CHAPTER 3

ADVANCED DAMAGE CONTROL - For Deck and Engine Personnel (Lesson Plans)

Section 3.1

INTERIOR COMMUNICATION SYSTEMS

I. OBJECTIVES.

A. To acquaint shipboard personnel with the purposes of communication systems.

B. To instruct crew members in the types of installed communication systems and their uses.

C. To acquaint personnel with the advantages and limitations of installed communication equipment.

D. To develop skill in the proper methods of using shipboard communication equipment.

II. MATERIAL.

A. Training Aids.

1. Portable sound-powered phones.

2. Ship's installed communication systems.

3. Film strip, SN-62AJ, "Interior Communications - Interior Communications Systems and Installations". (20 minutes, black and white, sound; for showing on 35 mm slide and film strip projector.)

B. References.

1. BuShips Manual, Chapter 65, "Interior Communication Installation".

2. BuShips Manual, Chapter 88, Section II, "Practical Damage Control".

3. NAVPERS 14005, Telephone Talkers Manual.

III. INTRODUCTION

A. Introduce self and subject (Interior Communication Systems).

B. Explain the scope and method of conducting the advanced damage control course.

C. Interior communication systems, as the name implies, are systems installed for communicating within the ship, between various interior locations.

D. These systems are necessary for:

1. The safety of ship, passengers, crew and cargo.

2. Interchange of orders and information between control stations and action stations.

3. Drills and emergencies.

4. Automatic warning of dangerous conditions.

E. Of prime importance are:

1. The reliability of individual communication systems.

2. Correct understanding of the scope, use, operation, and limitations of installed communication systems.

IV. PRESENTATION - Interior Communication Systems.

A. Types of Systems. Interior communication systems are electrical, mechanical, electronic and other devices for communicating information or orders between various locations within the ship as distinct from between ships, or ship to shore. Interior communication equipment will vary as to number and types of systems with the size, type and purpose of the particular ship. The main systems are:

1. Ship's service dial telephone system (in passenger ships).

2. Installed sound-powered telephone system.

3. Emergency sound-powered telephone system.

4. Engine order telegraph system.

5. General announcing system (public address).

6. Ship's intercommunicating system (talk-back).

7. Engine room - bridge intercommunicating system.

8. General alarm and ship's whistle.

9. Speaking tubes.

10. Other special systems and alarms.

B. Description of Systems.

1. Ship's Service Dial Telephone System. This system is composed of an automatic telephone switchboard which is located in the intercommunication (IC) room and the necessary number of dial telephones located throughout the ship. Each phone is assigned a number and dialing this number from any other station makes the connection automatically and rings the dialed station. A directory of station numbers should be posted at each station. However, you should memorize the extension of the bridge so that you can call the bridge without delay in emergencies.

2. Installed Sound-Powered Telephone System. This consists of a permanently installed wire phone circuit with handset phone stations, either desk type or bulkhead mounted, at various locations throughout the ship. Each station is fitted with a selector switch and a ringer crank. To use:

a. Lift the handset from its hook or cradle.

b. Set the selector switch on the desired station.

c. Turn the ringer crank. The bell will ring at the selected station only while ringer crank is being turned.

d. Lifting the receiver at the station called completes the connection.

e. This system is somewhat similar to a shoreside party line. All stations listening in are connected and can join in the conversation.

3. Emergency Sound-Powered Telephone System. The emergency sound-powered phone system consists of:

a. An installed wire phone circuit with jack boxes at selected locations and a number of portable phone headsets which can be plugged in at any jack box in the circuit. Again all stations plugged in are connected together and can talk with all others in the circuit, two-way. However, only one person should talk at a time or the message will be garbled.

b. Where a built-in sound-powered telephone system is not installed, repair parties have a portable sound-powered outfit. The assigned telephone talker will lay the wire from the scene of the emergency to Damage Control Central. The wire is a two-strand cable connecting headsets at each end. To talk, you must press the button on the mouthpiece and hold it down while talking. Release it to listen. No electric power is neede for either the installed or the emergency sound-powered systems--they are energized by sound vibrations.

4. Engine Order Telegraph System consists of annunciator pedestals with control dials and indicators at all conning stations (bridge, flying bridge, after steering station) and in the engine room. It provides means for relaying engine speed and direction (ahead-astern) orders from the conn to the engine room control platform and for acknowledgement back. It also provides a quick way for the engine watch officer to notify the conning officer of what speed he can maintain in case of engineering casualty below. In this event, the report must be followed by detailed information by telephone or by messenger immediately following the telegraph notification. The follow-up message would cover the type and extent of the casualty, progress in correcting, estimated time to complete corrective measures, and speed that can be maintained.

5. General Announcing System (Public Address) consists of a central microphone station on the bridge and loudspeakers in selected locations throughout the ship. There may be additional microphone stations in other locations from which announcements can be made (COMILDEPT office, gangway, etc.). At the broadcasting microphone station there are a number of selector switches and a "press-to-talk" switch by means of which specific areas may be cut in or out depending upon which areas it is desired to reach, i.e. machinery spaces, steering engine rooms, troop compartments, cabin areas, crew quarters, etc.

6. Ship's Intercommunicating System (Talk-Back) consists of a control microphone station on the bridge and loudspeakers located strategically about the open decks. The control station has a set of selector switches for cutting in or out any one or more of the speakers and also a "press-to-talk" switch. Each loudspeaker station has a switch for "talk-back" use, permitting two-way communication for muster reports, etc.

7. Engine Room - Bridge Intercommunicating System is a separate talk-back system generally connecting the bridge and the engine room. Sometimes, the master's and chief engineer's offices are also in the

circuit. A selector switch on the bridge cuts in the desired circuit. As in the ship's main talk-back system, it is necessary to use the "press-to-talk" switch to talk back from all stations other than the bridge.

8. General Alarm and Ship's Whistle are both used in emergencies, though not interconnected. The general alarm consists of rapid ringing of bells strategically located throughout the interior of the ship. The general alarm bells are rung for fire and collision, ABC defense, abandon ship, and for man-overboard. The ship's whistle (in addition to all Rules of the Road signals) is used only for abandon ship drill initially, for securing from all drills, and for directing the emergency boat.

9. Speaking Tubes are pipes run for short distances, such as from the bridge to the master's stateroom or radio room, for passing urgent information or calls by direct voice. They may be used anywhere in the ship as long as they do not pierce a watertight bulkhead below the bulkhead deck.

10. Other Special Systems and Alarms. In addition to the above systems of communication, there are many automatic alarm systems which give warning of danger or failure. Some of these are:

a. The smoke-detecting alarm system, located on the bridge, which samples the air from dangerous or remote compartments by the use of electronic "eyes".

b. The Zonite fire-detecting system has thermostatic fuses located overhead throughout the ship. Excessive heat will melt these fuses and set off the alarm on the bridge. The manual fire pulls (alarms) throughout the ship are tied in to the same system.

c. The steering engine alarm which rings in the engine room in the event of power failure to the steering gear.

d. The navigation running lights failure alarm consists of a buzzer on the bridge.

e. A low lube oil level alarm warns of possible loss of lube oil to the main engine. There is also a low lube oil pressure alarm.

f. An engine order telegraph alarm rings on the bridge and in the engine room when the control indicators fail to match up.

g. A gyro compass current failure alarm is located on the bridge or in the gyro room if it is nearby.

h. The CO^2 alarm is a klaxon located in the engine room. It is activated by the released CO^2 from the installed system.

11. Directories. At each station of the ship's service dial system and the installed sound-powered system, there should be provided a plate or list of the location and system designator number of each phone station in that circuit. These directory plates or lists must be posted for ready reference and so as to be protected from wear and kept clean and legible.

12. Messengers. When all else fails (due to loss of power, ruptured cables or other cause) reliance must be placed on messengers. In this event, messages should be written down to insure accurate delivery rather than relying on the memory of the messenger.

C. Tour of Ship. At this point, take the group on a tour of the ship. Ask individuals to identify various communication systems. Demonstrate each system's use and ask pertinent questions to ensure understanding of proper operation and indications of trouble or failure.

V. SUMMARY.

A. Use. Interior communication systems are required for:

1. Safety of ship, passengers, crew and cargo.

2. Interchange of orders and information between control stations and action stations.

3. Drill and emergencies.

4. Automatic warning of dangerous conditions.

B. Operation. Of prime importance are the:

1. Reliability of individual systems.

2. Correct understanding of the scope, use, operation, and limitations of the installed systems.

C. Communication Systems. Interior communication systems are electrical, mechanical, electronic and other devices for communication between various stations within the ship. This equipment will vary as to number and types of systems with the size, type and purpose of the particular ship. The main systems are:

1. Ship's service dial telephone system (with directories).

2. Installed sound-powered telephone system.

3. Emergency sound-powered telephone system.

4. Engine order telegraph system.

5. General announcing system (public address).

6. Ship's intercommunicating system (talk-back).

7. Engine room - bridge intercommunicating system.

8. General alarm and ship's whistle.

9. Speaking tubes.

10. Other special systems and alarms.

11. Messengers.

VI. TEST AND APPLICATION

A. Test. Use these and additional questions as an oral quiz.

1. Q. State the various types of interior communication systems aboard ship.

A. These are electrical, mechanical, electronic or other devices for communication within the ship between selected stations.

2. Q. What is the ship's service dial telephone system?

A. A system of dial telephones, electrically powered for administrative communication within the ship.

3. Q. What two types of emergency sound-powered circuits are in use?

A. A permanently installed system with jack boxes in selected locations, and a portable reel of wire from control to action stations using sound-powered headsets on both ends.

4. Q. Where is the general announcing system (public address) used?

A. In passenger ships from the bridge, or other control points, to loudspeakers throughout the ship.

5. Q. Where is the ship's intercommunicating system used and how does it differ from the general announcing (public address) system?

A. The ship's intercommunicating system is used for communication from the bridge to lifeboat stations on passenger ships. It is equipped with talk-back arrangements for two-way communication. The public address system is used for one-way announcements from the bridge.

6. Q. Is the engine order telegraph system considered an interior communication system? If so, why?

A. Yes. It is used by the bridge to signal desired changes in speed and direction and to notify the bridge of any necessary reduction in speed. Also, to indicate what speed can be maintained for maneuvering in event of engineering casualty.

7. Q. What are speaking tubes?

A. They are pipes which extend for short distances between key locations, and are used for direct voice communication.

8. Q. Can voice tubes be used anywhere in the ship?
A. Yes, as long as they do not pierce a watertight bulkhead below the bulkhead deck.

9. Q. Name a type of automatic interior communication system generally overlooked.
A. Automatic alarm systems which are generally required by law or USCG regulations; such as fire alarms, gyro failure, machine failures, etc.

10. Q. What would you do if any of the automatic alarms sounded while you were on watch?
A. Notify the watch officer immediately so that proper corrective action can be taken. Each situation will require immediate investigation and action.

B. Application. During a tour of the ship, have individuals identify, explain, and demonstrate the use of the various communication systems and alarms.

CHAPTER 3

ADVANCED DAMAGE CONTROL - For Deck and Engine Personnel (Lesson Plans)

Section 3.2

SOUND-POWERED PHONES

I. OBJECTIVES.

A. To familiarize personnel with sound-powered phones as installed and used aboard ship.

B. To develop understanding of the advantages and limitations of sound-powered phones.

C. To promote the proper operation and utilization of sound-powered phones.

D. To instruct personnel in the proper care and maintenance of sound-powered phone equipment.

II. MATERIAL.

A. Training Aids.

1. Sound-powered phone set.

~~2. Film: MN 3711A, "Battle Telephone Talker" (17 minutes, black and white, sound motion picture; shows operation of sound-powered telephones).~~ Ch #8

B. References.

1. BUSHIPS Manual, Chapter 65, Section II.

REPAIR PARTY MAINTAINS COMMUNICATIONS
BY SOUND - POWERED PHONE

2. BUSHIPS Manual, Chapter 88, Section II.

3. NAVPERS 14005, Telephone Talkers Manual.

III. INTRODUCTION.

A. Introduce self and subject (Sound-Powered Phones).

B. Purpose. During emergencies and drills, these phones provide quick, efficient and direct communication between damage control central on or near the bridge and action stations throughout the ship. Properly used, sound-powered phones serve to:

1. Quickly establish communication in an emergency.

2. Reduce confusion and provide for the transmission of information and orders with accuracy and dispatch.

C. Users Must Know:

1. The equipment.

2. Its capabilities.

3. Its limitations.

4. Necessary care and maintenance.

D. Sound-Powered Phone Systems.

1. General System. All ships are equipped with a sound-powered telephone system, or systems, for use in navigating, maneuvering, docking and engineering. Permanent phones are installed in various locations where it is necessary to transmit verbal orders between spaces such as the bridge, engine room, lookout, docking stations, steering engine room, and the master's and chief engineer's offices. Each phone has a station selector switch, a ringer crank and a handset. To use, lift the receiver, set the selector switch on the desired station, turn the ringer crank to call, then press the speaker button on the handset to talk and continue to hold it down while listening.

2. Damage Control System. This is a new feature in MSTS ships. It consists of an installed circuit which leads into jackboxes located at the repair lockers and at strategically selected locations in each zone area. In some cases the damage control system uses a portion of the talking circuit of an existing sound-powered telephone system. To use it, the talker goes to the nearest jackbox and plugs in to establish communication with damage control central. Where this circuit has not been permanently installed, a 300' reel of two-conductor phone wire is run from damage control central to the emergency area and portable headsets are connected to jackboxes or terminals on either end to provide emergency communication.

IV. PRESENTATION.

A. Advantages of Sound-Powered Phone Systems.

1. No batteries or electrical power supply are required.

2. Sound pressure waves created by the talker's voice are the only source of energy required.

3. They can be used with a permanently installed wire circuit or with a portable reel of wire strung between desired locations.

B. Explanation of Operation. Operation of sound-powered phone equipment is based upon induced electrical current produced by sound waves striking a diaphragm.

1. The diaphragm is connected to an armature running through a coil and pivoted between two pole plates connected to a magnet.

2. When someone speaks into the transmitter, the sound waves vibrate the diaphragm, moving the armature and inducing an electrical pressure (voltage).

3. The receivers are similarly constructed but work in reverse, picking up the electrical impulses and converting them back into sound waves.

4. A switch button is provided on the hand grip of handsets, and on the transmitter shell of headsets, to disconnect the transmitter when not talking and thus avoid introducing local noises into the circuit. On handsets, the button is held down for both speaking and listening. On headsets, it is pressed to speak and released to listen.

C. Rigging Phones.

1. Where a permanently installed circuit is available with jackboxes:

a. Remove the cap from the local jackbox, insert the headset jack, and tighten the threaded collar.

b. Press the handset speaker button to talk and continue to hold it down while listening.

2. To rig an emergency portable sound-powered phone line:

a. String a double wire between stations and connect a headset to the terminal at each end. Do not breech watertight integrity.

b. Immediately after rigging, test for good connection by pressing the speaker button and talking to anyone else on the line.

c. To speak, press the transmitter button, release the button to listen on the headset.

d. If the transmitter is damaged, you can use one of the ear pieces as a transmitter. In this case, don't press the speaker button.

3. Precautions must be taken to:

a. Break out the headsets carefully to avoid damage to transmitter, earpieces, phone jack or wire.

b. Properly insert the phone jack to assure a good connection.

c. When securing, make sure to tighten the cover on the jack box opening hand tight.

d. Make up the headset properly before stowing it to prevent damage to parts.

D. Talking Procedures. The proper procedures for talking on sound-powered phones are:

1. Messages must be transmitted accurately using clear, simple language, phrases and terms. Talkers must be brief and to the point, relaying messages exactly as directed.

2. Enunciation must be loud, clear, precise and at moderate speed. Do not shout.

3. Talkers must be able to remember words and numbers momentarily until transmitted.

4. The transmitter should be held about one-half inch from the mouth for best results.

5. Circuit discipline must be maintained. This means:

a. Only one station can transmit at a time.

b. Keep it brief and clear.

c. No private or general conversations will be permitted on the line.

d. Care of instruments demands reasonable attention to a few details:

(1) Stowage requires care. If stowed in phone station boxes, no part of the instrument or wire should be left sticking out. The lid must be tight to protect from dampness or damage. If stowage is in the repair locker, instruments should be hung on hooks or stowed neatly in a bin.

(2) Make up of instrument for stowage:

(a) Hang the receiver unit by its head band over the transmitter yoke on the breast plate.

(b) Coil the wire clockwise over the transmitter yoke.

(c) Turn the transmitter up against the breast-plate to make a neat, compact unit.

(3) Clean ear-phones with soap and water occasionally.

E. Training of Telephone Talkers.

1. Usually, talkers are yeomen and storekeepers assigned this duty by standard station bills. Many know and use shorthand.

2. Frequent drills should be held to keep talkers alert and interested. Points to stress are:

a. The sender should also be required to write the message as he speaks it, thus slowing him down to an easy rate for receiving.

b. The receiver should then repeat the message back exactly as he received it.

c. The talker at damage control central should keep a written log of all incoming and outgoing messages.

d. Reading of damage control publications will help to familiarize talkers with damage control terms, etc.

F. Tips for Talkers.

1. Be alert; pay strict attention to the officer-in-charge.

2. At damage control central, keep a log.

3. Do not smoke during the drill.

4. Hold button down while talking. Release the headset button to listen. (If using a handset, the button must be held down for both talking and listening.)

5. Hold transmitter about one-half inch from your mouth.

6. If transmitter is damaged, one ear piece may be used as a transmitter. In this case, don't press the button to talk.

7. No unnecessary conversation will be permitted on the line.

8. Test the circuit periodically to be sure that it is operating and that someone is standing by at the other end.

9. Never secure until given permission.

10. Use standard terms.

11. Tend your wire leads to be sure that they are not fouled.

12. Never allow the weight of the headset to bear on the wire leads.

13. Be sure that the collar of phone jack is hand tight.

V. SUMMARY.

A. Telephones provide quick, efficient and direct communications throughout the ship. They are, in fact, the ship's nerve system.

B. They can speed up action, reduce confusion and rapidly and accurately transmit information and orders where and when required.

C. Sound-powered phones have the advantages of simplicity, light weight, portability, sturdiness and independence of electrical or battery power.

D. Talkers have the responsibilities of receiving, transmitting and recording all messages relayed through them accurately. They must be able to speak distinctly, hear well and remember groups of words and numbers so as to correctly repeat messages given them. They must properly maintain their equipment.

E. Phone talkers should be drilled regularly and should adhere to standards of telephone talking procedure, terms, language, etc.

F. Circuit discipline must be maintained and conversation kept to the necessary minimum.

VI. TEST AND APPLICATION.

A. Test. Use these and additional questions as an oral quiz.

1. Q. What is the source of power or energy required for sound-powered phones?

A. The voice. No battery or ship's service power is needed.

2. Q. What procedure should a talker follow in order to insure accurate transmission?

A. Initiate the call, enunciate distinctly, use proper nautical terms, don't interfere with others using the circuit, and use the circuit only for business.

3. Q. Should any attempt be made to clean the rubber ear cushions of the phone?

A. Yes. Clean occasionally with soap and water.

4. Q. What are some of the advantages of sound-powered phones?

A. They are very easy to operate, portable, sturdy, light weight, and they do not need to be connected to a power system.

5. Q. How far should the transmitter be held from the mouth?

A. Approximately one-half inch.

6. Q. What two types of sound-powered systems are most likely to be found aboard ship?

A. (1) The permanently installed fixed system with station selector switch and ringer crank.

(2) The damage control system with local jackboxes for plug-in connections or a reel of wire strung from damage control central to the scene of the casualty.

7. Q. What two precautions should be particularly observed in stowing phones when finished with them?

A. (1) See that the transmitter and ear pieces do not touch the bare metal of the stowage box.

(2) See that no part of the instrument or wire is left sticking out of the box.

8. Q. What precaution should be observed in regard to the jackbox when securing? Why?

A. Make sure to replace the cover over the receptacle. It protects the receptacle from entry of dirt or water and insures a good connection when plugging in.

9. Q. When the headset transmitter fails, what is the procedure to maintain communications?

A. Speak into either earpiece while listening on the other one. Do not press the transmitter button.

10. Q. How many messages may be transmitted over a sound-powered phone circuit at the same time?

A. Only one! Circuit discipline must be maintained.

B. Application. Use a fixed sound-powered phone system and also rig a portable circuit and have new members demonstrate their ability to transmit and receive messages accurately with both handsets and/or handsets.

CHAPTER 3

ADVANCED DAMAGE CONTROL - For Deck and Engine Personnel (Lesson Plans)

Section 3.3

OXYGEN BREATHING APPARATUS AND ~~GAS~~ Protective MASKS

I. OBJECTIVES.

A. To instruct crew members in the proper use, care and operation of the oxygen breathing apparatus (OBA) and gas masks.

B. To acquaint personnel with the parts and basic maintenance of the OBA and gas masks.

C. To caution regarding the proper disposal of used OBA cannisters.

D. To stress safety precautions.

II. MATERIAL.

A. Training Aids.

1. Film, MN 6931, "Oxygen Breathing Apparatus" (20 minutes).

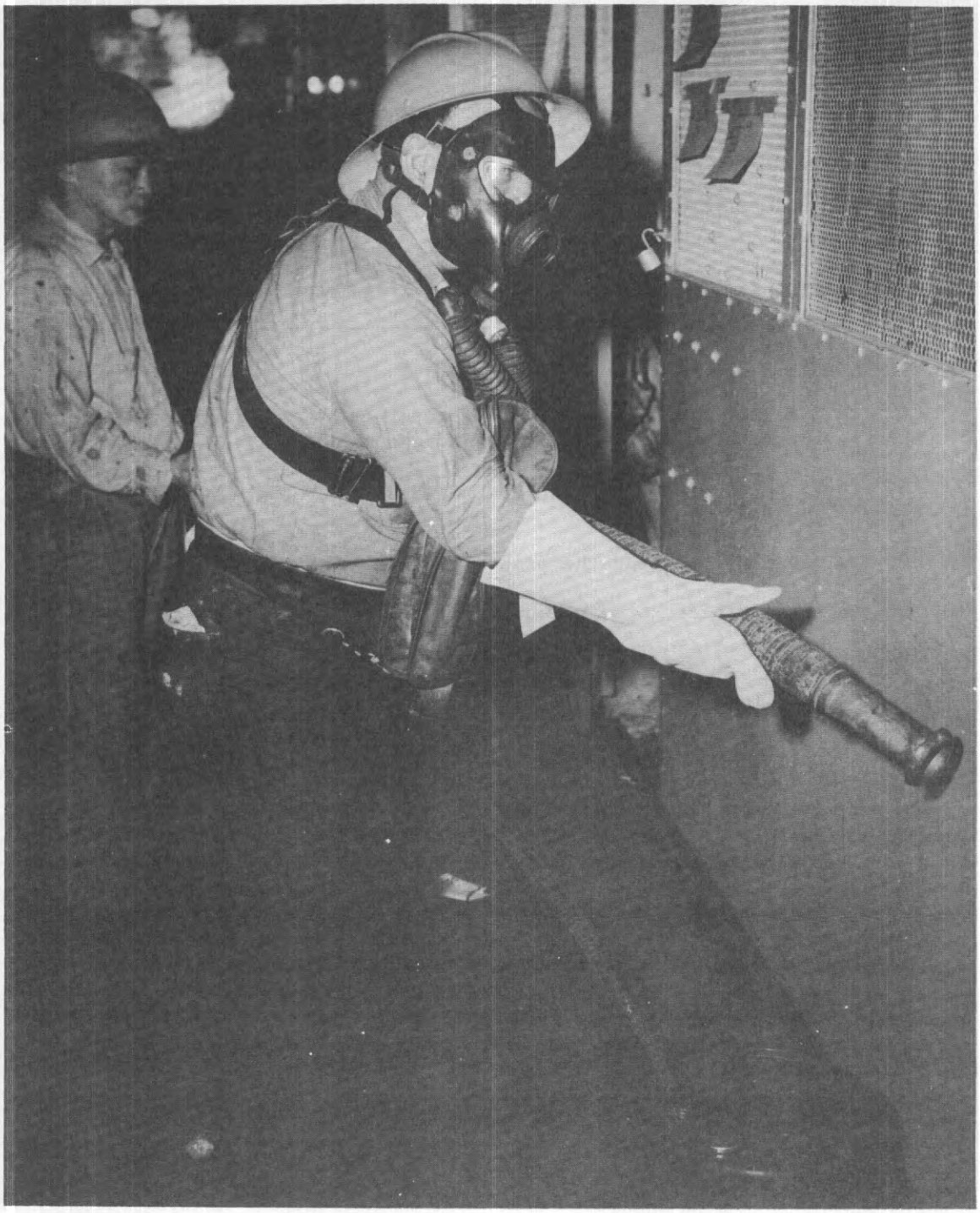
2. Film, MN 8867, "Gas Mask, Mark V: Use and Care of" (21 Minutes).

3. OBA's: Types A-1, A-2, A-3.

4. Candle and glass beaker.

5. Poster, 12ND - P1798 "Oxygen Breathing Canister."

6. Poster, "ND Mark V, Protective Mask Drill" - in this section.



B. References.

1. BUSHIPS Manual, Chapter 93, Section II.

2. Respirator Handbook, COMSTS INSTRUCTION 5100.8

3. Instruction Manual for OBA - Navships 393 - 0552.

4. U.S. Navy Manual of Safety Equipment, NAVEXOS P-422, page 54.

III. INTRODUCTION.

A. Introduce self and subject (Oxygen Breathing Apparatus)

B. Arouse interest by demonstration questions and discussion.

1. Light a candle and place it under a glass beaker until the flame goes out. What makes the flame go out? Answer: The oxygen in the beaker has been depleted by the flame.

2. This situation may also exist in a compartment after or during a fire or in a tank which has been closed up for some time.

3. The OBA has been developed to supply oxygen to the wearer, independent of the atmosphere in the compartment for a minimum of 45 minutes.

C. Therefore it is important to learn the purpose, characteristics, and use of the OBA and its canister, including its:

1. Uses and limitations.

2. Construction.

3. Operation.

4. Maintenance.

5. Stowage.

6. Safety precautions.

IV. PRESENTATION.

A. Parts of the OBA. (Point out and demonstrate the use of each part on an OBA.)

1. Headstraps.

a. Fabric covered elastic.

b. Adjustable.

c. Holds face piece tight when adjusted properly.

2. Face piece.

a. Heat-treated rubber.

b. Fits contour of face.

c. Airtight when properly adjusted.

3. Eye pieces.

a. Acetate glass, shatterproof.

b. Interchangeable.

c. Will withstand both heat and cold.

d. Inhalation defrosts glass.

4. Speaking diaphragm.

a. Mica or cellophane disc.

b. May be used with sound-powered telephone.

5. Tee tube. Made of alumimum; inhalation and exhalation valves are tinned. Starter valve used to activate apparatus.

6. Breathing tubes (inhalation and exhalation).

a. Made of heat treated rubber.

b. Corrugated and flexible.

(1) Permits wearer to work in awkward positions without kinking.

(2) Avoid over-stretching the tubes, or the corrugations will collapse.

7. Central casting.

a. Air passes to and from the canister through the central casting.

b. Plunger housing.

c. Cutter on the plunger.

d. Spring on the cutter.

e. Gasket for the canister.

8. Timer.

a. Clock-like device attached to the central casting.

b. Dial marked to 60 minutes.

c. After setting timer, bell rings at expiration of time.

9. Breathing bag.

a. Purpose - to store cooled air, acting as a reservoir for the oxygen generated from the canister.

b. Made of rubberized heat-treated fabric.

c. Wire-mesh air tubes inside.

(1) Directs air to bottom of bag.

d. Show passage of air through the bag.

10. Canister guard (holder).

a. Made of perforated aluminum with leather covering.

(1) Protects body from heat.

b. Convex-concave shaped. One side is concave; the other is convex. This prevents incorrect insertion of the similarly-shaped canister.

c. Canister stop holds canister in a standby position.

d. Bale and worm screw keeps the canister in place.

11. Harness.

a. Made of strong fabric webbing.

b. It is adjustable to fit any person.

c. Snap hooks and "D" ring are used to fasten the harness.

d. "D" ring in the back center is used to attach the lifeline.

12. Waist strap.

a. Made of a strong fabric webbing.

b. Adjustable to fit any person.

c. Snap hook on the strap is hooked into the small "D" ring on the back of the canister holder.

13. Lifeline.

a. Length - 50 Ft.

b. Material - 3/16" steel aircraft cable fitted with hooks.

14. Canister. The canister generates oxygen and removes CO_2 from the breathing system.

a. Concave-convex shaped. One side is concave; the other is convex. This prevents incorrect insertion in the similarly-shaped canister guard.

b. Contains chemicals.

c. Activated by the moisture of exhaled air.

d. Life of the canister is from 30 to 45 minutes.

e. Dangerous if oil or water is permitted to enter the canister.

f. Stow horizontally in a dry place.

g. Only use canisters painted battleship gray with a horizontal yellow stripe on the concave side, or the new type self-activating canister painted green with instruction in yellow.

B. OBA Types and Differences. (Show the different types as you describe each and explain their differences.)

1. A-1 and A-3 types may be considered identical as to operation although the following refinements have been incorporated in the A-3.

a. Replacement of wire mesh breathing tubes in breathing bags with corrugated rubber tubes, giving more air circulation and cooler air.

b. Separation of inhalation elbow and main casting to reduce heat transfer from main casting to inhalation elbow.

c. Rubber facepiece straps to permit quicker adjustment to the wearer's face.

d. Removal of the canister opens the system to the outside air until a new canister is inserted.

2. The A-2 type may be considered identical as to operation but differs from the A-1 and A-3 types in that the design of the main valve permits changing the canister in toxic or smoke-filled compartments.

C. Activation and Use of the OBA.

1. Select a crew member to don and demonstrate the use of the OBA.

a. Adjust the harness so that the OBA is low on the man's chest.

b. Adjust the waist strap.

c. Hang the face piece out of the way, temporarily, by tucking its head straps under the shoulder strap. Do not hang the face piece off by its hoses.

2. Demonstrate readying of canister by:

a. Removing its sealing cap and cardboard discs.

b. Showing its rubber gasket.

c. Placing the canister in the canister guard in its standby position.

3. Demonstrate proper donning of the face piece by having the crew member:

a. Blow out the face piece to clear of any dust.

b. Insert chin first in the face piece and pull the head straps over the head.

c. Adjust the head straps by starting at the bottom on each side and working up.

d. Activate the canister as shown below.

e. Test for air tightness by grasping both breathing tubes, pinching off the air and inhaling. The face piece should collapse against the face if air tight.

4. At this point, demonstrate setting of the timer.

a. Set the timer for 30 minutes if engaging in heavy physical activity (use of oxygen is greater).

b. Bell will ring at the expiration of 30 minutes. If more time is needed, the timer may be set for an additional 15 minutes.

c. When bell rings, return immediately to fresh air.

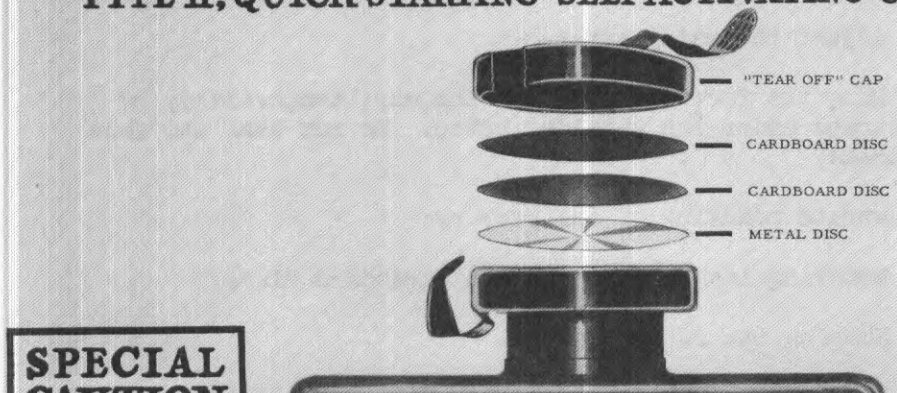
d. In some cases, canisters expire prematurely (before the timer bell rings).

(1) This will be indicated by fogging eyepieces or difficult breathing.

(2) Return immediately to fresh air.

OXYGEN BREATHING CANISTER

TYPE II, QUICK STARTING-SELF ACTIVATING GF4240-174-1365



SPECIAL CAUTION

CANISTER FOR
NAVY OXYGEN BREATHING APPARATUS
TYPES A, A-1, A-2 AND PATROL

CAUTION

NEVER ALLOW ANY SUBSTANCE TO ENTER NECK OF CANISTER, ESPECIALLY WATER, OIL AND WATER, GASOLINE, GREASE, OIL, ETC.

INSTRUCTIONS

1. REMOVE TEAR-OFF CAP, METAL AND CARDBOARD DISCS BEFORE INSERTING IN APPARATUS.
2. TO USE, SEAT CANISTER GASKET TIGHTLY AGAINST VALVE SEAT WITH LATCH OR BAIL ASSEMBLY.
3. DON FACEPIECE AND CHECK FOR AIRTIGHT FIT.
4. REMOVE COVER BY PUSHING DOWN AND IN, THEN PULL LANYARD STRAIGHT OUT AWAY FROM BODY. REMOVAL OF COTTER PIN FIRES CANDLE, AND INFLATES BREATHING BAG. A SLIGHT AMOUNT OF HARMLESS SMOKE MAY BE PRESENT WHILE CANDLE IS BURNING.
   WARNING—DO NOT PULL LANYARD UNTIL CANISTER IS IN APPARATUS READY FOR USE.

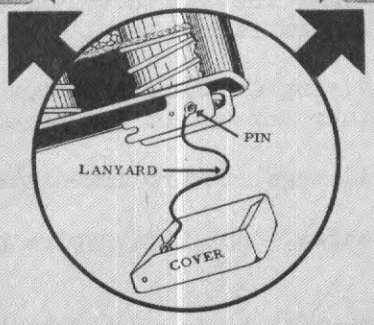
PUSH DOWN & IN PULL LANYARD

5. LIFE UNDER HARD WORK 30-45 MINUTES.
6. RESERVE SECOND CANDLE FOR EMERGENCY USE.
7. TO REMOVE, TRIP LATCH OR RELEASE BAIL, SWING IT OUT, AND ALLOW CANISTER TO DROP OUT. DO NOT TOUCH CANISTER WITH BARE HANDS.

SEE OTHER INSTRUCTIONS ON BACK

MINE SAFETY APPLIANCES COMPANY
PITTSBURGH 8, PENNA., U.S.A.

ACTIVATOR → ← COVERS REFERRED TO IN INSTRUCTION #4 ABOVE → ← ACTIVATOR



5. To activate the OBA using the old type canister, have the crew member:

a. Depress the canister stop with one hand.

b. With the other hand, turn the worm screw clockwise to seat the canister neck against the central casting.

c. Firmly grasp both breathing tubes with one hand, pinching off the air.

d. Depress the starter valve with the other hand.

e. Inhale deeply.

f. Release the breathing tubes and starter valve and exhale.

g. Repeat (c through f) until the breathing bag is fully inflated (usually three or four breaths).

h. Depress the starter valve and deflate the breathing bags by pressing on them with forearms.

i. Repeat (c through f) until the bottom of the canister feels warm.

(1) In cold weather, both the top and bottom of the canister should feel warm.

6. To activate the OBA with the new type canister:

a. Make sure you have removed the protective cap, and the cardboard and metal discs before inserting the canister.

b. Depress the canister stop with one hand. With other hand, turn the worm screw clockwise to seat the canister neck against the central casting.

c. Remove one activator cover on the bottom of the canister and pull the lanyard away from the body.

d. Use the second activator if the first one fails.

e. The new canister may also be activated in the same manner as the old type canister.

f. Activate your own canister. During a presail fire dirll in an MSTS ship, the Fourth Officer, an Assistant Repair Party O-in-C, attempted to expedite matters by activating another man's OBA canister. The OBA wearer had already inserted the canister into his OBA. Being unaware that the protective tear-off cap, cardboard and metal discs had not been removed, the Fourth Officer pulled the candle activating lanyard. The OBA wearer then informed the Fourth Officer that the canister had not been prepared for use. The Fourth Officer immediately removed the ignited canister from the set and attempted to remove the protective tear-off cap. While doing so the canister exploded, injuring the Fourth Officer. The old adage, "Too many cooks spoil the broth," still holds. In other words, an OBA wearer should not permit anyone to tamper with the activation of his canister. BUSHIPS Manual, paragraph 93-415, gives specific instructions and precautions for activating the OBA. All hands should know and observe these precautions.

7. Causes of difficult breathing when using the OBA:

a. Too much air in the breathing bag.

(1) Slide a finger under the cheek of the face piece to release excess air.

b. Chemical settled in the bottom of the canister.

(1) Tap the bottom of the canister lightly on the deck.

c. Sticking tee tube check valves.

(1) Tap tee tube lightly with finger.

(2) If sticking continues, send set ashore for overhaul.

d. Spent, or nearly spent canister.

8. Have the crew member demonstrate the proper method of removing the canister.

a. Spread legs apart.

b. Lean upper part of body slightly forward.

c. Turn worm screw counterclockwise to extreme "down" position.

d. Depress canister stop.

e. Swing the bail forward.

f. Catch the canister with gloved hand.

g. Never permit a canister to drop to the deck where there is loose water or oil.

9. Disposing of spent canister.

a. Puncture canister in several places in or near the bottom.

(1) Use a dry, grease-free, oil-free tool.

b. At sea - throw over the stern of ship.

c. In port - submerge in a drum of oil-free water.

(1) The water will become caustic and will burn exposed skin.

10. The Life Line.

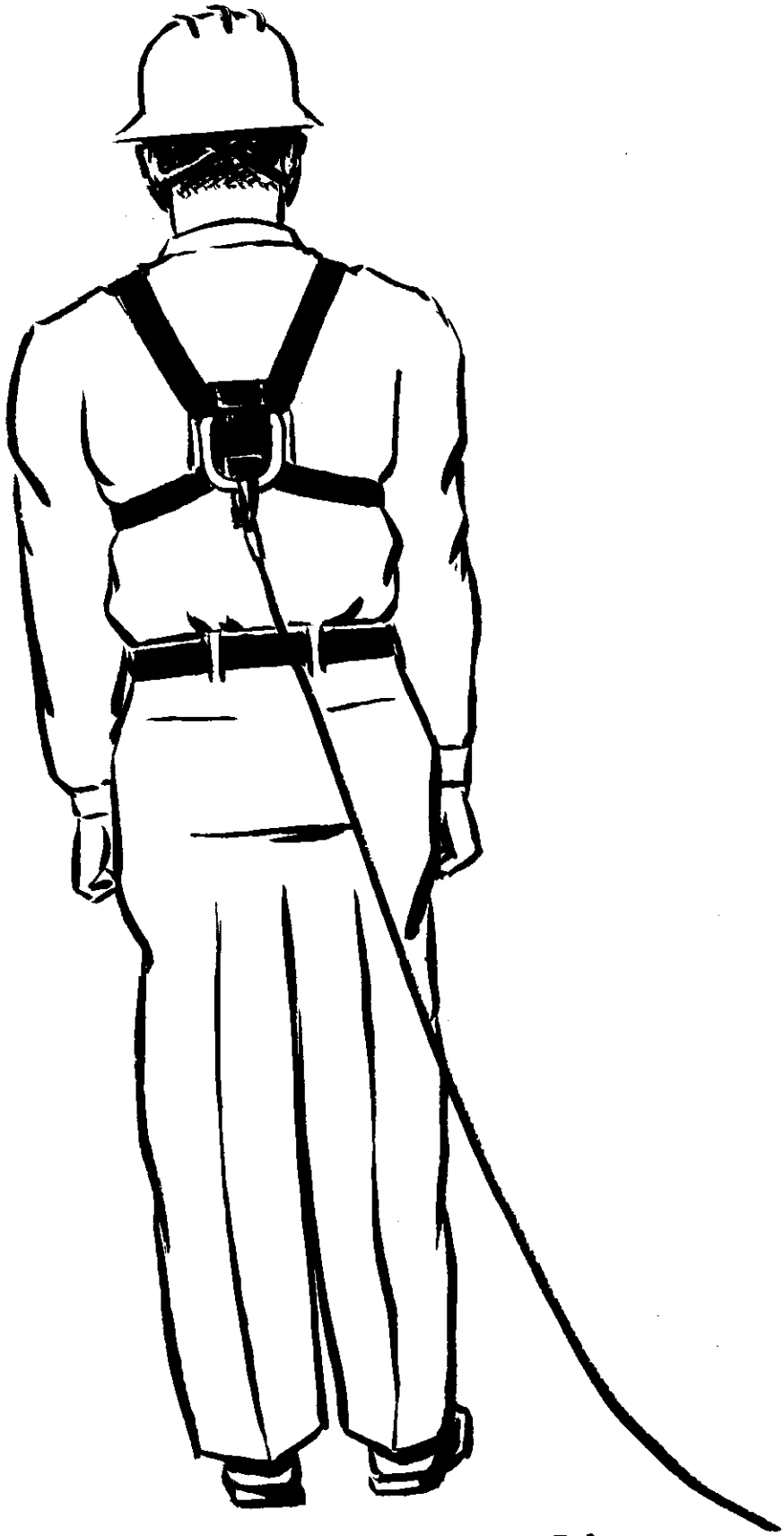
a. Secured to OBA harness when investigating compartments.

b. In emergency, can be used to haul injured personnel out of compartments.

(1) Do not secure in a loop around the waist.

c. Provides a means of communications to and from the OBA wearer.

d. It is not to be used on firefighters who are handling the fire hose.



LIFELINE USED WITH OBA

e. Care must be taken in preventing contact with electrical circuits.

f. Special instructions:

(1) Never investigate a compartment without a lifeline tended by a qualified tender.

(2) After the lifeline is made fast to your harness, take the bight of the lifeline in your right hand and hold it there when moving around.

(3) Tender will hold and tend the lifeline until the OBA man returns to safety.

(4) Tender will keep lifeline taut at all times. Slack only on signal.

(5) Answer all signals immediately as they are received.

(6) Send all signals clearly.

(7) Tender will time all descents made with OBA and will recall the wearer in ample time before his limit is reached.

(8) When returning the OBA man should follow his lifeline.

(9) When the danger signal is given, remove the OBA man at once.

g. Signals:

(1) Tender to wearer:

1 Pull - Are you OK?

2 Pulls - Advance

3 Pulls - Back out

4 Pulls - Come out immediately

(2) Wearer to tender:

1 Pull - I am OK

2 Pulls - I am going ahead

3 Pulls - Keep slack out of line

4 Pulls - Send help

(3) A quick way of remembering the signals:

Code	Pulls	Meaning
O	1	OK
A	2	Advance
T	3	Take up
H	4	Help

D. Care and Maintenance of the OBA:

1. The OBA should always be ready for immediate use. Check all parts of the set carefully after each use.

2. Clean the face piece with cotton and mild medical soap. Most disinfectants are harmful to the apparatus. Remove the canister before cleaning.

3. Do not use alcohol or gasoline to clean the OBA.

4. Keep oil or grease off and away from the OBA. It is particularly dangerous on or near the canister.

5. Handle the OBA by grasping it at the central casting. Avoid stretching the breathing tubes.

6. Stow it hanging up by the "D" ring, or lay it flat.

E. Safety Precautions.

1. Do not permit any liquid to enter canister.

2. Do not permit oil or grease on the OBA.

3. When disposing of the canister in water do not permit the solution to come in contact with the skin or eyes. If burned by the chemical, rinse with clean, fresh water. Do not use oil or petroleum derivatives.

4. Do not permit canister chemicals to spill on deck. This creates a fire hazard.

5. Always return to fresh air when changing canisters using the Type A-1 and A-3 apparatus.

6. In using the OBA lifeline, do not permit it to come in contact with electrical circuits.

7. Do not pull the lanyard on a sealed canister since the oxygen released will deform the canister and blow out the neck seal and gasket.

OBA INSTRUCTION AT GULF
BY DCI ~~HORBECK~~. HORNBEAK

a. Do not fire both candles simultaneously, second candle should normally be reserved for emergencies.

F. Protective Gas Masks. It is very important to use the proper type of respirator for the hazard involved. In particular, the manufacturer's directions regarding the protection afforded should be checked. Every seaman should clearly understand the difference between air-purifying respirators which remove contaminants from the air as it is inhaled by filtering or by chemical adsorbtion, and air-supplying respirators which provide clean air from an outside source or oxygen from a cylinder or a chemical supply carried by the wearer. The OBA is a self-contained respirator independent of the outside air; it generates its own oxygen and thus provides complete protection in oxygen deficient or gaseous atmospheres except in combustible vapors, where the fresh air hose mask must be worn. In contrast, the general purpose gas mask, or all-service gas mask, cannot be used unless there is sufficient oxygen to support life, as indicated by the flame safety lamp. It merely purifies air and will not supply or make oxygen. Therefore, it must not be used where the air is deficient in oxygen. The gas mask has wide application in fire fighting and rescue work. It provides respiratory protection in moderately high concentrations of toxic gases and vapors where there is sufficient oxygen. Besides protecting against organic vapors and acid gases, this mask will provide protection against carbon monoxide in concentrations up to two percent and against toxic dusts, fumes, mists, fogs, and smoke. It will not protect against higher concentrations of poisonous gases such as carbon monoxide, carbon dioxide, ammonia, etc., since these gases will pass through the canister. It will protect against most normal concentrations of ABC warfare agents and radioactive dust.

NOTE: Although referred to as a gas mask, the Mark 5 is not a true gas * mask but is merely a protective mask with limitations as explained above

1. Allowances. MSTS ships have in the past been equipped with Mark 4, and in some instances, Mark 3 gas masks. BUSHIPS and Ship's Parts Control Center have recently decided that the Mark 3 and 4 gas masks are ineffective against modern gases and radioactive dust. Accordingly, the Mark 5 mask is now designated as the standard gas mask and the Mark 3 and 4 masks have become obsolete. MSTS allowances now provide for use of the Mark 5. All gas masks consist of a facepiece and canister system which filters out or adsorbs gases, etc., before the air enters the facepiece for inhalation. Improvements in the Mark 5 (or V) mask include a speaking diaphragm to allow better communication, an all-vision facepiece and a new improved canister.

2. Preparation of the Mark V (for new, unassembled gas masks).

a. Mount the two canisters on the gas mask. To do this:

(1) Roll the rubber aprons of each canister completely over the outside edge of the canister.

(2) Position each canister snugly against its canister holder so that the canister holder contacts the perforated plate around its entire periphery. Canister holders are the two metal discs attached to the cheek portions of the mask.

(3) Roll the rubber apron of each canister back over the canister holder. This seals the canisters in place.

b. Treat the lens of the mask as directed on the container of antifog (see the small cylindrical container in bottom of mask carrier).

3. Fitting the mask.

a. Adjust straps of the head-harness to their full length.

b. Don the mask and hold the cap of the head-harness firmly against the back of the head.

c. Adjust the top-center strap of the head-harness so that the lowest portion of the mask lightly touches the under portion of the chin.

d. Adjust the two temple straps of the head-harness so that the upper portion of the mask is held lightly against the face.

e. Adjust the two cheek straps of the head-harness so that the lower portion of the mask is held lightly against the face.

f. The mask has been designed for a light touch of the pneumatic tube to the face rather than the tight seal used on all previous gas masks. The straps should not be taken up to a point where lines are visible on the wearer's face when the mask is removed.

4. Testing the Mask.

a. Tilt head forward - exhale forcibly while shaking head. Any leak will be evidenced by air blowing out between mask and face.

b. Exhale, place hands over the canister inlet so that no air can enter.

c. Inhale until the mask collapses against the face. If the mask does not collapse on inhalation, the mask has been improperly fitted.

d. Stop inhalation and hold breath for 10 seconds. During this period the mask, if properly adjusted, will remain collapsed with no tendency to return to its normal position.

e. If improper fit is indicated by the above tests, the mask should be completely refitted or the appropriate straps readjusted.

5. Removal of the Mask.

a. Loosen the two cheek straps of the head-harness by placing the forefinger nail under the tongues of the buckles and pulling forward.

b. Grasp the chin section of the mask and pull forward and upward. NOTE: The top-center and two temple straps of the head-harness are not loosened when removing the mask. These straps are intentionally difficult to adjust and should remain fixed after proper initial adjustment.

6. Stowage in Carrier.

a. Nest the cap of the head-harness into the interior of the mask.

b. Grasp the top-center portion of the mask with the right hand, keeping the inside of the mask next to the body.

c. Open the gas mask carrier with the left hand by pulling up on the top flap.

d. Insert the gas mask into the carrier, being sure that the inside of the mask is next to the body.

e. Close the carrier.

f. The gas mask carrier is designed for use on the left side of the wearer. It may be carried in either of two positions on the left side:

(1) Side-carry. In this case the top, wide strap is adjusted over the right shoulder and the bottom, narrow strap is adjusted around the waist.

(2) Leg-carry. In this case the top, wide strap is adjusted around the waist and the bottom, narrow strap is adjusted around the left leg.

7. Use of the Mark 5 Gas Mask.

a. Open the gas mask carrier with the left hand.

b. Grasp the top-center portion of the gas mask with the right hand.

c. Remove mask from carrier by pulling upward.

d. Grasp the mask at the center of each side with the thumbs below the two cheek straps.

e. Insert chin into mask.

f. Complete donning of mask by pulling up and back until head-harness is in place.

g. Tighten the two cheek straps of the head-harness until the mask rests lightly against the face.

h. Test for proper fit as described in 4 above.

i. Close mask carrier.

j. The three straps on the head-harness have been made long to accommodate all sizes of heads. When a mask has been issued permanently, i.e., not for training only, the following procedure should be used:

(1) Fit and test the mask.

(2) If possible, test the mask by wearing it in a tear gas chamber.

(3) Wear the mask for at least a half hour to make sure that it has not been adjusted so tightly as to cause a headache and/or leave red marks on the face.

(4) When the mask has been properly adjusted, thread the loose ends of the three top head-harness straps through the buckles between the body and the sliding member. Cut off the excess straps, leaving approximately half an inch protruding beyond the buckle.

k. The outlet valve sometimes sticks as a result of perspiration drying on it after the mask has been worn. If this occurs, the valve may be loosened by forceful exhalation of air or by massaging the valve through the outlet valve cover.

V. SUMMARY.

A. The OBA has been developed to supply oxygen to the wearer, independent of the outside atmosphere. Its proper use will avert casualties

such as the many which have occurred when men have entered tanks, double bottoms, compartments which were closed up for a long time, or smoke-filled compartments. It must be used wherever the flame safety lamp indicates a deficiency of oxygen. If in doubt, use the OBA!

B. Types A-1, A-2, and A-3.

1. These are the types most commonly used.

2. State the differences between the three types.

C. Activating the apparatus.

1. Insure that the bottom of the canister is warm. In cold weather, both top and bottom of the canister should be warm.

D. State the conditions that may cause difficult breathing.

E. Repeat all safety precautions.

F. The Mark 5 general purpose or all-service gas mask merely purifies the air and therefore must not be used where the air is deficient in oxygen. It is used in fire fighting, rescue work, and for ABC defense.

VI. TEST AND APPLICATION.

A. Test. Use these and additional questions as an oral quiz.

1. Q. What is the purpose of the OBA?
A. To supply oxygen to the wearer, independent of the outside atmosphere.

2. Q. What is the maximum time limit recommended for an OBA canister when fighting a fire?
A. Approximately 30 minutes. If breathing is normal at the end of that time, the timer may be set for an additional 15 minutes.

3. Q. What important precaution must be taken when handling the canister?
A. Do not permit any liquid to enter the neck of the canister.

4. Q. In what position are the OBA canisters to be stowed?
A. In a horizontal position.

5. Q. What causes difficult breathing when using the OBA?
A. Too much air in the breathing bag, chemicals settled in the bottom of the canister, sticking tee tube check valves, or a nearly-spent canister.

6. Q. What should be done to the OBA after use and before stowage?

A. Clean the face piece and check all parts so that the OBA is ready for immediate use.

7. Q. State several precautions in using the lifeline with the OBA.

A. Don't use a lifeline on firefighters handling hose; avoid contact with electrical circuits.

8. Q. State the four signals from tender to wearer.

A. One pull - Are you OK; two pulls - Advance; three pulls - Back out; four pulls - Come out immediately.

9. Q. If wearing an OBA and fighting fire, you found it difficult to breath, what would you do?

A. Leave the contaminated area and insert new canister.

10. Q. How do you dispose of used canisters?

A. Puncture several times with an oil-free tool and:
At sea - throw over the stern of the ship.
In port - submerge in oil-free water.

11. Q. Where is the Mark 5 gas mask used?

A. It is used for fire fighting, rescue work, and ABC defense in atmospheres in which there is sufficient oxygen to support life.

12. Q. Where would you not use the Mark 5 gas mask?

A. The Mark 5 mask must not be used where there is a deficiency of oxygen or in high concentrations of poisonous gases.

13. Q. How could you determine that there was sufficient oxygen in a compartment to permit entering it with the Mark 5 mask?

A. Test the compartment with the flame safety lamp. If the lamp burns, there is sufficient oxygen.

B. Application. Have each crew member crew member demonstrate his ability to check, don, activate, use and stow the OBA and Mark 5 gas mask properly. Make certain that each person knows the uses and limitations of each. Discuss appropriate lessons from casualties involving the use of the OBA and the gas mask. Distribute available copies of the Respirator Handbook for further study.

ND MARK V PROTECTIVE MASK *Drill*

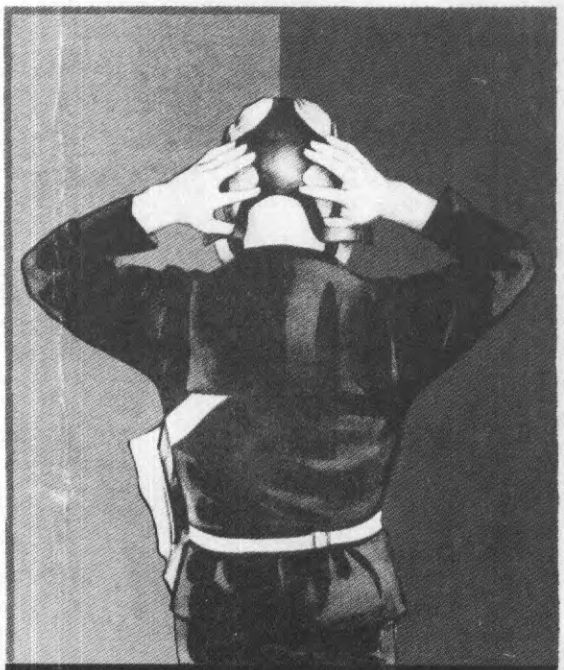
At the command of "GAS" stop breathing.

1 Remove headgear.
Yank open carrier with left hand.

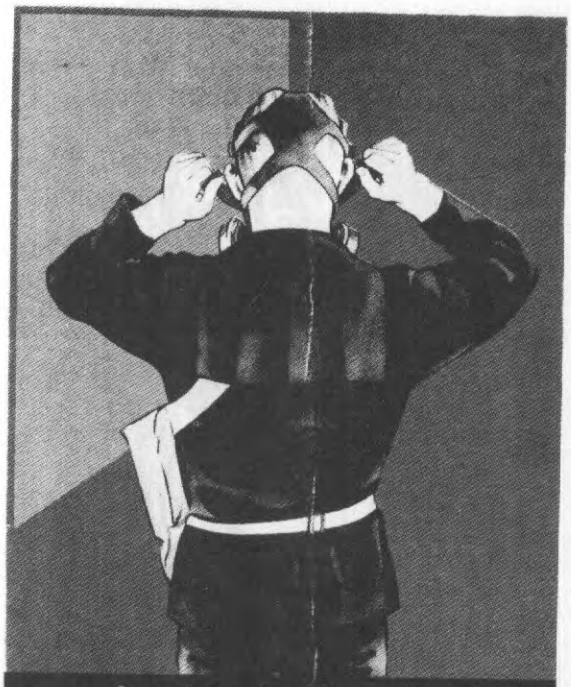
2 With right hand remove mask from carrier. Hold bottom of carrier with left hand.

3 Slide thumbs inside facepiece under all headharness straps. Grasp top of facepiece. Thrust chin forward.

4 Hold head still. Raise mask to out thrust chin. Bring harness over back of head.



5 Center head pad.



6 Grasp tab ends of lower straps. Pull straight back only enough to effect seal.

7 Close outlet valve with heel of hand. EXHALE FORCIBLY to clear facepiece.

8 Test for fit and leakage by placing palms over canisters. Inhale normally. Mask should collapse against face.

9 Resume breathing. Replace headgear. Fasten carrier flap.

At the command, "REMOVE AND REPLACE MASK", remove headgear. Loosen two lower straps.

Grasp both canisters. Pull mask down, out and up over head. Fold headharness into facepiece.

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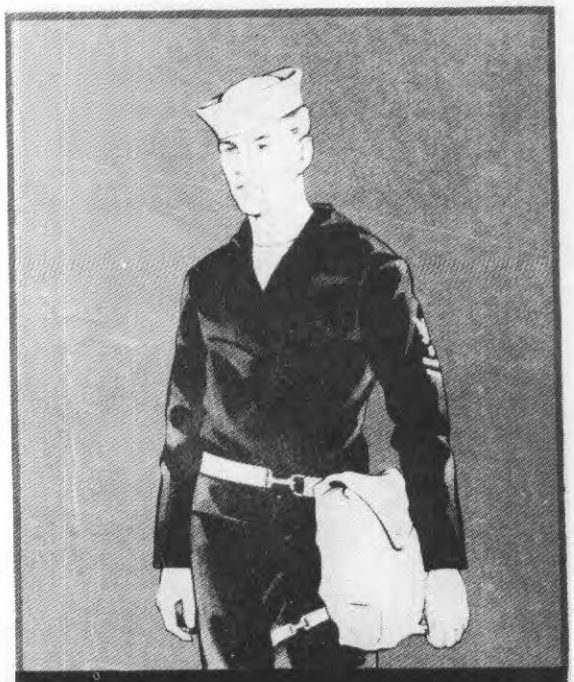
Open carrier flap. Place mask in carrier, canisters down, eyepiece away from body. Secure flap.



Alternate method of carry.

CHAPTER 3

ADVANCED DAMAGE CONTROL - For Deck and Engine Personnel (Lesson Plans)

Section 3.4

FLAME SAFETY LAMP

I. OBJECTIVES.

A. To familiarize shipboard personnel with the purpose and operation of the flame safety lamp.

B. To stress the limitations, proper care and stowage of the flame safety lamp.

II. MATERIAL.

A. Training Aids.

1. Flame Safety Lamp.

B. References.

1. BUSHIPS Manual, Chapter 92, Section VI, Part 6, Par. 456.

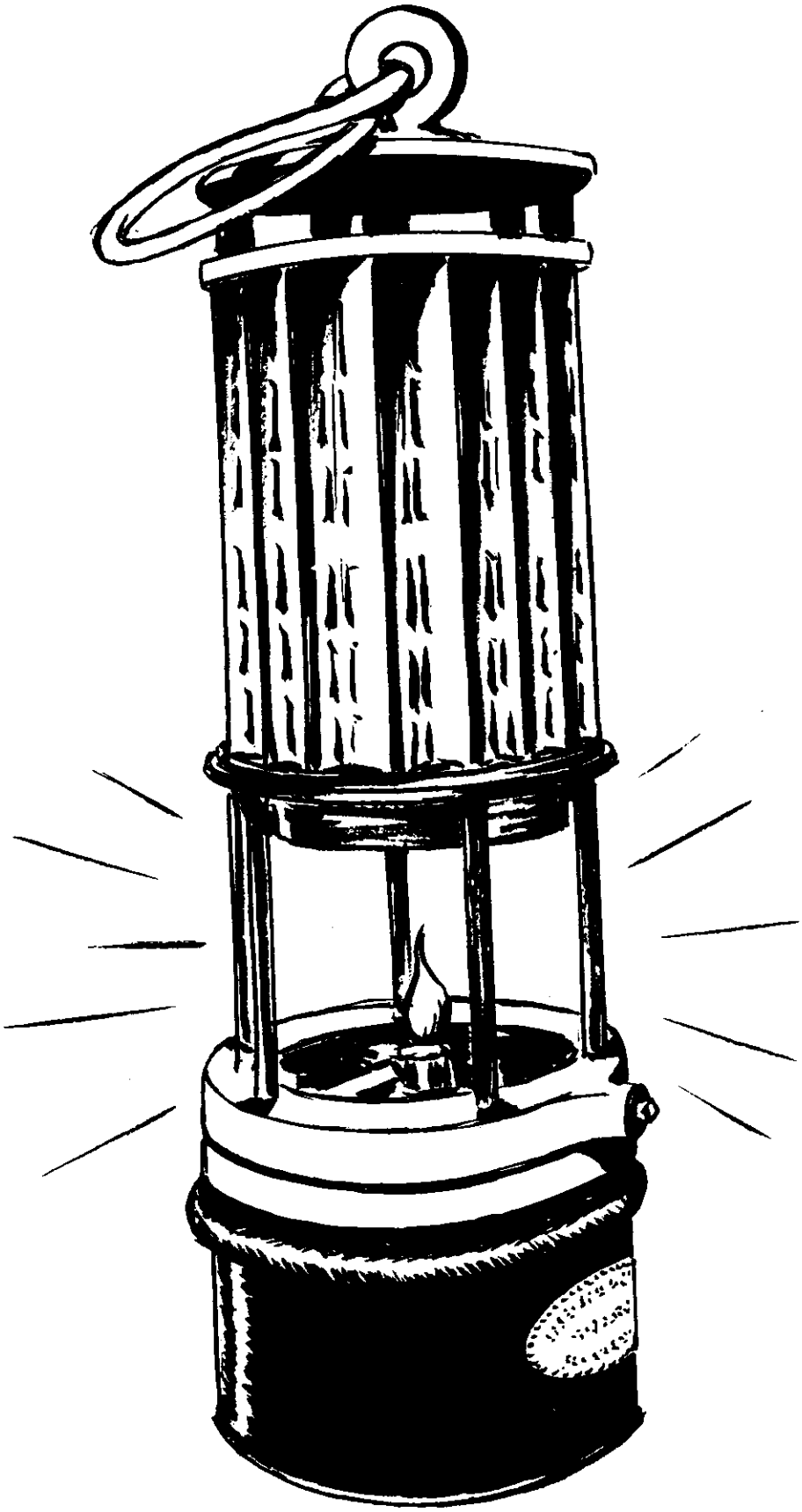
2. Manufacturers' Instruction Pamphlet.

3. CG 256, Rules and Regulations for Passenger Vessels, Sections 77.30-5 (c), 77.30-10.

4. Damage Controlman 1 & C, NAVPERS 91545-1 & 81546, pages 183-185.

5. CG 175, Manual for Lifeboatmen, pages 107-109.

6. Respirator Handbook, COMSTS INSTRUCTION 5100.8, page 73.



FLAME SAFETY LAMP

7. US Navy Manual of Safety Equipment, NAVEXOS P-422, page 2.

III. INTRODUCTION.

A. Introduce self and subject (Flame Safety Lamp). Show the lamp and pass it around for inspection by each crew member.

B. In this lesson, points covered will be:

1. The purpose of the flame safety lamp.

2. Operation of the flame safety lamp.

3. Proper care of the flame safety lamp.

4. Proper stowage of the flame safety lamp.

C. The flame safety lamp is an important item of damage control equipment. All personnel of repair parties should know the purpose, operation and use of the lamp for testing oxygen-deficient atmosphere in enclosed spaces. You may have to enter an unventilated compartment, hold or tank. Unless you first test the atmosphere in the space with a flame safety lamp, you cannot be sure that it contains sufficient oxygen. Therefore it is important that you know the lamp and how to use it.

IV. PRESENTATION.

A. Caution. The flame safety lamp is a valuable and important piece of equipment for damage control use but, improperly used, it can be a dangerous hazard. "The flame safety lamp is intended solely for the detection of oxygen deficiencies in atmospheres in which men must work. The lamp will also detect the presence of flammable gasses, but its intentional use for this purpose in spaces suspected of containing explosive gases or vapor--especially spaces suspected to contain acetylene or hydrogen--is dangerous and is expressly forbidden." (Quote from BUSHIPS Manual 92-456.)

1. The flame safety lamp should not be used to test for explosive gases. An approved combustible-gas-indicator is used to detect flammable gases.

2. A new oxygen deficiency indicator has been developed to serve the same purpose as the flame safety lamp. It is used to draw a sample of the air from a compartment, through an intake tube, and test it for oxygen deficiency on the outside of the compartment. However, the flame safety lamp will probably remain the standard instrument aboard ship for this purpose for some time.

B. History. The flame safety lamp has been used in English mines since 1816, originally as a means of illumination.

1. It is sometimes called the "Davey Lamp" after the man credited with developing the original lamp. He developed the safe confinement of the flame by the cooling effect of the wire gauzes.

2. Two other men are credited with developing improvements in its design and safety features. Clanny enclosed the lamp in a case to form a combustion chamber. Stephenson developed interior ventilation by the underfeed principle.

C. Modern Lamps. At present, lamps produced by only two manufacturers are being used:

1. MSA-Wolf - which we use and will cover.

2. Koehler.

D. Description of Wolf Lamp. (Show the lamp and each part as you describe and explain it.) The Wolf flame safety lamp is constructed in two component assemblies (the font and the bonnet) each composed of a number of parts. (Show each part as you describe it and demonstrate its assembly and use in the lamp.)

1. Bonnet. The bonnet component acts as a shield for the protection of the flame and incorporates the safety features.

a. Gauzes may be of fine brass or steel wire mesh.

(1) They provide the safety feature of the lamp by cooling the flame.

(2) Rust, dirt, oil or grease on the lamp or gauze will decrease the safety features.

(3) Gauzes should not be used too long, since heat of the flame oxidizes the wire, decreases its diameter, increases the openings of the mesh and permits more air to pass, thus decreasing its designed safety features.

b. The chimney. Each of the two makes of lamp, Wolf and Koehler, must be provided with the correct type of chimney. While similar in design, their parts are not interchangeable.

(1) The words "Pyrex, Made in USA" are printed on each genuine Koehler chimney glass.

(2) The inscription "Wolf, Made in USA" and the word "Top", to insure correct right-side-up installation, are printed on each genuine Wolf glass.

(3) If not so identified, they should not be used in assembly of these lamps.

c. The air admission ring provides the "under-feed" principle.

(1) It is installed below the chimney and admits air to the combustion chamber below the flame.

(2) It has two wire gauzes for cooling effect and to eliminate foreign matter. It is important that these gauzes be thoroughly cleaned each time the lamp is used.

d. Gaskets are made of asbestos and two are used, one on top and one under the bottom of the chimney glass. They seal and insulate between the glass of the chimney and the metal parts of the font and bonnet.

2. Font. The font contains:

a. Cotton, for saturation with fuel.

b. Wick for adjustment of flame.

c. Spark igniter.

E. Preparation of Lamp for Use: (Show and demonstrate each step, using the lamp itself, as you explain the procedure.)

1. Inspection. Check the lamp carefully to make certain that:

a. No parts are missing.

b. All parts are in good condition.

c. All parts fit together properly.

d. The wick is trimmed even with its holder and is free of crust or soot. This is necessary to produce a stable and uniform flame.

2. Fueling the Lamp.

a. Remove the filling cap and saturate the cotton in font with fuel.

(1) Use only approved naphtha fuel -- gasoline and lighter fluids cause crusting of the wick and clogging of the gauzes with soot.

(2) Because all fuels may gum up when standing, especially if exposed to sunlight, not more than one month's supply should be kept available and it should be kept in an opaque container.

b. Turn the font upside down and drain out the excess fuel, taking care to completely remove any fuel remaining on outside of font.

(1) This precaution is necessary because when the lamp becomes heated, this excess fuel may evaporate and enter the test flame thereby tending to give false indications.

c. Replace and tighten the cap or filler plug.

3. Assembling the Lamp. (Demonstrate on the lamp itself and have crew members assemble the lamp under supervision.)

a. Put the air admission ring in place on top of the font.

b. Put the asbestos gasket in place on the air admission ring.

c. Place the chimney glass in place, with the second gasket on top of the chimney, making certain that the chimney is right-side-up.

d. Place the two gauzes, one inside the other, in place on top of the second gasket.

e. Make sure that the expansion spring ring is in place in the bonnet and place it over the gauzes and chimney. Screw the bonnet down onto the font tightly, making sure not to cross the threads.

f. Lock the entire assembly together by lining the set screw up with the notch on the font and then screw the set screw up firmly with its key. Then remove the key.

g. Check carefully to insure against the following assembly errors:

(1) Leaving out one or both gaskets.

(2) Using broken gaskets.

(3) Omission of one of the two gauzes.

(4) Using a cracked, chipped, or broken chimney glass.

(5) Using defective gauzes.

(6) Failure to tighten the filler plug.

(7) Failure to use an expansion spring ring.

(8) Failure to screw the bonnet onto the font to correct tightness.

(9) Omission of the deflection ring.

(10) Using a distorted bonnet.

(11) Failure to examine each part to see that it is clean and in good condition.

4. Lighting the Lamp. (Demonstrate and permit crew members to practice.)

a. Turn up the wick.

b. Push the igniter up from below and turn its knob to the right to produce an ignition spark.

c. Adjust flame to a height of about 1/2" in normal atmosphere.

d. Check for leaks by blowing against the chimney.

e. The lamp should be lit about 5 minutes before using it for testing and to permit its flame to reach the best operating temperature.

F. Use of Lamp to Test Atmosphere in Enclosed Spaces.

1. When entering a compartment to test the oxygen content of its air, be sure you are wearing an OBA or fresh air hose mask.

a. Don't remove the mask until you have tested all different air levels (from deck to overhead) of the compartment.

2. The effect of oxygen content of the air on the flame of the safety lamp and on you is as shown in the following table. Keep in mind that normal air contains 21% oxygen.

% Oxygen	Effect on flame	Effect on you
0	No flame	Almost immediate death (suffocation).
0-6	No flame	Rapid collapse - death in 6 to 8 minutes.
6-10	No flame	Slow collapse - recovery with prompt treatment.
10-16	No flame	Dangerous but seldom fatal.
16-18	Dim flame	Lowered efficiency - usually no collapse.
18-21	Increasing flame	Sufficient oxygen for normal breathing.
21	Bright flame	None - air is normal.

G. Indications of Flammable Gas.

1. Primary Use to Test for Oxygen Deficiency. The flame safety lamp is designed primarily to test for oxygen deficiency. In a normal

FLAME SAFETY LAMP
DEMONSTRATION