaces will affect eductor operation as well. You may unknowingly be removing water from the bilges in an adjacent space instead of the intended compartment. Proper supply pressure from the firemain must be substantially higher than the pressure against which the eductor is required to operate. If the pressure is not high enough to be discharged overboard, it will simply back up through the eductor into the space, actually increasing the rate of flooding in the compartment. Improper valve lineups may actually cause flooding in other compartments. When using the eductor, posted operating procedures, or Engineering Operational Sequence System (EOSS) (if installed), is mandatory.

Installed eductors function to create a vacuum in suction piping, removing water from bilges, either in the compartment where they are located or remotely. Unattended operation, especially in remote spaces, may asphyxiate personnel working in the compartment. Train personnel working in confined or closed spaces to recognize the potential for hazards of asphyxiation.

WARNING

Eductors located in remote spaces, if activated, can remove all breathing air, particularly if ventilation is secured, inadequate, or not installed. Ensure sufficient make-up air is provided and the space has adequate oxygen before entry in all eductor-equipped remote spaces. Maintain communication with personnel working inside the remote space while eductor operation is in progress.

Concern for the environment is extremely important, and various pollution laws have been enacted. Federal law prohibits the discharge of oil into inland or coastal waters, and there are restrictions pertaining to shipboard discharges on the high seas. The engineering officer of the watch (EOOW) must give permission for eductor operation.

Fixed eductors are installed in the ship's main drainage system and are normally used to dewater bilges. Fixed eductors are normally of the perijet design with no suction strainers installed. A cross-sectional view of a perijet eductor is shown in figure 5-36.

Portable eductors can be rigged as required to dewater a compartment or space. They are often used with the P-100 pump to dewater compartments. Figure 5-37 shows one arrangement that could be used. In this arrangement both the P-100 pump and the eductor are removing water from the flooded compartment.

PORTABLE AFFF IN-LINE EDUCTORS

The portable in-line eductor is used to mix seawater and AFFF concentrate to produce an AFFF solution for combating fires especially class BRAVO fires. The eductor consists of a bronze body with an internal ball check valve and flexible pickup tube assembly. The eductor is used in conjunction with a 95 gpm vari-nozzle. Seawater passing through the eductor creates a suction in the pickup tube assembly which, in turn, draws AFFF concentrate from a 5-gallon can or 55-gallon drum (fig. 5-38). The eductor mixes the AFFF concentrate and seawater at approximately 6 percent ratio when the inlet pressure to the eductor is 100 psig. Continuous use will require about 5 gallons of AFFF concentrate per minute.

In-line eductors should be connected directly to fire plugs to minimize inlet pressure reduction due to friction loss. Friction loss downstream of the eductor can create sufficient backpressure so the AFFF suction will cease to operate, but seawater will continue to flow. Users of the in-line eductor must limit the hose length downstream of the eductor to three lengths (150 feet) when fighting fires in the horizontal plane or advancing up not more than one deck. When the AFFF eductor is rigged on a deck above the deck where the fire is being fought (as in machinery space re-entry), up to six lengths of hose (300 feet) may be connected downstream of the eductor.

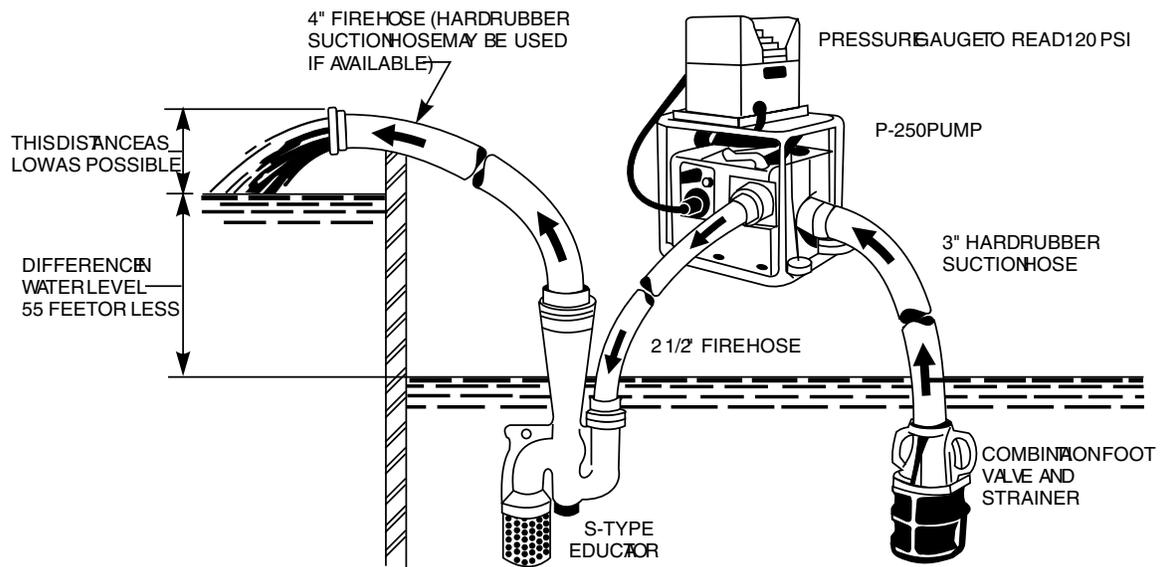


Figure 5-37. P-250 pump and eductor rigged for dewatering a flooded compartment.

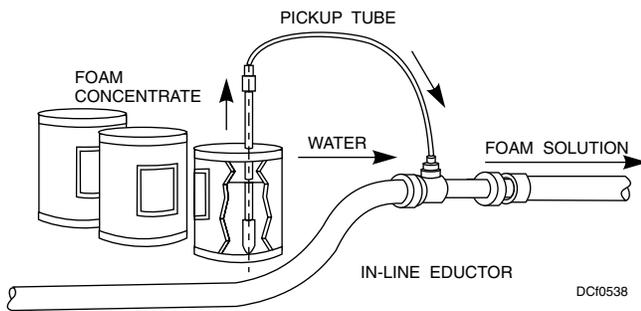


Figure 5-38. AFFF in-line eductor setup.

EMERGENCY OVERBOARD DISCHARGE CONNECTIONS

The emergency overboard discharge connections, port and starboard, are installed through the hull of each main transverse subdivision on the damage control deck. It is a 4-inch connection, reduced to 2 1/2 inches, and is normally used during dewatering evolutions. Some smaller ships may use a standard 2 1/2-inch connection that does not require a reducer. These connections are not normally fitted with valves; instead, they are fitted with watertight screw caps over the inboard ends. Eductor or portable fire-fighting pumps may be directed overboard through these connections.

Maintenance for the emergency overboard discharge connections will include cleaning, inspecting, and lubrication. Maintenance will be accomplished according to the applicable planned maintenance.

REVIEW QUESTIONS

- Q11. What dangerous gas is produced when the P-100 pump is operated?
1. Chlorine
 2. Hydrogen sulfide
 3. Carbon monoxide
 4. Carbon dioxide
- Q12. The portable submersible pump is rated to deliver 180 gallons per minute, against a maximum head of 50 feet.
1. True
 2. False
- Q13. An eductor is a jet-type pump that contains no moving parts.
1. True
 2. False
- Q14. What equipment is designed to mix seawater and AFFF concentrate to produce an AFFF solution for combating fires?
1. Firemain
 2. Submersible pumps
 3. Portable AFFF in-line eductor
 4. P-100 pump with AFFF mixer attached

MISCELLANEOUS PORTABLE EQUIPMENT

Learning Objective: To recall characteristics of desmoking fans and blowers and other miscellaneous pieces of damage control gear.

There are other miscellaneous pieces of portable damage control equipment that you need to be familiar with. These include various fans and blowers and battle lanterns.

PORTABLE FANS AND BLOWERS

Different types of fans and blowers are available for desmoking, and each has different advantages. Some are electric motor-driven and are not to be used in explosive environments. Other blowers are powered by the firemain; these require that the firemain be available and that hoses be rigged to supply them. These fans require cleaning, inspection, and maintenance to ensure their reliability, and this may be your responsibility. Additionally, you may be involved in repairs and/or component replacement and will use PMS and the manufacturer's technical manuals to ensure quality maintenance.

Fans or blowers are often used to recirculate or remove large volumes of air. Electric "box" fans are convenient and easy to rig but pose risks when operating in (or removing) explosive atmospheres. Additionally, these fans require that power be available for operation. Water-driven blowers do not pose this threat (as long as they are properly grounded), but other considerations do apply. The firemain is the motive force for this blower and must be rigged to supply it, as well as a discharge hose.

Portable Ramfan™

The portable Ramfan™ is one of the primary fans used aboard ships today for desmoking or introducing ventilation into a compartment. The firemain or a P-100 pump supplies the power for the Ramfan™ through a 1 1/2-inch hose connection. A water turbine operates the fan blades, which may rotate in excess of 10,000 rpm (depending on firemain pressure). The Ramfan™ is compact (18 inches in diameter) and weighs under 35 pounds, allowing easy transport.

WARNING

Exhausting gases through duct can create a static electric charge. It is important to ensure

positive contact to ground to avoid unwanted discharge while operating around explosive atmospheres.

Portable Electric Desmoking Fans

The medium capacity fan is a portable electric fan designed to be used by damage control personnel for rapidly desmoking compartments in areas where exhaust ducting is not needed. It produces a tight spiral of air or smoke to prevent recirculation into the area being desmoked.

The portable desmoking fan should be inspected for damage before use. Careful inspection of the electrical cord is necessary to prevent shock hazards, and the tamper seal on the electric motor must be intact. If this seal is broken, the fan must not be used in any explosive environments. Ensure that the screen guards are in place before operation.

The portable electric desmoking fan operates using 115 volts ac; simply plug it in and turn it on. Damage control plates and your Main Space Fire Doctrine will assist you in determining the most efficient desmoking methods. Additional guidance may be found in *NSTM*, chapter 555, volume 1.

Cleaning, inspection, and testing of these fans must be accomplished according to PMS and the manufacturer's technical manual.

BATTLE LANTERNS

Battle lanterns are provided throughout the ship for emergency lighting whenever normal lighting is unavailable. The two types of battle lanterns are relay and portable lanterns and they are mounted in strategic locations to illuminate passageways, damage control equipment, ladders, and scuttles. Battle lanterns are damage control equipment, and the damage control petty officer uses PMS to repair and maintain them.

Relay Lanterns

Relay lanterns are installed throughout the ship to provide limited illumination when other sources fail. Battle lanterns use standard-issue 6-volt batteries and are periodically checked to ensure their reliability. The electrical relays in these lanterns turn the lantern on whenever the normal lighting circuits are de-energized. These have the following uses and applications:

- Prevent panic and personnel injury, which might occur in total darkness.
- Mark escape routes (both normal and emergency).
- Permit charging of fixed foam injection units.
- Permit emergency destruction of classified material.
- Permit restoration of electric power.
- Permit operation of locks on facilities installed for stowage of classified material.
- Permit performance of ship control functions, damage control, personnel decontamination, and continued medical treatment where no delay can be tolerated.

Portable Lanterns

Portable lanterns are used to supplement relay lanterns and at other stations where duties involve the functional operation of the ship. Portable lanterns shall be used according to the following requirements:

- Stations and small spaces that are only used occasionally (except such spaces as staterooms and lockers) shall have one lantern.
- In ship magazines, lanterns shall be installed so that there is one to illuminate each access closure and one to illuminate each passing scuttle. One additional lantern per 200 square feet shall be installed, preferably on stanchions, to illuminate aisle spaces.
- In cargo magazines, four lanterns shall be installed at each access.
- Lanterns shall be installed to provide detail illumination of items such as tabletops, charts, and information displays, where such illumination is required to perform ship control functions, and where a slight delay can be tolerated.

FLASHLIGHTS/HEADLAMPS

The Navy provides a variety of general-purpose flashlights for daily use. These flashlights are relatively sturdy, and little maintenance is required. You should inspect the flashlight casing, lens, and switch for damage. Operationally, test the flashlight by turning it on and observing the brightness. If necessary, replace the batteries.

Several models of explosion-proof flashlights are now available for repair locker use and for use in gas-free inspections. These flashlights are sealed so that no electrical current can come in contact with a potentially explosive environment.

Headlamps are installed on fire fighter's helmets to enable the fire fighter to see wherever he turns his head without having to hold a flashlight in his hand. There are several models available; all are battery powered and must be tested periodically to ensure that they will work when needed. Headlamps that fail must be replaced or repaired.

REVIEW QUESTIONS

- Q15. The firemain or a P-100 pump supplies the power for the Ramfan™ through a 1 1/2-inch hose connection.
1. True
 2. False
- Q16. Battle lanterns use standard-issue 6-volt batteries.
1. True
 2. False
- Q17. What person is responsible for performing maintenance on battle lanterns?
1. Officer of the deck
 2. Damage control petty officer
 3. Damage control assistant
 4. Damage control officer

SUMMARY

In this chapter you were introduced to a variety of portable equipment used in fire fighting and in emergency dewatering. Some specialized damage control equipment is covered in other chapters of this book; other newer equipment may not be covered at all. The intent of this chapter is to give you a basic overview of certain portable equipment. To become proficient, you must train with this equipment under proper supervision and familiarize yourself with the technical manuals.

REVIEW ANSWERS

- A1. What type of fire-fighting agent is known to foul electrical and electronic components as well as the internal parts of turbines and engines? **(4) PKP**
- A2. What type of fire-fighting agent may be used to vapor seal a small fuel spill? **(3) AFFF**
- A3. Before using a portable CO₂ fire extinguisher, you should ground the cylinder to the deck. **(1) True**
- A4. What piece of fire-fighter's equipment produces its own oxygen and allows entry into otherwise uninhabitable areas? **(4) Oxygen breathing apparatus (OBA)**
- A5. The chlorate candle of an OBA quick-starting canister can produce oxygen for approximately what maximum length of time, in minutes? **(4) About 5 minutes**
- A6. Why must you turn an OBA timer to 60 minutes before turning it back to 30 minutes? **(3) To wind the timer fully**
- A7. What person can grant permission to dispose of used OBA canisters at sea? **(1) OOD**
- A8. The self-contained breathing apparatus (SCBA) is a piece of fire-fighter's equipment that provides air from a tank carried on your back that allows you to enter spaces in much the same manner as an OBA. **(1) True**
- A9. The primary purpose of the SAR/SCBA is to support gas-free testing and inspections. **(1) True**
- A10. The emergency air supply of the SAR/SCBA is stored in two lightweight cylinders in a harness and carry pouch. **(1) True**
- A11. What dangerous gas is produced when the P-100 pump is operated? **(3) Carbon monoxide**
- A12. The portable submersible pump is rated to deliver 180 gallons per minute, against a maximum head of 50 feet. **(1) True**
- A13. An eductor is a jet-type pump that contains no moving parts. **(1) True**
- A14. What equipment is designed to mix seawater and AFFF concentrate to produce an AFFF solution for combating fires? **(3) The portable AFFF in-line eductor**
- A15. The firemain or a P-100 pump supplies the power for the Ramfan™ through a 1 1/2-inch hose connection. **(1) True**
- A16. Battle lanterns use standard-issue 6-volt batteries. **(1) True**
- A17. What person is responsible for performing maintenance on battle lanterns? **(2) Damage control petty officer**