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USE AND MAINTENANCE

OF

OXYGEN EQUIPMENT

This publication replaces T. O. No. 03-50-1, dated 1 July 1944 and revised 10 January 1945.

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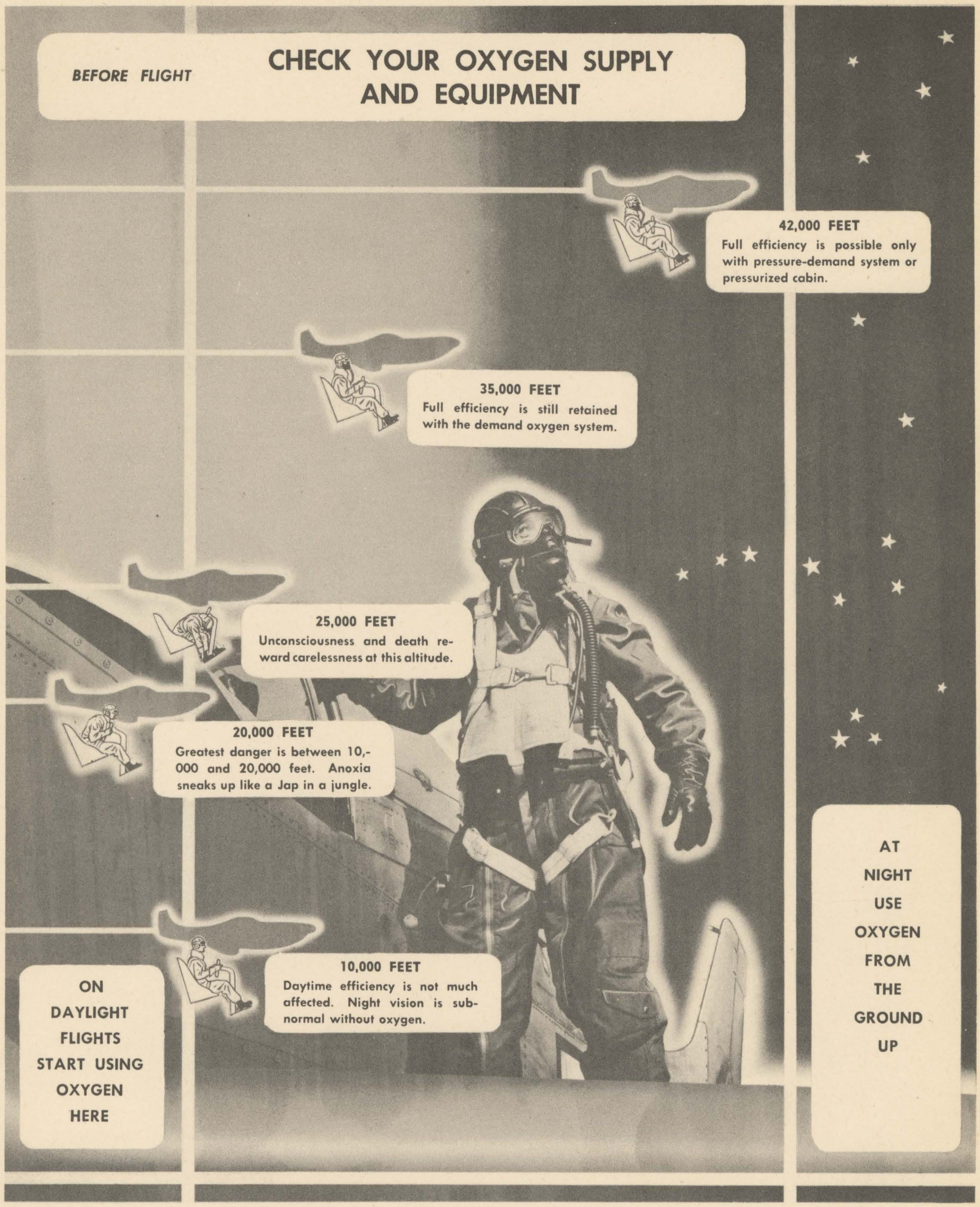


Figure 1-1. Basic Rules for the Use of Oxygen

SECTION I
GENERAL INFORMATION

1-1. WHEN AND WHERE TO USE OXYGEN.

1-2. Oxygen equipment is installed in aircraft for your safety and welfare as a flyer, and in order to help you do the best possible job. The records of accidents, deaths, and aborted missions show that trouble often develops from failure of personnel to make the proper use of oxygen equipment when and where it is needed. For this reason your particular attention is called to the following basic rules:

Always use oxygen at and above 10,000 feet.

Always use oxygen between 8,000 and 10,000 feet when you expect to maintain this altitude for 4 hours or more.

Always use oxygen at night on all combat missions at all altitudes from the ground up. On all other night missions, use oxygen from the ground up, whenever equipment is available.

1-3. WHAT THIS BOOK CONTAINS.

1-4. In this Handbook you will find basic information on the use, operation, servicing, inspection, and maintenance of airplane oxygen systems.

1-5. Sections I through VI are addressed to all who are concerned with oxygen equipment in any way, but mainly to you who use oxygen in flight. These sections discuss the need for oxygen, and tell how it is used to prevent anoxia, the bends, and the chokes. They describe the basic types of oxygen installation and equipment, and give data for estimating the duration of an oxygen supply.

1-6. Sections VII through X are addressed chiefly to maintenance and inspection personnel, and to Personal Equipment Officers. They tell how to service, inspect, and maintain oxygen systems.

1-7. The Appendix lists important items of oxygen equipment and related materials, together with their part numbers and stock numbers. This helps in requisitioning items from various property classes as required for maintenance, repair, and replacement.

1-8. WHERE TO FIND RELATED INFORMATION.

1-9. TECHNICAL ORDERS. You can find detailed information and instructions about individual components of oxygen systems in Technical Orders of the 03-50 series. These are listed in T.O. No. 00-1, the Index of AAF Technical Publications. Certain Technical Orders are also listed in the Appendix of this Handbook, in connection with the particular items of equipment to which they apply. T.O. No. 30-105-1, Your Body in Flight, is of special interest and importance to all flying personnel.

1-10. SPECIFICATIONS. AAF Specification No. 40363 covers installation of low-pressure oxygen equipment. It includes a complete list of detail specifications.

1-11. MAINTENANCE INSTRUCTION CHARTS. AAF Maintenance Instruction Charts are illustrated posters. Those in series C-03-50, listed in T.O. No. 00-1, are concerned with oxygen equipment. They can be requested on AAF Form No. 104-B, as prescribed in T.O. No. 00-5-2.

1-12. WD TECHNICAL MANUAL. TM 1-424, Aircraft Hardware and Materials.

1-13. AAF MANUALS.

AAF Manual No. 25-2, Physiology of Flight.

AAF Manual No. 34, Notes on the Use of Oxygen Equipment for Fighter Pilots and P. R. U.

AAF Manual No. 35, Notes on the Use of Oxygen Equipment for Air Crews.

AAF Manual No. 55-0-1, Reference Manual for Personal Equipment Officers.

1-14. TRAINING FILMS.

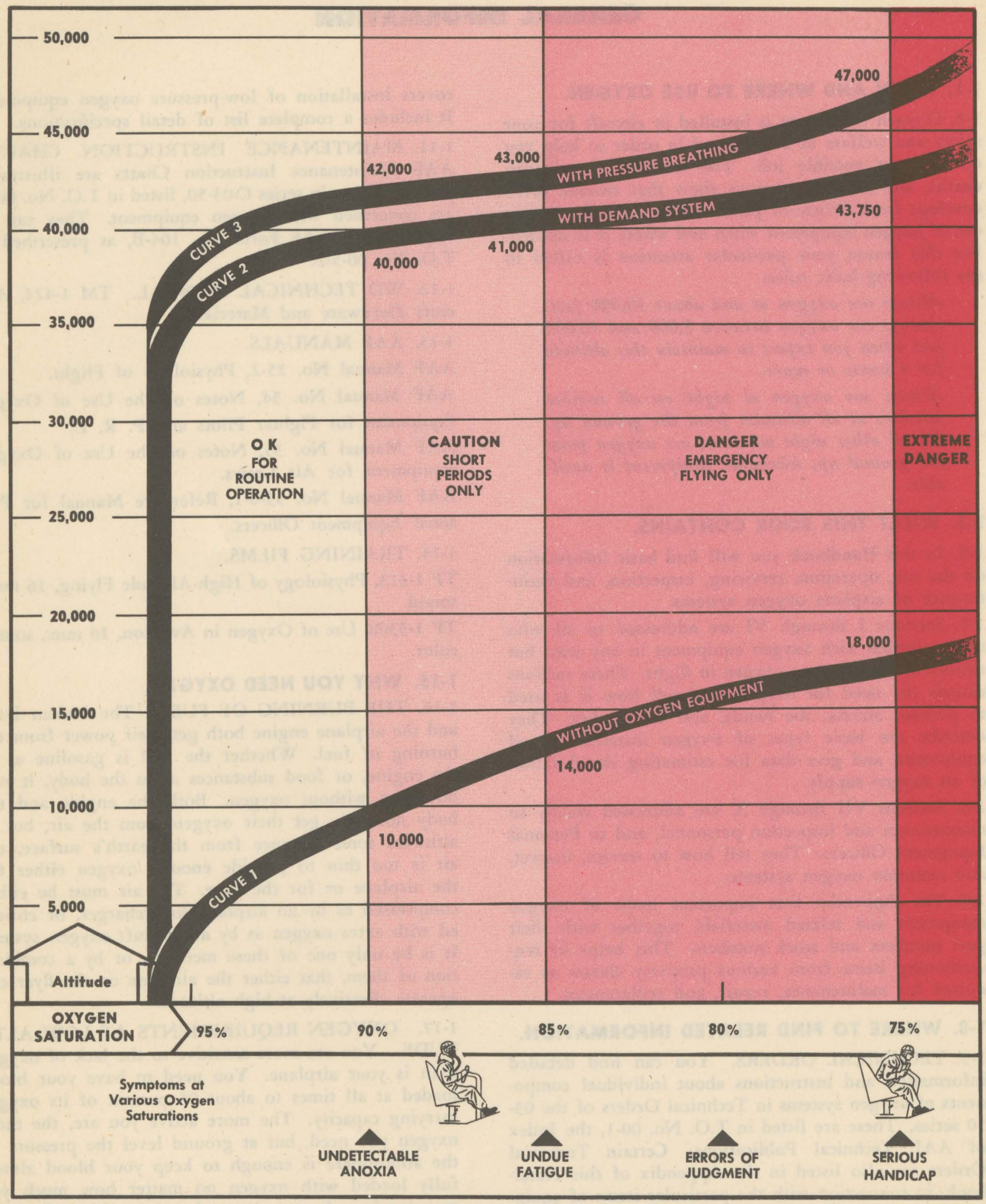
TF 1-313, Physiology of High-Altitude Flying, 16 mm., sound.

TF 1-3308, Use of Oxygen in Aviation, 16 mm., sound, color.

1-15. WHY YOU NEED OXYGEN.

1-16. THE BURNING OF FUEL. The human body and the airplane engine both get their power from the burning of fuel. Whether the fuel is gasoline as in the engine, or food substances as in the body, it will not burn without oxygen. Both the engine and the body normally get their oxygen from the air, but at altitudes some distance from the earth's surface, the air is too thin to provide enough oxygen either for the airplane or for the flyer. The air must be either compressed as by an airplane supercharger, or enriched with extra oxygen as by an aircraft oxygen system. It is by only one of these methods, or by a combination of them, that either the airplane or the flyer can operate effectively at high altitude.

1-17. OXYGEN REQUIREMENTS AT LOW ALTITUDE. You are more sensitive to the lack of oxygen than is your airplane. You need to have your blood loaded at all times to about 95 percent of its oxygen carrying capacity. The more active you are, the more oxygen you need, but at ground level the pressure of the atmosphere is enough to keep your blood almost fully loaded with oxygen no matter how much you may require. As you go up, however, the atmospheric pressure gets lower and lower, and your blood loses more and more of its oxygen load. (See figure 1-2.) When you reach 10,000 feet, the pressure of the atmosphere around you is only about two-thirds of what



The relation between altitude and blood oxygen saturation is shown for the flyer without oxygen equipment (curve 1); with the demand system (curve 2); and with the pressure demand system (curve 3). Curves 2 and 3 are based on the assumption that no mask leakage occurs. A special advantage of pressure-breathing is that it completely eliminates the chance of inboard mask leaks.

Figure 1-2. How Oxygen Equipment Raises Your Ceiling

it was at sea level, and your blood is carrying only about 90 percent of its full load. This will considerably reduce your ability to see at night, but unless you stay at this altitude for several hours or engage in strenuous activity, you can still function efficiently in other respects. Up to 10,000 feet, your oxygen intake system will adjust itself fairly well to its atmospheric environment.

1-18. 10,000 FEET, GOING UP. As you go from a pressure altitude of 10,000 feet to one of 20,000 feet, the ambient pressure (that is, the pressure of the surrounding atmosphere) falls to less than half its sea-level value. As this happens, the oxygen load of your blood falls from 90 percent to about 65 percent. Unfortunately, your body has no "warning system" to signal that it is not getting enough oxygen. On the contrary, you may even feel better than usual, despite the dimming and narrowing of your vision, the partial loss of control over your muscles, and the impairment of your ability to think clearly. This condition of oxygen starvation is technically called "ANOXIA." Mild anoxia causes poor night vision, extreme fatigue, foggy thinking, poor coordination, and occasionally headache or emotional disturbances. The time to avoid anoxia is before you get it. The way to avoid it is by following the rules stated in paragraph 1-2.

1-19. 20,000 FEET AND ABOVE. At the indicated altitude of 20,000 feet, most flyers would stay conscious without oxygen equipment for perhaps 30 minutes. During this period they would become anoxic and incapable of performing their duties. At 25,000 feet one may "pass out" (lose consciousness) in as short a time as 3 minutes; at 30,000 feet, it may happen in 1 minute or less. Death may follow very quickly, and the unconsciousness which precedes death makes it impossible for one to help himself.

1-20. EXAMPLE OF ANOXIA. One of numerous reports from the European theater demonstrates the speed with which anoxia can strike. At 25,000 feet, the pilot called the tail gunner on the interphone and got no answer. He continued the ascent, and sent the navigator back to see what was the trouble. At 30,000 feet, several minutes later, neither the tail gunner nor the navigator could be reached on the interphone. A third crew member went back and found both the gunner and the navigator dead. The gunner had become disconnected from his oxygen supply, and the navigator had gone back without a walk-around bottle.

1-21. HOW TO AVOID THE BENDS AND CHOKES.

1-22. CAUSES OF BENDS AND CHOKES. Bends and chokes are symptoms of decompression sickness, which is caused by the formation of bubbles, consisting mainly of nitrogen, when the pressure upon the body is greatly and rapidly reduced. The symptoms sometimes occur in flyers at high altitudes, especially after rapid climb or during muscular activity. (Refer to T.O. No. 30-105-1, Your Body in Flight.)

1-23. WHAT TO DO BEFORE REACHING ALTITUDE. The best way of avoiding these symptoms is to breathe 100 percent oxygen before arriving at altitude. Most flyers who are subject to decompression sickness get adequate protection if they breathe pure oxygen for 1 hour before reaching 25,000 feet. At the present time decompression sickness is not often a serious problem, and special protective measures are seldom needed. If such protection is needed, however, these general rules may be followed:

a. Breathe 100 percent oxygen for at least 1 hour before reaching 25,000 feet. Part of the period of oxygen breathing may be spent on the ground and part during ascent, so long as pure oxygen is breathed continuously for 1 hour.

b. If the oxygen supply in the plane is sufficient, and the ascent will take 1 hour or longer, then breathe 100 percent oxygen only during ascent.

c. If the oxygen supply in the plane is not sufficient to permit breathing pure oxygen during ascent, then breathe pure oxygen for 1 hour just before take-off, and during ascent, use the oxygen system in the plane with the diluter set at "NORMAL" (automix "ON").

d. You will get some protection by breathing pure oxygen for only 15 minutes, but the longer you breathe it the more resistant you will be.

1-24. WHAT TO DO AT ALTITUDE. If severe symptoms occur at altitude, the only remedy is partial descent, while keeping as quiet as possible. If you feel faint, make sure you are getting 100 percent oxygen.

1-25. WHAT TO DO AFTER DESCENT. If you have had severe symptoms during flight, or if you still have the chokes after descent, you should notify the Flight Surgeon immediately.

1-26. WHAT THE PERSONAL EQUIPMENT OFFICER DOES FOR THE FLYER.

1-27. The functions of the Personal Equipment Officer are essential to the effective use of air power. His duties with reference to the use of oxygen equipment are given in detail in AAF Regulation 55-7. He assists you in several ways as follows:

1-28. INSTRUCTION. He extends and supplements the Altitude Training Program by giving you detailed instruction in the use of oxygen equipment. He also instructs inspection and maintenance personnel in the use and maintenance of oxygen equipment.

1-29. FITTING AND CARE OF MASKS. He fits and tests your oxygen mask, and helps you to keep it in good condition.

1-30. INSPECTION OF EQUIPMENT. He supervises and assists in the servicing and inspection of oxygen equipment in the airplane, and makes sure that adequate supplies of oxygen are available. He prepares and submits Unsatisfactory Reports as provided in AAF Regulation 15-54.

1-31. REPORTING OF ACCIDENTS. He cooperates

with the Flight Surgeon in preparing a report of each accident to, or death of flying personnel caused by malfunctioning of oxygen equipment or by failure to use it properly. Such reports are submitted in triplicate to the Office of the Air Surgeon, Headquarters, Army Air Forces, Washington 25, D. C., within 5 days following the date of the accident or death.

SECTION II

OXYGEN INSTALLATIONS IN GENERAL

2-1. BASIC COMPONENTS OF AN OXYGEN SYSTEM.

2-2. All aircraft oxygen systems include the following basic components:

a. CYLINDERS. These are containers for the storage of oxygen.

b. PLUMBING. This term is sometimes used to include the tubing, valves, and fittings necessary to interconnect the fixed components of the system, and to permit recharging of the cylinders.

c. REGULATORS. These govern the flow of oxygen to the flyer.

d. INDICATORS. Oxygen supply pressure is shown by a pressure gage. Action of the regulator is shown by a flow indicator.

e. DELIVERY APPARATUS. This usually consists of a mask and a flexible tube connecting it to the regulator.

2-3. PORTABLE AND EMERGENCY EQUIPMENT. Walk-around assemblies are provided in multiplace aircraft, for movements of personnel from station to station within the airplane. Emergency cylinders furnish

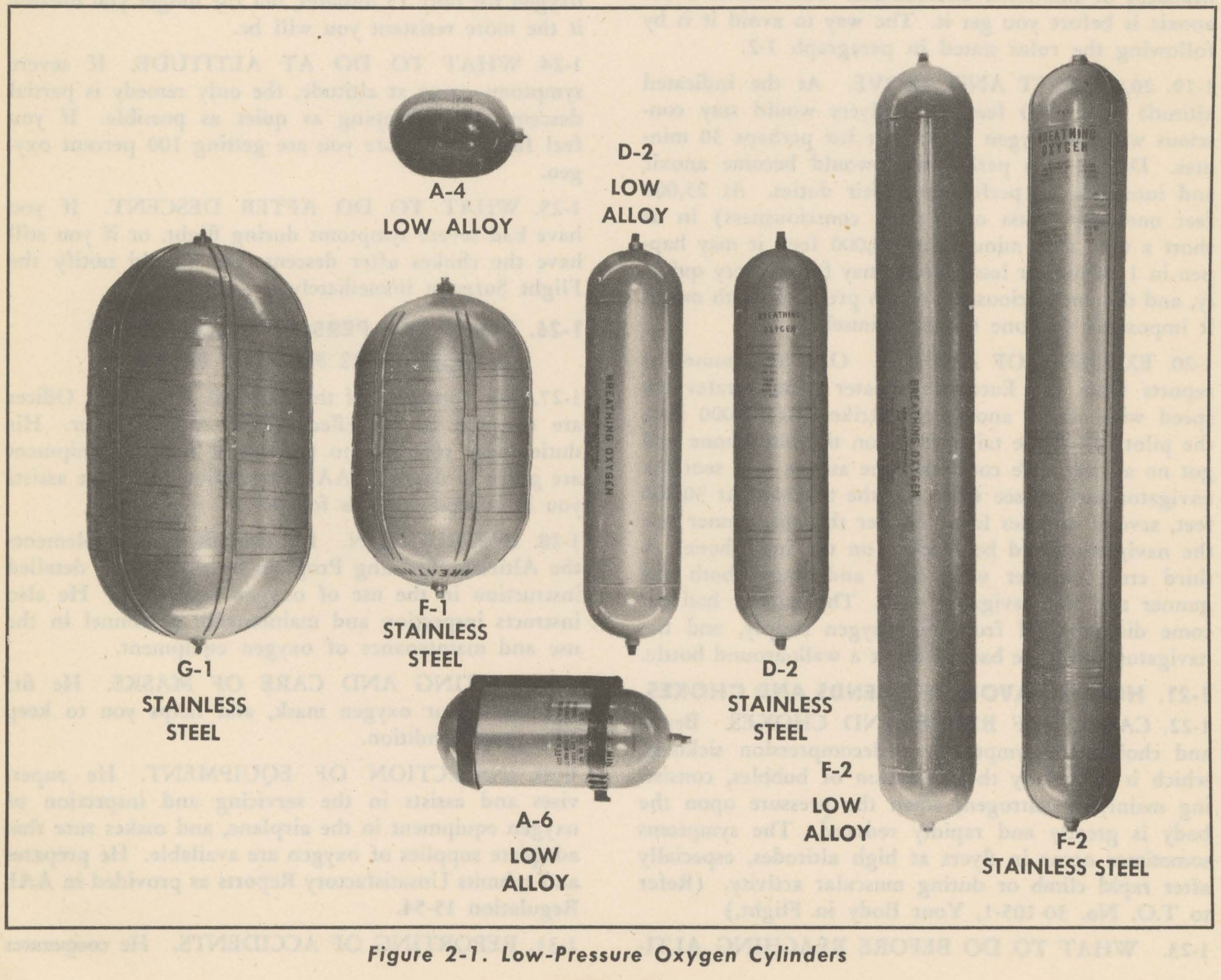


Figure 2-1. Low-Pressure Oxygen Cylinders

a source of oxygen which can be used in parachute escape at high altitude, or in the event that the normal oxygen supply is lost.

2-4. FLIGHT STATION EQUIPMENT. Regulators, indicators, delivery apparatus, portable and emergency assemblies may be referred to collectively as flight station equipment. There are three types of flight station equipment: the demand type, the pressure-demand type, and the continuous-flow type. These three types of equipment are discussed separately in sections III, IV, and V of this Handbook. Cylinders and plumbing are essentially similar in almost all aircraft, varying mainly in arrangement. These two components are discussed in this section.

2-5. LOW-PRESSURE CYLINDERS. (See figure 2-1.)

2-6. CHARACTERISTICS. Combat aircraft carry only low-pressure cylinders. These are described in detail in T.O. No. 03-50C-3. They can hold a maximum charge of 450 psi, and are normally filled to a pressure of 400 psi. Spuds for attachment of fittings are found at one or both ends. Except for the type A-4 walk-around bottle, which is green, all low-pressure cylinders are painted yellow.

2-7. SHATTERABLE AND NONSHATTERABLE CYLINDERS. Most low-pressure cylinders will resist shattering by gunfire even when filled to 400 psi. These are called "shatterproof" or "nonshatterable." They are identified either by the presence of welded steel bands or by the sign "NONSHATTERABLE" on their surface.

WARNING

Nonbanded low-pressure cylinders which are not marked with the sign "NONSHATTERABLE" are not to be used in combat at a pressure greater than 300 psi, (Refer to T.O. No. 03-50-9.)

2-8. TYPES AND CAPACITIES. These are listed in Table I and illustrated in figure 2-1.

TABLE I. CHARACTERISTICS OF LOW-PRESSURE OXYGEN CYLINDERS

Low-Pressure Cylinder Type	*Description*	*Internal Volume (cubic inches)*	*Available 02 400 to 50 psi (cubic feet)*	*Working Pressure (combat)*
A-4	Green—Banded (Shatterproof) 7-5/8 x 5-1/4 inch—one spud	104	1.44	400 psi
A-4	Green—Nonbanded (Shatterproof) 7-5/8 x 5-1/4 inch—one spud	104	1.44	400 psi
A-6	Yellow—Nonbanded (Shatterproof) 14-1/2 x 5-3/4 inch—one spud	280	3.8	400 psi
D-2	Yellow—Banded (Shatterproof) 23-1/2 x 5-3/4 inch—two spuds	500	6.9	400 psi
D-2	Yellow—Nonbanded (Shatterproof) 23-1/2 x 5-3/4 inch—two spuds	500	6.9	400 psi
F-1	Yellow—Nonbanded (Shatterable) 17-1/2 x 9-3/4 inch—one spud	1000	13.8	300 psi
F-1	Yellow—Banded (Shatterproof) 17-1/2 x 10-1/8 inch—two spuds	1000	13.8	400 psi
F-2	Yellow—Nonbanded (Shatterproof) 44-1/2 x 5-3/4 inch—two spuds	1000	13.8	400 psi
F-2	Yellow—Banded (Shatterproof) —two spuds	1000	13.8	400 psi
G-1	Yellow—Nonbanded (Shatterable) 24-1/2 x 12-1/4 inch—one spud	2100	29.0	300 psi
G-1	Yellow—Banded (Shatterproof) 24-1/2 x 12-9/16 inch—two spuds	2100	29.0	400 psi
J-1	Yellow—Nonbanded (Shatterproof) 49-1/4 x 24-1/2 inch—two spuds	18000	248.0	400 psi

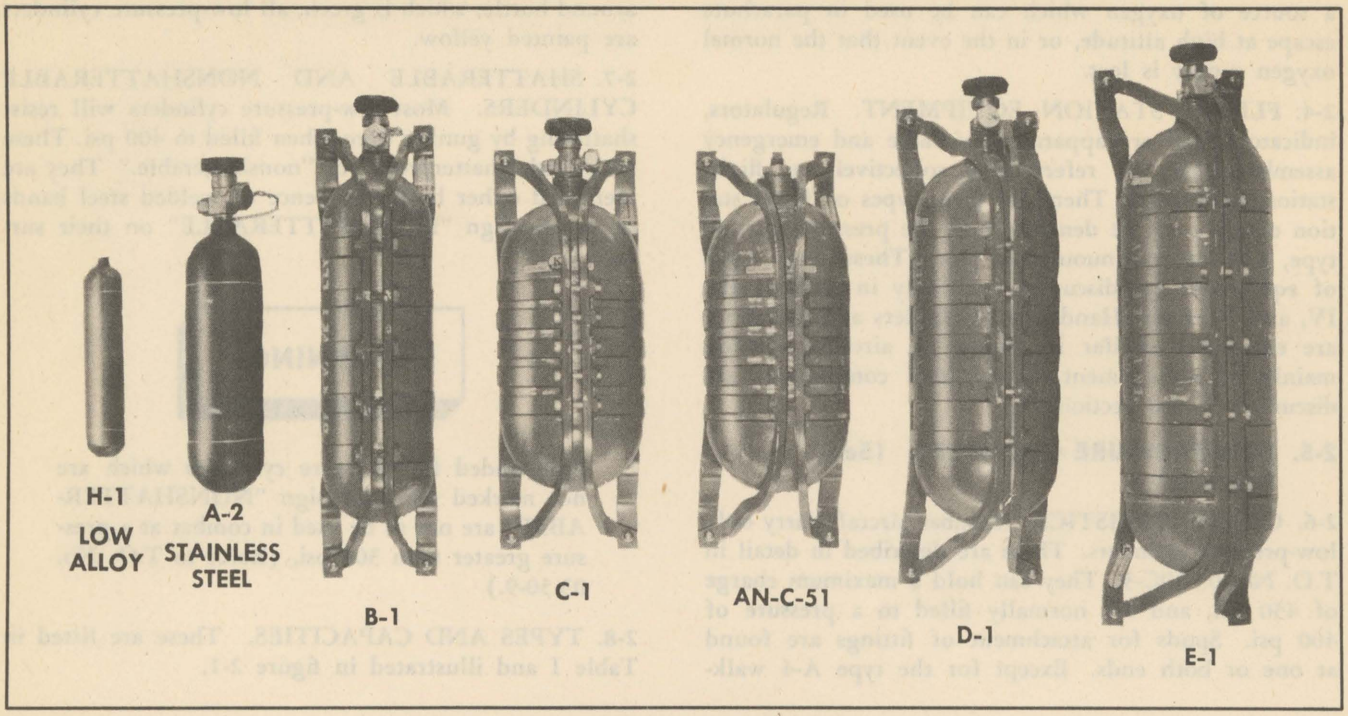


Figure 2-2. High-Pressure Oxygen Cylinders

2-9. HIGH-PRESSURE CYLINDERS.

2-10. A limited number of high-pressure cylinders are in use in some types of training aircraft. They may be identified by their green color and the presence of a hand-operated shut-off valve installed in the neck. Their types and capacities are listed in Table II and illustrated in figure 2-2.

2-11. OXYGEN PLUMBING.

2-12. TUBING. Tubing used in low-pressure installations is made of aluminum alloy conforming to Federal Specification No. WW-T-787. It has an outside diameter of 5/16 inch and a wall thickness of 0.032 or 0.035 inch. Tubing running from the filler valve to the cylinders is identified by bands of self-sealing Scotch cellulose tape of the color combination light green, yellow, light green (figures 2-3 and 2-4). Distribution lines, that is, tubing leading from the cylinders to the regulators, are banded with the single color light green. Light green is also used to identify a tube used both as a filling line and as a distribution line. In high-pressure systems, 3/16-inch copper tubing is used in place of 5/16-inch aluminum alloy.

2-13. FITTINGS. In low-pressure systems, the parts are joined by means of flared tube connections, with adapters where necessary to attach them to pipe thread fittings. A flared tube connection consists of a nipple held against the mouth of the flared tube by a sleeve and a coupling nut. Most flares now in use are simple, funnel-shaped expansions of the tubing. These are gradually being replaced by double flares which give a better and more enduring seal. Pipe thread fittings are used to attach tubing to cylinders, regulators, and indicators. The connection is made by the engagement of threaded male and female parts which are tapered in diameter. Directions for making both flared tube and pipe thread connections are given in section IX. Various types of fittings are illustrated in figure 10-13. The copper tubing used with high-pressure systems requires silver soldered fittings.

2-14. CHECK VALVES. Check valves are installed in combat aircraft to prevent the loss of the entire oxygen supply in the event that a single cylinder or length of tubing is punctured by gunfire. A check valve permits a rapid flow of oxygen in only one direction, indicated on the valve casing by an arrow. The present check valves (figure 2-5) are not spring-loaded; they will allow a slow back-flow under slight pressure differential, except when installed with the arrow pointing upward. A large and sudden fall of pressure on the upstream side, however, will seat a valve installed in any position. The importance of these facts is indicated in the following paragraphs.

Note

The effect of leakage or puncture at any point in the oxygen system of a given airplane depends upon the exact arrangement of cylinders, check valves, and outlets in that particular plane. For this reason every crew member should be familiar with the oxygen system of the airplane in which he flies.

2-15. BASIC SCHEMES OF LOW-PRESSURE OXYGEN INSTALLATIONS.

2-16. Oxygen systems in army aircraft are designed for maximum safety with minimum maintenance. It is emphasized that the basic schemes described following *do not represent the actual installation in*

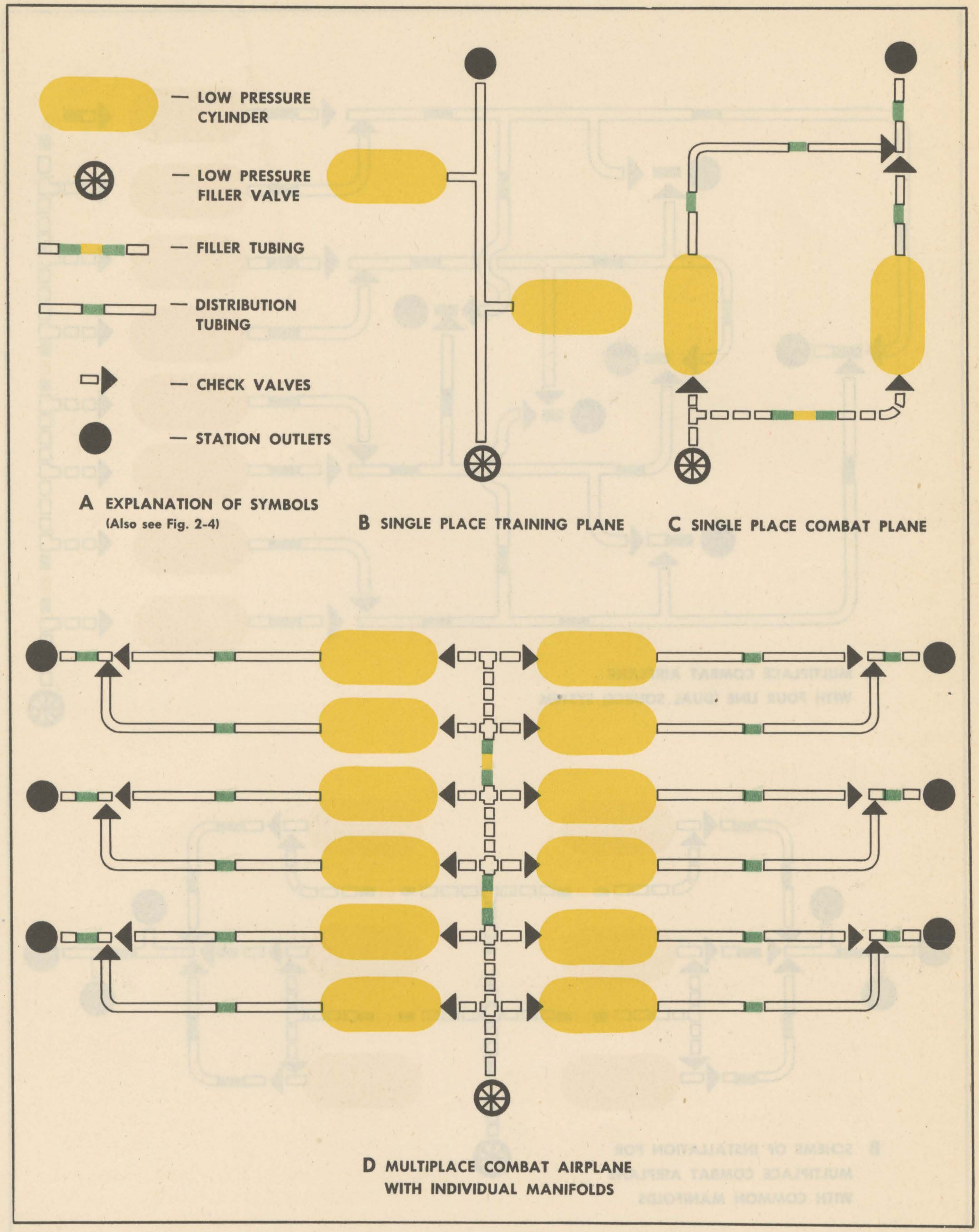


Figure 2-3. Schematic Diagrams of Oxygen Installations: a. Legend, b. Single-Place Trainer, c. Single-Place Combat, d. Individual Manifolds

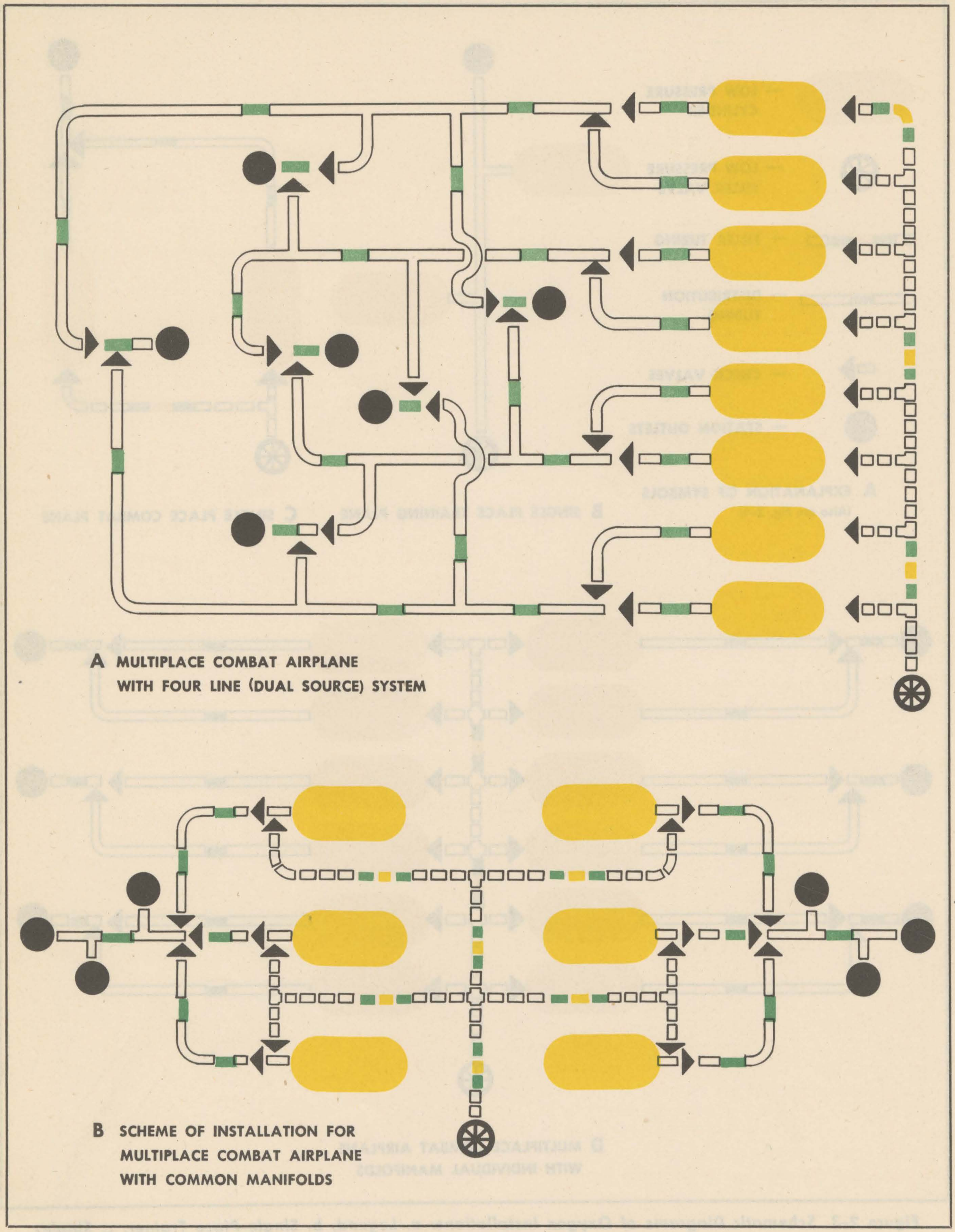


Figure 2-4. Schematic Diagrams of Oxygen Installations: a. Four Line, b. Common Manifolds

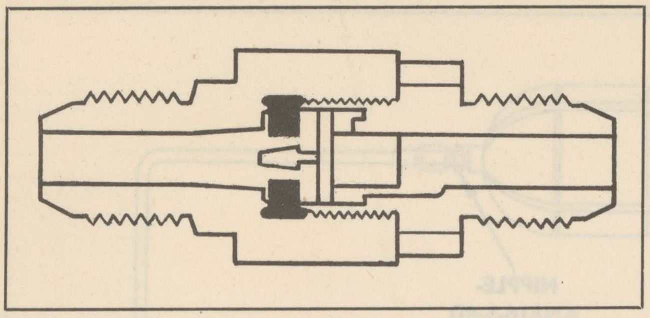


Figure 2-5. Cutaway of Low-Pressure Oxygen Check Valve, Style A

any actual airplane. For data on the various aircraft *types,* refer to the Technical Orders of the 01- series. For data on the individual airplane, the only reliable source is the airplane itself.

2-17. SINGLE-PLACE TRAINING AIRPLANE. (See figure 2-3, detail "B".) Such airplanes are equipped with an oxygen system consisting of one or more cylinders, a filler valve, a common filler, and distribution manifold, and the essential flight station equipment. Since gunfire is not anticipated, there are no check valves.

2-18. SINGLE-PLACE COMBAT AIRPLANE. (See figure 2-3, detail "C".) These airplanes have not less than two cylinders, and usually have more. Filler and distribution manifolds are distinct. For protection against oxygen loss from gunfire, the system is always fitted with check valves.

2-19. MULTIPLACE COMBAT AIRPLANE, INDIVIDUAL MANIFOLDS. This scheme of installation provides a single, independent manifold for each individual station outlet. It has the advantage that no single puncture can deprive more than 1 man at a time of his oxygen supply. The length of critically vulnerable tubing is reduced to a minimum. All cylinders are connected to a common filler line, so that until the check valves are closed by puncture or sudden loss of pressure in some part of the system, the pressures in some or all of the cylinders will be equalized at all times. The actual operation of the check valves in such a system, however, depends upon the position in which they are installed (paragraph 2-14) and upon details of the recharging procedure.

2-20. MULTIPLACE COMBAT AIRPLANE, FOUR LINE (DUAL SOURCE) SYSTEM. (See figure 2-4, detail "A".) In this installation, while several outlets (1) are connected to a single manifold (2), the various manifolds are also interconnected in such a way that each outlet is actually supplied from two manifolds, either one of which may be punctured without draining the other. The filling system (3) is the same as that described in paragraph 2-19. The advantage of this plan is that many outlets may be supplied by relatively few cylinders with maximum safety.

2-21. MULTIPLACE COMBAT AIRPLANE, COMMON MANIFOLDS. (See figure 2-4, detail "B".) This is a nonstandard installation found on certain heavy bombers. Several outlets (1) are supplied from a common manifold (2) to which a number of cylinders (3) are connected. Puncture of any distribution manifold will deplete the oxygen supply for several men. The filling system (4) is the same as described previously.

SECTION III
THE DEMAND OXYGEN SYSTEM

3-1. GENERAL CHARACTERISTICS.

3-2. The demand oxygen system gets its name from the fact that it delivers oxygen to your lungs in response to the suction of your own breath, that is, *on demand.* It will give you enough oxygen for all altitudes up to 35,000 feet. Each time you inhale, you close a valve in the mask and open a valve in the regulator. When you exhale, you reverse this process. These movements automatically start and stop the oxygen flow, so that you get as much as you demand, and no more. In order to prolong the duration of the supply, the oxygen is automatically diluted in the regulator with suitable amounts of atmospheric air. This dilution takes place at all altitudes below 34,000 feet, but not above that altitude. Although the system works automatically, it is operated by your own breathing. This makes it important that your mask should not leak atmospheric air.

3-3. As installed in army aircraft (figure 3-1), the demand system employs low-pressure cylinders and plumbing such as are described in section II. The characteristic elements of the system, however, are the regulator and the mask. You cannot use a demand mask with a continuous-flow regulator, or a demand regulator with a continuous-flow mask. These parts are not separately interchangeable with those of other types of equipment.

Note

Certain exceptions to this rule are noted in connection with pressure-demand equipment. (Refer to *note* following paragraph 4-14.)

3-4. THE DILUTER-DEMAND REGULATOR.

3-5. GENERAL DESCRIPTION. The essential feature of a diluter-demand regulator is a diaphragm-

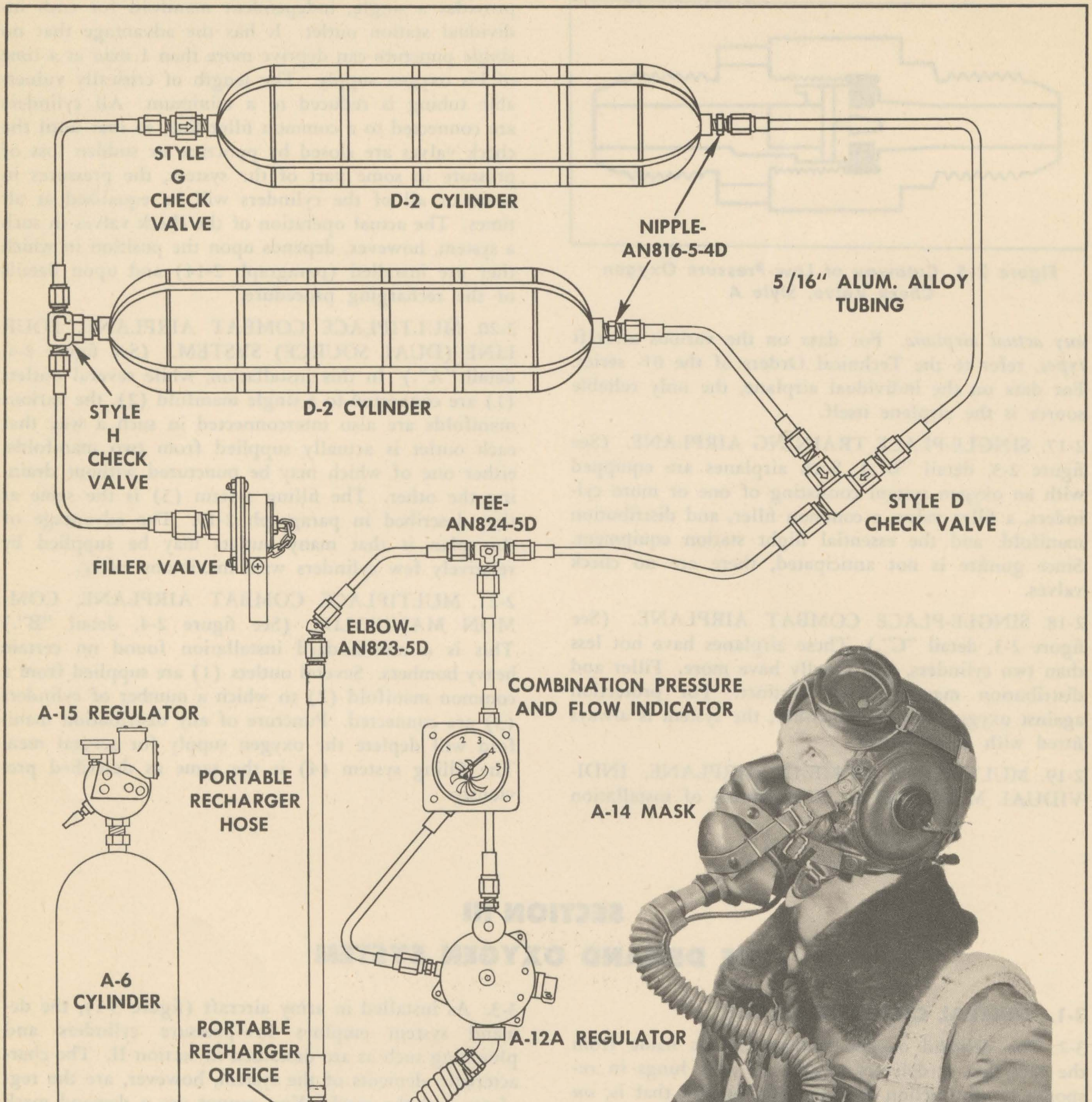


Figure 3-1. Parts of a Demand Oxygen System

operated valve (called the demand valve), which you open by slight suction on the diaphragm when you inhale, and which closes when you exhale. A reducing valve upstream from the demand valve provides a controlled working pressure. Downstream from the demand valve is the diluter or "automix" mechanism. This consists of an aneroid assembly (a sealed, evacuated bellows) which controls an air inlet. When the diluter lever is set in the position marked "NORMAL" (automix "ON"), you get mainly atmospheric air at ground level, with very little if any added oxygen. As you go up, the air inlet is gradually closed by the bellows, to give you an ever higher concentration of oxygen until, at about 34,000 feet, the air inlet is completely closed, and you get practically 100 percent oxygen. As you come down, of course, this process is reversed.

3-6. USE OF THE DILUTER (AUTOMIX) CONTROL. The diluter can be set by turning the lever to give "100% OXYGEN" (automix "OFF") at any altitude. At moderate altitudes, however, this causes the oxygen supply to disappear much more rapidly than is normal. The diluter should be set at "NORMAL" (automix "ON") for all routine operations. It should be set at "100% OXYGEN" (automix "OFF") only for the following special purposes:

a. Treatment of wounds or shock.

b. Protection against exhaust gases or other poisonous gases in the airplane.

c. To avoid the bends and chokes.

d. To correct a feeling of oxygen lack.

Note

If you set the diluter at "100% OXYGEN" (automix "OFF") to correct a feeling of oxygen lack, try to find out what was causing the trouble. If your mask is correctly fitted, and your other equipment is working properly, you should not feel any lack of oxygen with the diluter set at "NORMAL" (automix "ON"). When you have found out what was wrong, and have corrected it, set the diluter back at "NORMAL" (automix "ON"), so as not to waste oxygen.

3-7. THE EMERGENCY VALVE. The diluter-demand regulator is provided with an emergency valve, operated by a red knob on the front of the regulator. Opening this valve directs a steady stream of pure oxygen into your mask, regardless of your altitude. You should use the emergency valve without hesitation in any of the following emergencies:

Anoxia or unconsciousness in any crew member.

Sudden serious leakage in your oxygen mask or mask-to-regulator tubing.

Malfunction of the regulator.

Note

Use of the emergency valve exhausts the oxygen supply in a very short time. For this reason, the valve knob is secured so that you cannot open it without breaking a wire. When you have corrected the emergency condition, turn the valve off. If for any reason you have to leave the emergency valve open, the airplane should descend to a lower altitude.

3-8. TYPES OF DILUTER-DEMAND REGULATORS.

3-9. The types and designs of diluter-demand regulators differ somewhat in construction and performance, but are nevertheless regarded as interchangeable.

3-10. TYPE A-12A REGULATORS.

Note

The term "A-12A" is used in this Handbook to apply to the regulators now listed in Stock List S-03K under part No. AN6004-1, as Regulator-Diluter Demand Oxygen AN-R-5, stock No. 5500-717645, and to the Pioneer design of this same regulator. Future procurements of these regulators will bear the type designation "A-12A." This designation will also appear in future stock lists. The A-12A regulator will be identical with the present regulator which is listed as AN6004-1. All references in this Handbook to A-12A regulators apply also to the AN6004-1.

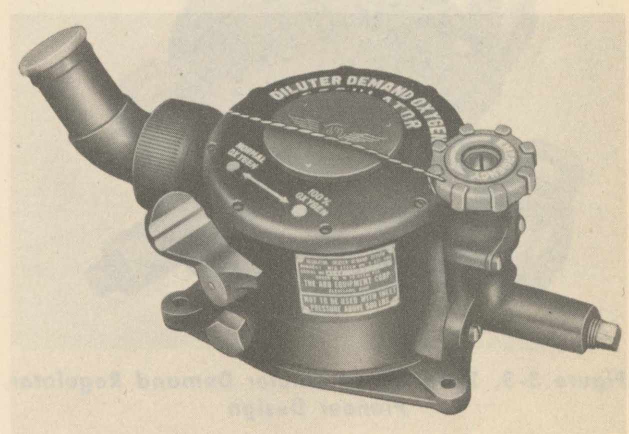


Figure 3-2. Type A-12A Diluter Demand Regulator, Aro Design

3-11. ARO DESIGN. (See figure 3-2.) Regulators of this design are made by several manufacturers. A schematic diagram is given in figures 3-6 and 3-7. Green arrows represent oxygen; white arrows represent air.

3-12. At altitudes up to about 34,000 feet, air enters the regulator through an inlet provided with a check valve (1). Oxygen enters through a pressure reducing valve (2). Each time you inhale, the slight suction of your breath pulls the diaphragm (3) inward, and opens the demand valve (4). Oxygen then follows

the path indicated by the green arrows until it reaches the oxygen metering port (5). The diluter mechanism includes two valves, one covering the *air* metering port (6), and the other, the *oxygen* metering port (5). These valves are mounted on a single lever, controlled by an aneroid (7).

3-13. At sea level, the aneroid, being compressed by the pressure of the atmosphere, permits the lever to keep the oxygen valve closed and the air valve open. With the mechanism in this position, you get nothing but atmospheric air.

3-14. As you go up, the aneroid expands. This pushes the lever toward the right (in the diagram), gradually opening the oxygen metering port, and closing the air metering port. In this way, up to about 34,000 feet, the regulator delivers a mixture of oxygen and air which contains an increasing proportion of oxygen as the altitude is increased.

3-15. At 34,000 feet and above, the aneroid will have completely closed the air valve, leaving the oxygen valve wide open. At these altitudes you get practically pure oxygen.

3-16. The diluter control lever is not shown in the figure, but the device by which it closes the air metering port is indicated at No. (8). The emergency valve (9) controls a bypass between the oxygen inlet and the chamber leading to the mask outlet.

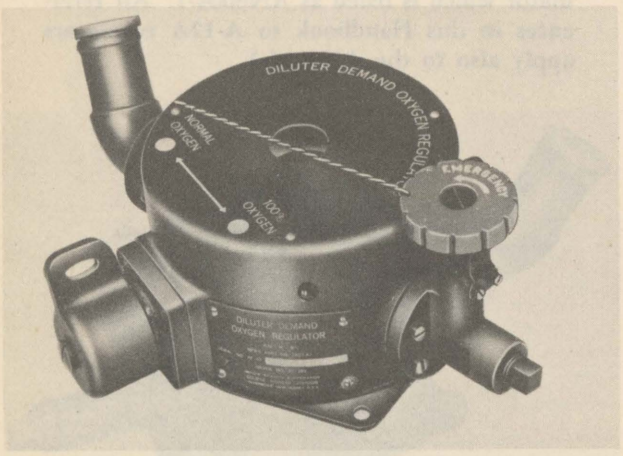


Figure 3-3. Type A-12A Diluter Demand Regulator, Pioneer Design

3-17. PIONEER DESIGN A-12A REGULATOR. (See figure 3-3.) This is the product of a single manufacturer. It differs from the Aro design in appearance and in construction, but not in the way in which it is used. A schematic diagram of its operaton is given in figure 3-9.

3-18. The demand valve (1) is similar in principle to that of the Aro regulator, but the diluter (2) and the pressure reducing mechanism (3) are somewhat different. The pressure reducing valve is operated by a spring-loaded bellows. The diluter mechanism contains an aneroid which actuates only the valve controlling the air metering port.

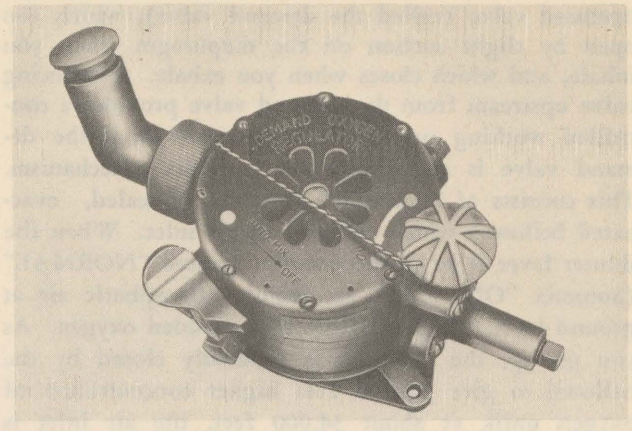


Figure 3-4. Type A-12 Diluter Demand Regulator, Airco Design

3-19. At sea level, the air metering port is fully open. When you inhale, you simply draw in atmospheric air. Suction on the diaphragm is so slight that the demand valve is opened very little.

3-20. With increasing altitude, the air inlet becomes more and more restricted by the action of the aneroid. As this happens, the suction of your breath becomes more and more effective in opening the demand valve, with the result that more oxygen and less air are supplied to your mask.

3-21. At and above 34,000 feet, the aneroid will have closed the air metering port completely, so that with each breath you inhale practically pure oxygen.

3-22. Turning the diluter control lever to the position marked "100% OXYGEN" closes the air inlet from the outside, so that you can get pure oxygen at any altitude. (Refer to paragraph 3-6.) The emergency valve (4) works in the same way as that in the Aro A-12A regulator.

3-23. TYPE A-12 REGULATORS.

3-24. AIRCO DESIGN. (See figure 3-4.) This is an earlier version of the Aro A-12A regulator, and is still in use in many airplanes. It differs from the

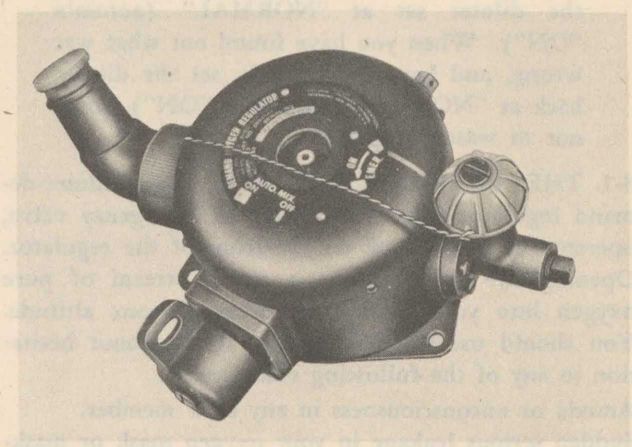


Figure 3-5. Type A-12 Diluter Demand Regulator, Pioneer Design

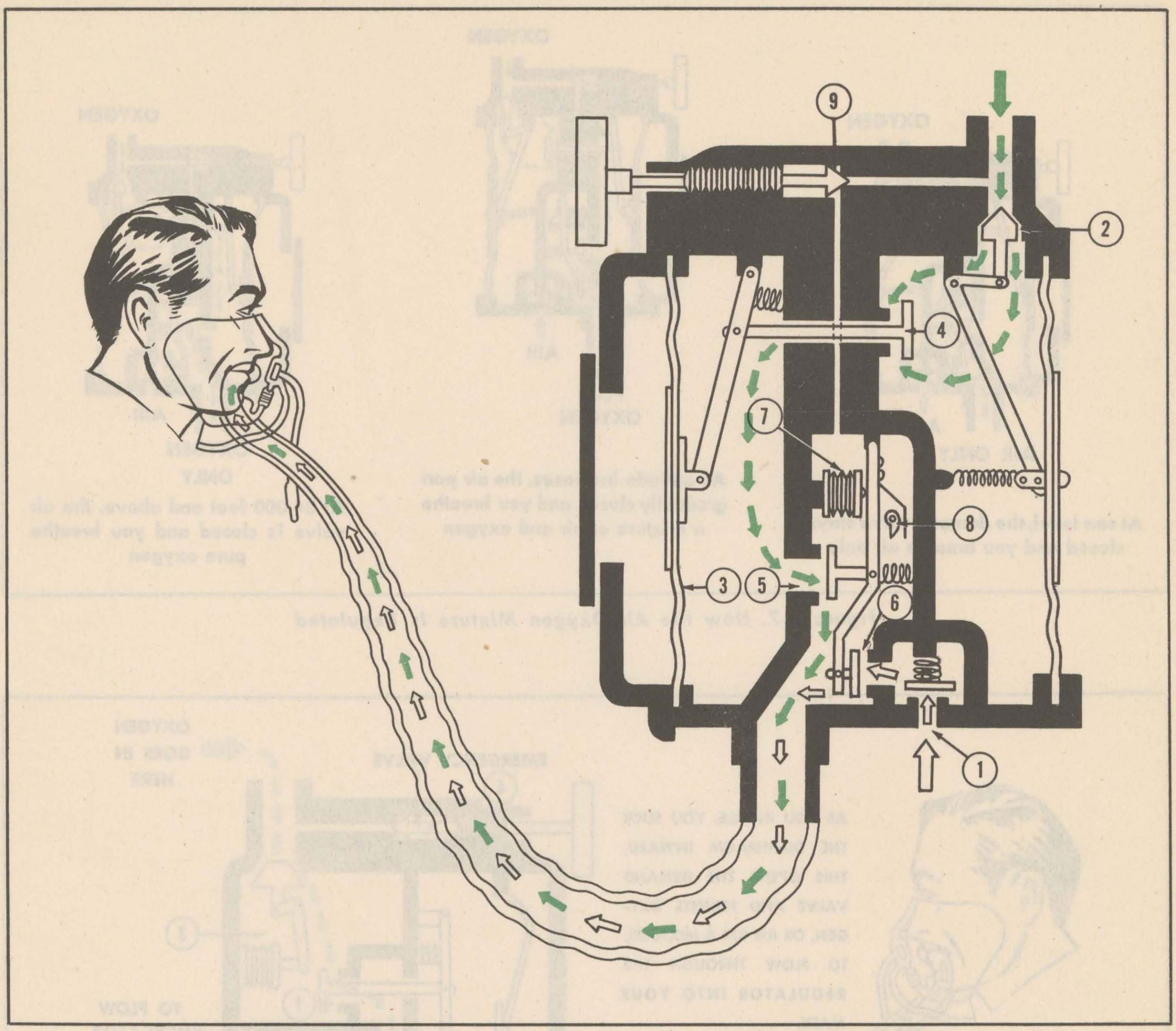


Figure 3-6. Normal Operation of the Aro Design A-12A Regulator

newer design in appearance and in certain details of performance, but is essentially similar in operation. This older regulator is marked with the term "AUTO-MIX ON" or "OFF," in place of the markings "NORMAL" and "100% OXYGEN" which show the settings of the diluter control lever on the face of the A-12A. Most of these regulators have no check valve in the air inlet. For this reason you should turn the automix "OFF" whenever it is necessary to use the emergency valve. Otherwise, most of the oxygen will leak out into the atmosphere instead of going into your mask.

Note

Type A-12 regulators of the Airco design and certain AN6004-1 regulators of the Aro design may not begin to deliver supplementary oxygen until they reach an altitude of 8,000 feet or more. Since oxygen is required even at low altitudes in order to maintain satisfactory night vision, this condition is not desirable in night operations. It is possible to get pure oxygen from these regulators at any altitude by turning the automix "OFF," but this will seriously reduce the duration of the oxygen supply. (See figures 6-1 and 6-2.) T.O. No. 01-15F-29 identifies these regulators by serial number and gives instructions for replacing them in the P-61 airplane.

3-25. PIONEER DESIGN A-12 REGULATORS. (See figure 3-5.) This is an earlier version of the Pioneer A-12A regulator, still in use in many airplanes. It differs from the newer design in appearance and in certain details of performance, but it is essentially similar in operation. The settings of the diluter control lever are marked automix "ON" and "OFF," which

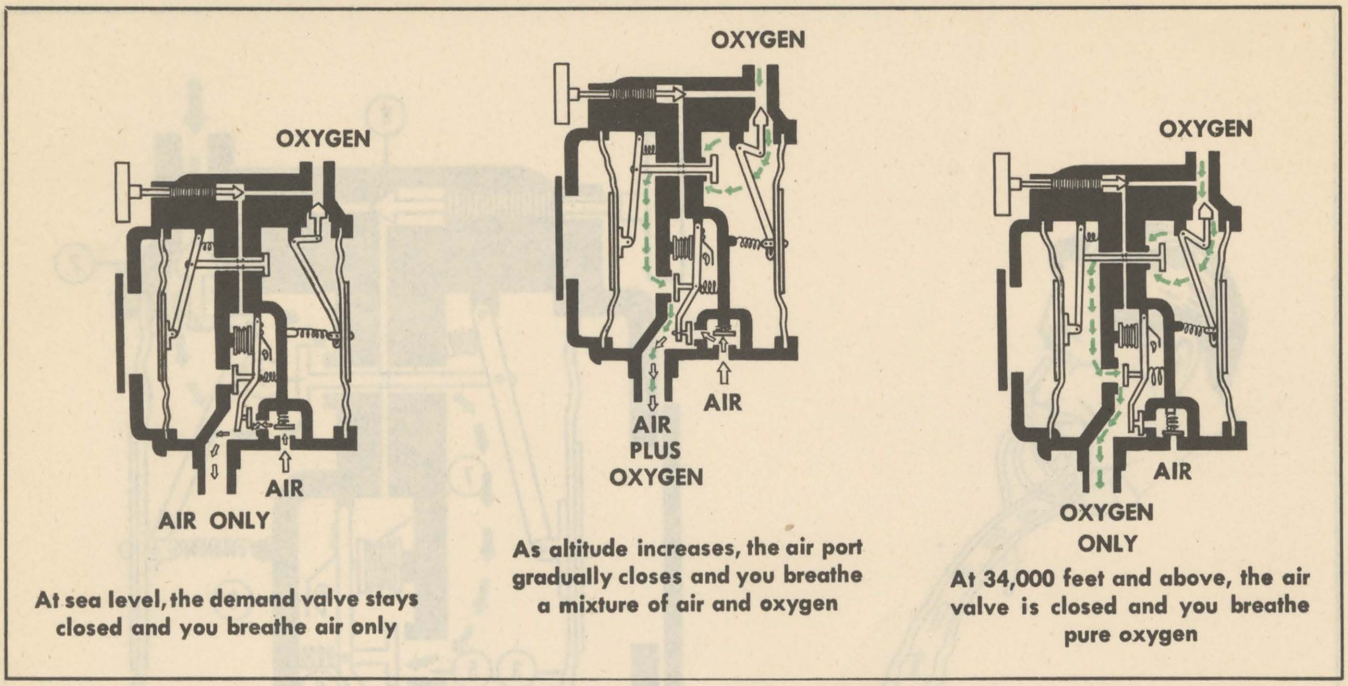


Figure 3-7. How the Air-Oxygen Mixture Is Regulated

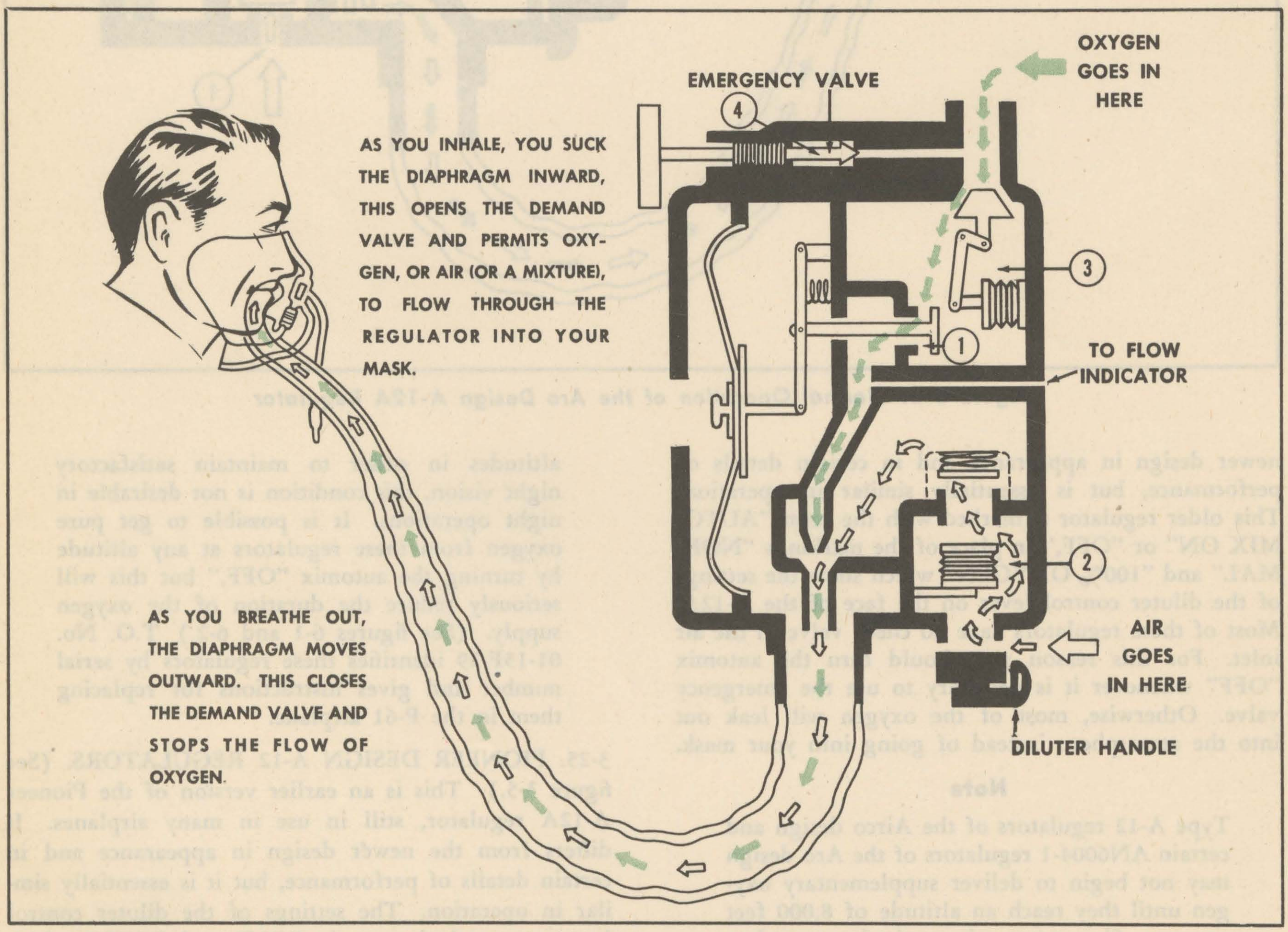


Figure 3-8. Normal Operation of the Pioneer Design A-12A Regulator

correspond to the terms "NORMAL" and "100% OXYGEN" on the A-12A regulators.

3-26. FLOW INDICATORS.

3-27. The purpose of the flow indicator is to tell you whether oxygen is flowing through the regulator. It does *not* tell you how *much* oxygen is flowing, nor does its operation guarantee that you are getting *enough* oxygen.

3-28. The blinker type A-3 flow indicator (figure 3-9) is connected to the regulator. When it is used with a regulator of the Aro or Airco design, the "eye" closes as you inhale and opens as you exhale. With Pioneer regulators, this action is reversed. In either case it is the *blinking* that is important. When the emergency valve is opened, the eye does not blink.

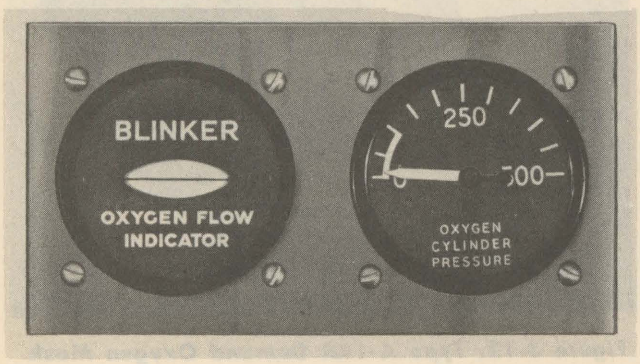


Figure 3-9. Type A-3 Flow Indicator and Type K-1 Pressure Gage

Note

Tubing which connects the blinker to a Pioneer regulator should be as short as possible, in order to reduce the loss of oxygen. (Refer to paragraph 6-8.)

3-29. The type A-1 or "bouncing ball" flow indicator is no longer standard. It consists of a transparent tube installed in the distribution line upstream from the regulator. A ball rises in the tube as you inhale and falls as you exhale.

3-30. PRESSURE GAGE.

3-31. The type K-1 pressure gage is usually mounted on the same panel with the flow indicator. (See figure 3-9.) The gage shows the oxygen pressure in the cylinders that supply your station. Normally the pressures in all of these cylinders will be the same. But if one cylinder is punctured, the check valves will isolate that cylinder and will leave the pressure gage reading practically the same as before, although the oxygen supply will be greatly reduced. To make intelligent use of any oxygen pressure gage, you should be familiar with paragraph 6-16, of this Handbook.

3-32. COMBINATION PRESSURE AND FLOW INDICATOR, TYPE T-1.

(See figure 3-10.)

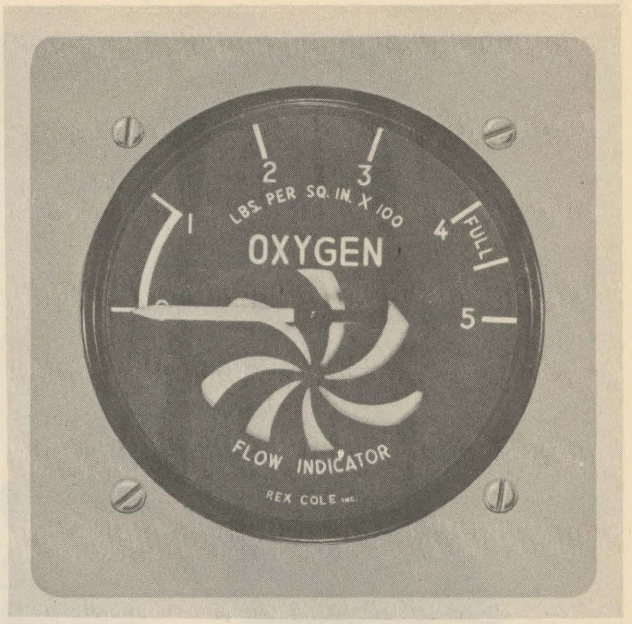


Figure 3-10. Type T-1 Combination Pressure Gage and Flow Indicator

3-33. A combination oxygen pressure and flow indicator has been standardized for future installation in production aircraft. Both elements are inclosed in a single, standard-size aircraft instrument case, together with a contact switch assembly which operates a panel of oxygen check lights located at a central station in the airplane. The combination indicator is installed at each oxygen station. The flow indicating element is a rotary type of blinker, with a luminescent disc resembling a pin-wheel, the sectors of which rotate alternately into view and out of view each time you breathe. The pressure indicator dial resembles that of the K-1 gage described in paragraph 3-31.

3-34. DEMAND MASKS.

3-35. Oxygen masks for use with demand regulators are somewhat similar in operation to a gas mask, although the design is different. The only mechanical feature is a single outlet valve, consisting of a circular flap of rubber, which opens the outlet when you exhale, and closes it when you inhale. The operation of the entire system depends upon the seating of this valve, and upon the slight suction created in the mask when you inhale. This is one reason why such care must be taken in fitting the mask to your face and helmet. For detailed information on the fitting and testing of demand oxygen masks, see the Technical Orders of series 03-50B; see also paragraph 3-43 following, and paragraph 9-37.

3-36. TYPE A-14A DEMAND MASK. (See figures 3-11 and 3-13, detail C.) At the present, this is the standard demand oxygen mask. It is made in four sizes, extra small, small, medium, and large. The usual distribution of sizes is 16 percent large, 68 percent medium, and 16 percent small. The extra small size is available only for limited use in special cases. Bomber

Figure 3-11. Type A-14A Demand Oxygen Mask

Figure 3-12. Type A-10A Demand Oxygen Mask

crews often require a few more of the large size, while fighters may need more of the small size. The A-14A differs from the earlier A-14 (figure 3-13, detail B) in having patch-like inserts which partly cover the openings for the inflow of oxygen. This helps to prevent freezing. A locking device (figure 3-16) is installed by the manufacturer. Fittings are supplied with the mask, by means of which it can be attached permanently to the helmet. The tubing is somewhat longer and less subject to kinking than that of the earlier masks.

3-37. TYPE A-14 DEMAND MASK. (See figure 3-13, detail B.) This mask is the same as the A-14A, except for the points previously mentioned. The A-14 may be modified by the Personal Equipment Officer to include most of the special features of the A-14A. In some of the masks a baffle (figure 3-13, detail A) was used instead of the insert patches to help prevent freezing.

3-38. OTHER DEMAND MASKS. Several earlier types of demand masks are still in stock. One of these is the A-10A, shown in figure 3-12. The earlier masks should be replaced as soon as possible with A-14A or modified A-14 masks.

CAUTION

Pressure-demand masks should not be used with straight demand regulators unless demand type outlet valves are substituted for the presure-demand exhalation valves. (Refer to paragraph 4-13.) If the mask is not so modified, the regulator diaphragm is likely to be ruptured if you open the emergency valve.

3-39. HOW TO CHECK YOUR MASK FIT.

3-40. When your demand mask is first issued, your Personal Equipment Officer will arrange to have it properly fitted to your face and attached to your helmet. At this time, and at intervals thereafter, he should check the fit by means of his oxygen testing kit, which will tell you not only *whether* your mask leaks, but *how much* it leaks. He will help you make any mask adjustments that you may need, including the installation of a microphone.

3-41. Possibly several times during each flight, *you* will need to check the mask fit for *yourself*. This is how to do it:

a. SUCTION TEST. This test is good only when it is done carefully and correctly. It is the only test which can be used conveniently in flight and which does not require any special equipment. First kink your mask tubing and pinch the kink so as to block the tubing *completely*. Inhale gently. You should not be able to draw in any air at all. Don't try to take a deep breath, because this merely seals the mask to your face by excessive suction, and disguises any leak that

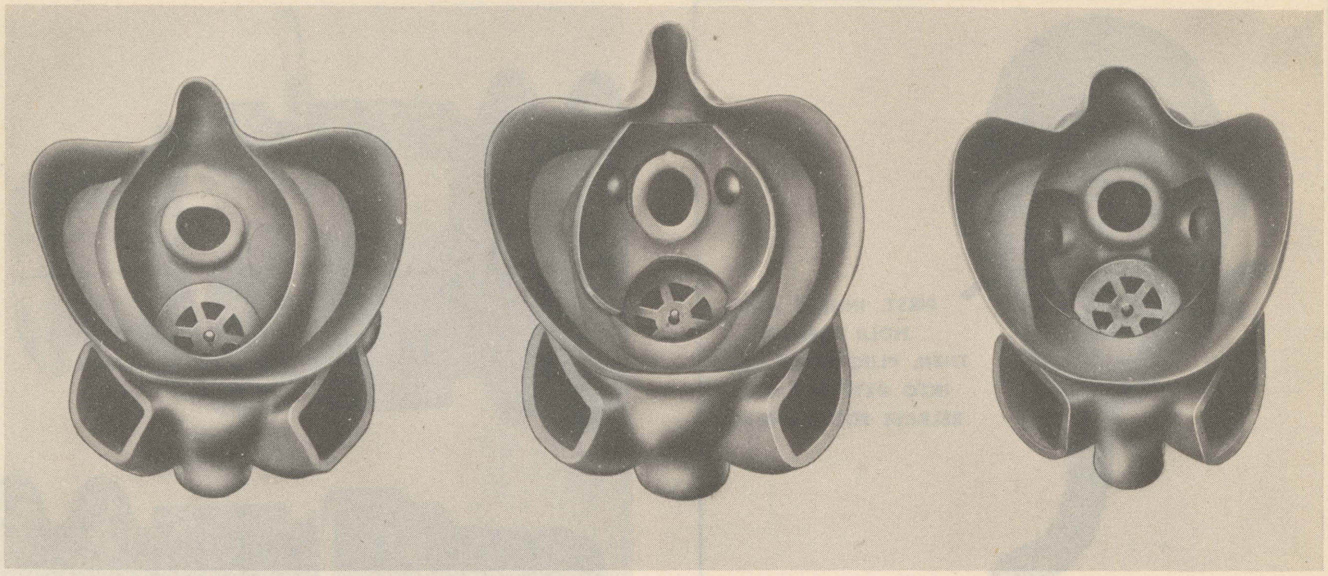


Figure 3-13. Antifreeze Modifications of Type A-14 Demand Mask: a. A-14 Unmodified Mask, b. A.T.S.C. Baffle, c. 8 AF Inserts

might have been present on normal inhalation. You can also make the test by covering the open end of the mask tubing with the palm of your hand.

CAUTION

Never kink the mask tubing while the emergency valve is open. This would rupture the diaphragm of the regulator.

b. SNIFF TEST. Connect your mask to the oxygen supply and set the diluter at "100% OXYGEN" (automix "OFF"). Hold a nasal inhaler containing a little oil of wintergreen or peppermint, or a cotton swab moistened with one of these substances, close to but not touching your mask. If you can smell the aromatic oil *at all*, your mask is leaking.

c. MECHANICAL LEAK TEST. Take a deep breath and hold it *without further suction*, as though you were swimming under water. Plug your mask into the mechanical leak detector (figure 3-14), holding the box so that it is completely closed. While still holding your breath, release the lower plate of the leak detector. If the plate drops down all the way within 10 seconds or less, your mask is leaking dangerously. This test is not effective if it is done incorrectly or in haste.

Note

Once a demand mask has been properly adjusted to your face and helmet, these items of equipment should never be loaned or exchanged except in an extreme emergency.

3-42. HOW TO REMOVE AND REPLACE YOUR MASK IN FLIGHT.

3-43. During flight, even at high altitudes, it may be necessary to remove your oxygen mask from time to time in order to blow your nose or to get rid of excessive moisture. Here is a safe and simple way to do it:

a. Wait until you are in level flight and can devote your full attention to what you are going to do. Don't remove your mask during combat or aerial maneuvers.

b. Unhook the mask from the right-hand side of your helmet, but do not remove it from your face.

c. Holding the mask firmly against your face, take three or four breaths of oxygen; then hold your breath.

d. Let the mask swing from the left-side of your helmet.

e. Before taking your next breath, blow your nose, or do whatever is necessary. If you have to breathe before you have finished, hold the mask firmly against your face as you do so, and then remove it again. The main thing is not to inhale atmospheric air.

f. After you have replaced the mask, you may continue breathing while you fasten the hook.

g. When you have adjusted the mask, test the fit by the suction test described in paragraph 3-41. Use great care to keep the mask tubing from getting kinked and the suspension straps from getting twisted.

Note

It is permissible to set the diluter at "100% OXYGEN" (automix "OFF") before commencing this procedure. If you do so, however, be sure set it back at "NORMAL" (automix "ON") when you have finished. If you are ill and have to remove your mask to vomit, turn on the emergency valve first. Be sure to turn the valve *off* when you have readjusted your mask.

Figure 3-14. Use of the Mechanical Leak Detector

3-44. HOW TO DE-ICE YOUR MASK.

3-45. If you are exposed to extreme cold, ice may form in your mask from the moisture in your breath. The ice can usually be removed by bending or squeezing the mask with your hands from time to time. After you have done this, recheck the fitting and operation of the mask by means of the suction test described in paragraph 3-41. It is a good plan to carry a spare mask as a replacement. If you are to be exposed to temperatures below –40° F, your mask should be provided with an electric heater.

3-46. MASK-TO-REGULATOR CONNECTIONS.

3-47. Attached by a clamp to the outlet elbow of each demand regulator is a length of flexible tubing, bearing at its outer end a clothing clip, a dust cap, and a socket which receives the male part of the mask tubing connector. The combination of the socket with the male part is called the mask-to-regulator connector or, more commonly, "the quick disconnect." Two types of male parts are in use: the prong type (figure 3-15, detail A), and the C-ring type (figure 3-15, detail B).

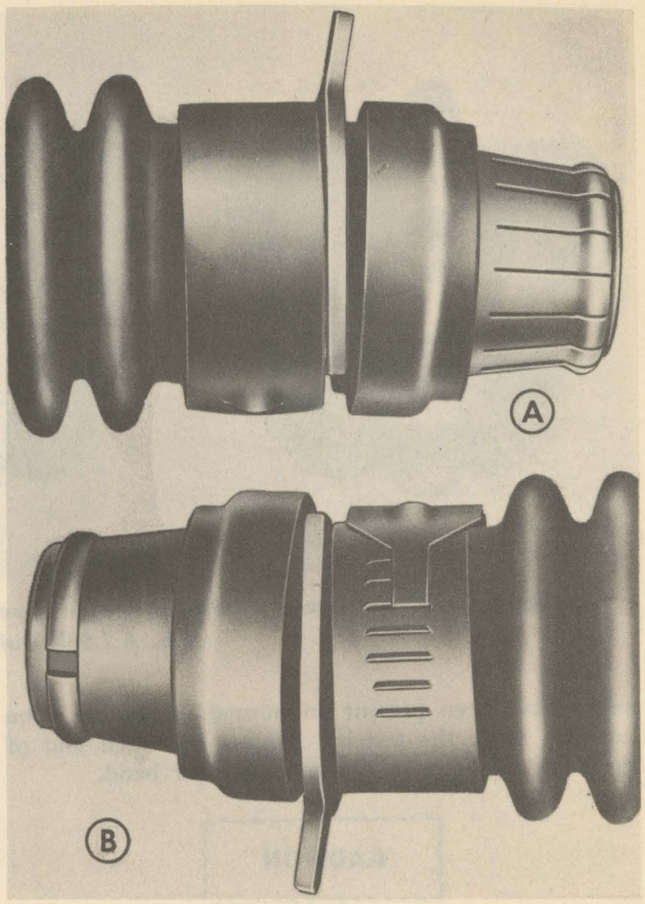


Figure 3-15. Male Oxygen Mask Connectors: a. Prong Type, b. C-Ring Type

With either of these, the seal is completed by a rubber gasket, while the parts are held together by friction.

3-48. Repeated instances of accidental disconnection have made it necessary to equip all demand and pressure-demand masks with a locking device. (See figure 3-16.) A tongue projecting from this device fits under the edge of the open dust cap on the mask-to-regulator hose in such a way that the mask cannot be disconnected unless the dust cap is opened still further to release the tongue. (See figure 3-17.)

Note

With your mask tubing locked in place by this device, you cannot leave the airplane without deliberately disconnecting yourself. Moreover, accidental disconnection is still possible, either through inadvertent release of the locking device or through loosening of the knurled collar on the elbow outlet of the regulator.

3-49. DEMAND TYPE PORTABLE EQUIPMENT.

3-50. GENERAL DESCRIPTION. Portable oxygen units, usually called "walk-around bottles," consist of a special type of demand oxygen regulator directly attached to a small supply cylinder. Portable demand regulators have a socket for direct connection with the mask tubing. They also have a pressure gage, a clothing

clamp, and a recharger adapter by means of which you can refill the cylinder during flight.

3-51. USE IN FLIGHT. Before leaving your station, tell the airplane commander where you are going and what you are going to do. Look at the pressure gage on your portable regulator to see that the cylinder is charged. Clip the regulator to your clothing or your parachute harness, or suspend it from your shoulder by its sling. Hold your breath as you disconnect from your regular supply and plug into the portable unit.

WARNING

Always check the pressure gage at frequent intervals when you are using any kind of portable oxygen unit. Don't rely upon your judgment as to how long the oxygen will last. When the pressure gets down to 100 psi, go to a regular oxygen outlet or to a recharger hose where you can refill the portable unit.

3-52. RECHARGING. To refill a portable unit, uncap the valve at the end of the portable recharger hose, and plug in the recharger adapter that projects from the side of the portable regulator. A portable recharger hose is usually found at each station where there might be a need for it. You can continue to

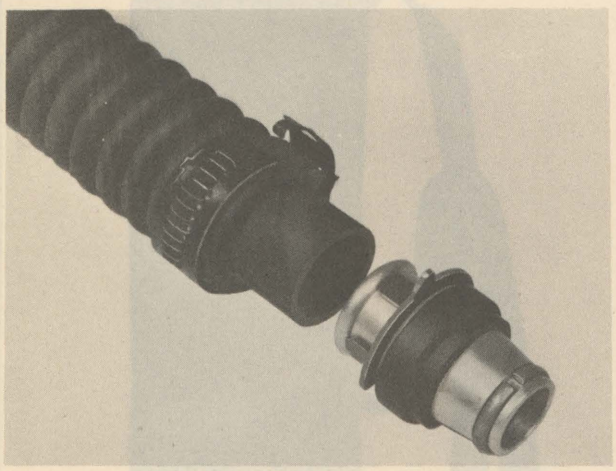


Figure 3-16. Disassembled Mask Tubing Male Connector and Positive Locking Device

breathe from the portable unit while it is being refilled.

Note

To recharge a portable unit, you have to push the adapter into the recharging valve with considerable force, so that it clicks and locks itself into place. It is worthwhile to practice this procedure while wearing your flying gloves, so that you will be able to do it quickly when

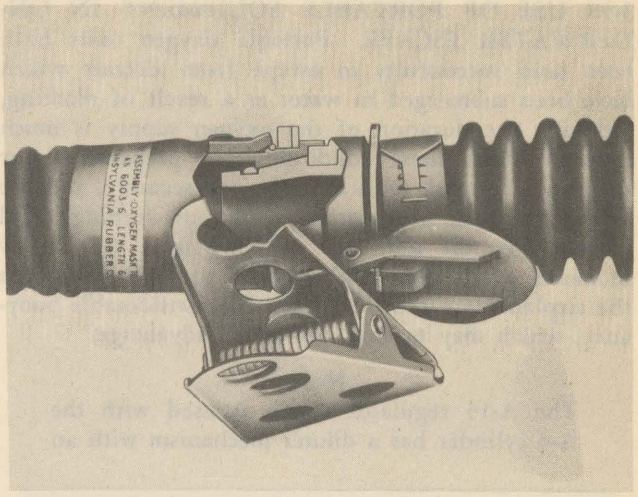


Figure 3-17. Mask-to-Regulator Connector Assembly

your safety depends upon it. Watch the pressure gage on the portable regulator. The cylinder will be filled in a few moments, and the final pressure on this gage will then be the same as, or a little below the pressure shown on the gage at that station.

3-53. TYPES OF DEMAND PORTABLE UNITS.

3-54. A-6 CYLINDER WITH A-15 REGULATOR. (See figure 3-18.) This is the most convenient and economical of the various types. A diluter mechanism in the A-15 regulator prolongs the duration of the supply, while the cylinder is small enough to be worn and handled easily. When charged to 400 psi, this unit will last about 30 minutes, assuming that you are only moderately active and at an altitude of about 25,000 feet. But watch the pressure gage! (Refer to the note following paragraph 3-58 for the use of this assembly in underwater escape.)

3-55. D-2 CYLINDER WITH A-13 REGULATOR. (See figure 3-19.) The A-13 regulator used in this assembly has no diluter. With the larger D-2 cylinder however, the duration of the oxygen supply is approximately the same as that of the A-6 cylinder used with the A-15 regulator. Because of its bulkiness, this unit is carried in a sling.

3-56. A-14 CYLINDER WITH A-13 REGULATOR. (See figure 3-20.) These units have a supply duration of 4 to 8 minutes when fully charged, depending upon altitude and activity. They are being replaced by the A-6 cylinder and A-15 regulator previously described.

3-57. PORTABLE OXYGEN STATION. For aircraft which do not normally carry oxygen equipment but are nevertheless required to fly at oxygen altitudes, portable or removable oxygen stations may be assembled locally. Such an assembly, shown in figure 3-21, consists of an F-1 cylinder, an A-12 regulator, a K-1 pressure gage, a filler valve, and the necessary plumbing.

3-58. USE OF PORTABLE EQUIPMENT IN UNDERWATER ESCAPE. Portable oxygen units have been used successfully in escape from aircraft which have been submerged in water as a result of ditching, although the duration of the oxygen supply is much reduced under these conditions. In preparation for ditching, the mask must be tightened securely, and the cylinder must be firmly attached to your clothing. Used in this way, the unit will not only give you a few moments of oxygen supply should you go down with the airplane, but it will also provide considerable buoyancy, which may or may not be of advantage.

Note

The A-15 regulator which is used with the A-6 cylinder has a diluter mechanism with an air inlet opening into the regulator body. (See figure 3-18.) If you have to use this assembly underwater, you must keep this air inlet tightly covered with the palm of your hand.

3-59. EMERGENCY EQUIPMENT.

3-60. This equipment is intended as an independent source of oxygen to be used either for emergency purposes in the airplane or for parachute descents from high altitudes. It should be carried by all flying personnel operating at altitudes of 25,000 feet or more.

3-61. H-2 EMERGENCY OXYGEN ASSEMBLY. (See figure 3-22.) This unit contains a 10-minute supply of oxygen in a nonshatterable cylinder designed for a working pressure of 1800 psi. It is carried in a spe-

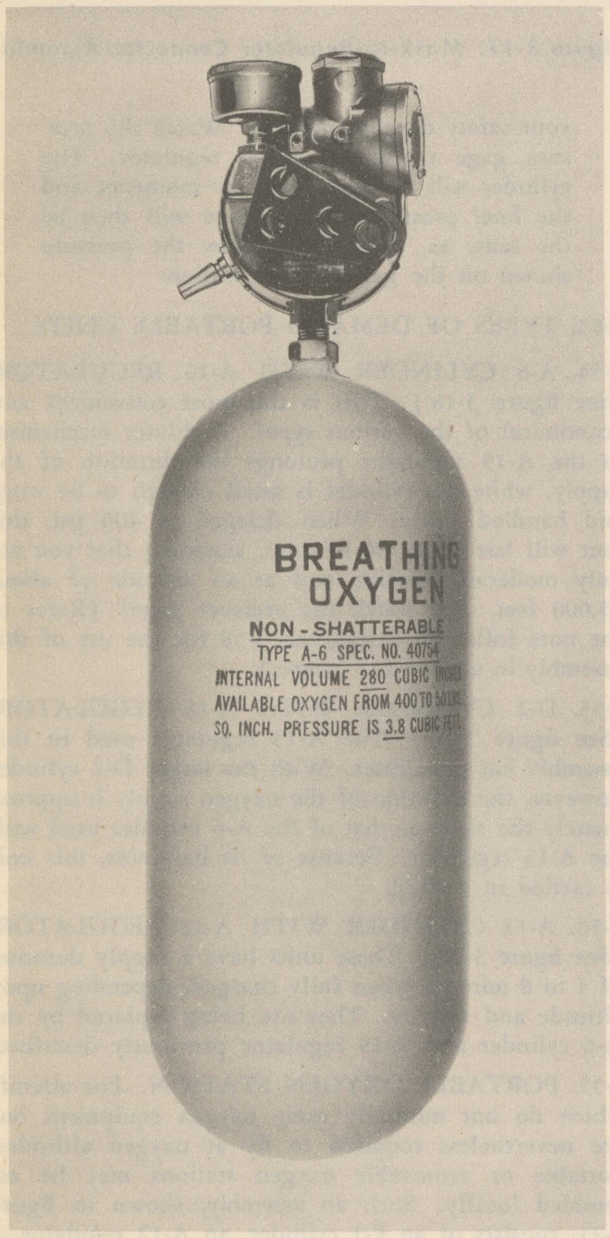


Figure. 3-18. Portable Oxygen Unit, A-6 Cylinder with A-15 Regulator

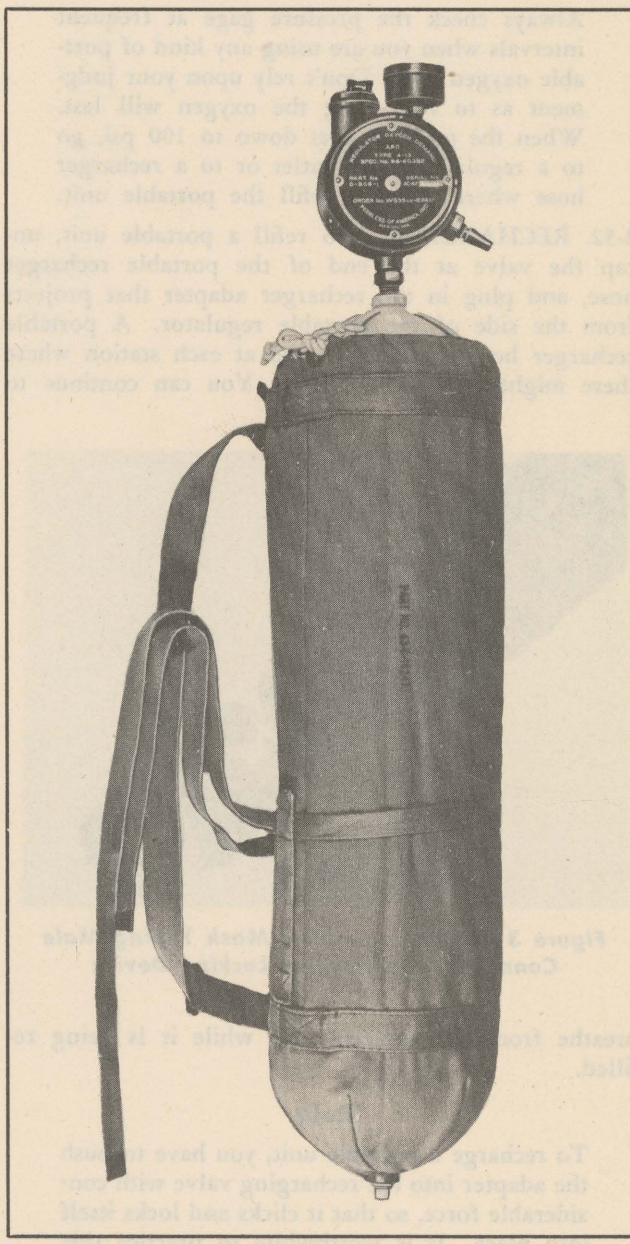


Figure 3-19. Portable Oxygen Unit, D-2 Cylinder, A-13 Regulator and Sling

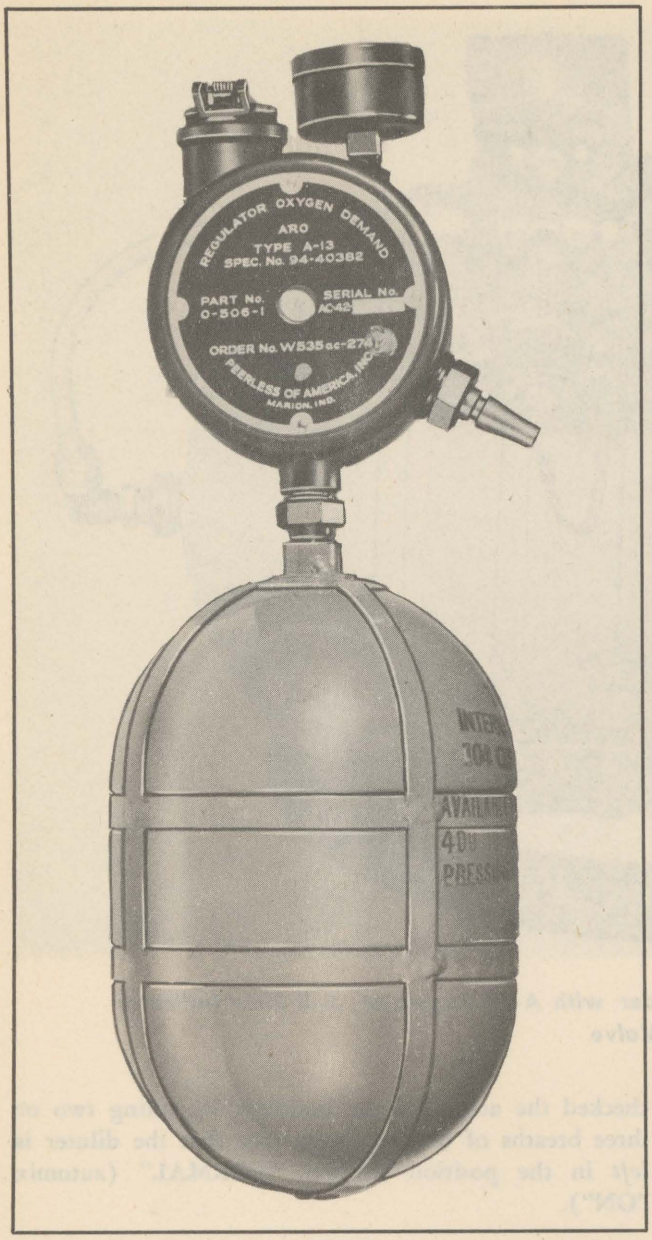


Figure 3-20. Portable Oxygen Unit, A-14 Cylinder and A-13 Regulator

cial pocket in the leg of the flying suit, or in a canvas bag such as that shown in figure 3-22. In either case, the cylinder must be securely fastened to your leg, so that it will not break loose with the opening shock of the parachute. A pull on the ball-and-cable release starts the flow of oxygen through a flexible rubber tube. This tube is connected to an adapter which can be installed in any demand or pressure-demand oxygen mask. Although the cylinder is provided with a pressure gage and a recharging mechanism, it cannot be refilled in flight. For additional details refer to AN 03-50C-5.

3-62. H-1 BAIL-OUT ASSEMBLY. (See figure 3-23.) The cylinder in this assembly is of the same size as that of the H-2 unit, but is shatterable. The flow of oxygen is started by turning a hand valve. No mask adapter is used. The flexible delivery tube ends in a pipe stem which is thrust into the mouth and held between the back teeth. Instructions for recharging the cylinder are given in paragraph 8-8. The H-1 assembly is obsolete and is rapidly being replaced by the H-2 described in the preceding paragraph.

3-63. FLYER'S CHECK LIST FOR DEMAND EQUIPMENT.

3-64. Many aborted missions, anoxia accidents, and deaths have occurred because of the failure of flyers to make frequent and adequate checks of their oxygen equipment. The points listed following should be checked, as described, by every member of the air crew on every flight requiring the use of oxygen. Make these checks a habit. Do them the same way every time, so that you can be sure not to miss anything which might make trouble for you later.

3-65. BEFORE TAKE-OFF. Know the oxygen system. Be sure that you are familiar with the oxygen installation in the particular airplane in which you are going to fly. Know where to go and what to do in an emergency that deprives you of your normal source of oxygen. Then check each item of equipment as described following. To make sure that you have covered each point, remember this name:

P. McCRIPE

P ressure gage
M ask
c onnections at mask
C onnections at regulator
R egulator
I ndicator
P ortable unit
E mergency cylinder

3-66. PRESSURE GAGE (P.). The gage should read between 400 and 450 psi, and should agree approximately with the gages at other stations.

3-67. MASK (M). Be sure that you have your own mask and your own helmet, and that they are properly and securely attached. Look for cuts, tears, and cracks in the rubber. Look for faulty fasteners and for loose tubing clamps. If there is no mask microphone, be sure that the pressure relief vent is sealed. (Refer to T.O. No. 03-50B-8.) Test the fitting of your mask by one of the tests described in paragraph 3-39.

3-68. CONNECTIONS AT MASK (c). Be sure that the gasket is in place on the male part of the "quick disconnect." Test the pull required to separate the two parts; it should be 10 to 20 pounds *without the locking device.* Then be sure that the locking device (figure 3-17) and the clothing clamp are in working order. When you attach the clamp to your clothing, be sure that it is up high enough so that you can move your head freely in all directions. (see figure 3-1.)

3-69. CONNECTIONS AT REGULATOR (C). See

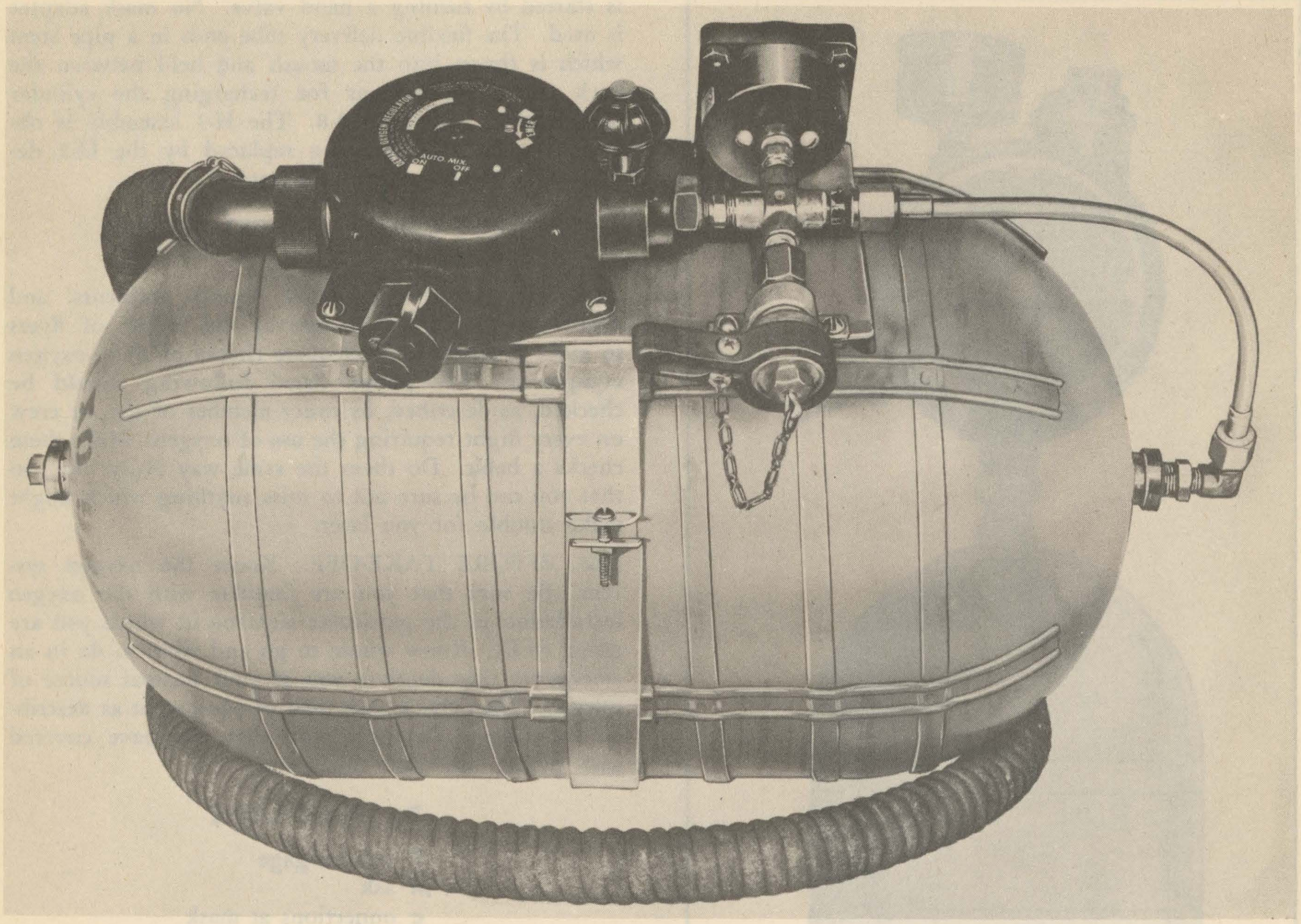


Figure 3-21. Portable Oxygen Assembly, F-1 Cylinder with A-12 Regulator, A-3 Flow Indicator and Filler Valve

that the regulator outlet elbow is pointing in the right direction, that the knurled collar is tight, and that the tubing is securely clamped to the elbow. Run the tubing through your hand to detect kinks, cuts, or flat spots.

3-70. REGULATOR (R). Before take-off, the diluter should be set at "NORMAL" (auto mix "ON"). See that the emergency valve is tightly closed and secured with wire. You can detect large leaks in the regulator diaphragm by placing the open end of the mask-to-regulator tube against your mouth and blowing into it for about 5 seconds. Any escape of air from the regulator indicates either a leaky diaphragm or a faulty check valve in the air inlet.

Note

This test is not valid with the older Airco design regulators, which have a check valve in the *outlet* rather than in the air inlet.

3-71. INDICATOR (I). The flow indicator may not blink at ground level unless you set the diluter at "100% OXYGEN" (automix "OFF"). After you have checked the action of the indicator by taking two or three breaths of oxygen, make sure that the diluter is *left* in the position marked "NORMAL" (automix "ON").

Note

Movements of the mask-to-regulator tubing may cause the indicator to blink even when your mask is disconnected. Be sure that *you* (not the tubing) are operating the indicator.

3-72. PORTABLE UNIT (P). Check the clothing clamp on the portable regulator. Then plug your mask into the regulator and test the pull required to disconnect it. With your mouth against the opening for the mask tubing, blow gently into the regulator to detect a leaky diaphragm or a faulty check valve. Connect the unit to the recharger hose, and fill the cylinder to 400 psi. Then disconnect and listen for leakage in the recharger valve. If no leakage is detected, recap the valve and return both the hose and the portable unit to their proper brackets.

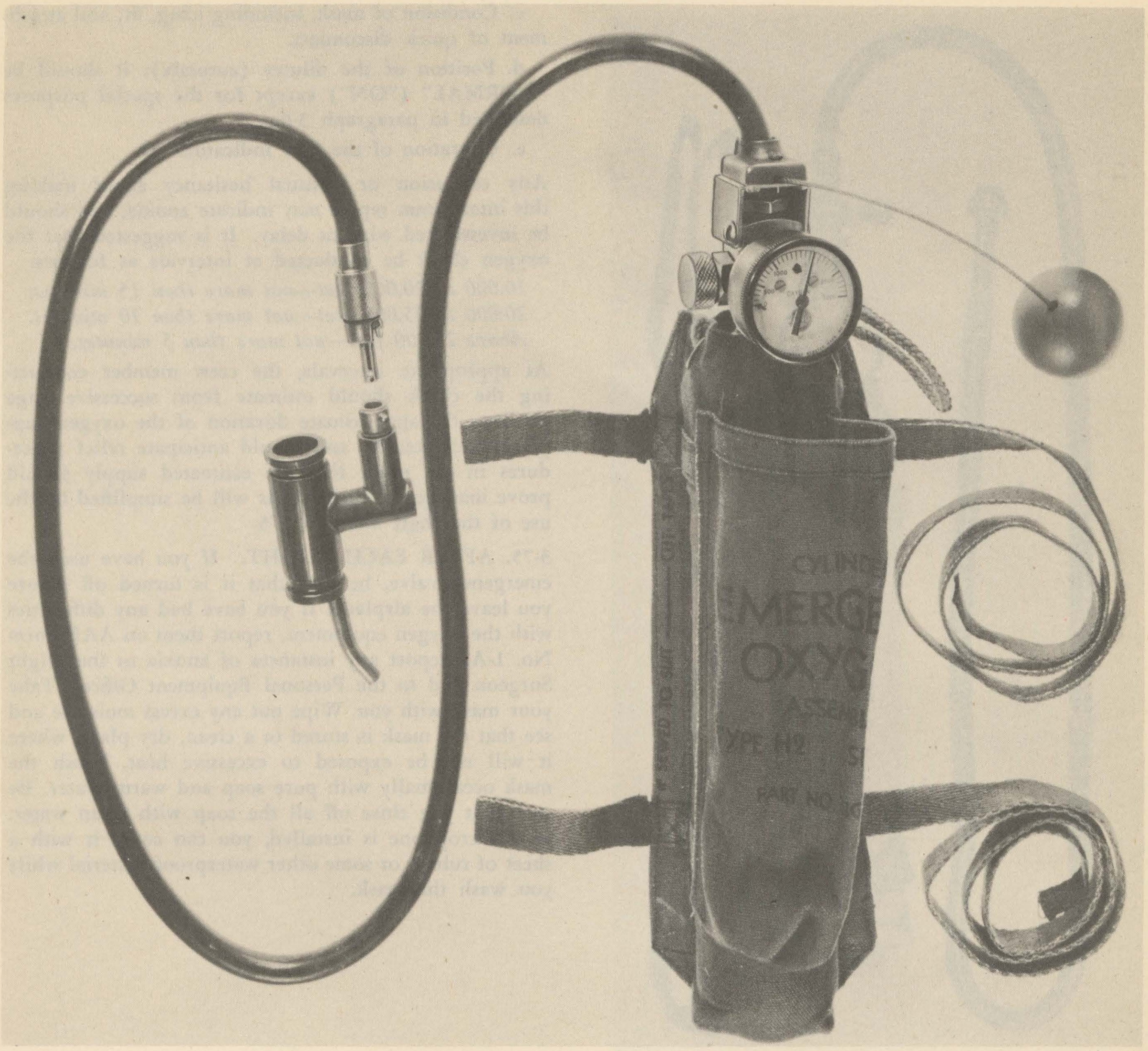


Figure 3-22. H-2 Emergency Oxygen

Note

You can sometimes reseat a leaky recharger valve by a sharp blow on the valve casing, or by reinserting the adapter for a moment. If this fails, you may be able to stop the leak temporarily by leaving a portable unit connected to the recharger hose until the valve can be repaired or replaced.

3-73. EMERGENCY CYLINDER (E). The pressure gage on your emergency cylinder should read 1800 psi. Examine the release mechanism for any obvious defects. If you have an H-2 emergency assembly, check the mating of the parts that connect the tubing to the mask, and leave them connected so that the equipment will be ready for immediate use. See that the cylinder is securely fastened to your leg and to your clothing.

3-74. DURING FLIGHT. Each member of the crew should make a frequent check on the condition of his mask, connections, regulator, and indicators, covering the applicable points listed in the preflight check. This in-flight inspection of oxygen equipment is especially important for fighter pilots, who are entirely dependent upon their own alertness to prevent the development of anoxia. In multiplace aircraft, a responsible member of the crew should be delegated by the airplane commander to conduct a regular and frequent oxygen check using the intercommunication system. Each crew member in turn should be expected to report:

a. Any symptoms of oxygen lack or other illness.

b. Oxygen pressure gage reading.

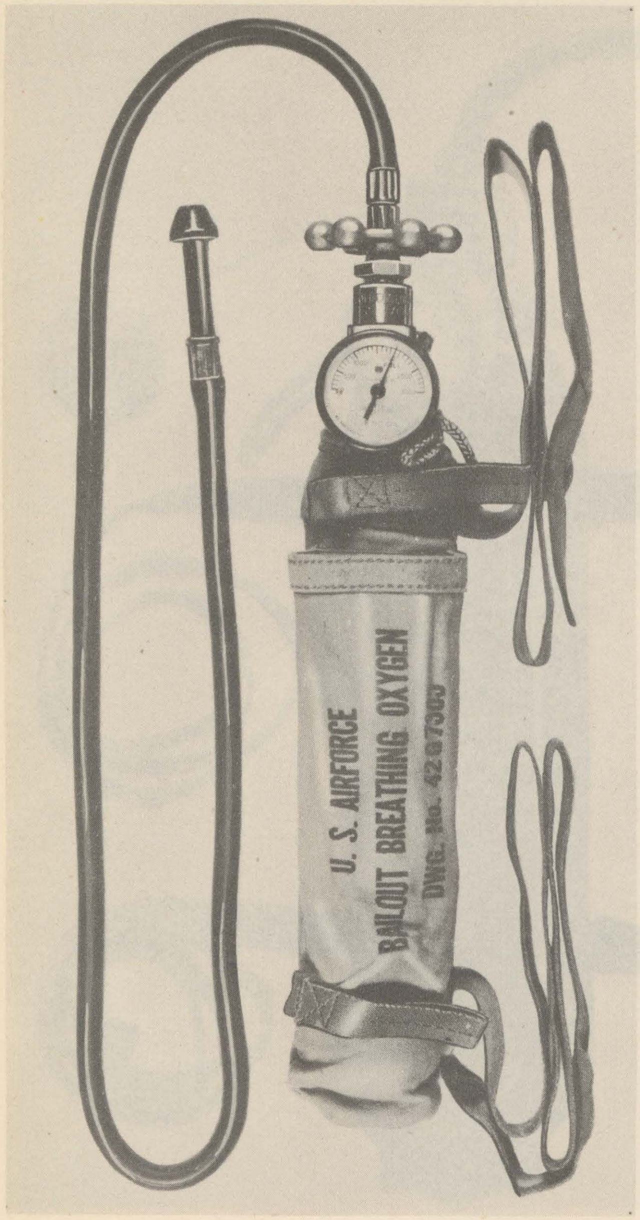


Figure 3-23. H-1 Emergency Oxygen

c. Condition of mask, including icing, fit, and attachment of quick disconnect.

d. Position of the diluter (automix); it should be "NORMAL" ("ON") except for the special purposes described in paragraph 3-6.

e. Operation of the flow indicator.

Any confusion or unusual hesitancy about making this inter-comm report may indicate anoxia, and should be investigated without delay. It is suggested that the oxygen check be conducted at intervals as follows:

10,000 to 20,000 feet—not more than 15 minutes.
20,000 to 25,000 feet—not more than 10 minutes.
Above 25,000 feet—not more than 5 minutes.

At appropriate intervals, the crew member conducting the check should estimate from successive gage readings the approximate duration of the oxygen supply at each station, and should anticipate relief procedures in the event that the estimated supply should prove inadequate. Estimations will be simplified by the use of the chart in figure 6-5.

3-75. AFTER EACH FLIGHT. If you have used the emergency valve, be sure that it is turned off before you leave the airplane. If you have had any difficulties with the oxygen equipment, report them on AAF Form No. 1-A. Report any instances of anoxia to the Flight Surgeon and to the Personal Equipment Officer. Take your mask with you. Wipe out any excess moisture and see that the mask is stored in a clean, dry place, where it will not be exposed to excessive heat. Wash the mask occasionally with pure soap and warm water. Be sure that you rinse off all the soap with clean water. If a microphone is installed, you can cover it with a sheet of rubber or some other waterproof material while you wash the mask.

SECTION IV
THE PRESSURE-DEMAND SYSTEM

4-1. WHY YOU NEED PRESSURE-DEMAND EQUIPMENT AT VERY HIGH ALTITUDES

4-2. When you are using the conventional demand oxygen system described in section III, the pressure in your lungs is at all times very nearly the same as the pressure of the atmosphere outside your body. Although this pressure decreases constantly as you ascend, your demand equipment will nevertheless provide you with a concentration of oxygen entirely adequate for any reasonable activity up to an altitude of about 35,000 feet. (See figure 1-2.) Between 35,000 and 40,000 feet, because of the declining pressure of the oxygen in your lungs, there will be some reduction in the oxygen load of your blood. Still, if you are relatively quiet and if your mask is free from leakage, you are in no danger of serious anoxia. Above 40,000 feet, however, as the oxygen load of the blood continues to decline with the decreasing pressure, anoxia becomes more and more

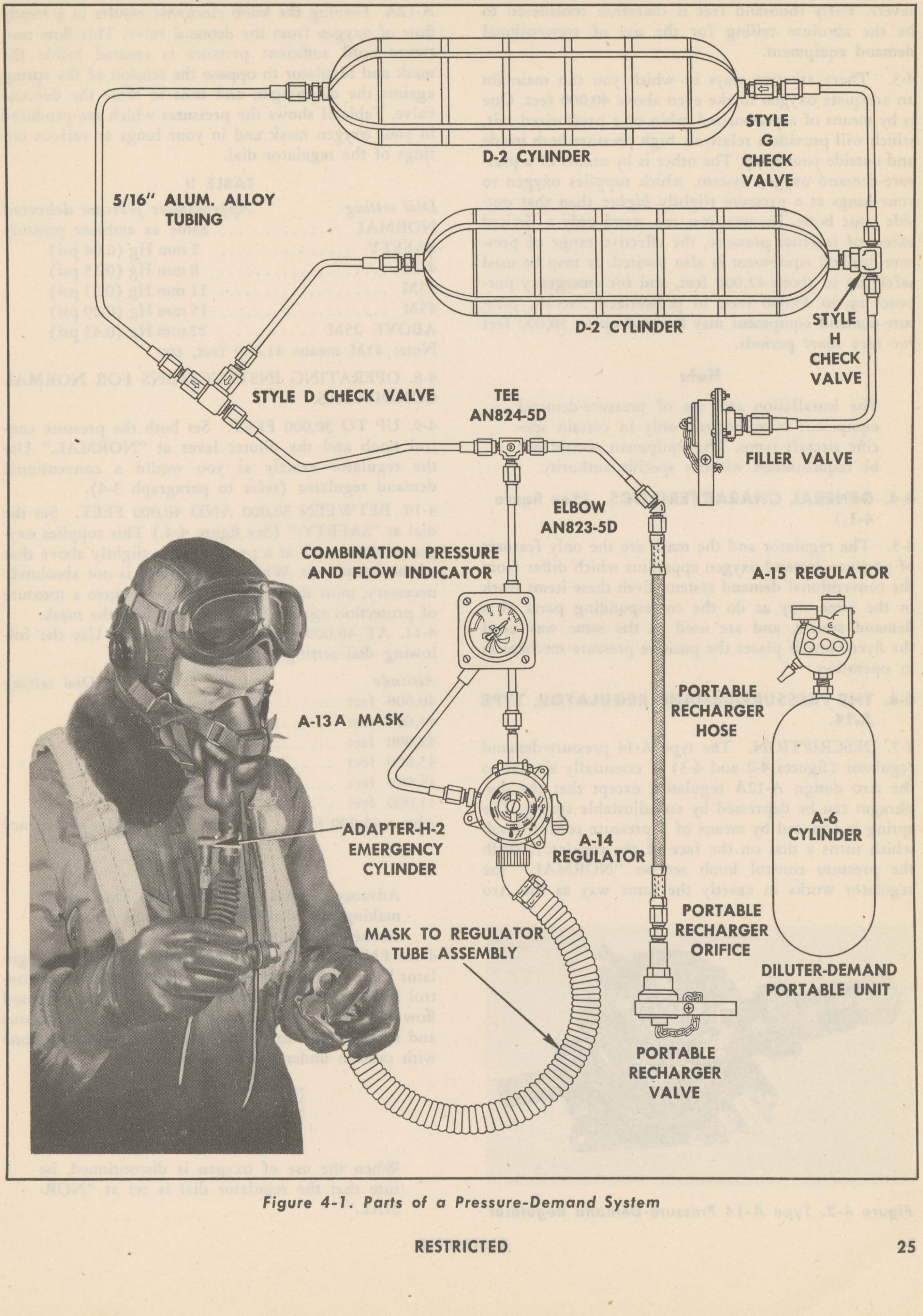


Figure 4-1. Parts of a Pressure-Demand System

severe. Forty thousand feet is therefore considered to be the absolute ceiling for the use of conventional demand equipment.

4-3. There are two ways in which you can maintain an adequate oxygen intake even above 40,000 feet. One is by means of a pressurized cabin or a pressurized suit, which will provide a relatively high pressure both inside and outside your body. The other is by means of a pressure-demand oxygen system, which supplies oxygen to your lungs at a pressure slightly *higher* than that outside your body. Because you can stand only a limited excess of internal pressure, the effective range of pressure-demand equipment is also limited. It may be used safely up to about 42,000 feet, and for emergency purposes up to 45,000 feet. In pressurized aircraft, pressure-demand equipment may be used up to 50,000 feet *for very short* periods.

Note

The installation and use of pressure-demand equipment is authorized only in certain specific aircraft types. The equipment should not be requisitioned without specific authority.

4-4. GENERAL CHARACTERISTICS. (See figure 4-1.)

4-5. The regulator and the mask are the only features of pressure-demand oxygen apparatus which differ from the conventional demand system. Even these items work in the same way as do the corresponding parts of a demand system, and are used in the same way until the flyer himself places the positive pressure mechanism in operation.

4-6. THE PRESSURE-DEMAND REGULATOR, TYPE A-14.

4-7. DESCRIPTION. The type A-14 pressure-demand regulator (figures 4-2 and 4-3) is essentially similar to the Aro design A-12A regulator, except that the diaphragm can be depressed by an adjustable spring. The spring is adjusted by means of a pressure control knob which turns a dial on the face of the regulator. With the pressure control knob set on "NORMAL," the regulator works in exactly the same way as the Aro A-12A. Turning the knob clockwise results in a steady flow of oxygen from the demand valve. This flow continues until sufficient pressure is created inside the mask and regulator to oppose the tension of the spring against the diaphragm, and thus to close the demand valve. Table II shows the pressures which are produced in your oxygen mask and in your lungs at various settings of the regulator dial.

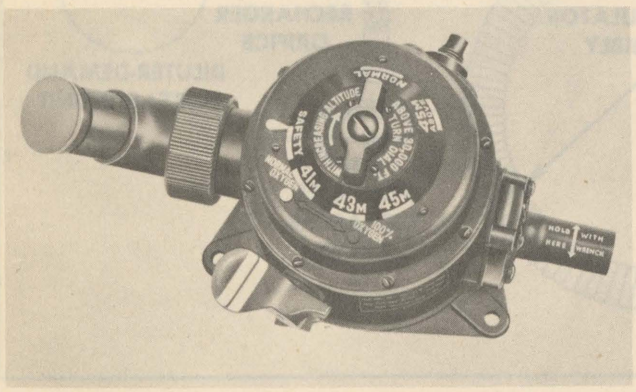


Figure 4-2. Type A-14 Pressure-Demand Regulator

TABLE II

Dial setting	*Approximate pressure delivered*
NORMAL	Same as ambient pressure
SAFETY	2 mm Hg (0.04 psi)
41M	8 mm Hg (0.15 psi)
43M	11 mm Hg (0.21 psi)
45M	15 mm Hg (0.29 psi)
ABOVE 25M	22 mm Hg (0.43 psi)

Note: 41M means 41,000 feet, etc.

4-8. OPERATING INSTRUCTIONS FOR NORMAL CONDITIONS.

4-9. UP TO 30,000 FEET. Set both the pressure control knob and the diluter lever at "NORMAL." Use the regulator exactly as you would a conventional demand regulator (refer to paragraph 3-4).

4-10. BETWEEN 30,000 AND 40,000 FEET. Set the dial at "SAFETY." (See figure 4-4.) This supplies oxygen to your mask at a pressure very slightly above that of the outside air. While this pressure is not absolutely necessary, most flyers feel that it gives them a measure of protection against leakage of air into the mask.

4-11. AT 40,000 FEET AND ABOVE. Use the following dial settings:

Altitude	*Dial setting*
40,000 feet	41M
41,000 feet	41M
42,000 feet	43M
43,000 feet	43M
44,000 feet	45M
45,000 feet	45M
Above 45,000 feet	45M ABOVE (for emergency use only)

Note

Advance the dial *first;* then go up. Don't delay making the dial adjustment until you have reached the altitude.

4-12. EMERGENCY OPERATION. The A-14 regulator has no special emergency valve. The pressure control knob can be used, however, to obtain an increased flow of oxygen. This is useful in the event of serious and uncorrectable mask leakage, but it should be done with caution under other circumstances.

CAUTION

When the use of oxygen is discontinued, be sure that the regulator dial is set at "NORMAL."

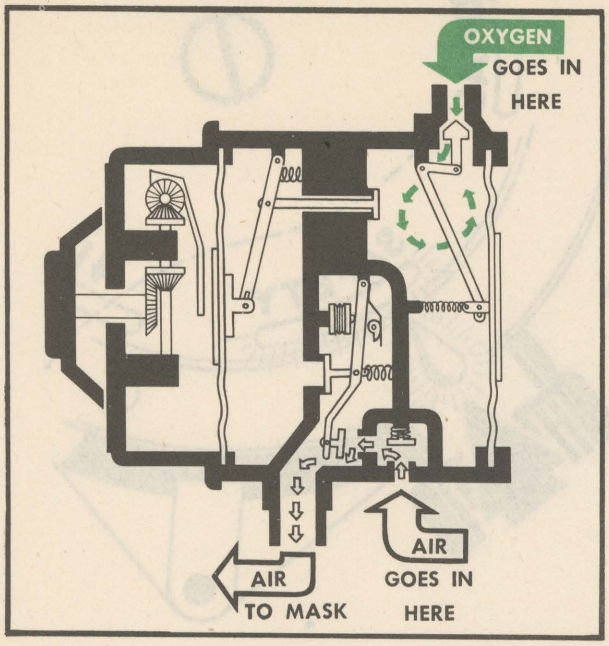


Fig. A. A-14 Regulator During Inhalation at Sea Level

Oxygen valve is closed; air valve is open, and you breathe air only.

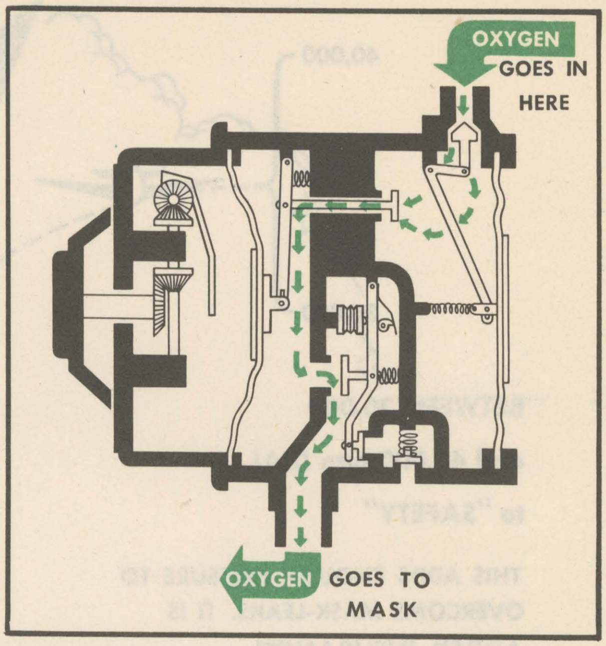


Figure B. Regulator During Inhalation at 34,000 Feet

Air valve is closed; oxygen valve is open, and you breathe 100% oxygen.

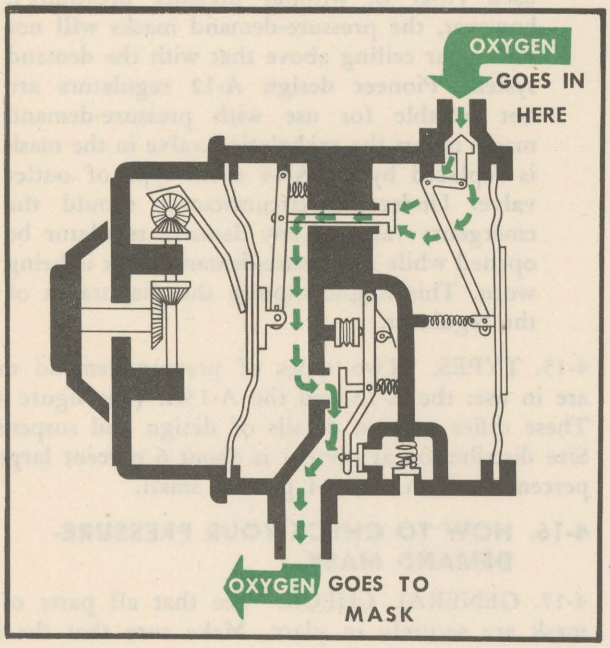


Figure C. Regulator During Inhalation With Pressure Breathing

Spring presses down on diaphragm, opening demand valve, and forcing oxygen into the mask under pressure.

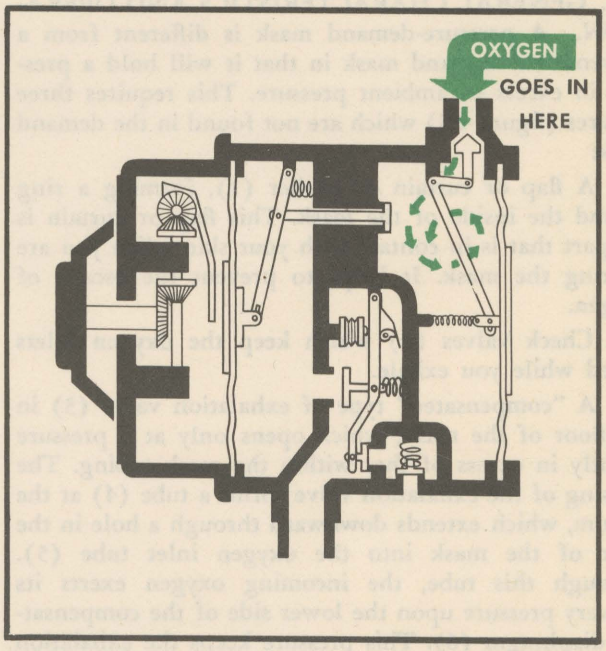


Figure D. Regulator During Exhalation With Pressure Breathing

As you exhale you momentarily raise the pressure in the mask above the oxygen supply pressure, forcing the diaphragm up against the spring tension. The demand valve closes and no oxygen flows.

Figure 4-3. Normal Operation of A-14 Regulator (A, B, C, & D)

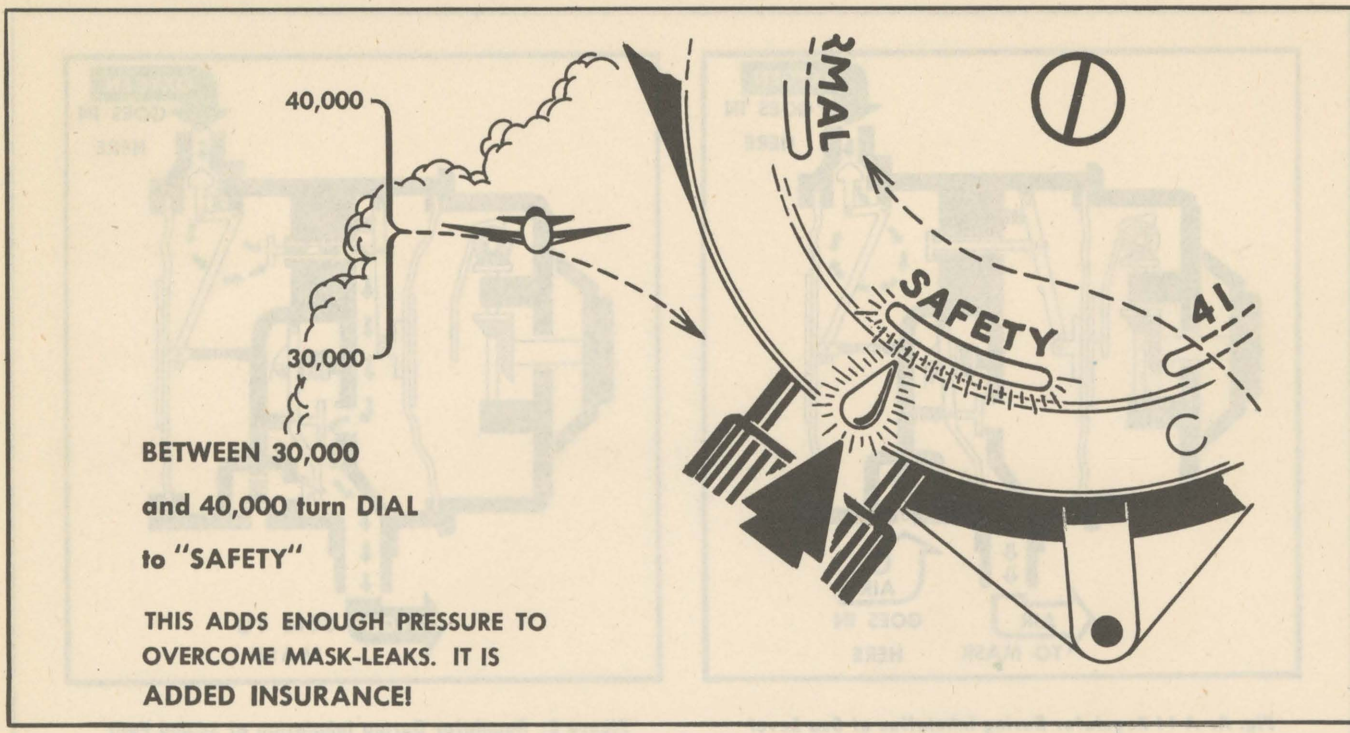


Figure 4-4. Use of Safety Setting

4-13. PRESSURE-DEMAND MASKS.

4-14. GENERAL CHARACTERISTICS AND OPERATION. A pressure-demand mask is different from a conventional demand mask in that it will hold a pressure in excess of ambient pressure. This requires three features (figure 4-5) which are not found in the demand mask:

a. A flap or curtain of rubber (1), forming a ring around the inside of the mask. This flap or curtain is the part that is in contact with your skin when you are wearing the mask. It helps to prevent the escape of oxygen.

b. Check valves (2) which keep the oxygen inlets closed while you exhale.

c. A "compensated" type of exhalation valve (3) in the floor of the mask, which opens only at a pressure slightly in excess of that within the mask tubing. The housing of the exhalation valve forms a tube (4) at the bottom, which extends downward through a hole in the floor of the mask into the oxygen inlet tube (5). Through this tube, the incoming oxygen exerts its delivery pressure upon the lower side of the compensating diaphragm (6). This pressure keeps the exhalation valve closed until a slightly *greater* pressure, produced by the act of exhalation, is brought to bear upon the upper surface of the main diaphragm (7). The valve then opens, and the exhaled air leaves the mask through the expiratory port (8).

Note

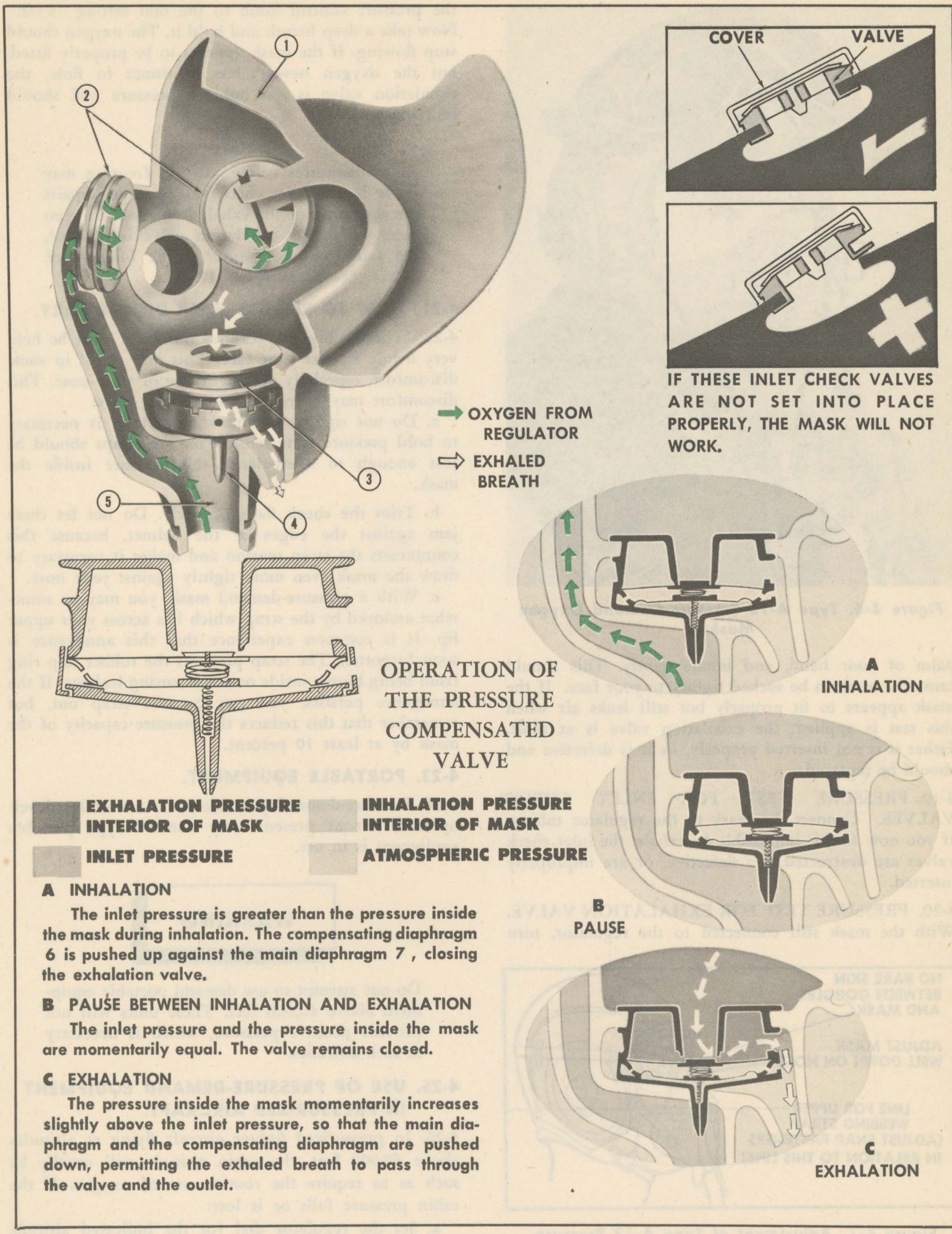
While pressure-demand masks are designed especially for use with the pressure-demand regulator, they may also be used with Aro design A-12 or A-12A regulators. When so used (that is, without pressure breathing), however, the pressure-demand masks will not raise your ceiling above that with the demand system. Pioneer design A-12 regulators are not suitable for use with pressure-demand masks unless the exhalation valve in the mask is replaced by an A-14 mask type of outlet valve. Under no circumstances should the emergency valve of any demand regulator be opened while a pressure-demand mask is being worn. This might rupture the diaphragm of the regulator.

4-15. TYPES. Two types of pressure-demand masks are in use: the A-13 and the A-13A. (See figure 4-6.) These differ only in details of design and suspension. Size distribution at present is about 6 percent large, 50 percent medium, and 44 percent small.

4-16. HOW TO CHECK YOUR PRESSURE-DEMAND MASK.

4-17. GENERAL CHECK. See that all parts of the mask are securely in place. Make sure that the inlet check valves are properly installed. (See figure 4-5.) If you are going to be exposed to extreme cold, see that the inlet check valves are covered with plastic shields, with the arrows pointing downward so that moisture cannot drain into the valves. For temperatures below –10° F, your mask should be provided with an electric heater.

4-18. SUCTION TEST. Put on your helmet and goggles, and strap the mask securely into place. (See figure 4-7.) Close the end of the mask tube with the



A INHALATION

The inlet pressure is greater than the pressure inside the mask during inhalation. The compensating diaphragm 6 is pushed up against the main diaphragm 7 , closing the exhalation valve.

B PAUSE BETWEEN INHALATION AND EXHALATION

The inlet pressure and the pressure inside the mask are momentarily equal. The valve remains closed.

C EXHALATION

The pressure inside the mask momentarily increases slightly above the inlet pressure, so that the main diaphragm and the compensating diaphragm are pushed down, permitting the exhaled breath to pass through the valve and the outlet.

Figure 4-5. Operation of the Pressure-Demand Mask

Figure 4-6. Type A-13 Pressure-Demand Oxygen Mask

palm of your hand, and inhale gently. This should cause the mask to be sucked tightly to your face. If the mask appears to fit properly but still leaks air when this test is applied, the exhalation valve is at fault. Either it is not inserted properly, or it is defective and should be replaced.

4-19. PRESSURE TEST FOR INLET CHECK VALVES. Connect the mask to the regulator tubing. If you now find it impossible to *exhale,* the inlet check valves are obstructed, are defective, or are improperly inserted.

4-20. PRESSURE TEST FOR EXHALATION VALVE. With the mask still connected to the regulator, turn the pressure control knob to the dial setting "43M." Now take a deep breath and hold it. The oxygen should stop flowing. If the mask appears to be properly fitted, but the oxygen nevertheless continues to flow, the exhalation valve is not holding pressure and should be replaced.

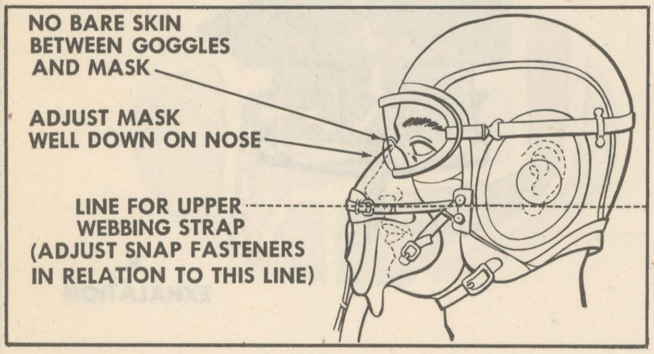


Figure 4-7. Adjustment of Type A-13 Pressure-Demand Mask

Note

At temperatures below –10° F, freezing may occur in the inlet check valves. This impairs the operation of the exhalation valve. In most cases where the exhalation valve is blocked, the fault will be found in the *inlet check valves.* See paragraph 4-17.

4-21. HOW TO REDUCE MASK DISCOMFORT.

4-22. For the higher pressures the mask must be held very firmly against your face. This may result in some discomfort, especially on the bridge of your nose. This discomfort may be reduced in several ways:

a. Do not tighten the mask more than is necessary to hold pressure. The tension on the straps should be just enough to overbalance the pressure inside the mask.

b. Trim the cheek flaps properly. Do not let them jam against the edges of the helmet, because this counteracts the strap tension and makes it necessary to draw the mask even more tightly against your nose.

c. With a pressure-demand mask, you may be somewhat annoyed by the strap which lies across your upper lip. It is common experience that this annoyance is soon forgotten. The strap prevents the rubber flap ring from being blown inside out and causing leakage. If the annoyance persists, you can cut the strap out, but remember that this reduces the pressure capacity of the mask by at least 10 percent.

4-23. PORTABLE EQUIPMENT.

4-24. Pressure-demand portable units are under development, but at present only demand type portable equipment is in use.

WARNING

Do not attempt to use demand portable equipment above 40,000 feet. These units will not provide positive pressure, which is necessary at such altitudes.

4-25. USE OF PRESSURE-DEMAND EQUIPMENT IN PRESSURIZED AIRCRAFT.

4-26. In pressurized fighter aircraft flying at altitudes above 40,000 feet, the cabin altitude will usually be such as to require the routine use of oxygen. If the cabin pressure fails or is lost:

a. Set the regulator dial for the indicated altitude of the airplane.

b. Tighten the mask suspension enough to hold the pressure.

c. If you are above 42,000 feet, descend to this or to a lower altitude.

4-27. FLYER'S CHECK LIST FOR PRESSURE-DEMAND EQUIPMENT.

4-28. BEFORE TAKE-OFF. Know the oxygen system. Be sure that you are familiar with the oxygen installation in the particular airplane in which you are going to fly. Know where to go and what to do in an emergency that deprives you of your normal source of oxygen. Then check each item of equipment as outlined following. To make sure that you have covered each point, remember the name, P. McCRIPE, and take each letter in order. (Except as noted, the check is the same as that given in paragraph 3-65 for the demand system.)

P RESSURE GAGE.

M ASK. Same as the demand mask check, and in addition, the pressure tests described in paragraph 4-16.

c ONNECTION AT MASK.

C ONNECTION AT REGULATOR.

R EGULATOR. With your mask disconnected, and and with the dust cap open, set the regulator dial at "SAFETY." A slight but steady flow of oxygen should result. Higher settings should increase the flow. Turn the dial back to "NORMAL." The flow of oxygen should cease. Leave the dial at "NORMAL" until you need to use it. Before take-off the diluter should also be set at "NORMAL." The blow-back test for a leaky diaphragm or check valve may be used with the A-14 regulator as described in paragraph 3-39.

I NDICATOR.

P ORTABLE UNIT.

E MERGENCY CYLINDER.

4-29. DURING FLIGHT. Follow instructions given in paragraph 3-74. In addition, on the regular intercomm oxygen check, each crew member should report the setting of his regulator dial, whether or not positive pressure is being used. When the use of oxygen is discontinued, set the regulator dial at "NORMAL."

4-30. AFTER EACH FLIGHT. Follow instructions given in paragraph 3-75, except that the regulator dial must be set at "NORMAL" before you leave the airplane. Keep your pressure-demand mask in a clean, dry container when you are not using it to protect it from dirt particles. Dirt particles interfere seriously with the operation of the mask when they get stuck in the inlet check valves.

SECTION V
CONTINUOUS-FLOW SYSTEMS

5-1. GENERAL CHARACTERISTICS. (See figure 5-1.)

5-2. Although continuous-flow equipment has practically disappeared from combat aircraft, it is still used in a few training and patrol airplanes. It is used regularly in aircraft engaged in the transportation of troops and cargo, and in air evacuation. The main reason for its restricted use is that in its present state of development it does not satisfactorily meet the varying oxygen requirements imposed by different degrees of activity, especially in the higher ranges of altitude. While the continuous-flow system employs the same sort of cylinders and plumbing as the demand system, the flight station equipment is quite different.

5-3. CONTINUOUS-FLOW REGULATORS.

5-4. HAND-ADJUSTMENT TYPES. The purpose of these regulators is to deliver a continuous stream of oxygen, at a rate of flow which is controlled by a hand adjustment. This is accomplished by a pressure reducing mechanism and a needle valve with a hand adjustment knob. A cylinder pressure gage and a flowmeter are incorporated into the regulator itself. You adjust the valve until the reading of the flowmeter corresponds to your altitude. If you climb at a rapid rate, become active during flight, or feel that you need more oxygen, set your flowmeter to read about 5,000 feet above your indicated altitude in order to increase the oxygen flow. The type A-9A regulator (figure 5-1) is used only with low-pressure cylinders. The type A-8A, although similar, is used only with high-pressure cylinders.

5-5. AUTOMATIC TYPE. The A-11 automatic continuous-flow regulator (figures 5-2 and 5-3) is entirely different from the hand-adjustment types, in appearance, operation, and use. It is designed for transport aircraft, to regulate the oxygen flow to several troop outlets. No manual adjustment is required. As a safety precaution, at least two regulators are used for any installation. No more than three are installed to supply oxygen to any one group of passengers. When the number of passenger outlets exceeds 30, instead of a single bank of four regulators, a new bank is used, with a new passenger distribution line. The regulator contains no pressure gage. One crew member is made responsible for noting the pressure at frequent intervals on a pressure gage installed at a convenient point in the distribution line.

5-6. CONTINUOUS-FLOW MASKS.

5-7. OPERATION. All types of continuous-flow

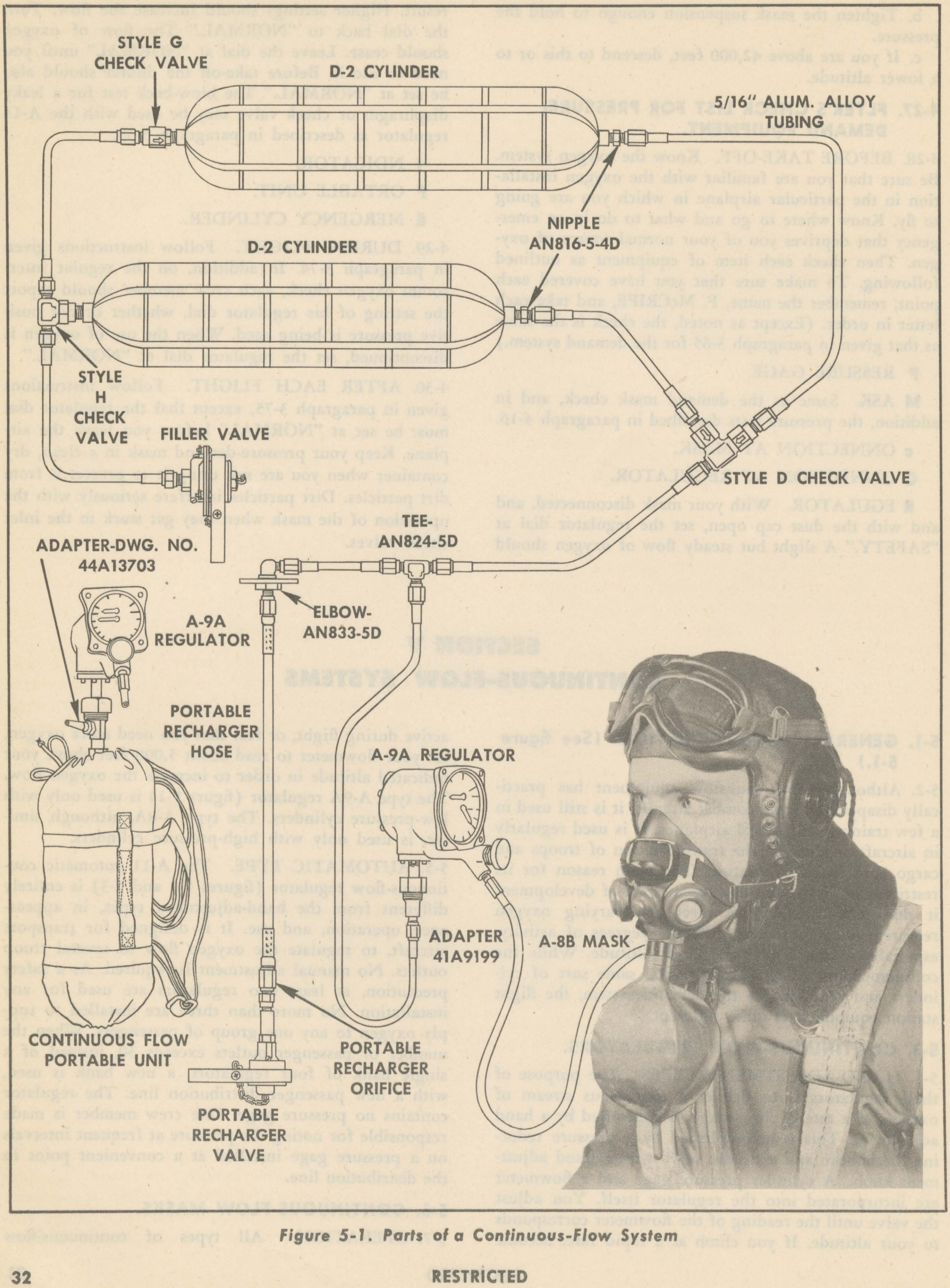


Figure 5-1. Parts of a Continuous-Flow System

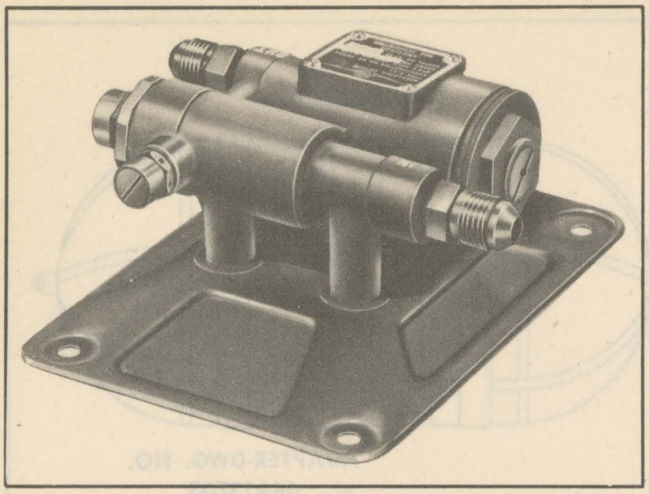


Figure 5-2. Type A-11 Automatic Continuous-Flow Oxygen Regulator

masks operate on the same principle. The mask is connected to the regulator by a slender rubber tube and a bayonet type of connector. Oxygen is delivered in a continuous stream to a rubber bag which is attached to the facepiece of the mask. When full, the bag contains about a pint. This is approximately the volume of a normal breath taken at rest. If you inhale so deeply as to empty the bag, porous rubber sponges in the facepiece of the mask admit atmospheric air in addition to the oxygen which comes from the bag. When the flow from the regulator is too slow to fill the bag between breaths, these sponges permit the oxygen to be diluted, with much the same effect as that produced by the diluter of a demand regulator, paragraph 3-5. If you increase the flow by adjusting the regulator, it is possible to get almost 100 percent oxygen, provided the depth of your breathing does not exceed the capacity of the bag. On exhalation, a part of your expired air (still, however, containing a high concentration of oxygen) is returned to the bag to mix with the freshly delivered oxygen, while the remainder of the exhaled air escapes through the sponges. Although they are fairly comfortable to wear, these masks are subject to icing, which interferes seriously with their operation. Mask warmers and shields are available which help to prevent this condition, but the best protection is to carry one or more spare masks.

5-8. TYPES. Common types of continuous-flow masks are the A-8B, the A-7A, and the A-7B. (See figures 5-1 and 5-3.) The first of these covers both nose and mouth; the latter two cover only the nose. With these you must remember not to breathe through your mouth.

5-9. CONTINUOUS-FLOW PORTABLE EQUIPMENT.

5-10. Use of a continuous-flow mask requires the use of continuous-flow regulators, both at fixed stations and on portable equipment. Four kinds of portable apparatus are available:

a. A low-pressure cylinder, type D-2, with an A-9A regulator, a filler valve, and a sling. (See figure 5-4.) This was intended for supplying oxygen in flight to wounded evacuees, but it is also useful as a portable unit.

b. A low-pressure cylinder, type A-6, with an A-9A regulator, a recharging adapter, and a sling. (See figure 5-5.) This may be fabricated locally from drawing No. 44B24619.

c. A high-pressure cylinder, type A-2, with an A-8A regulator and sling. (See figure 5-6.) This assembly cannot be recharged in flight.

d. A high-pressure cylinder, type B-1, with an A-8A regulator. This is used in some cargo aircraft which have no permanent provision for oxygen supply.

Note

In using continuous-flow portable equipment, remember that you must adjust the regulator valve before any oxygen will flow. With high-pressure assemblies, you must also open the *cylinder* valve. Since the portable unit is ordinarily used only during some form of activity, it is wise, especially at high altitude, to allow a somewhat greater flow than would be required for the same altitude when at rest. This means setting the flowmeter to read a few thousand feet above the indicated altitude. After use, be sure to turn off both the regulator valve and the cylinder valve.

5-11. EMERGENCY EQUIPMENT.

5-12. The H-1 emergency cylinder is used in the same way with continuous-flow as with demand equipment. (Refer to paragraph 3-62.) The H-2 emergency assembly, described in paragraph 3-61, cannot be connected to a continuous-flow mask and is therefore not suitable for use with the continuous-flow system.

5-13. FLYER'S CHECK LIST FOR CONTINUOUS-FLOW EQUIPMENT (HAND-ADJUSTMENT TYPE).

5-14. BEFORE TAKE-OFF. Know the oxygen system. Be sure that you are familiar with the oxygen installation in the particular airplane in which you are going to fly. Know where to go and what to do in an emergency that deprives you of your normal source of oxygen. Then check each item of equipment as described following. To make sure that you have covered each point, remember the name, P. McCRIPE, and take each letter in order:

PRESSURE GAGE (**P.**). The gage should read between 400 and 450 psi, and should agree approximately with the gages at other stations.

MASK (**M**). Look for cuts, tears, and cracks both in the facepiece and in the rebreather bag. Make sure that both the bag and the facepiece are securely attached to the yoke connector. See that the rubber sponges are in good condition, and that the drain pipe at the bottom of the rebreather bag is properly plugged. If there

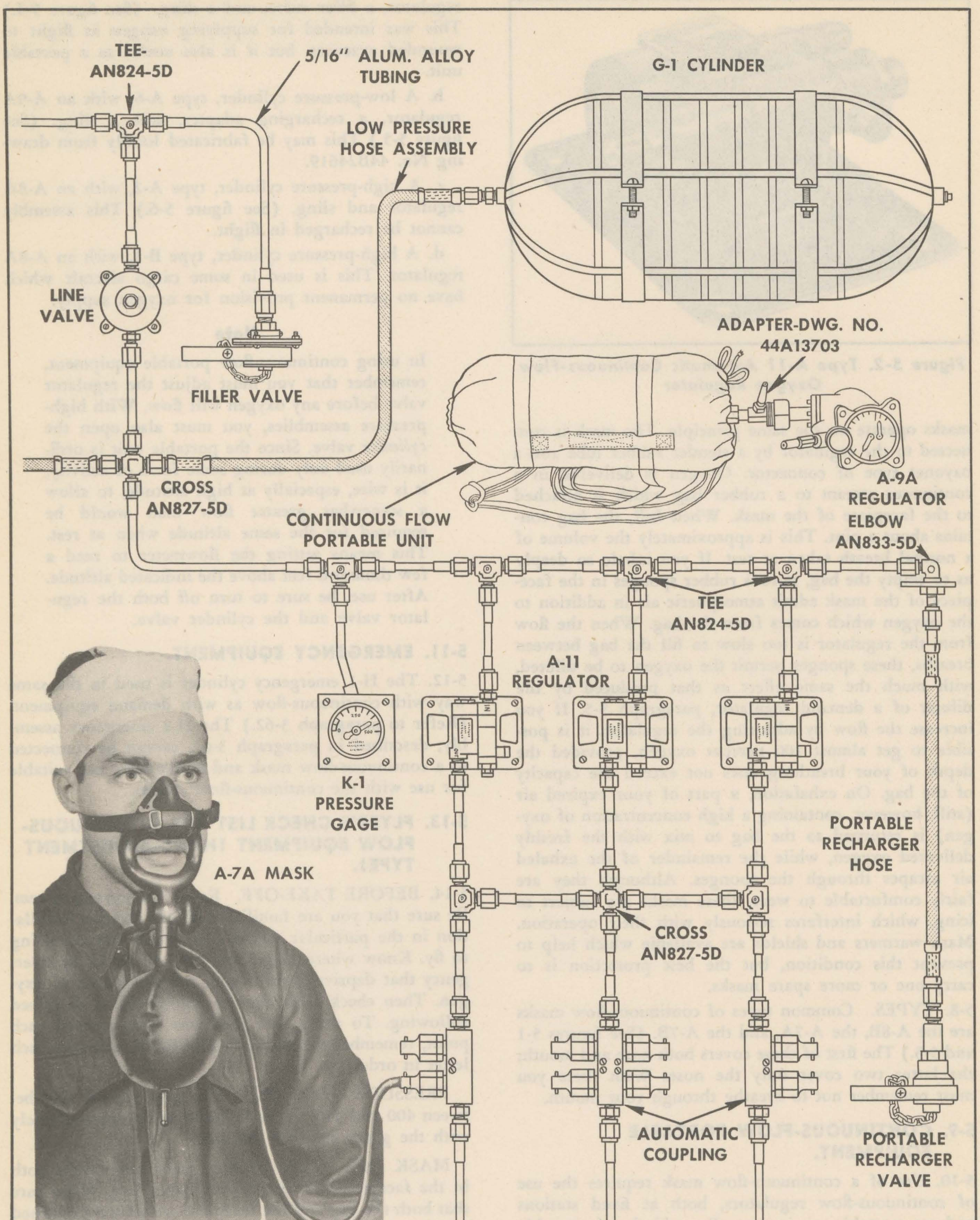


Figure 5-3. Parts of a Troop Oxygen System

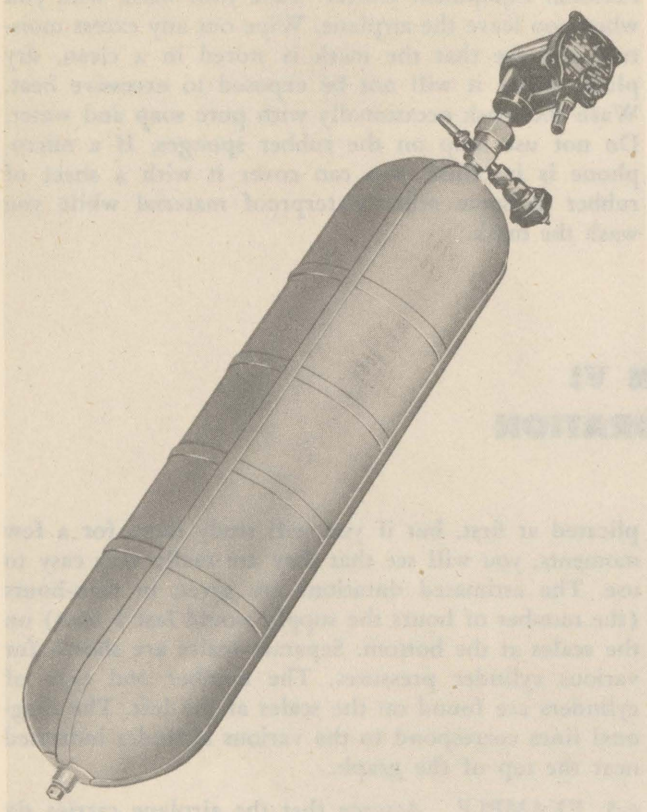


Figure 5-4. Portable Oxygen Unit, D-2 Cylinder, A-9A Regulator, Filler Valve and Recharging Adapter

is no mask microphone, be sure that the pressure relief vent is sealed. (Refer to T.O. No. 03-50B-8.) See that the suspension straps and fittings are in good order and are adjusted so that the mask fits snugly but not tightly against your face. To check the fit, first kink or block the delivery tube. Then cover the sponge turrets with palms of your hands and inhale gently. Air should not enter the mask.

Note

If you are going to be exposed to extreme cold, protect the mask with a mask warmer and rubber shields. (Refer to T.O. No. 03-50B-5.) Also, carry a spare mask.

CONNECTIONS AT MASK (**c**). See that the delivery tube is securely attached to the yoke connector.

CONNECTIONS AT REGULATOR (**C**). Be sure that a gasket is in place in the bayonet connector, and that the bayonet fits the regulator outlet. When connected, the bayonet fitting must be locked in place.

REGULATOR (**R**). The adjustment knob should turn smoothly and with moderate resistance.

INDICATOR (**I**). The flow indicator hand on the face of the regulator should make a full, smooth excursion starting from zero as you turn the valve adjustment knob. The hand should return to zero when the valve is closed.

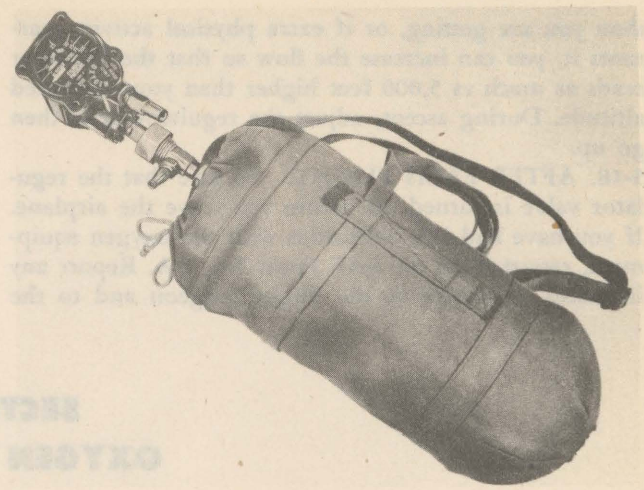


Figure 5-5. Portable Oxygen Assembly, A-6 Cylinder, A-9A Regulator, Filler Adapter and Sling

PORTABLE UNIT (**P**). Portable units must be equipped with continuous-flow regulators of the appropriate type. (Refer to paragraph 5-9.) High-pressure cylinders should be filled to 1800 psi; low-pressure cylinders, to 400 psi. Check the portable regulators including gages and indicators, as previously described.

EMERGENCY CYLINDER (**E**). The H-1 emergency assembly should be charged to 1800 psi. Examine the release valve for any obvious defects. See that the cylinder is securely fastened to your leg and to your clothing.

5-15. DURING FLIGHT. Most of the instructions on the checking of demand equipment during flight (paragraph 3-51) are also applicable to continuous-flow equipment. *In addition*, keep close watch of the following:

5-16. ICING OF MASK. Continuous-flow masks are particularly susceptible to freezing. If squeezing the mask does not get rid of the ice, change to a spare mask while you thaw and dry the frozen one.

5-17. REGULATOR. Keep the flow regulator adjusted to correspond with the altitude of flight. The flow rate at a given altitude is usually sufficient for ordinary physical activity. If you feel that you need more oxygen

Figure 5-6. Portable Oxygen Unit, A-2 Cylinder and A-8A Regulator

than you are getting, or if extra physical activity warrants it, you can increase the flow so that the indicator reads as much as 5,000 feet higher than your indicated altitude. During ascent, adjust the regulator *first;* then go up.

5-18. AFTER EACH FLIGHT. Be sure that the regulator valve is turned off before you leave the airplane. If you have had any difficulties with the oxygen equipment, report them on AAF Form No. 1-A. Report any instances of anoxia to the Flight Surgeon and to the Personal Equipment Officer. Take your mask with you when you leave the airplane. Wipe out any excess moisture and see that the mask is stored in a clean, dry place, where it will not be exposed to excessive heat. Wash the mask occasionally with pure soap and water. Do not use soap on the rubber sponges. If a microphone is installed, you can cover it with a sheet of rubber or some other waterproof material while you wash the mask.

SECTION VI
OXYGEN DURATION

6-1. DURATION DATA IN GENERAL.

6-2. This section will help you to estimate how long the oxygen supply will last in a given airplane at various altitudes. The actual duration depends upon several factors:

a. The type of oxygen equipment and how it is used.

b. The number and size of the oxygen cylinders.

c. The initial pressure in the cylinders.

d. The altitude.

e. The amount of loss or leakage due to battle damage.

f. The rate and depth of breathing (both of which vary greatly in activity or excitement).

g. Emergencies which may require the use of an exceptionally large amount of oxygen.

h. The temperature at the time when the use of oxygen is discontinued.

The first four of these factors are constant or relatively predictable for any particular airplane and mission. The last four, although equally important, cannot be anticipated precisely enough for accurate calculations.

Note

The graphs shown in figures 6-1 through 6-4 are conservative estimates of oxygen duration, based upon the first four factors listed preceding, and upon anticipated rates and depths of breathing consistent with moderate activity. In plotting them, it was assumed that no serious leakage or emergency would occur, and that there would be no great change of ground level temperature.

6-3. DURATION WITH THE DEMAND SYSTEM.

6-4. HOW TO USE THE GRAPHS. Figure 6-1 gives the estimated oxygen duration with the diluter at "NORMAL" (automix "ON"). Figure 6-2 gives the estimated duration with the diluter at "100% OXYGEN" (automix "OFF"). The graphs may look complicated at first, but if you will study them for a few moments, you will see that they are really very easy to use. The estimated durations are given in man-hours (the number of hours the supply would last 1 man) on the scales at the bottom. Separate scales are shown for various cylinder pressures. The number and type of cylinders are found on the scales at the left. The diagonal lines correspond to the various altitudes indicated near the top of the graph.

6-5. EXAMPLE. Assume that the airplane carries six type G-1 cylinders, that it is going to fly at 20,000 feet, and that the gage pressure before take-off is 300 pounds per square inch (psi). To estimate the oxygen duration follow these steps:

a. Select the proper vertical scale for the type G-1 cylinder, and spot the No. "6" on this scale.

b. Draw a horizontal line from the No. "6" over to the diagonal line marked "20,000."

c. From the intersection of your horizontal line with the "20,000" diagonal, drop a vertical line to the base of the graph. Right below this base line are several scales showing the duration value (in man-hours) for various gage pressures. If the pressure were 400 psi, you would read the duration on the scale marked at the left, "400 psi." But since we assumed a gage pressure of only 300 psi, you read the duration on the scale marked "300 psi." This duration value turns out to be approximately 20 man-hours. That is, under the assumed conditions, there is enough oxygen to last 1 man for 20 hours, or 2 men for 10 hours, or 5 men for 4 hours and so on. In other words, to find the oxygen range of the airplane under the assumed conditions, divide the number of man-hours' supply by the number of men who will use it.

6-6. PIONEER COMPARED WITH ARO DESIGN REGULATORS.

6-7. DIFFERENCE IN OXYGEN DELIVERY. The percentage of oxygen delivered at various altitudes will differ somewhat in the several designs of demand regulator. The duration value with a system using a Pioneer

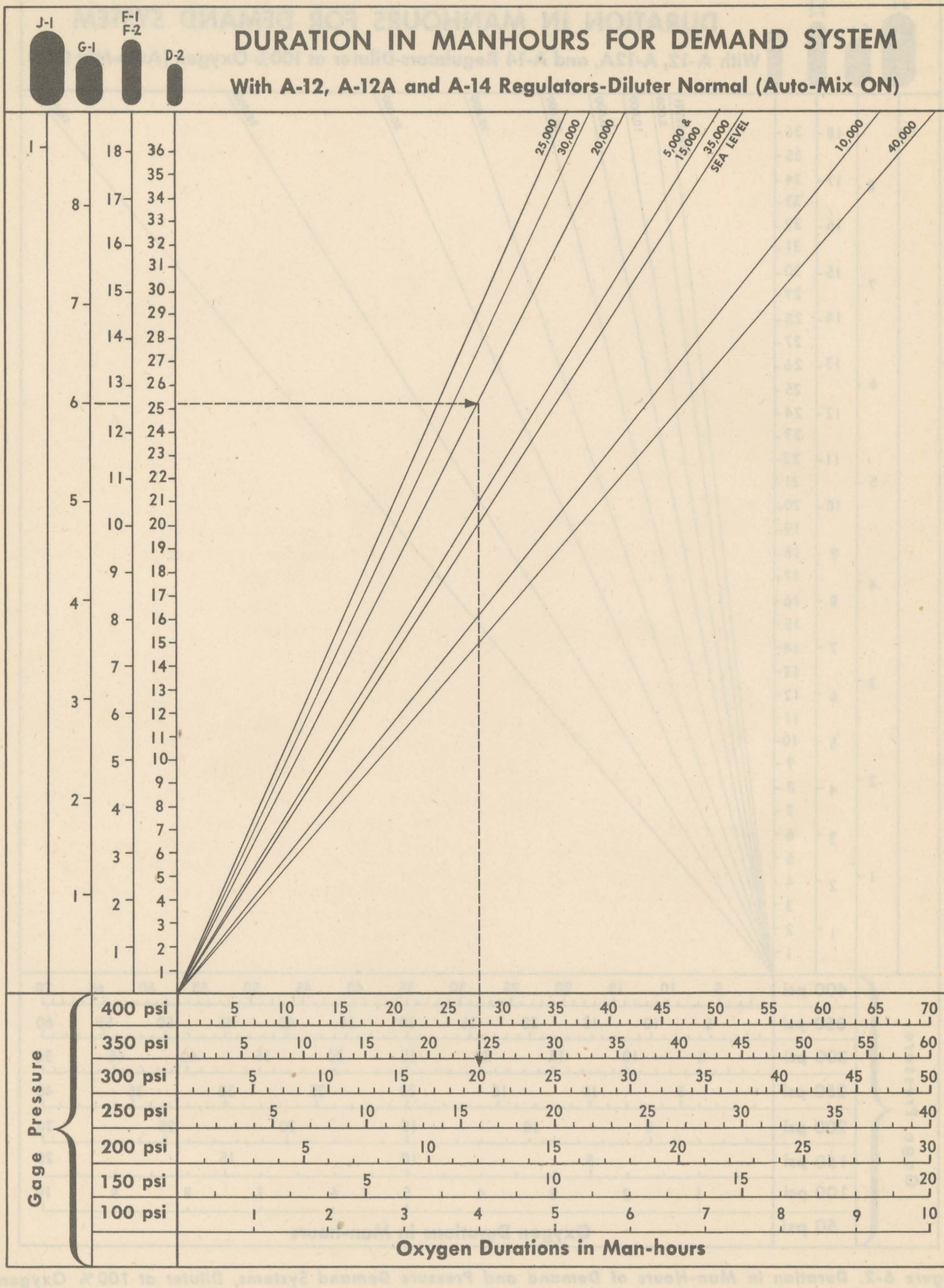


Figure 6-1. Duration in Man-Hours of Demand and Pressure Demand System—Diluter Normal

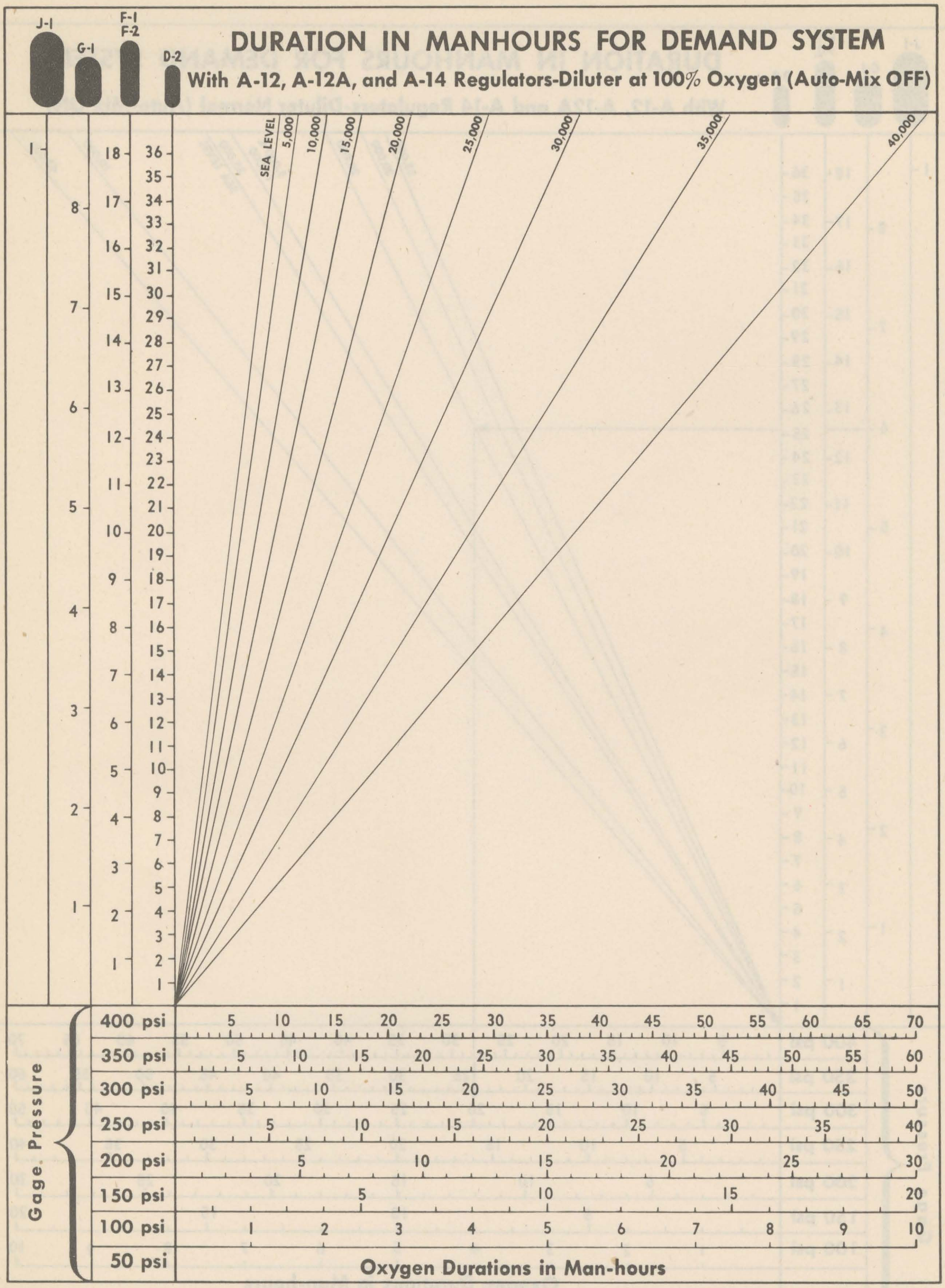
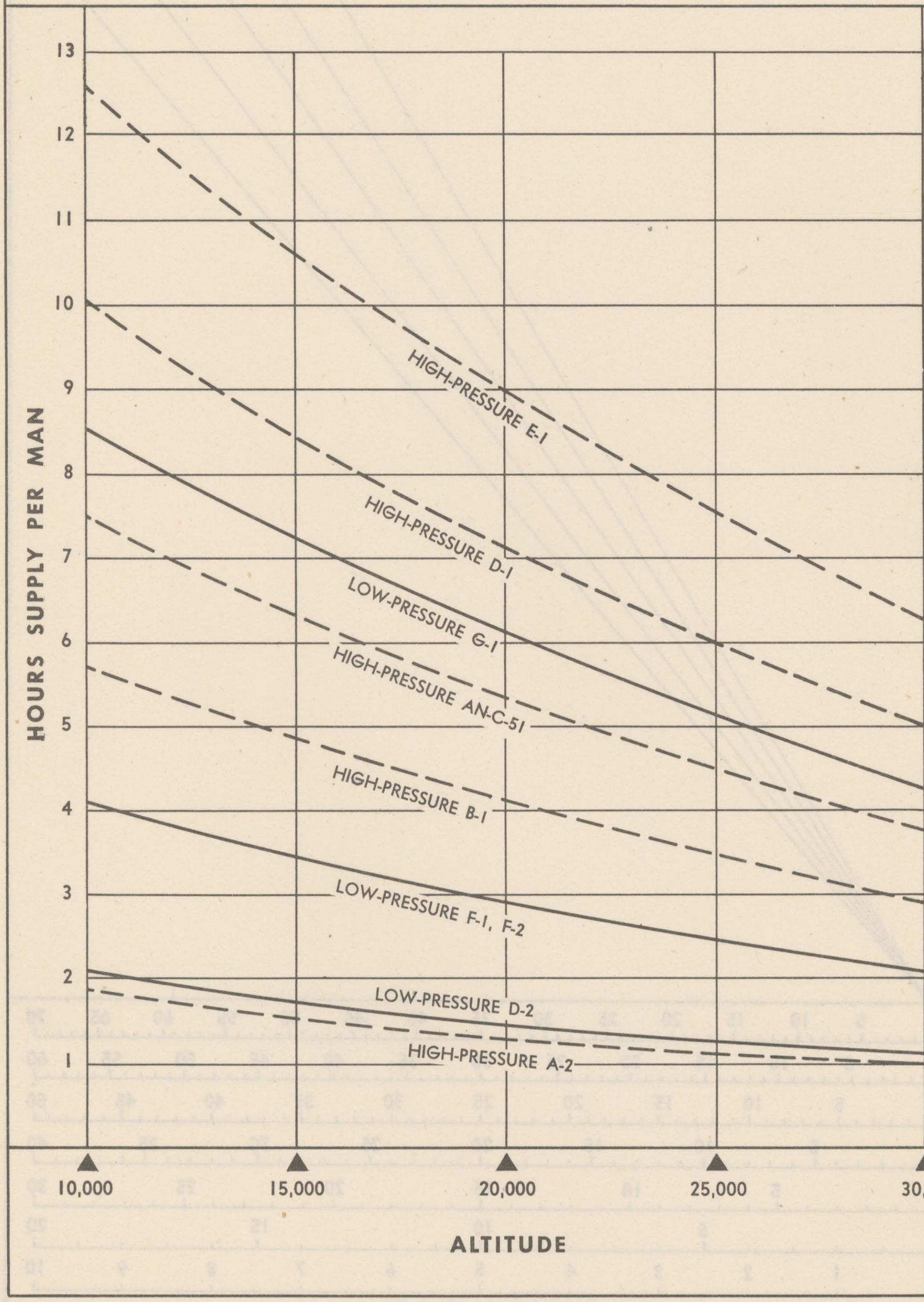


Figure 6-2. Duration in Man-Hours of Demand and Pressure Demand Systems, Diluter at 100% Oxygen

DURATION IN MANHOURS FOR LOW-PRESSURE CYLINDERS with A-9A Regulators and HIGH-PRESSURE CYLINDERS with A-8A Regulators



HOW TO USE THIS GRAPH

1. Select altitude at bottom of graph.
2. Follow vertical up till it intersects the line for proper cylinder.
3. From this intersection draw horizontal line to left and read man-hours on vertical scale.

EXAMPLE

At 25,000 feet, one G-1 cylinder will supply one man slightly more than 5 hours.

Figure 6-3. Duration in Man-Hours of Low Pressure Cylinders (when used with A-9A Regulators) and of High Pressure Cylinders (when used with A-8A Regulators)

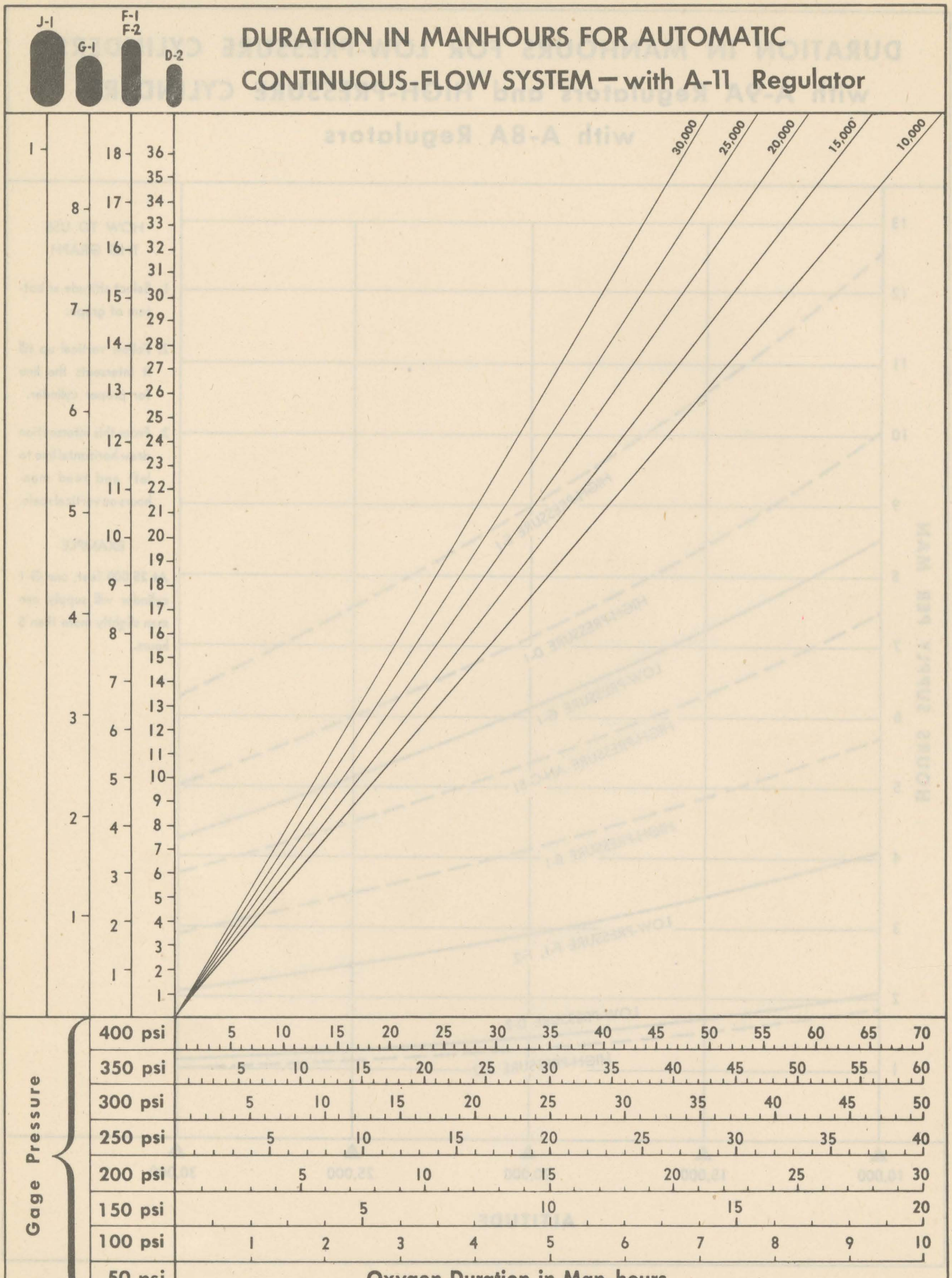


Figure 6-4. Duration in Man-Hours for Automatic Continuous-Flow System with A-11 Regulator

TO ESTIMATE OXYGEN DURATION IN FLIGHT, AT PRESENT RATE OF DEPLETION:

1. Read the oxygen pressure gage as closely as possible.
2. Wait thirty minutes.*
3. Read the gage again.
4. Subtract the second gage reading from the first. The difference is ΔP on the right hand side of scale B.
5. Lay a straightedge so that it intersects the second gage reading on scale A, and ΔP on scale B.
6. Read OXYGEN DURATION IN HOURS where the straightedge intersects scale C.

---

*If the oxygen pressure appears to be falling rapidly, take readings at 15 minute intervals, and use the left hand side of scale B.

For intervals other than 15 or 30 minutes, multiply the observed pressure loss by 30/m, where m is the chosen interval in minutes. This gives ΔP on the right hand side of scale B.

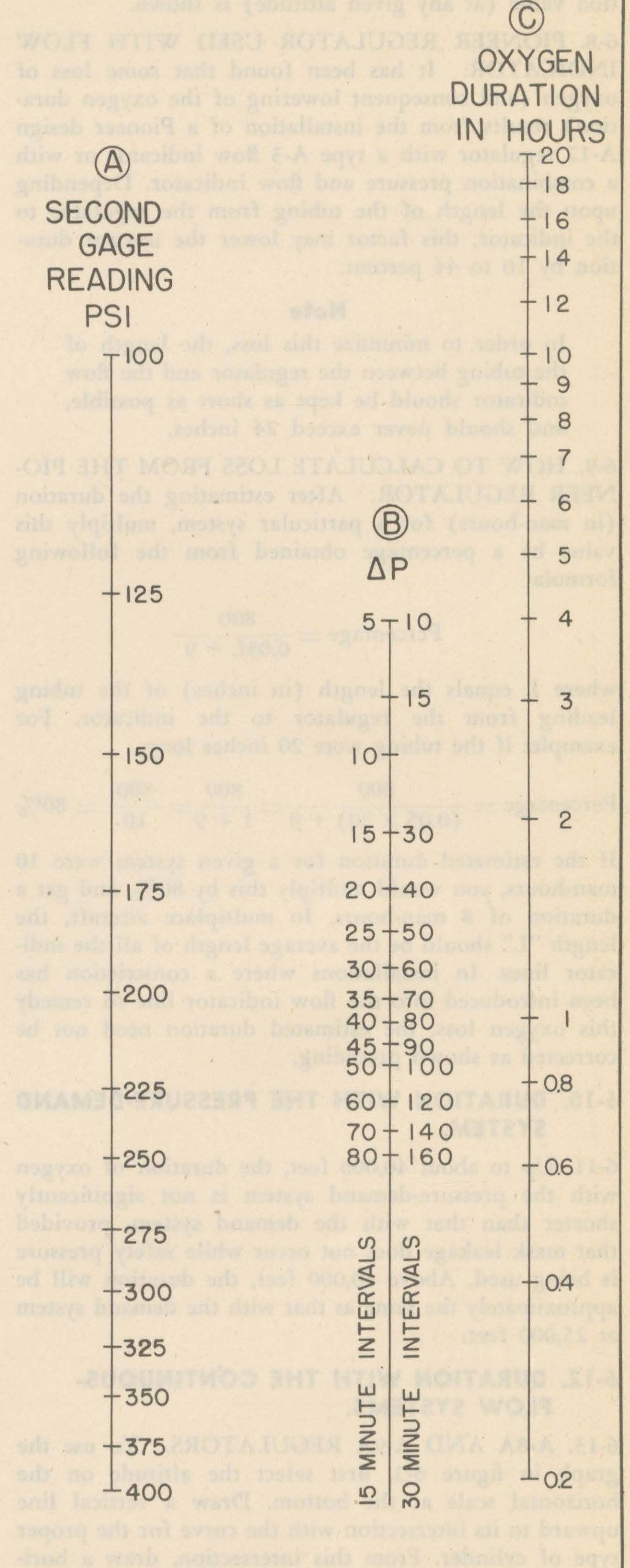


Figure 6-5. Duration Nomograph

A-12 regulator will be slightly different from one using an Aro A-12 regulator. In the graphs, the lesser duration value (at any given altitude) is shown.

6-8. PIONEER REGULATOR USED WITH FLOW INDICATOR. It has been found that some loss of oxygen (and consequent lowering of the oxygen duration) results from the installation of a Pioneer design A-12 regulator with a type A-3 flow indicator or with a combination pressure and flow indicator. Depending upon the length of the tubing from the regulator to the indicator, this factor may lower the oxygen duration by 10 to 44 percent.

Note

In order to minimize this loss, the length of the tubing between the regulator and the flow indicator should be kept as short as possible, and should never exceed 24 inches.

6-9. HOW TO CALCULATE LOSS FROM THE PIONEER REGULATOR. After estimating the duration (in man-hours) for a particular system, multiply this value by a percentage obtained from the following formula:

$$\text{Percentage} = \frac{800}{0.05L + 9}$$

where L equals the length (in inches) of the tubing leading from the regulator to the indicator. For example: if the tubing were 20 inches long,

$$\text{Percentage} = \frac{800}{(0.05 \times 20) + 9} = \frac{800}{1 + 9} = \frac{800}{10} = 80\%$$

If the estimated duration for a given system were 10 man-hours, you would multiply this by 80%, and get a duration of 8 man-hours. In multiplace aircraft, the length "L" should be the average length of all the indicator lines. In installations where a constriction has been introduced into the flow indicator line to remedy this oxygen loss, the estimated duration need not be corrected as shown preceding.

6-10. DURATION WITH THE PRESSURE-DEMAND SYSTEM.

6-11. Up to about 40,000 feet, the duration of oxygen with the pressure-demand system is not significantly shorter than that with the demand system, provided that mask leakage does not occur while safety pressure is being used. Above 40,000 feet, the duration will be approximately the same as that with the demand system at 25,000 feet.

6-12. DURATION WITH THE CONTINUOUS-FLOW SYSTEMS.

6-13. A-8A AND A-9A REGULATORS. To use the graph in figure 6-3, first select the altitude on the horizontal scale at the bottom. Draw a vertical line upward to its intersection with the curve for the proper type of cylinder. From this intersection, draw a horizontal line leftward, and read man-hours duration on the vertical scale. This value will be for *one* cylinder of the specified type. To determine the oxygen duration for a whole system, multiply this value by the number of cylinders in the system.

Note

Figure 6-3 gives the duration with fully charged cylinders; that is, with low-pressure cylinders charged to 400 psi, and with high-pressure cylinders charged to 1800 psi. Duration with low-pressure cylinders drops one-seventh for each 50 psi drop in gage pressure. Duration with high-pressure cylinders drops approximately one-seventh for each 200 psi drop in gage pressure.

6-14. A-11 REGULATORS. Figure 6-4 gives duration values for the automatic continuous-flow system with A-11 regulators. Use this graph in the same way as figures 6-1 and 6-2.

6-15. HOW TO ESTIMATE OXYGEN DURATION IN FLIGHT. (See figure 6-5.)

6-16. During flight, especially in combat, there is only one way of making a reasonable estimate of oxygen duration. That is by observing the *rate* at which the oxygen pressure is falling. Because of the action of the check valves, the puncture of one or more oxygen cylinders will not necessarily have an immediate effect upon the gage pressure, although the loss of part of the supply *will* affect the rate of oxygen depletion. Figure 6-5 is a chart for making simple and rapid estimates of oxygen duration from successive gage readings. This chart is based upon a range of available oxygen from 400 to 50 psi.

Note

In estimating oxygen duration from successive gage readings, you assume that the gage pressure wil' *continue* to fall at the same rate as it does when the estimate is made. Actually, of course, the rate may vary greatly within a short time. For this reason, estimates should be made at frequent intervals, especially when the airplane has been exposed to gunfire.

6-17. EFFECT OF TEMPERATURE CHANGE.

6-18. As an airplane ascends to high altitudes, where the temperature is normally quite low, the oxygen cylinders become chilled. As the cylinders grow colder, the oxygen gage pressure is reduced, sometimes rather rapidly. This rapid fall in pressure is occasionally a cause of unnecessary alarm. It does not mean that any oxygen has been lost. All the oxygen is still there, and as the airplane descends to warmer altitudes, the pressure will tend to rise again, so that the rate of oxygen usage may appear to be *slower* than normal. A rapid fall of oxygen pressure while the airplane is in level flight, or while it is descending, is not ordinarily due to falling temperature, of course. When *this* happens, leakage or loss of oxygen must be suspected.

SECTION VII
OXYGEN PROCUREMENT AND HANDLING

7-1. AVIATORS' BREATHING OXYGEN.

7-2. Aviators' breathing oxygen, Specification No. AN-0-1, has a minimum purity, disregarding moisture content, of 99.5 percent by volume. It is odorless and free from all poisonous substances and adulterants, including drying agents. Two grades are specified:

GRADE A.—Aviators' breathing oxygen, grade A, must not contain more than 0.02 milligrams of water vapor per liter at 760 millimeters Hg and 20° C (68° F).

GRADE B.—Aviators' breathing oxygen, grade B, is the same as grade A except that its moisture content is unspecified. Do not confuse aviators' breathing oxygen with "welding" oxygen or "hospital" oxygen. While the latter types may be pure enough for breathing, they usually contain water, which would freeze and plug the lines and valves of an airplane oxygen system.

7-3. PROCUREMENT.

7-4. IN CONTINENTAL UNITED STATES. In continental United States, aviators' breathing oxygen, grade A, is obtained by centralized procurement in accordance with Specification No. AN-0-1. Unless otherwise specified, oxygen is supplied in 220 to 250 cubic-foot, high-pressure, commercial cylinders. Such commercial cylinders, when used for the storage of aviators' breathing oxygen, are identified by the following combination of characteristics: (Refer to T.O. No. 06-20-2.)

GREEN COLOR.

WHITE STENCIL LETTERS reading "AVIATORS' BREATHING OXYGEN, SPECIFICATION No. AN-0-1."

BLUE BAND 2 inches wide encircling the middle of the cylinder.

STEEL IDENTIFICATION RING attached to the collar of the cylinder, embossed with the words, "OXYGEN-AVIATORS'."

Exchange depleted cylinders for charged cylinders of a similar type. Do not send high-pressure cylinders designed for installation in aircraft to commercial oxygen suppliers for recharging. Have them recharged by local service facilities in compliance with T.O. No. 03-50C-1.

CAUTION

Take care to prevent pressure in oxygen supply cylinders from falling below 50 psi. If the pressure falls much below this value, moisture is very likely to accumulate in the cylinders. Keep the valves closed when the cylinders are not in use.

7-5. THEATERS OF OPERATION. In theaters of operation, aviators' breathing oxygen, grade A, or the best grade available, is purchased or generated locally. Mobile oxygen generating equipment, truck mounted, is available in certain theaters. This equipment is capable of producing oxygen of 99.5 percent purity. If the purity of the oxygen is less than 98 percent, it is considered unsatisfactory and should not be used in aircraft. All oxygen, however produced or procured, will be dried by one or more of the standard purifier assemblies on the portable servicing equipment. After the contents of 16 cylinders have passed through the purifier, change the purifier cartridge as described in T.O. No. 19-1-2.

7-6. IDENTIFICATION.

7-7. At present it is not possible for maintenance personnel in the field to determine the grade or purity of oxygen. Oxygen may be distinguished from other gases, however, by the following combination of tests:

a. ODOR. Oxygen is odorless.

b. COMBUSTION. Oxygen itself is noninflammable, but it makes other materials burn rapidly. A sample of oxygen discharged against a glowing ember, will cause the ember to burst into bright flame.

WARNING

Do not perform this test within 50 feet of any airplane or inflammable structure. The ember must not be held on or near any person, but should be placed on the ground well away from oil, grease, or other inflammable material. The oxygen sample may be collected in a clean rubber bag, such as the rebreather bag of a continuous-flow type oxygen mask.

7-8. OXYGEN TEST KIT. (Refer to T.O. No. 03-50-26.) The oxygen testing kit, type K-1 or K-2, may be used to determine the approximate purity of oxygen. A sample of aviators' breathing oxygen is almost completely absorbed by the material in the burette. Any gas which remains unabsorbed should not extend beyond the first or second division of the burette scale.

Note

If you are in doubt about the quality of oxygen being supplied to your activity, you can

send a sample for analysis to CG, FATSC, Patterson Field, Ohio. Collect the sample according to instructions supplied with the oxygen sampling cylinder, class 06-B, stock No. 7560-096000.

7-9. STORAGE.

7-10. Store oxygen cylinders in compliance with Army Regulation 850-60. Protect cylinders from excessive heat, and from the direct rays of the sun. Oxygen cylinders must be segregated from cylinders of other gases, and must not be stored near inflammable material of any kind. Cylinders depleted to a pressure approaching 50 psi are to be marked "EMPTY" and segregated from other cylinders.

7-11. SPECIAL CAUTIONS AND WARNINGS ON HANDLING OXYGEN.

7-12. Oxygen under pressure is a friend when used properly, but an enemy when handled carelessly. The handling of oxygen is not dangerous if you follow these simple rules:

a. KEEP OIL AND GREASE AWAY! Don't handle oxygen with greasy hands or clothing. Don't let fittings, hose, or any oxygen equipment get smeared with oil, grease, hydraulic fluid, or dirt. A drop of oil in the wrong place can cause an explosion.

b. KEEP OXYGEN AWAY FROM FIRES! A small fire in the presence of oxygen can quickly become a big one. A lighted cigarette in a jet of oxygen will flare up and burst into flame. Carelessness on this score burned up an airplane and nearly killed a man. He was smoking a cigarette while replacing a fitting in the plane. The cigarette suddenly flared up and he dropped it. It landed in a pool of oil. The man escaped, but the plane was destroyed by the fire.

c. HANDLE CYLINDERS AND VALVES CAREFULLY! Before opening a cylinder valve, make sure that the cylinder is firmly supported. Never let a cylinder be dropped or tipped over. A broken valve may cause a cylinder to rocket like a torpedo! Close valves *by hand only*. If the valve cannot be fully closed by hand, it should be returned to the depot with the cylinder for repair.

d. NEVER FILL LOW-PRESSURE SYSTEMS WITHOUT A REDUCING VALVE! Airplanes have

been practically demolished by failure to observe this precaution.

e. NEVER MIX OXYGEN WITH OTHER GASES! Never use oxygen in systems intended for other gases. Never put anything but oxygen into an oxygen system. At Columbus, Ohio, a cylinder of *hydrogen* was used in recharging the oxygen system of a B-17. This caused an explosion which killed 4 men and demolished the airplane. The cylinder was plainly marked "HYDROGEN." This incident demonstrates the need for adequate instruction of ground personnel in the handling of oxygen.

SECTION VIII
SERVICING OF OXYGEN EQUIPMENT

8-1. BASIC PLAN OF AN OXYGEN RECHARGING SYSTEM.

8-2. All types of equipment for recharging low-pressure oxygen systems include the following basic components: (See figure 8-1.)

a. HIGH-PRESSURE COMMERCIAL OXYGEN CYLINDERS. There may be two, six, or more such cylinders (1) depending upon the type of servicing equipment used.

b. MANIFOLD. A manifold (2) connects the high-pressure cylinders to the pressure reducing valve.

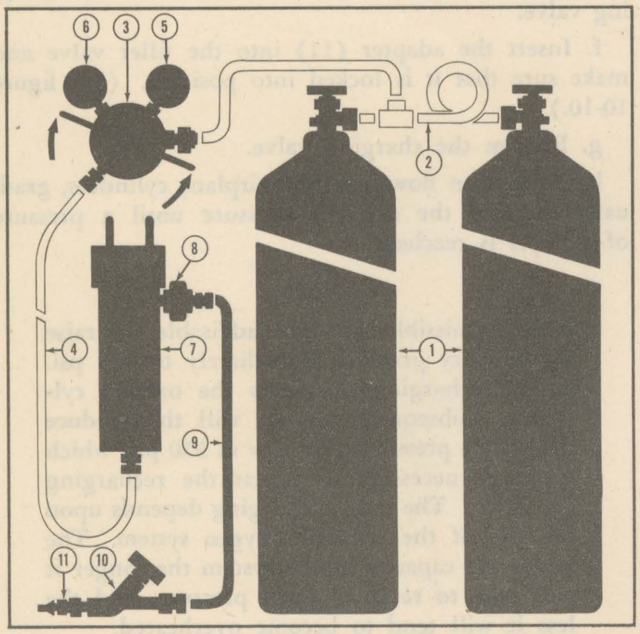


Figure 8-1. Essential Parts of a Low-Pressure Recharger Apparatus

c. PRESSURE REDUCING VALVE. This valve (3) reduces the pressure of the oxygen received from the high-pressure cylinders, and discharges it at a reduced pressure (determined by a hand adjustment) into a tube (4) which usually leads to the purifier. Two pressure gages are connected to the valve: one (5) shows the supply cylinder pressure; the other (6) shows the reduced pressure.

d. PURIFIER ASSEMBLY. This assembly (7) consists of a cartridge of chemicals which removes moisture from the oxygen, except in the E-1 trailer the purifier is installed on the low-pressure side of the reducing valve.

e. FILTER. This filter (8) strains out coarse particles of any kind after the oxygen has passed through the purifier.

f. FLEXIBLE HOSE. This hose (9) connects the filter with the charging valve and adapter.

g. CHARGING VALVE. This is a hand-operated shut-off valve (10) used to stop the flow of oxygen from the flexible hose.

h. ADAPTER. This adapter (11) connects the recharging apparatus with the airplane filler valve. (See figure 8-5.)

8-3. TYPES OF SERVICING EQUIPMENT.

8-4. Various types of oxygen servicing equipment are in use. Some of these are fabricated locally. The following types are listed in stock list S-19-A:

a. RECHARGER ASSEMBLY—AIRCRAFT OXY-

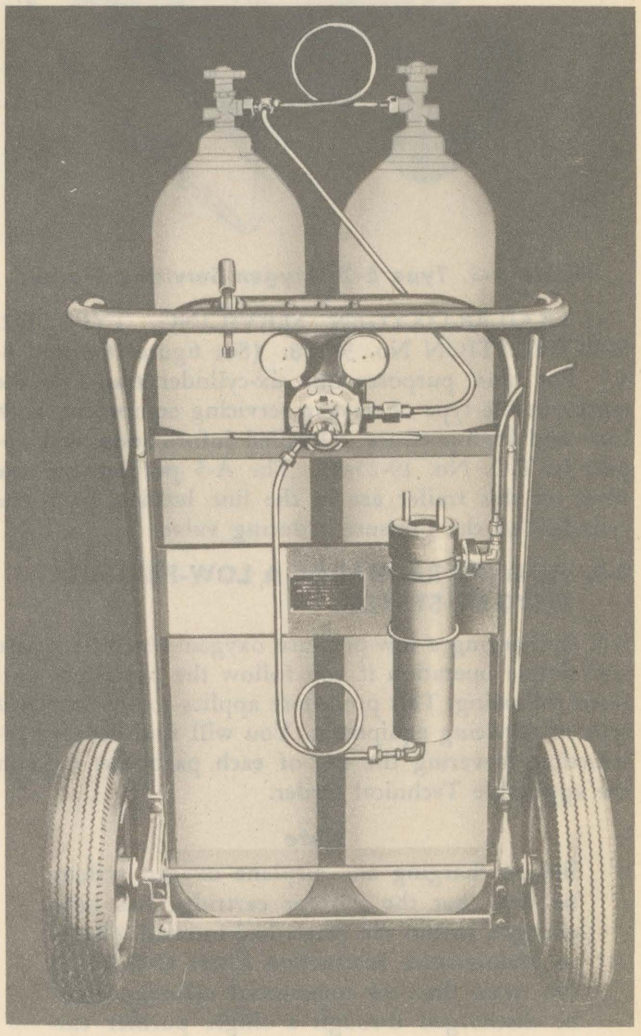


Figure 8-2. Model 02 Oxygen Recharger Assembly

GEN CYLINDER, SPECIFICATION No. 40327. (See figure 8-2.) This two-cylinder unit is now limited standard. Because of its small supply of oxygen, it is not suitable for use with large aircraft. For detailed information, refer to T.O. No. 19-1-2.

b. TRAILER-OXYGEN SERVICING, TYPE E-1, SPECIFICATION No. 91-85. This trailer carries 14 commercial cylinders manifolded to a single reducing valve. It is in limited use, mainly on large airdromes. For detailed information, refer to T.O. Nos. 19-25-73 and 19-5-10.

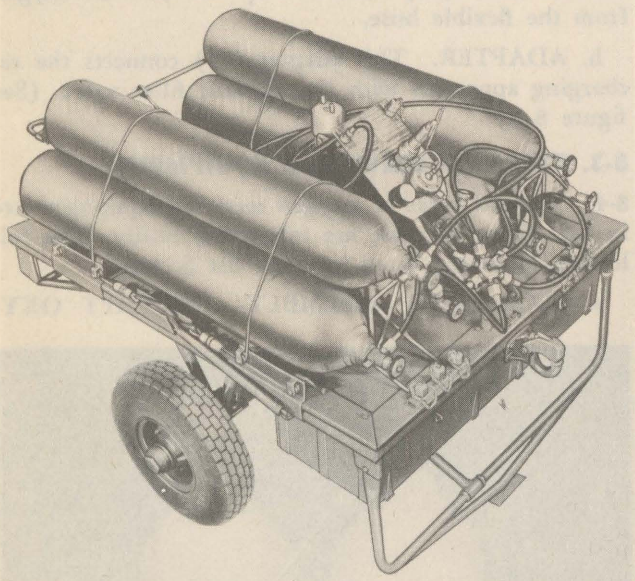


Figure 8-3. Type E-2 Oxygen Servicing Trailer

c. TRAILER-OXYGEN SERVICING, TYPE E-2, SPECIFICATION No. 30168. (See figures 8-3 and 8-4.) For most purposes this six-cylinder trailer is the most suitable type of oxygen servicing equipment, both low- and high-pressure. Detailed information will appear in T.O. No. 19-25-85. The A-5 purifier and the filter on this trailer are in the line leading from the cylinders to the pressure reducing valve.

8-5. HOW TO RECHARGE A LOW-PRESSURE OXYGEN SYSTEM.

8-6. Recharging a low-pressure oxygen system is a safe and simple operation if you follow the procedure outlined following. This procedure applies to any standard type of servicing equipment. You will find detailed instructions covering the use of each particular type in the applicable Technical Order.

Note

Before charging any airplane oxygen system, be sure that the purifier cartridge has been changed within the prescribed interval. (Refer to Maintenance Instruction Chart C-03-50-3.) No more than 16 commercial cylinders must be discharged through a single purifier cartridge.

a. Remove the cover plate from the low-pressure oxygen filler valve recess on the airplane. (See figure 8-5.) Remove the valve cap. Make sure that the valve is clean, and free from oil or grease.

b. (See figure 8-1.) Make sure that pressure-adjusting screw of the regulator (3) is screwed out counterclockwise (to the left) until it turns freely. This *closes* the regulator valve.

c. Open the valves of the supply cylinders, very slowly, one at a time. Open any manifold valves necessary to connect the supply cylinders with the pressur regulator. The gage (5) now shows the supply pressure.

d. Turn the pressure-adjusting screw on the regulator clockwise (to the right) until the delivery pressure gage (6) registers 150 psi.

e. Open the charging valve (10) at the end of the flexible hose, in order to blow out any dirt that may have collected in the adapter. Then close the charging valve.

f. Insert the adapter (11) into the filler valve and make sure that it is locked into position. (See figure 10-10.)

g. Reopen the charging valve.

h. As oxygen flows into the airplane cylinders, gradually increase the delivery pressure until a pressure of 425 psi is reached.

Note

It is permissible, but not advisable, to raise the delivery pressure immediately to 425 psi. Rapid recharging overheats the oxygen cylinders. Subsequent cooling will then reduce the system pressure to as low as 350 psi, which makes it necessary to repeat the recharging operation. The rate of charging depends upon the size of the airplane oxygen system. The larger the capacity of the system the longer it will take to reach a given pressure, and the less it will tend to become overheated.

i. Portable oxygen unit assemblies must be filled while the airplane is being recharged. Connect them to the portable recharger hoses in the airplane before charging the system, and leave them there until the charging has been completed. Then disconnect them, recap the filler valves, and return the portable units to their proper places. Some aircraft have independent oxygen cylinders supplying certain gun turrets. These, also, must be charged with the rest of the oxygen system, and must be disconnected from their filler line when the operation has been finished.

j. After the pressure in the airplane system reaches 425 psi as indicated on the station pressure gages in the airplane, close the charging valve (10), release the adapter, recap the filler valve, and replace the cover plate. If the servicing equipment is not to be used again until later, close the pressure regulator valve by turning the adjusting screw to the left (coun-

Figure 8-4. Type E-2 Oxygen Servicing Trailer on the Line

terclockwise) until it rotates freely. Then close the cylinder and manifold valves. Release the pressure in the flexible hose by opening the charging valve. Be sure to close this valve again after the pressure has been released.

Note

Pending the development and installation of spring-loaded check valves in airplane oxygen systems, it is permissible, but not mandatory, to seat the present check valves in the filling manifold after recharging. This may be done by inserting the Army to British low-pressure adapter, part No. 42A6950, into the filler valve. After the filling manifold has been drained, it should be refilled to a pressure of 100 to 150 psi in order to prevent the "breathing" of moisture-ladened air or of gas fumes into the filler line. It should be clearly understood that when the check valves have been seated there will be no exchange of oxygen between cylinders or between individual manifolds.

8-7. HOW TO RECHARGE EMERGENCY OXYGEN CYLINDERS.

8-8. TYPE H-1.

a. Mount the recharging yoke assembly (Ohio Chemical and Manufacturing Company, part No. 250), AAF Stock No. S126-250, Class 19-C, on the commercial cylinder valve outlet, with the throat of the yoke facing you.

b. Remove the cap screw from the side of the emergency cylinder valve. This exposes the "charging inlet" in the valve body.

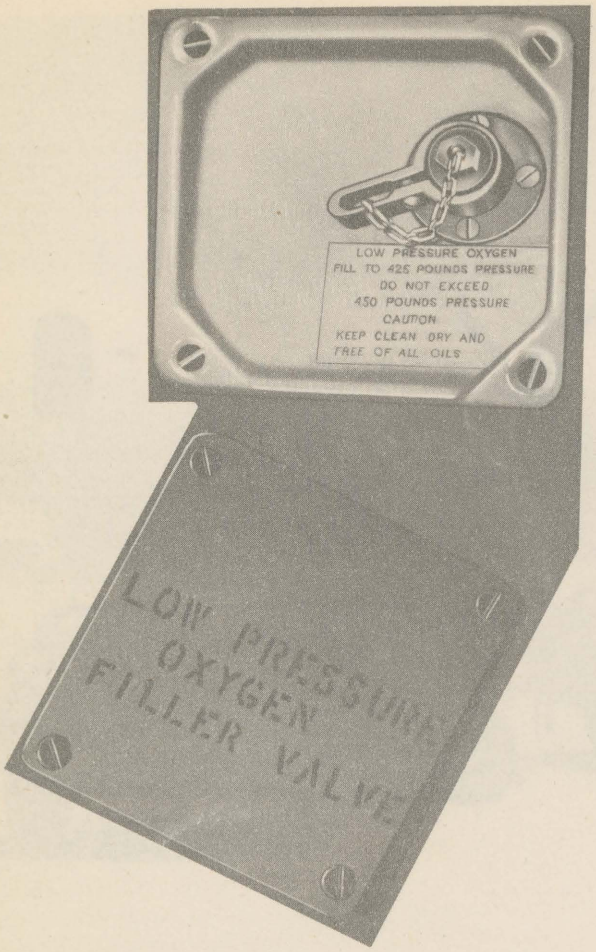


Figure 8-5. Low-Pressure Oxygen Filler Valve Recess and Cover Plate

c. Mount the emergency cylinder in the recharging yoke, placing the charging inlet against the outlet port of the yoke. Tightly screw up the handwheel on the yoke.

d. Open the emergency cylinder valve by turning the handwheel. If this is not done, no oxygen will flow into the emergency cylinder.

e. Crack the commercial cylinder valve, charge the emergency cylinder to 1800 psi, turn off the emergency cylinder valve, then turn off the valve on the commercial cylinder. While being charged, the emergency cylinder heats up slightly, and the pressure may drop below 1800 psi. When this happens, raise the pressure by repeating steps d. and e.

f. Remove the emergency cylinder from the yoke and replace the cap screw on the emergency cylinder valve. Make sure this cap screw is put in tightly.

g. Check the emergency cylinder for leaks by inserting the tip of the pipe stem in water and watching for bubbles. Then make sure to remove all moisture from the pipe stem to prevent freezing and possible plugging of the pipe stem at low temperatures.

8-9. TYPE H-2. The recharging method outlined preceding will not apply to the H-2 emergency cylinder. For instructions on recharging the H-2, refer to T.O. No. 03-50C-5.

SECTION IX
SERVICE INSPECTIONS

9-1. GENERAL INFORMATION.

9-2. Service inspections of aircraft oxygen systems are performed in accordance with T.O. No. 00-20A. The periodic inspection of oxygen masks is discussed at the end of this section.

Note

In accordance with T.O. No. 00-20A-2, a summary of the periodic inspections prescribed in this section will be entered on the Master Airplane Maintenance Instruction Forms maintained in the back of Form No. 41-B for the airplanes affected.

9-3. PREFLIGHT OR DAILY INSPECTION.

9-4. PREFLIGHT INSPECTION OF THE DEMAND SYSTEM.

9-5. SYSTEM PRESSURE. If the oxygen system pressure is below 400 psi, as indicated by the average pressure gage readings in the airplane, recharge the entire system, including turret cylinders and portable units, to 425 psi.

9-6. OXYGEN PRESSURE GAGE. Make a rough check of the oxygen pressure gage in the airplane by comparing it with the delivery pressure gage on the servicing cart or trailer. The comparison should be made after the indicator hand on the delivery pressure gage has stopped at 425 psi, before the adapter is disconnected from the filler valve, and before the cylinders have had time to cool. All gages in the airplane should read within 35 psi of the delivery gage pressure.

pressure.

Note

In a plane which has been serviced previously, and where no standard of comparison is available, each gage should read within 35 psi of the average reading on all the gages.

9-7. MASK-TO-REGULATOR TUBING. Make sure that the mask-to-regulator tubing is securely tightened in place, on the regulator outlet elbow, by a suitable clamp. (Refer to paragraph 10-42.) Run the hose through your hand to detect holes, kinks, or dents. See that the dust cap and clothing clamp are present and in working order. Then return the tubing end to its proper place, so that it will not become entangled with other equipment.

9-8. DEMAND REGULATOR.

a. Make sure that the outlet elbow is adjusted to a position that suits the user's convenience. If the knurled collar is loose, make sure that the gasket is present, and then tighten the knurled collar by hand as tightly as possible. On old regulators in which the outlet elbow is free to turn when the knurled collar is loose, first point the elbow one-half turn from the desired position; next, turn the collar until it just begins to feel tight; then, turn both collar and elbow together one-half turn, so as to tighten the collar securely with the elbow pointed in the right direction.

b. Set the diluter at the position marked "100% OXYGEN" (automix "OFF") and listen carefully for escaping oxygen. There should be no sound of leakage.

c. With the diluter still set at "100% OXYGEN" (automix "OFF"), place the open end of the mask to regulator tubing against your mouth and blow gently into the tubing. There should be positive and continued resistance to blowing. If there is only slight resistance, the diaphragm or some part of the air metering system may be leaking.

Note

On the older Airco design regulators, which have a check valve in the outlet, this test is ineffective.

9-9. OXYGEN FLOW INDICATOR. Leaving the diluter set at "100% OXYGEN" (automix "OFF"), take several normal breaths from the mask-to-regulator tubing. You should be able to breathe easily, and the flow indicator should move freely with each breath.

Note

When you have finished the preceding tests, set the diluter at "NORMAL" (automix "ON"), and *leave it* in that position.

9-10. PORTABLE OXYGEN EQUIPMENT. A portable oxygen unit (walk-around bottle) should be available at each station in multiplace aircraft where crew members may have to move from place to place.

a. Make sure that the portable recharger valve is free from oil, grease, and water. Connect the portable unit to the recharger valve to make sure that the parts mate properly, and that the cylinder is filled. Then disconnect, recap the recharger valve, and return the hose to its clip. Portable units should be filled during the system recharging operation as described in paragraph 8-6. The pressure gage on the portable regulator should read within 75 psi of the pressure registered in the airplane oxygen system.

b. Hold the outlet of the portable regulator against your mouth and inhale once or twice to make sure that the regulator will deliver oxygen. Then blow gently into the regulator outlet. There should be positive and continued resistance to blowing. If there is only slight resistance, either the diaphragm or (in A-15 regulators) the check valve in the air inlet may be leaking.

c. Make sure that the clothing clamp is present and in working order. Then return the unit to its proper place.

9-11. EMERGENCY OXYGEN EQUIPMENT. On flights above 25,000 feet, every crew member should have an emergency oxygen cylinder, type H-1 or H-2, properly adapted to the type of mask he is using. Each emergency oxygen cylinder should be charged to 1800 psi. Detailed instructions for the inspection of the H-2 emergency cylinder are given in T.O. No. 03-50C-5.

9-12. PREFLIGHT INSPECTION OF THE PRESSURE-DEMAND OXYGEN SYSTEM. The preflight or daily inspection of the pressure-demand oxygen system is the same as that for the demand system, with the following additions:

a. Before doing the leakage, suction, and blow-back tests, see that both the pressure control knob and the diluter (automix) lever are set in the position marked "NORMAL."

b. Raise the dust cap at the end of the mask-to-regulator tubing, and turn the pressure control knob about 90-degrees clockwise. A steady flow of oxygen should result. Turn the pressure control knob back to "NORMAL" and leave it in that position.

9-13. PREFLIGHT INSPECTION OF THE CONTINUOUS-FLOW OXYGEN SYSTEM. For instructions on the preflight inspection of continuous-flow oxygen systems refer to the applicable Technical Orders of series 03-50A.

9-14. 50-HOUR INSPECTION.

9-15. 50-HOUR INSPECTION OF THE DEMAND SYSTEM.

Note

The 50-hour inspection of the demand system is the same as the preflight or daily inspection, with the following additions.

9-16. SYSTEM LEAK TEST.

a. Charge the oxygen system to a pressure between 425 and 450 psi, and allow it to cool for 1 hour.

b. Read and record the oxygen gage pressure at all stations in the airplane. (Note each reading by drawing a line on the glass over the gage pointer.)

c. Record the air temperature.

d. WAIT 12 HOURS.

e. Read the gage pressures again, and subtract the second reading from the first reading on the same gage. This gives the 12-HOUR GAGE DROP on scale A. (See figure 9-1.)

f. Read the temperature again and note whether it has gone up (+) or down (−) and how much. This gives the 12-HOUR CHANGE IN TEMPERATURE on scale B.

g. Lay a straightedge so that it intersects the 12-HOUR GAGE DROP on scale A and the 12-HOUR CHANGE IN TEMPERATURE on scale B.

h. Read the 12-HOUR LEAK on scale C.

i. If the 12-HOUR LEAK is 25 psi or more, the airplane should not be cleared for flights above 10,000 feet until the leak has been corrected, and the oxygen system recharged to 425 psi. If the 12-HOUR LEAK is within permissible limits, the system should nevertheless be recharged to 425 psi.

Note

If a shorter interval is used for the system leak test, multiply the observed gage pressure drop by 12/H, where H is the number of hours between readings. This gives the 12-HOUR GAGE DROP on scale A. Then follow steps f. through i. In airplanes having several distribution manifolds, the procedure outlined in section X may be followed on the 50-hour inspection. This makes it possible to identify the leaking sections of the system.

9-17. FEMALE OXYGEN MASK-TO-REGULATOR CONNECTOR. Test the female part of the oxygen mask-to-regulator connector by means of a go, no go gage (to be fabricated locally as shown in figure 9-2). Push the gage straight into the female part—not at an angle. A slight rocking or twisting motion may be used, but the gage *must not be forced.* The "go" portion should slip through the smallest internal diameter of the female part, while the "no go" portion should be stopped at that point.

9-18. PORTABLE UNITS.

a. Fill each portable unit to a pressure between 300 and 450 psi, and allow 15 minutes for cooling.

b. Follow the procedure outlined in paragraph 9-16 for the system leak test, using an interval of 6 hours and multiplying the observed pressure drop by 2 to find the 12-HOUR GAGE DROP.

c. Replace any unit in which the 12-HOUR LEAK is 50 psi or more.

9-19. 50-HOUR INSPECTION OF THE PRESSURE-DEMAND SYSTEM. The 50-hour inspection of the pressure-demand system is the same as the preflight or

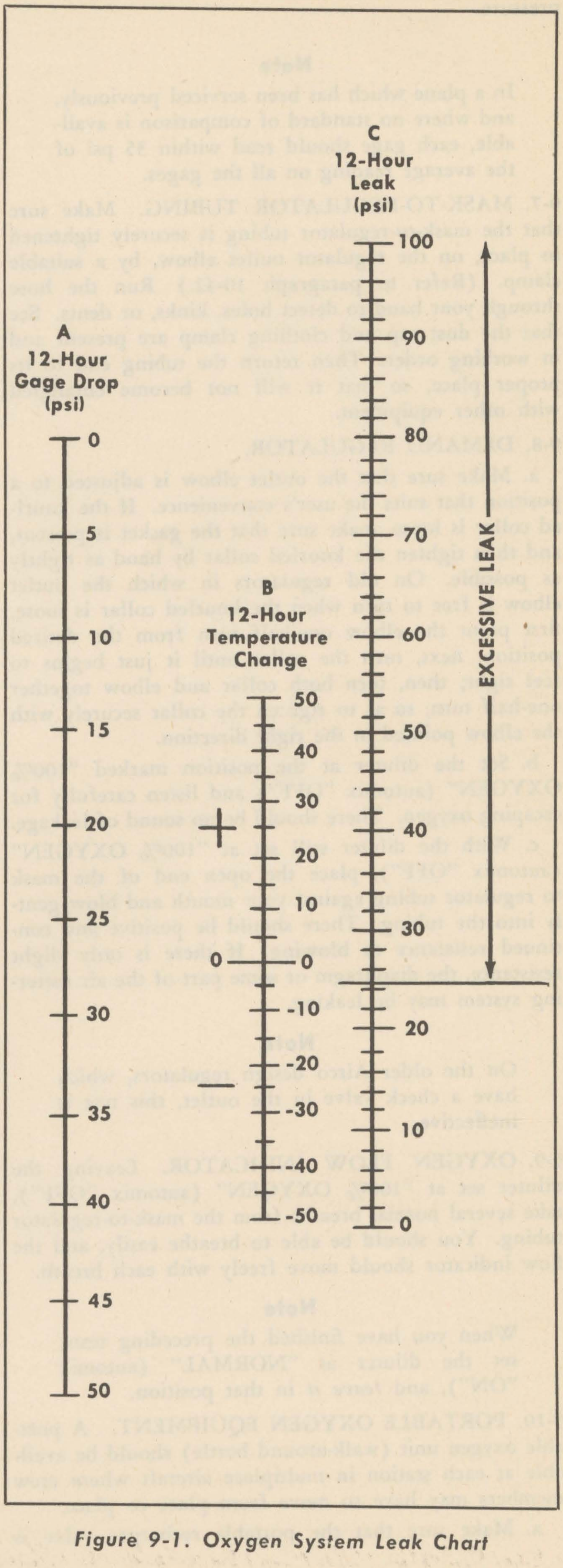


Figure 9-1. Oxygen System Leak Chart

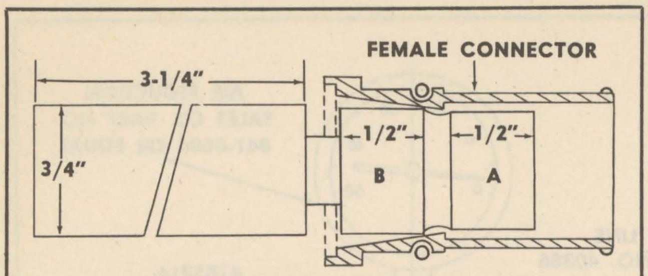


Figure 9-2. Go, No-Go Gage for Testing Female Connectors

daily inspection, with the following additions:

9-20. SYSTEM LEAK TEST. Use the same test as for the demand system. (Refer to paragraph 9-16.)

9-21. REGULATORS.

a. Connect a water manometer or suitable aneroid pressure gage to the bail-out adapter on an A-13 or A-15 mask, using a length of Arctic tubing and a bayonet disconnect fitting.

b. Connect the mask to the A-14 regulator and hold or adjust the mask so that it presses firmly against the face.

c. Take a deep breath; hold it. While holding your breath, turn the pressure control knob to the various dial settings and compare each setting with the indicated gage pressure. The gage pressures should agree with those indicated in table II, following paragraph 4-7.

Note

This test should be carried out whenever trouble is suspected, or every 30 days even though the airplane has flown 50 hours during the 30-day period.

9-22. PORTABLE UNITS. Use the same test as for the demand system. (Refer to paragraph 9-18.)

9-23. 50-HOUR INSPECTION OF THE CONTINUOUS-FLOW SYSTEM. For instructions on the 50-hour inspection of continuous-flow oxygen systems refer to the applicable Technical Orders of series 03-50A.

9-24. 100-HOUR OR 90-DAY INSPECTION.

9-25. 100-HOUR OR 90-DAY INSPECTION OF THE DEMAND SYSTEM. In the event that an airplane does not fly for 100 hours during a 90-day period, this inspection should be conducted every 90 days. The 100-hour or 90-day inspection of the demand system is the same as the preflight and 50-hour inspections, with the following additions.

9-26. CLEANLINESS OF THE OXYGEN SYSTEM. Inspect the system thoroughly for cleanliness. Parts which are continually being contaminated with oil should be either relocated or protected by deflector plates. Use clean cloths and a pure soap solution to clean rubber parts. Be sure to dry both rubber and metal parts with clean cloths after washing, to prevent the growth of molds. Use clean cloths and carbon tetrachloride to remove oil or contaminating matter from metal parts of the system.

WARNING

Avoid breathing the fumes of carbon tetrachloride or getting it on your skin. Absorbed in quantities it is highly poisonous!

9-27. OXYGEN CYLINDER BRACKETS. Inspect all cylinder brackets to be sure they hold the cylinders securely.

9-28. CHECK VALVES.

a. With the oxygen system charged to 200 psi, seat the check valves in the filling manifold by inserting the Army to British adapter into the filler valve.

b. Allow 5 minutes for the filler line to empty. Then draw a film of pure soap solution over the open end of the adapter. Bubbling of the soap solution indicates that one or more check valves have failed to seat.

c. See that the oxygen system is charged to a pressure *not higher* than 200 psi. Take a portable oxygen unit filled to 400 psi and plug it into a portable recharger hose in the airplane. If the check valves in the distribution line to that station are seating properly, the pressure in the line will rise immediately to about 375 psi.

d. Procedures for identifying and replacing faulty valves and for correcting leaks are given in section X.

9-29. REGULATORS. With the diluter set at "NORMAL" (automix "OFF"), break the wire which safeties the emergency valve, and open the valve fully for a moment. A steady flow of oxygen should result, and should cease when the valve is turned off. Otherwise, replace the regulator. If the regulator is satisfactory, rewire the emergency valve, using copper, annealed, 0.0179-inch diameter wire, class 23-A, stock No. 6800-295900. Do not use any other kind of wire.

9-30 MASK-TO-REGULATOR TUBING. Make sure that this tubing is of the proper length to suit the user's convenience.

9-31. PORTABLE RECHARGER HOSE. Make sure that a portable recharger hose is located at each station from which a crew member may have to move about during flight. See that the dust cover chain is attached so that it extends from the rear margin of the valve handle. Otherwise the chain may interfere with the charging of portable units.

9-32. 100-HOUR INSPECTION OF THE PRESSURE-DEMAND SYSTEM. The 100-hour inspection of the pressure-demand system is the same as the 50-hour in-

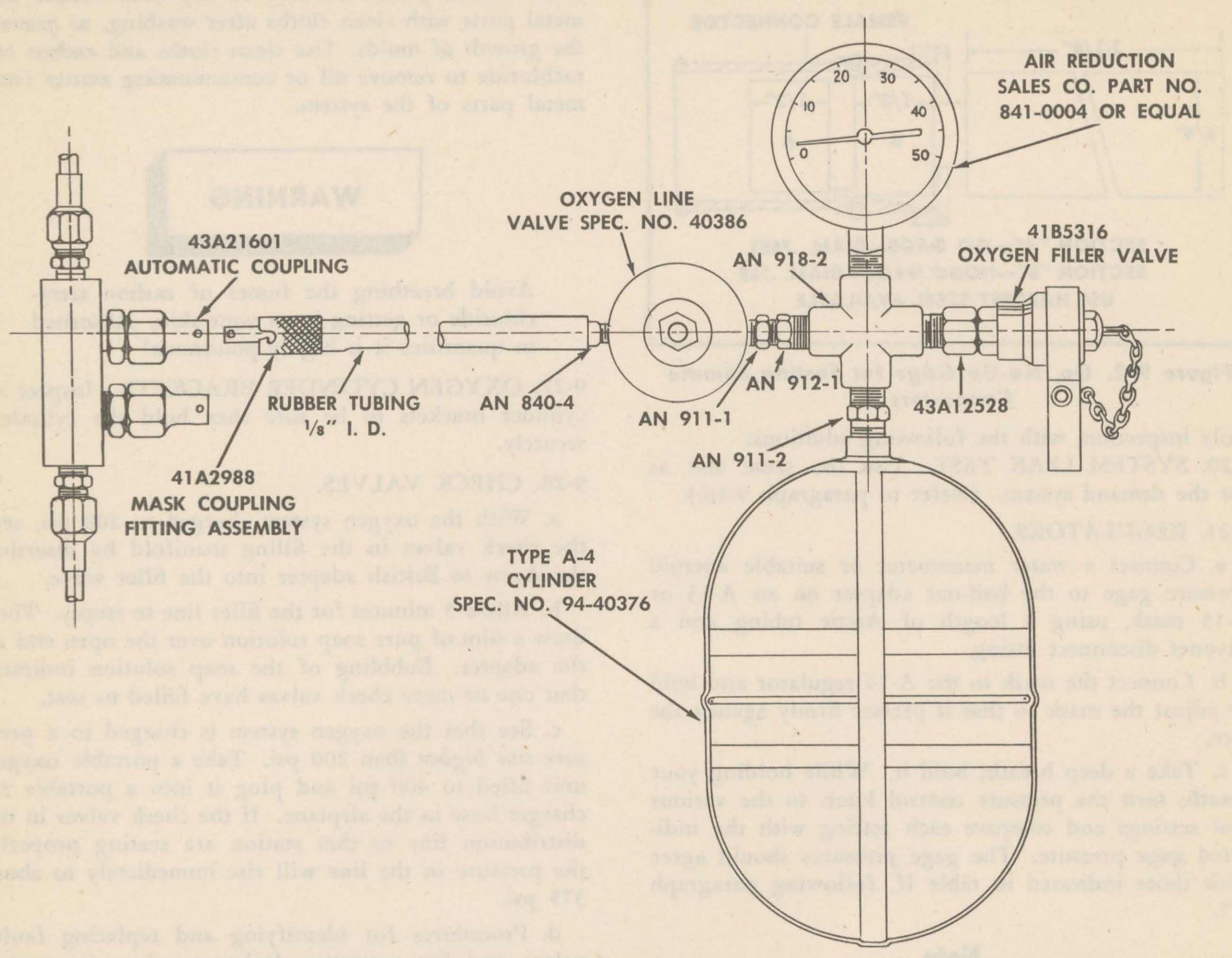


Figure 9-3. Oxygen System Leak Tester

spection. It also includes all points covered in the 100-hour inspection of the demand system, except the point concerned with the regulator.

9-33. 100-HOUR INSPECTION OF CONTINUOUS-FLOW SYSTEMS.

9-34. TROOP OXYGEN SYSTEM LEAK TEST. In airplanes having a troop oxygen system, test each section of the delivery lines as described following. Use the troop oxygen system leak tester, AAF Drawing No. 44B10627. (See figure 9-3.) This leak tester is not carried in stock, but can be made locally.

a. Charge the leak tester to a pressure between 25 and 30 psi.

CAUTION

Make sure you do not exceed 30 psi. Higher pressures will permanently injure the type A-11 regulators on the troop oxygen system.

b. By means of the oxygen mask coupling fitting assembly on the end of the leak tester hose, plug the leak tester into an automatic coupling in the troop system delivery line.

c. Make sure that there are no oxygen mask coupling fitting assemblies coupled to the other automatic couplings in the troop oxygen system delivery line.

d. Release oxygen from the leak tester into the delivery line by opening the line valve on the leak tester.

e. Allow 5 minutes for pressures to equalize; then read the pressure gage on the leak tester.

f. Fifteen minutes later, again note the pressure on the leak tester gage. There should be no change from the previous reading. If the pressure has changed, leaks are present and should be corrected.

Note

For further instructions on the 100-hour inspection of continuous-flow oxygen systems, see the applicable Technical Orders of series 03-50A.

9-35. 500-HOUR OR 180-DAY INSPECTION.

9-36. The 500-hour or 180-day inspection of all types of oxygen systems includes all the points covered on the 100-hour inspection of the corresponding systems, except that all types of oxygen regulators will be removed from the airplane and sent to the overhaul depot after 500 hours of service. Exception to the latter rule will be made only in the case of an emergency.

9-37. ISSUE AND PERIODIC INSPECTIONS OF OXYGEN MASKS.

9-38. GENERAL INFORMATION. The Personal Equipment Officer will test the fitting, adjustment, and connections of demand and pressure-demand masks:

a. When the mask is issued.

b. Approximately every 30 days thereafter, as long as the mask is in regular or frequent service.

c. When the mask has not been used for 30 days or more and is again required for use.

d. When a complaint is made about the operation of the mask or disconnect.

9-39. DEMAND MASKS. Inspect demand masks as follows:

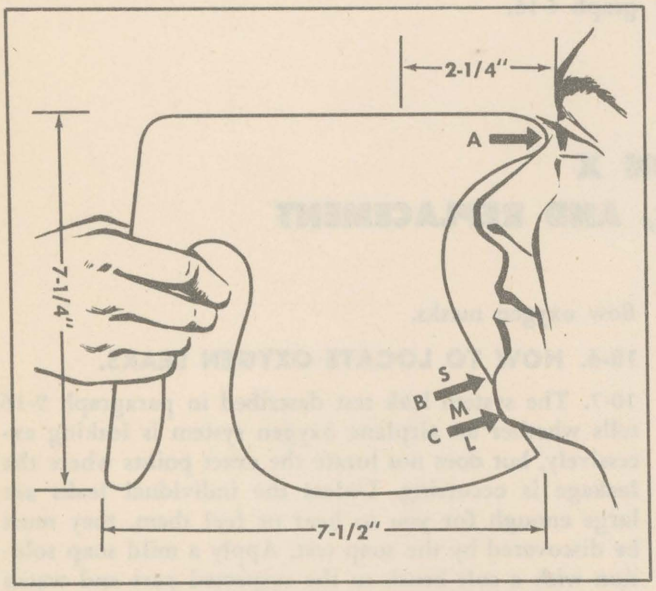


Figure 9-4. Mask Sizing Template

a. Be sure that a mask of the correct size has been issued. Figure 9-4 shows how to select a mask of the right size by using a template for measuring the flyer's face. By following the dimensions in the figure, you can make the template for yourself. Find the mask size by noting where the tip of the flyer's chin bone strikes the marked portion of the template. Figure 9-5 shows that the size of man's *head* is not necessarily an indication of the size of oxygen mask which will fit him correctly.

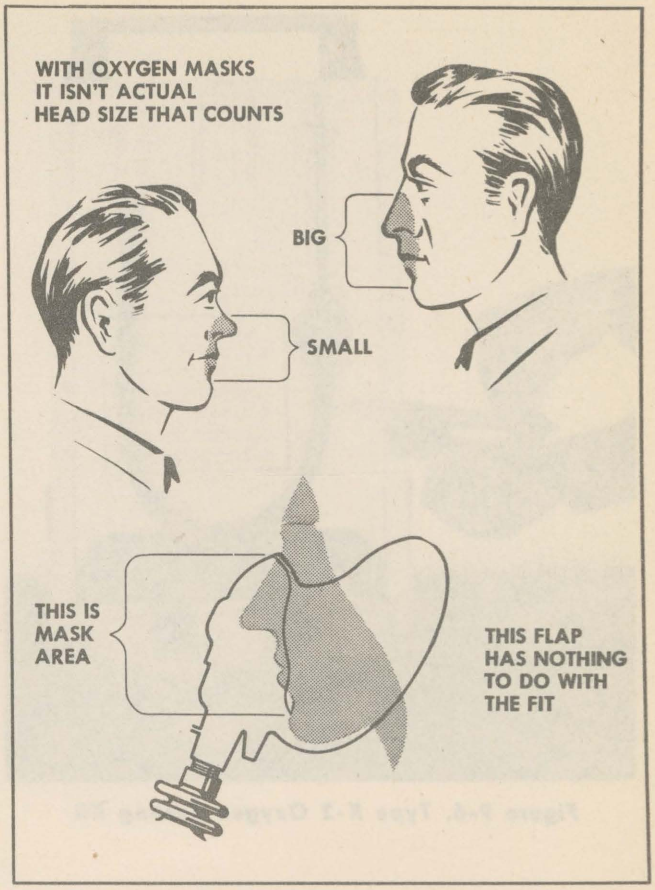


Figure 9-5. Relation of Mask Size to Head Size

b. Examine all parts of the mask for evidences of deterioration or damage. If no microphone is installed, be sure that the pressure relief vent has been sealed in compliance with T.O. No. 03-50B-8.

c. Adjust the mask to the wearer's face and to his helmet as described in the applicable Technical Orders of series 03-50B. Be sure that the wearer is comfortable. An uncomfortable fit is unsatisfactory whether the mask leaks or not.

d. Determine the percent of leakage by using the oxygen testing kit, type K-1 or K-2 (figure 9-6), as described in T.O. No. 03-50-26. For flights above 30,000 feet the demand mask must not leak more than 5 percent. For flights at lower altitudes a leak of 12 percent may be tolerated.

e. Test the pull required to separate the male from the female portions of the oxygen mask-to-regulator connector. This pull must not be less than 10 pounds nor more than 20 pounds. In making the test, be sure to use a female part which has recently been tested with the go, no go gage as described in paragraph 9-17. Make sure that the correct type of gasket is in place, and that a locking device (figure 3-17) is properly installed as described in T.O. No. 03-50B-9.

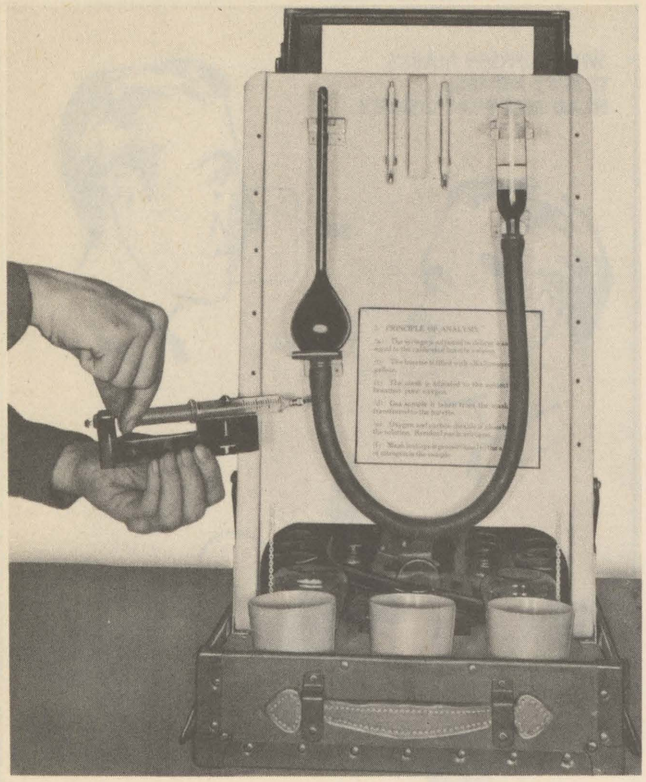


Figure 9-6. Type K-2 Oxygen Testing Kit

9-40. PRESSURE-DEMAND MASKS. Inspect pressure-demand masks as follows:

a. To be sure that the correct size has been issued, follow instructions given in paragraph 9-39, a.

b. Examine all parts of the mask for evidence of deterioration or damage. See that the inlet check valves are secure. If the mask is to be used in extreme cold, see that the inlet check valves are covered by plastic shields.

Note

It is very important that the arrows on the plastic shields point downward. The shields keep moisture away from the inlet check valves. If the shields do not point downward, more moisture will get into the valve than if the shields are not used at all.

c. Follow the procedures for testing the fitting and operation of pressure-demand masks given in paragraph 4-16.

d. If the mask is torn and no longer usable, reclaim the valves before discarding the mask. If the valves are serviceable, they may be used for replacements in other masks, which must then be tested as described in paragraph 4-16.

SECTION X
MAINTENANCE, REPAIR, AND REPLACEMENT

10-1. GENERAL INFORMATION.

10-2. Many defects noted in the service inspections of oxygen systems can be corrected as soon as they are discovered. Others, requiring more time or special technique, must be recorded on AAF Form No. 41-B and corrected as soon as possible after the inspection. Detailed instructions for maintenance, repair, and replacement of many items of oxygen equipment are given in other Technical Orders of the 03-50 series.

10-3. MAINTENANCE KITS.

10-4. OXYGEN SYSTEM MAINTENANCE KIT. This kit, assembled and supplied as described in T.O. No. 00-30-157, provides airplane squadrons with small hand tools, replacement parts, and miscellaneous supplies for use in the maintenance and repair of airplane oxygen systems. See figure 10-13 of this handbook for aid in identifying certain standard fittings, adapters, and other items included in the kit.

10-5. OXYGEN MASK MAINTENANCE KIT. This kit, assembled and supplied as described in T.O. No. 00-30-158, provides hand tools, spare parts, and instructions for use in the fitting, conversion, maintenance, and repair of all current types of demand and continuous-flow oxygen masks.

10-6. HOW TO LOCATE OXYGEN LEAKS.

10-7. The system leak test described in paragraph 9-16 tells whether an airplane oxygen system is leaking excessively, but does not locate the exact points where the leakage is occurring. Unless the individual leaks are large enough for you to hear or feel them, they must be discovered by the soap test. Apply a mild soap solution with a soft brush to the suspected part and watch carefully for frothing, bubbling, or growing bubbles. If you can first find out *approximately* where the leak is, you may be able to reduce the number of fittings that have to be soap-tested. To do this, proceed as follows:

a. Charge the system to 400 psi.

b. Seat the check valves in the filling manifold by inserting the Army to British low-pressure adapter into the filler valve.

c. Draw a soap film over the open end of the adapter and watch for bubbling which indicates improperly seated check valves. If the check valves are not seating properly, these must be replaced before further search for the leak.

d. When the check valves are properly seated, re-

charge the filler line to about 350 psi.

e. Insert into the filler valve, an A-13 regulator adapter, part No. 2528, stock No. 5500-005600, connected to a type K-1 pressure gage. A rapid pressure drop within 3 minutes indicates *leakage in the filler manifold.* Find the exact point of leakage by the soap test.

f. If the filling manifold appears to be leak-free, leave the check valves seated and the filling manifold partly recharged in order to prevent the "breathing" of moisture, dust, or gas fumes. Be sure to wipe all soap solution from the filler valve. Then apply the system leak test (paragraph 9-16) to the individual distribution manifolds. Any manifold which shows a 12-hour leak of 25 psi or more must be soap-tested.

10-8. HOW TO CORRECT OXYGEN LEAKS.

10-9. LEAKAGE AT FLARED TUBE CONNECTIONS. Leakage at oxygen fittings may sometimes be corrected merely by tightening. Excessive tightening, however, will weaken or destroy the connection rather than improve it. When used with plain flares, oxygen fittings should never be tightened with a wrench torque greater than 100 inch-pounds. On double flares a torque of 200 inch-pounds may be used. Do not apply the maximum allowable torque at first, but tighten the fitting just enough to stop leakage. If you cannot stop the leak with the prescribed amount of torque, the connection is faulty and must be replaced. Thread compounds should not be used on flared tube fittings unless experience has shown that the threads are seizing. In this event, apply a compound conforming to Specification No. AN-C-86. Apply the compound sparingly to the outer three threads of the male fitting. Never apply thread compound directly on the face of the nipple or the flare; this would destroy the metal-to-metal contact between flare and fitting which is necessary to produce the seal.

10-10. LEAKAGE AT PIPE FITTINGS. The threaded portion of a pipe fitting is tapered, so that when it is tightened, the part with the external thread (male) is forced into the internally threaded (female) part, thereby creating a seal. Since it is not practical to machine pipe threads for perfect fit, a combination antiseize and sealing compound should be used when installing pipe fittings. Use extreme care in tightening pipe fittings with thread compound on them. The compound makes it hard to feel how tight you are getting them. Overtightening causes distortion, splitting, and leaks. Pipe fittings of the 1/8-inch size should be tightened with a wrench no longer than 6 inches; 1/4-inch fittings, with a wrench no longer than 8 inches.

10-11. REPLACEMENT OF OXYGEN TUBING.

10-12. MATERIAL. All tubing used for replacements in low-pressure oxygen systems must be of aluminum alloy, 5/16-inch outside diameter, 0.032- or 0.035-inch wall, conforming to Specification No. WW-T-799. Use copper tubing only when aluminum-alloy tubing is not available.

10-13. LENGTH AND EXPANSION BENDS. As a general rule, keep the amount of tubing at a minimum. When check valves are used, install minimum tube length between the regulator and the nearest check valve in the distribution line. All "straight" lengths of tubing in the system should be bent slightly to allow for expansion and contraction and to facilitate connecting the tube with the fittings.

10-14. HOW TO BEND TUBING. (See figures 10-1 and 10-2.) Never use a fitting where a bend in the tube will serve as well. Tube bends are lighter, cheaper, and less troublesome than fittings. Bends in low-pressure oxygen tubing should have a radius of curvature of at least 11/16 inch and should begin not less than 2 inches from the nearest flare. Flattened, wrinkled, or irregular bends should not be installed. Wrinkled bends usually result from trying to bend thin-walled tubing without using a tube bender. To make acceptable bends use the hand tube bender, stock No. 7900-020500, as follows:

a. To insert the tube into the bender, hold the chieve block handle stationary in the left hand and raise the slide bar handle as far as it will go. Raise the clip and drop the tube into place.

b. Drop the clip over the tube and turn the slide bar handle about its pin so that the full length of the groove in the slide bar is in contact with the tube. Note that the zero mark on the chieve block will coincide with the mark on the slide bar.

c. Pull the handle until the mark on the slide bar coincides with the mark for the desired angle on the chieve block.

10-15. HOW TO CUT TUBING. (See figure 10-3.) To insure a good flared tube connection, the tube must be cut off squarely, and the end must be squared and burred before it is flared.

a. Clamp the tube cutter, stock No. 7900-173900, over the tube.

b. Rotate the cutter toward its open side, gradually feeding the cutting wheel downward by turning the thumbscrew. Do not feed the wheel too rapidly. Moderate or light tension on the thumbscrew will maintain an even tension on the cutting wheel. This prevents bending and avoids excessive burrs on the soft tubing.

c. If a cutter is not available, use a hacksaw blade with 32 teeth per inch.

10-16. HOW TO PREPARE THE TUBE END FOR FLARING. (See figure 10-4.) After tube has been cut off, file the end square with any fine-toothed flat file. If a hacksaw has been used, file the end of the tube until all saw marks have been removed. A tube vise or a flaring block makes a good clamp for holding the tube while filing. If a flaring block is used, turn it bottom-side up to avoid file marks on the top surface. To get the tube square, let it protrude only slightly from the block or vise, and file until the file runs flatly across the face of the block.

b. Remove burrs from both the inside and the outside

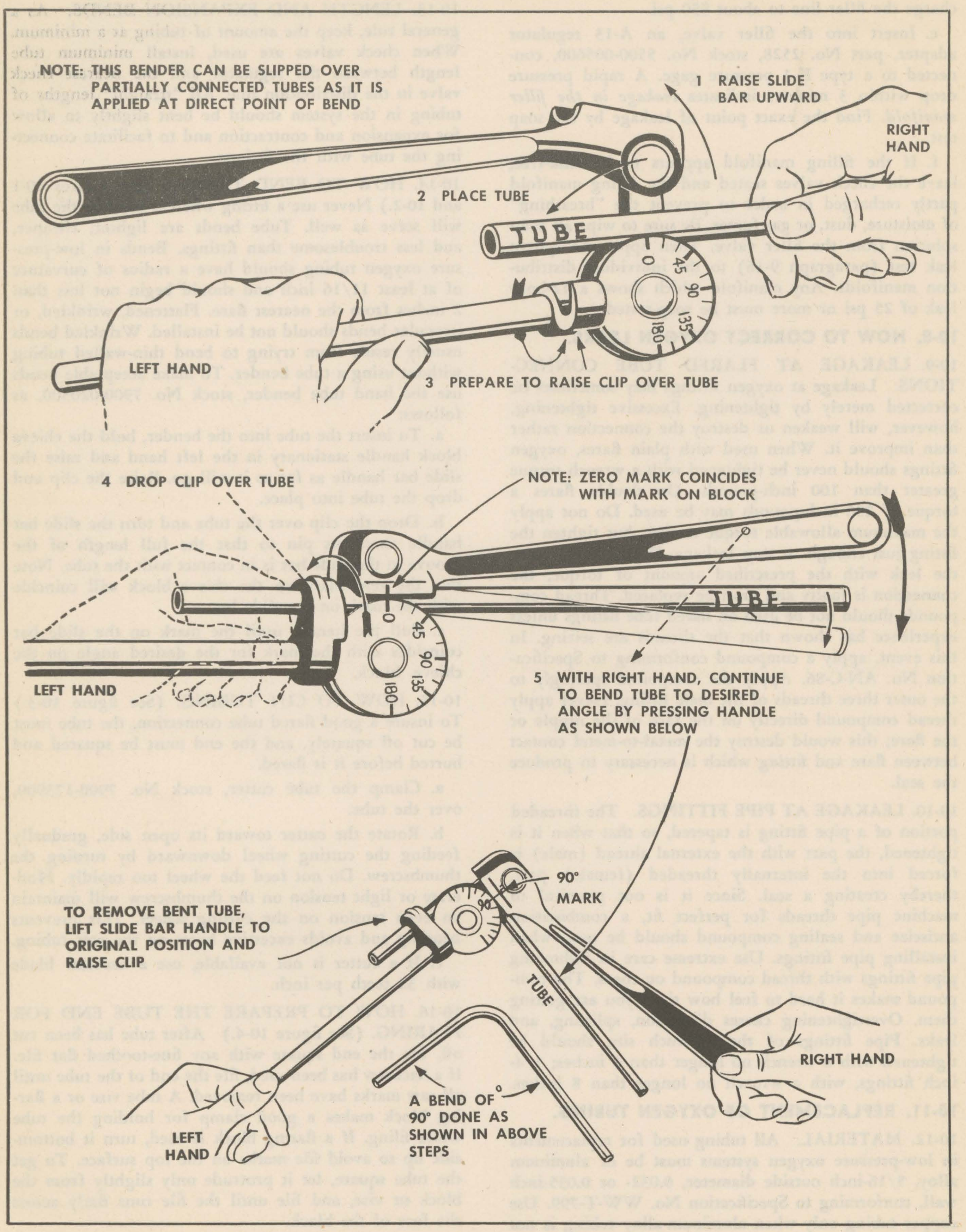


Figure 10-1. Steps in Tube Bending

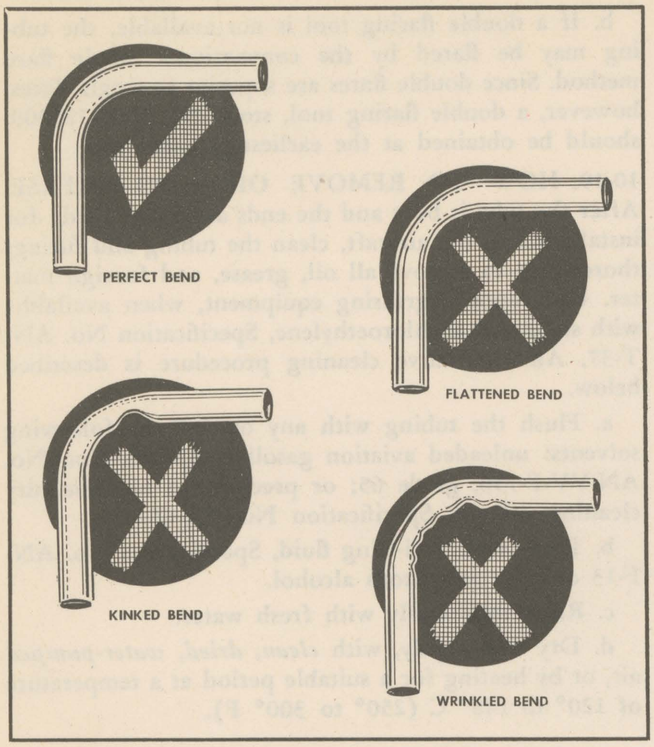


Figure 10-2. Good and Bad Tubing Bends

of the tube by means of a burring tool. Such a tool is supplied with the double flaring tool under stock No. 7900-788000. If a burring tool is not available, remove the inside burrs with a knife or scraper, and the outside burrs with a flat file. Do not round the edges too much. Leakage will result if the tube is not properly burred.

c. Remove all filings, chips, burrs, and grit from the inside of the tube in order to avoid pock marks, or scratches on the inner surface of the flare.

d. Clean the tube thoroughly, by blowing out with either oil-free compressed air or dry oxygen.

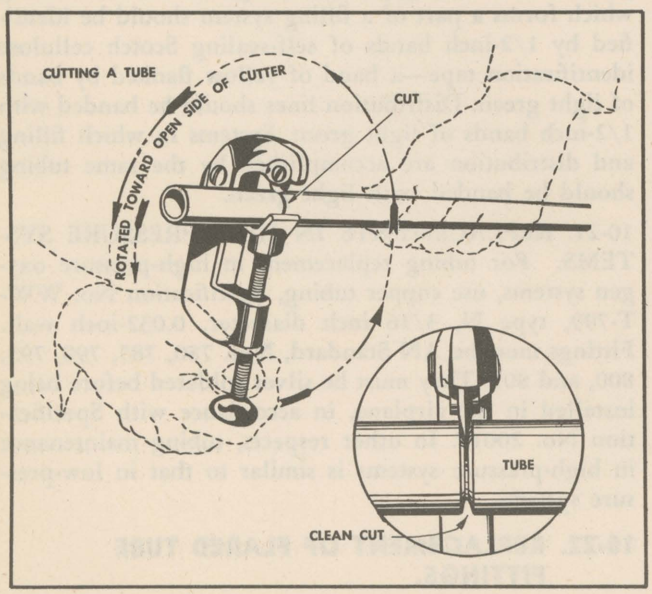


Figure 10-3. Tube Cutting

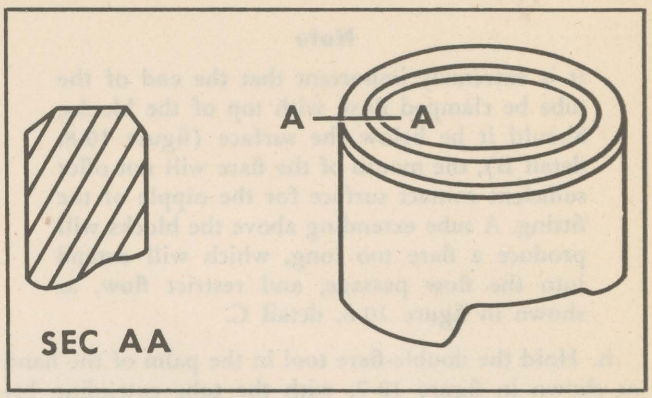


Figure 10-4. Properly Burred Tube

e. Inspect the tube end to be sure that it is round, square, clean, free of draw marks, mill scale, and scratches. Scratches and draw marks are likely to spread and split the tube when it is flared.

10-17. HOW TO MAKE A DOUBLE FLARE. Double flares are better than plain flares. They are smoother, more concentric, and more resistant to the shearing effect of torque. They are made by means of hand-tool, double-flaring, 5/16-inch oxygen tubing, stock No. 7900-788000. The procedure for making a double flare is as follows: (See figures 10-5 and 10-6.)

Note

These instructions apply to the use of the Parker type tool only. Directions for use of the Kent-Moore tool are supplied with the tool itself.

a. Separate the clamp blocks of the double-flare tool. Make certain that the clamping surfaces are absolutely free from oil or grease. An occasional cleaning with a solvent such as carbon tetrachloride is recommended. Clamp the tubing securely (it must not slip) with the burred end flush with the top of the clamp blocks. Additional leverage may be obtained by inserting one of the flaring pins into the guide hole, to aid in tightening tube.

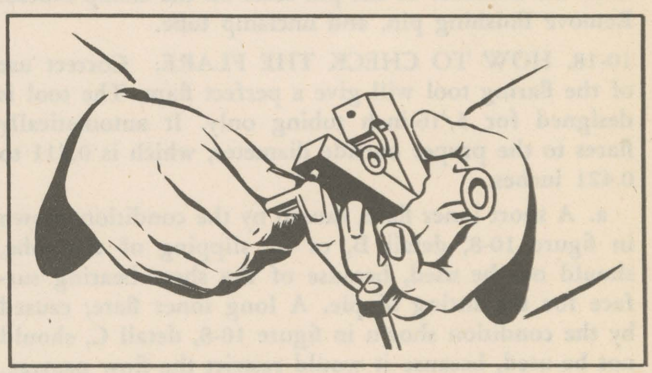


Figure 10-5. Placing Burred Tube in Double Flaring Tool

Note

It is extremely important that the end of the tube be clamped flush with top of the blocks. Should it be below the surface (figure 10-8, detail B), the mouth of the flare will not offer sufficient contact surface for the nipple of the fitting. A tube extending above the blocks will produce a flare too long, which will extend into the flow passage, and restrict flow, as shown in figure 10-8, detail C.

b. Hold the double-flare tool in the palm of the hand as shown in figure 10-7, with the tube extending between the second and third fingers. Double flaring requires two operations.

Note

Do not touch or hold the tightening bar while flaring the tube.

c. Insert the starting pin (figure 10-7, detail A) into the flaring pin guide, and hammer it with sharp blows until the shoulder of the pin stops against the clamp blocks. Remove the starting pin from the guide. Do not loosen the tube.

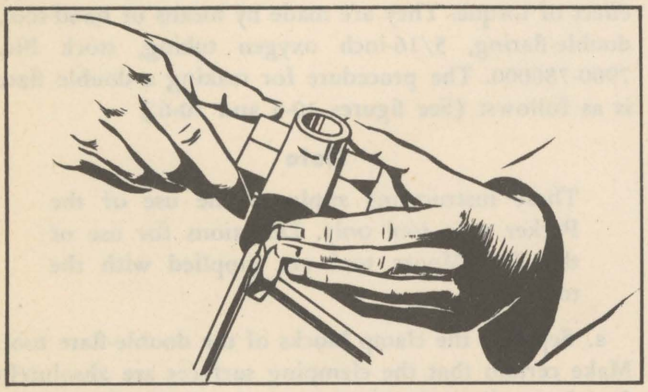


Figure 10-6. Clamping Burred Tube in Double Flaring Tool

d. Insert the finishing pin (figure 10-7, detail B) into the flaring pin guide, and hammer it with sharp blows until the shoulder of the pin seats on the clamp blocks. Remove finishing pin, and unclamp tube.

10-18. HOW TO CHECK THE FLARE. Correct use of the flaring tool will give a perfect flare. The tool is designed for 5/16-inch tubing only. It automatically flares to the proper outside diameter, which is 0.411 to 0.421 inches.

a. A short inner flare, caused by the condition shown in figure 10-8, detail B, or by slipping of the tube, should not be used, because of the short bearing surface for the fitting nipple. A long inner flare, caused by the condition shown in figure 10-8, detail C, should not be used, because it would restrict the flow passage. A defective flare of either kind should be cut off and done over.

b. If a double flaring tool is not available, the tubing may be flared by the conventional single flare method. Since double flares are superior to single flares, however, a double flaring tool, stock No. 7900-788000, should be obtained at the earliest possible time.

10-19. HOW TO REMOVE OIL AND GREASE. After the tube is bent and the ends are flared ready for installation in the aircraft, clean the tubing and fittings thoroughly to remove all oil, grease, and foreign matter. Use vapor degreasing equipment, when available, with stabilized trichloroethylene, Specification No. AN-T-37. An alternative cleaning procedure is described below.

a. Flush the tubing with any one of the following solvents: unleaded aviation gasoline, Specification No. AN-VV-F-756, grade 65; or precipitated naphtha, dry cleaning solvent, Specification No. P-S-661.

b. Flush with anti-icing fluid, Specification No. AN-F-13 or with anhydrous alcohol.

c. Rinse thoroughly with fresh water.

d. Dry thoroughly, with *clean, dried, water-pumped* air, or by heating for a suitable period at a temperature of 120° to 148° C (250° to 300° F).

CAUTION

Omission of any of these steps is dangerous. Before starting the procedure, make sure that materials are available to complete all the steps.

10-20. MOUNTING AND IDENTIFICATION. To prevent vibration and chafing, install cushion clips at 15-inch intervals and as close to tube bends as possible. Use flexible grommets or hose around the tubing at points where tubing passes through bulkheads. Tubing which forms a part of a filling system should be identified by 1/2-inch bands of self-sealing Scotch cellulose identification tape—a band of yellow flanked by bands of light green. Distribution lines should be banded with 1/2-inch bands of light green. Systems in which filling and distribution are accomplished by the same tubing should be banded with light green.

10-21. REPLACEMENTS IN HIGH-PRESSURE SYSTEMS. For tubing replacement in high-pressure oxygen systems, use copper tubing, Specification No. WW-T-799, type N, 3/16 inch diameter, 0.032-inch wall. Fittings must be AN Standard, Nos. 780, 785, 790, 795, 800, and 805. They must be silver soldered before being installed in the airplane, in accordance with Specification No. 20019. In other respects, tubing maintenance in high-pressure systems is similar to that in low-pressure systems.

10-22. REPLACEMENT OF FLARED TUBE FITTINGS.

10-23. GENERAL DESCRIPTION. Flared tube fit-

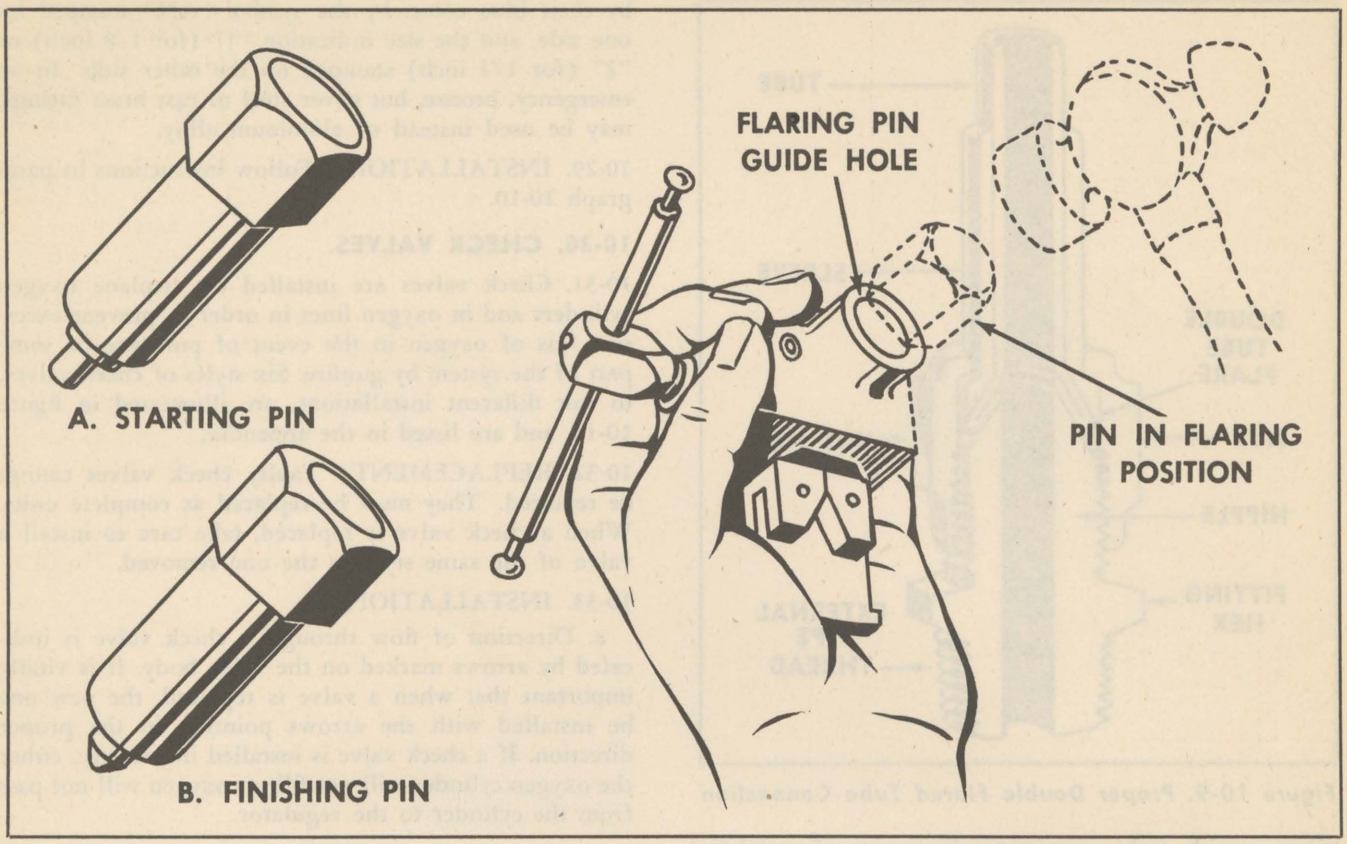


Figure 10-7. Flaring Tube with Double Flaring Tool Pins (A & B)

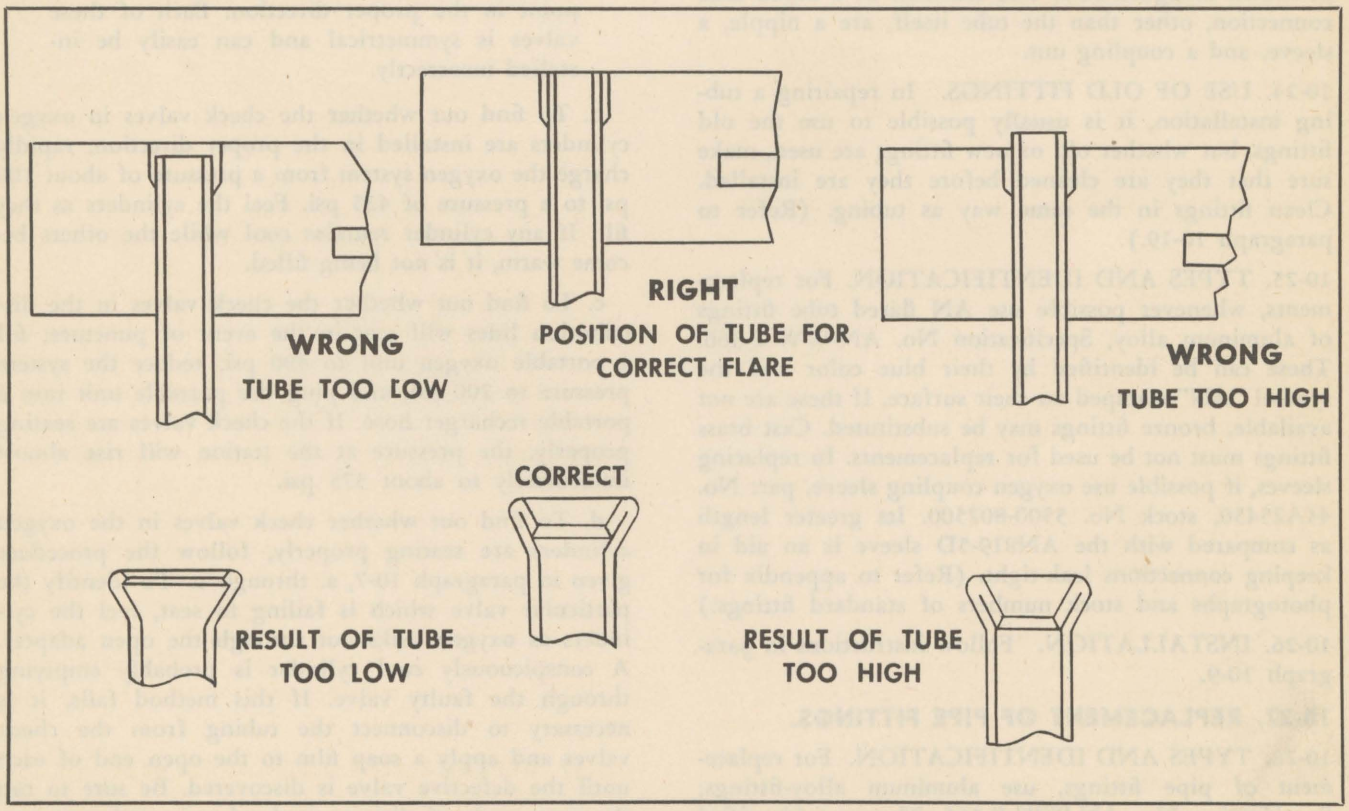


Figure 10-8. Tube Positions and Resulting Flares: a. Good Flare, b. Short Flare, c. Long Flare

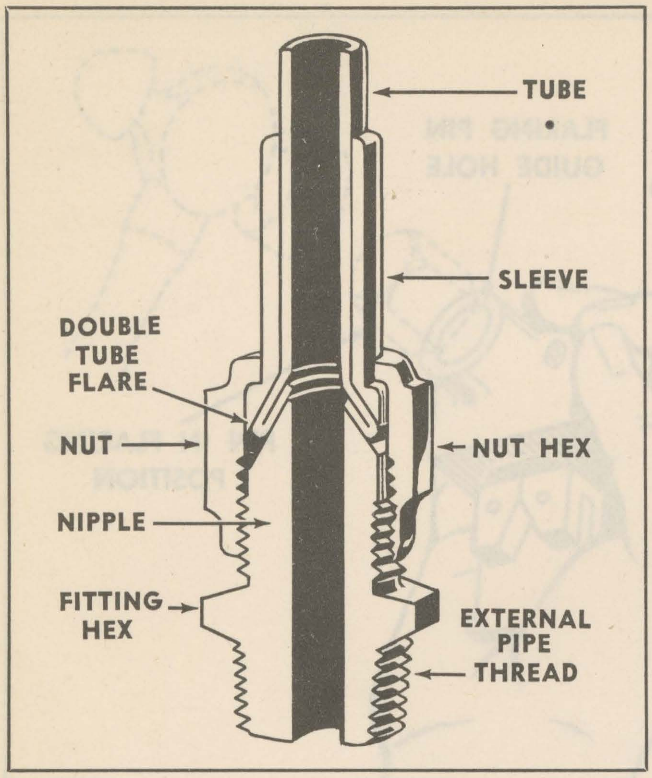


Figure 10-9. Proper Double Flared Tube Connection

tings provide tight connections by means of metal-to-metal contact. The flared end of the tubing is pressed tightly against the nipple when the parts are assembled as shown in figure 10-9. The elements of a flared tube connection, other than the tube itself, are a nipple, a sleeve, and a coupling nut.

10-24. USE OF OLD FITTINGS. In repairing a tubing installation, it is usually possible to use the old fittings, but whether old or new fittings are used, make sure that they are cleaned before they are installed. Clean fittings in the same way as tubing. (Refer to paragraph 10-19.)

10-25. TYPES AND IDENTIFICATION. For replacements, whenever possible use AN flared tube fittings of aluminum alloy, Specification No. AN-WW-F-366. These can be identified by their blue color and the symbol "AN" stamped on their surface. If these are not available, bronze fittings may be substituted. Cast brass fittings must not be used for replacements. In replacing sleeves, if possible use oxygen coupling sleeve, part No. 44A25450, stock No. 5500-802500. Its greater length as compared with the AN819-5D sleeve is an aid in keeping connections leak-tight. (Refer to appendix for photographs and stock numbers of standard fittings.)

10-26. INSTALLATION. Follow instructions in paragraph 10-9.

10-27. REPLACEMENT OF PIPE FITTINGS.

10-28. TYPES AND IDENTIFICATION. For replacement of pipe fittings, use aluminum alloy-fittings, Specification No. AN-WW-F-366. They are identified by their blue color, by the symbol "AN" stamped on one side, and the size indication "1" (for 1/8 inch) or "2" (for 1/4 inch) stamped on the other side. In an emergency, bronze, but never steel or cast brass fittings, may be used instead of aluminum alloy.

10-29. INSTALLATION. Follow instructions in paragraph 10-10.

10-30. CHECK VALVES.

10-31. Check valves are installed on airplane oxygen cylinders and in oxygen lines in order to prevent excessive loss of oxygen in the event of puncture of some part of the system by gunfire. Six styles of check valves, to suit different installations, are illustrated in figure 10-14, and are listed in the appendix.

10-32. REPLACEMENT. Faulty check valves cannot be repaired. They must be replaced as complete units. When a check valve is replaced, take care to install a valve of the same style as the one removed.

10-33. INSTALLATION.

a. Direction of flow through a check valve is indicated by arrows marked on the valve body. It is vitally important that when a valve is replaced, the new one be installed with the arrows pointing in the proper direction. If a check valve is installed incorrectly, either the oxygen cylinder will not fill, or oxygen will not pass from the cylinder to the regulator.

Note

When installing styles "A" and "C" check valves, take particular care that the arrows point in the proper direction. Each of these valves is symmetrical and can easily be installed incorrectly.

b. To find out whether the check valves in oxygen cylinders are installed in the proper direction, rapidly charge the oxygen system from a pressure of about 100 psi to a pressure of 425 psi. Feel the cylinders as they fill. If any cylinder remains cool while the others become warm, it is not being filled.

c. To find out whether the check valves in the distribution lines will seat in the event of puncture, fill a portable oxygen unit to 400 psi, reduce the system pressure to 200 psi, and plug the portable unit into a portable recharger hose. If the check valves are seating properly, the pressure at the station will rise almost immediately to about 375 psi.

d. To find out whether check valves in the oxygen cylinders are seating properly, follow the procedure given in paragraph 10-7, a. through c. To identify the particular valve which is failing to seat, feel the cylinders as oxygen leaks out through the open adapter. A conspicuously cool cylinder is probably emptying through the faulty valve. If this method fails, it is necessary to disconnect the tubing from the check valves and apply a soap film to the open end of each until the defective valve is discovered. Be sure to cap the open ends of disconnected tubes in order to pre-

vent dirt or moisture from getting in. Remove all traces of soap solution before reconnecting the tubing.

10-34. REPLACEMENT OF FILLER VALVES.

10-35. The filler valve used in recharging the airplane oxygen system contains a check unit which prevents the escape of oxygen from the filler line. It should be replaced as a complete unit except that either the cap or the handle may be replaced separately. The valve is usually installed with a filler valve flange, and is fastened to the flange by setscrews. Locate the valve, when it is inserted into the flange, so that the flat surfaces on the valve body will be under the setscrews. The setscrews must be tightened against the flat surfaces—not against the curved surface. When attaching the filler valve handle, make sure that the handle grips the valve firmly and does not stick out beyond the top of the filler valve. If the handle is not properly installed, it interferes with the seating of the valve cap.

Note

Keep the filler valve covered with the filler valve cap when it is not in use. This keeps dirt, oil, and water from contaminating the oxygen system.

10-36. PORTABLE RECHARGER HOSE ASSEMBLY.

10-37. This assembly consists of a length of flexible hose with a filler valve at the end. Filler valves identified by the part No. AN6024-2 (figure 10-10, detail A) are identical, except for the mounting flange, with the filler valve used in recharging the oxygen system. They should be replaced only by filler valve AN6024-5 (figure 10-10, detail B), which is easier to operate and more reliable than the earlier type.

10-38. REGULATORS.

10-39. Oxygen regulators require no maintenance or lubrication. *Never apply oil or grease to any part of an oxygen regulator!* Although regulators are replaced routinely after 500 hours of service, it is sometimes desirable to test their performance before this period has elapsed in order to determine whether earlier replacement is necessary.

10-40. SPECIAL TEST OF DEMAND AND PRESSURE-DEMAND REGULATORS.

a. Charge the airplane system with aviators' breathing oxygen to a pressure of at least 100 psi.

b. Set the diluter at "100% OXYGEN" (automix "OFF"). See that the knurled collar and hose clamp on the outlet elbow are tight.

c. Using the methods and equipment prescribed with the oxygen testing kit (T.O. No. 03-50-26), take a sample of gas from the mask-to-regulator hose about 2 inches below the outlet. The sample should be taken during gentle inhalation after several breaths of oxygen have been drawn from the hose.

d. Analyze the sample. If it shows a "leakage" of more than 4 percent, replace the regulator.

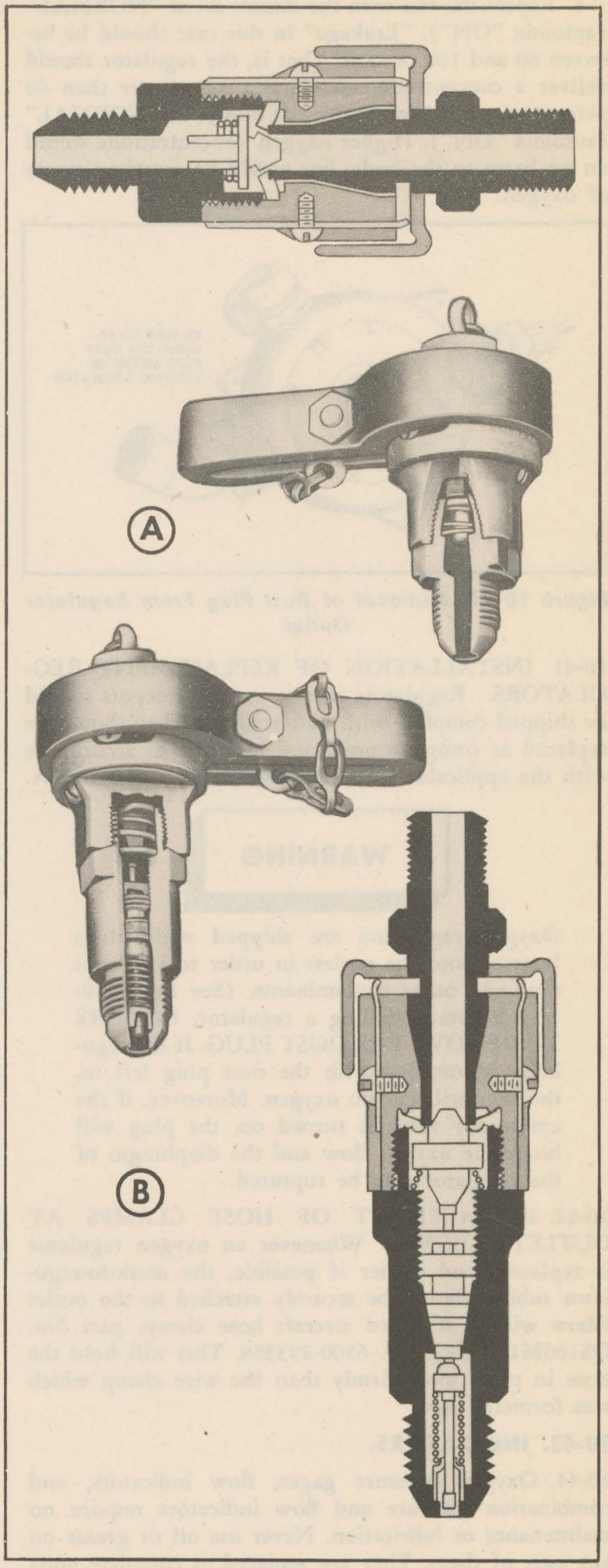


Figure 10-10. Filler and Recharging Valves: a. Old, b. New

e. Repeat the test with the diluter set at "NORMAL" (automix "ON"). "Leakage" in this case should be between 60 and 100 percent. That is, the regulator should deliver a concentration of oxygen *no greater* than 40 percent at ground level with the diluter at "NORMAL" (automix "ON"). Higher oxygen concentrations would do no harm to the body, but would be a serious waste of oxygen.

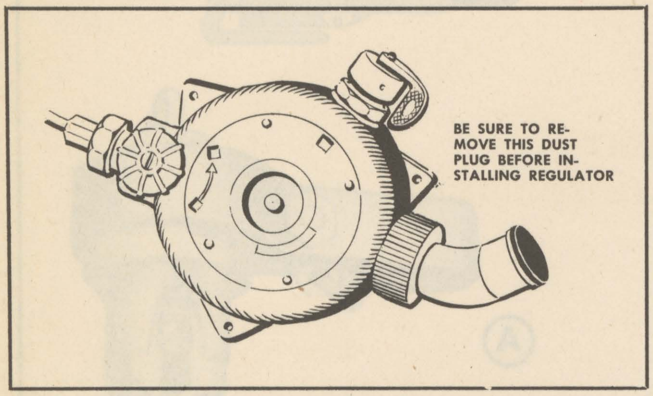


Figure 10-11. Removal of Dust Plug From Regulator Outlet

10-41. INSTALLATION OF REPLACEMENT REGULATORS. Regulators sent to overhaul depots should be shipped complete with outlet elbow. They should be replaced as complete units and installed in accordance with the applicable Technical Orders of series 03-50A.

WARNING

Oxygen regulators are shipped with plugs inserted into the outlets in order to keep out dust and other contaminants. (See figure 10-11.) Before installing a regulator, BE SURE TO REMOVE THE DUST PLUG. If the regulator is installed with the dust plug left in, the user will get no oxygen. Moreover, if the emergency valve is turned on, the plug will block the oxygen flow and the diaphragm of the regulator may be ruptured.

10-42. REPLACEMENT OF HOSE CLAMPS AT OUTLET ELBOWS. Whenever an oxygen regulator is replaced, and earlier if possible, the mask-to-regulator tubing should be securely attached to the outlet elbow with a standard aircraft hose clamp, part No. QS100M12, stock No. 6500-293358. This will hold the hose in place more firmly than the wire clamp which was formerly used.

10-43. INDICATORS.

10-44. Oxygen pressure gages, flow indicators, and combination pressure and flow indicators require no maintenance or lubrication. Never use oil or grease on any part of them. They are replaced as complete units in accordance with applicable Technical Orders of series 03-50D.

Note

Before installing any flow indicator for use with a Pioneer regulator, be sure you have read and understood section VI, paragraph 6-8 of this handbook.

10-45. PORTABLE AND EMERGENCY EQUIPMENT.

10-46. No maintenance or lubrication is required. Never use oil or grease on any oxygen equipment. A-15 regulators may be tested by the method described in paragraph 3-54. Since this type of regulator delivers 100 percent oxygen at high altitudes only, the test is equivalent to that for the A-12A or A-14 regulator with the diluter at "NORMAL" (automix "ON"). Damaged regulators or cylinders may be replaced individually.

10-47. OXYGEN MASKS.

10-48. An oxygen mask deteriorates fairly rapidly, even with good care, but under normal usage it should remain in serviceable condition for at least 6 months. Maintenance consists of keeping the mask clean, and of keeping its parts in working order. If you have to take care of oxygen masks, submit a requisition through your usual supply channels for an oxygen mask maintenance kit, stock No. 8300-559292, as provided in T.O. No. 00-30-158. For detailed instructions on the maintenance of individual types of masks, see the Technical Orders of series 03-50B.

10-49. CLEANING. Since the oxygen mask is worn next to the skin, it should be kept as clean as possible. This will not only help to make the mask more comfortable, but it will also reduce the danger of infection, and will prolong the life of the mask. For ordinary cleaning, wash the mask with pure soap solution and rinse it well with clean water. If a microphone is installed, use a clean swab rather than running water, in order to keep the microphone from getting wet. To disinfect an oxygen mask, swab it carefully and thoroughly with a gauze pad which has been soaked in a water solution of merthiolate (1 part merthiolate to 1,000 parts water). Spray the inner crevices to be sure that the disinfectant penetrates thoroughly. Wipe the mask with a clean cloth, and let it dry before it is used.

10-50. MALE MASK-TO-REGULATOR CONNEC-

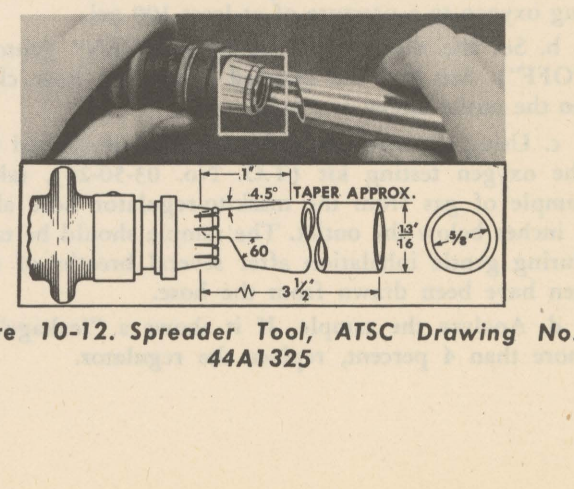


Figure 10-12. Spreader Tool, ATSC Drawing No. 44A1325

TOR. To correct a loosely fitting male mask-to-regulator connector of the prong type (figure 3-15, detail A), spread the prongs with a spreading tool (figure 10-12), or with a knife blade. The tool may be made locally from drawing No. 44A1325. If the mask has a C-ring type of male connector (figure 3-15, detail B), the only remedy for loose fitting is to replace the part. With either type of male connector, a locking device must be installed (figure 3-16). The locking device can be made locally from drawing No. 44A26409.

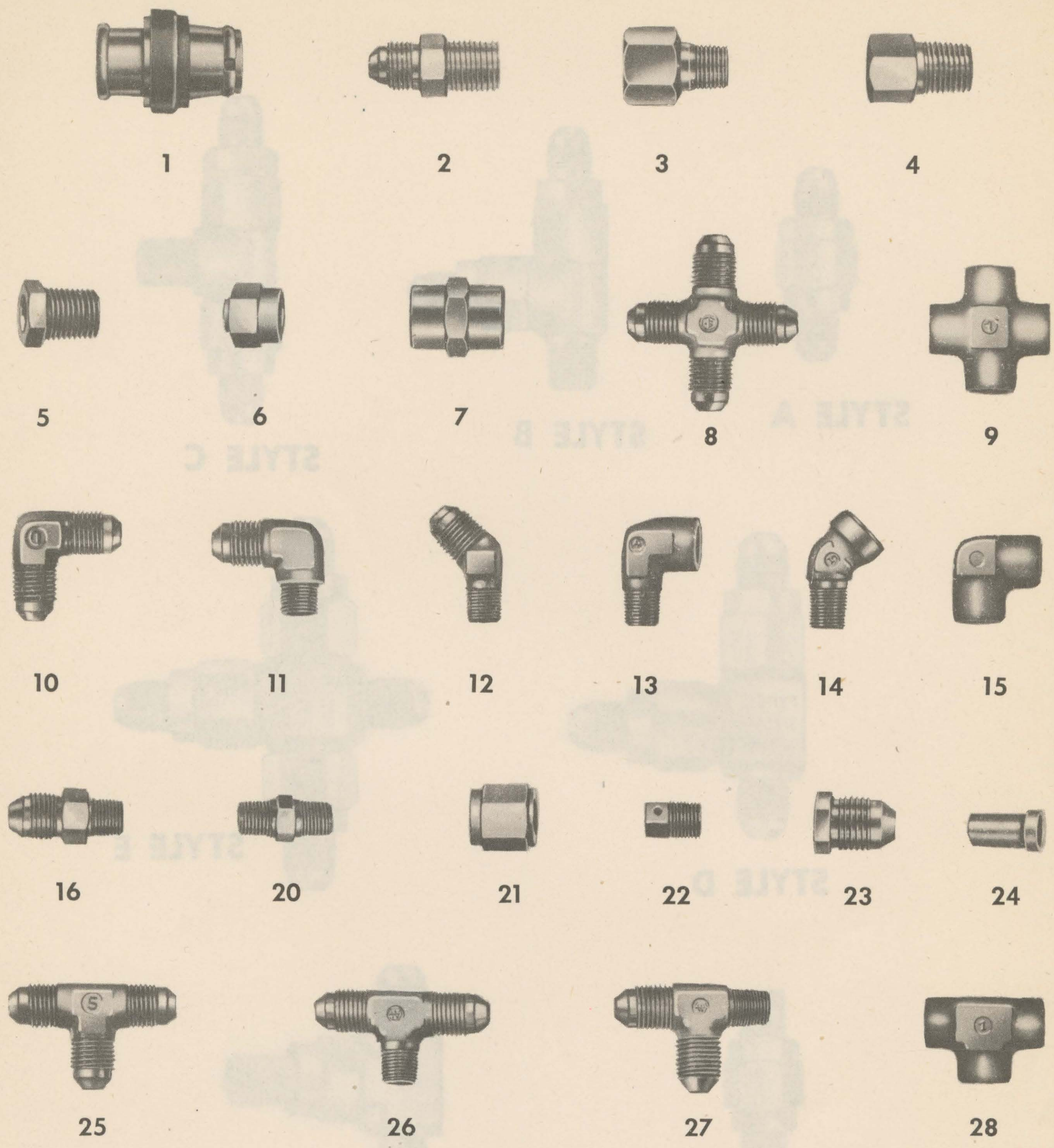
Note

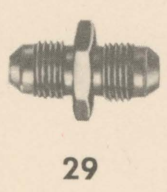
When the locking device is used, the flyer should clearly understand that he cannot leave the airplane in an emergency without deliberately disconnecting himself from his oxygen supply.

APPENDIX
TABLES OF OXYGEN EQUIPMENT

The following tables of oxygen equipment are intended to help you find stock numbers, part numbers, and Technical Orders pertaining to the more common items of oxygen equipment and related materials. The tables are not intended to serve in place of Stock Lists, which you should consult for more complete information. A few items which do not bear identifying marks are illustrated in figure 10-13. Figure 10-14 shows the various styles of check valve. The illustrations are keyed by number to the listings in the tables. An index to the tables appears below.

INDEX TO TABLES





Each item is keyed by number to its listing in the tables. All items except item 1 appear in table 3. Item 1 is identified in table 8. Item numbers appear in the tables, in parentheses, to the right of the entries.

Figure 10-13. Oxygen Fittings

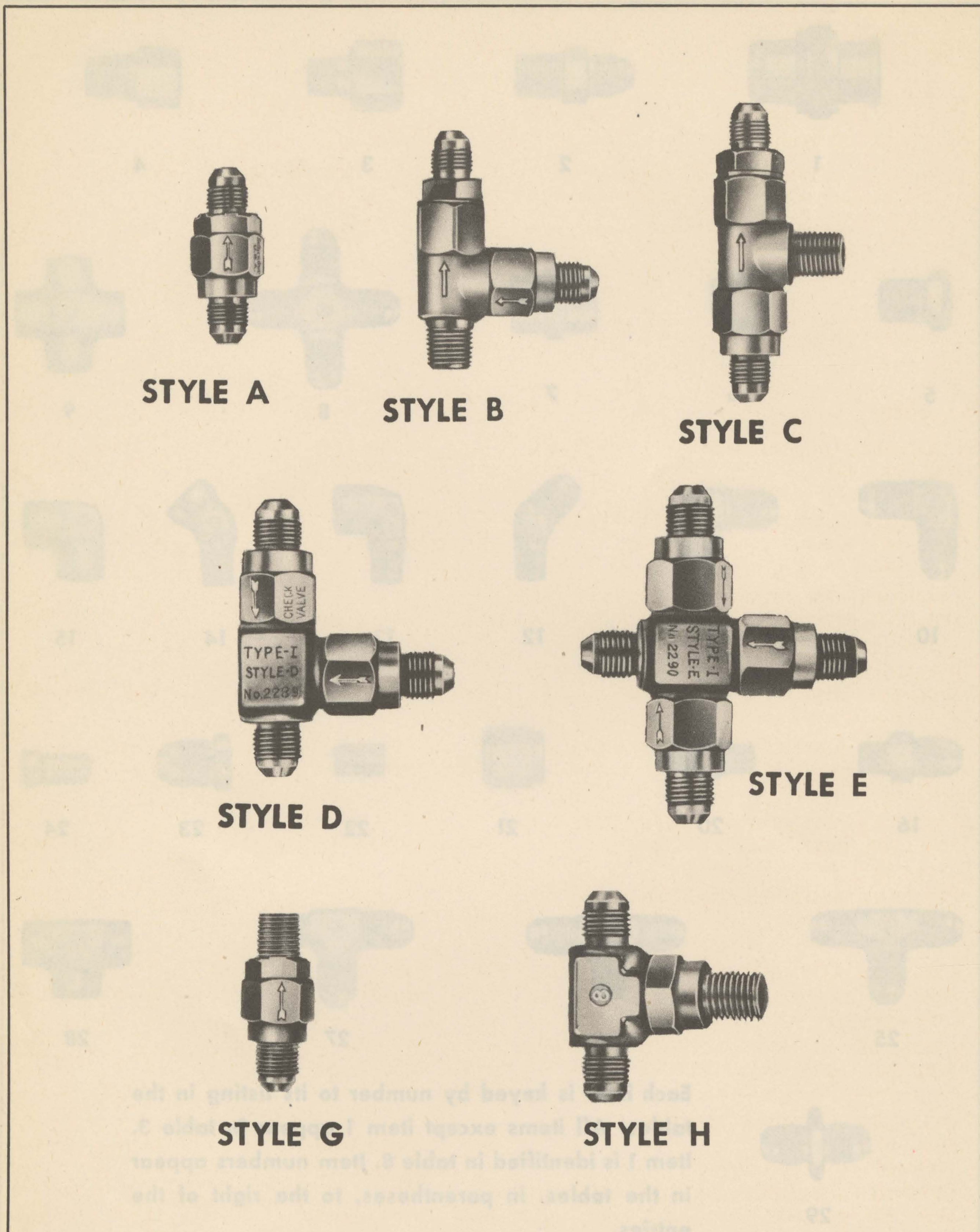


Figure 10-14. Low Pressure Oxygen Check Valves (See Table 15 in Appendix.)

Item	Class Symbol	Stock No.	Part No.	Status		Applicable Technical Orders
TABLE 1						
COUPLINGS—AUTOMATIC						
COUPLING—AUTOMATIC OXYGEN .... 5/16-inch flared tube male end, Army-Navy Aeronautical Standard Drawing No. AN6009. Used with low-pressure automatic continuous-flow oxygen regulator and continuous-flow oxygen mask.	03-K	5500-272000	AN6009-1A	S	R	
COUPLING ASSEMBLY—AUTOMATIC OXYGEN .... 1/8 pipe thread. Used with low-pressure automatic continuous-flow regulator and continuous-flow oxygen mask.	03-K	5500-271500	AN6009-2	S	NR	
TABLE 2						
CYLINDERS						
CYLINDER—OXYGEN PORTABLE, TYPE A-4 SPEC. NO. 40376 .... Low-pressure, 104 cu in. capacity.	03-K	5500-358130		S	R	03-50C-3
CYLINDER—OXYGEN PORTABLE, TYPE A-6, SPEC. NO. 40754 .... Low-pressure, 280 cu in. capacity.	03-K	5500-358135		S	R	03-50C-3
CYLINDER ASSEMBLY—OXYGEN, TYPE D-2, SPEC. NO. 40355 .... Low-pressure, 500 cu in. capacity.	03-K	5500-344020		S	R	03-50C-3
CYLINDER ASSEMBLY—OXYGEN, TYPE F-1, SPEC. NO. 40330, SHATTERPROOF .... Low-pressure, 1,000 cu in. capacity.	03-K	5500-345100		S	R	03-50C-3
CYLINDER ASSEMBLY—OXYGEN, TYPE F-2, SPEC. NO. 40356 .... Low-pressure, 1,000 cu in. capacity.	03-K	5500-345120		S	R	03-50C-3
CYLINDER ASSEMBLY—OXYGEN, TYPE G-1, SPEC. NO. 40321, SHATTERPROOF .... Low-pressure, 2,100 cu in. capacity.	03-K	5500-345230		S	R	03-50C-3
CYLINDER ASSEMBLY—OXYGEN, TYPE J-1, SPEC. NO. 40407 .... Low-pressure, 18,000 cu in. capacity.	03-K	5500-345500		S	R	03-50C-3
CYLINDER ASSEMBLY—OXYGEN, TYPE A-2, SPEC. NO. 94-40302 .... High-pressure, 96 cu in. capacity.	03-K	5500-341750		LS	R	03-50-4
CYLINDER ASSEMBLY—OXYGEN, TYPE B-1, SPEC. NO. 40246, SHATTERPROOF .... High-pressure, 295 cu in. capacity.	03-K	5500-342000		LS	R	03-50-4
CYLINDER ASSEMBLY—OXYGEN, TYPE C-1, SPEC. NO. 94-40247 .... High-pressure, 386 cu in. capacity.	03-K	5500-343000		LS	R	03-50-4
CYLINDER ASSEMBLY—OXYGEN, TYPE D-1, SPEC. NO. 94-40248 .... High-pressure, 514 cu in. capacity.	03-K	5500-344000		LS	R	03-50-4
CYLINDER ASSEMBLY—OXYGEN, TYPE E-1, SPEC. NO. 94-40251 .... High-pressure, 646 cu in. capacity.	03-K	5500-345000		LS	R	03-50-4

Item	Class Symbol	Stock No.	Part No.	Status		Applicable Technical Orders
CYLINDER ASSEMBLY—EMERGENCY OXYGEN, TYPE H-2, SPEC. NO. 40642 .... High-pressure 22 cu in. capacity, continuous-flow emergency bail-out cylinder with pressure gage, metering valve, and hose and adapter for connection to oxygen mask. Contained in a flame-resistant bag. Supersedes type H-1.	13	8300-165000	44D7586	S	R	03-50C-5

TABLE 3

Item	Class Symbol	Stock No.	Part No.	Status		Applicable Technical Orders
FITTINGS						
ADAPTER—ARMY OR NAVY TO BRITISH OXYGEN UNION .... Used in filling Army or Navy high-pressure cylinders from British recharging equipment.	03-K	5500-005900	AN6005-1	S	NR	03-50-10
ADAPTER—BRITISH TO ARMY OR NAVY OXYGEN UNION .... Used in filling British high-pressure cylinders from Army or Navy recharging equipment.	03-K	5500-007300	AN6006-1	S	NR	03-50-1C
ADAPTER—NAVY TO ARMY OXYGEN UNION .... Used in filling Navy high-pressure cylinders from Army recharging equipment. (Navy connections fit Army high-pressure cylinders directly and no adapters are needed.)	03-K	5500-007600	AN6007-1	S	NR	03-50-10
ADAPTER—ARMY TO BRITISH LOW-PRESSURE OXYGEN .... Used in filling Army low-pressure systems with British recharging equipment.	03-K	5500-006050	42A6950	S	NR	03-50-10
ADAPTER—ARMY TO NAVY LOW-PRESSURE OXYGEN .... Used in filling Army low-pressure systems from Navy recharging equipment.	03-K	5500-006100	42A7543	S	NR	03-50-10
ADAPTER—VALVE ASSEMBLY—OXYGEN FILLER. LOW PRESSURE .... Used in filling low-pressure systems from Army recharging equipment. Provided with 41G5917 recharger cast.	19-C	5152-40A8475	AN-6027-1	S	NR	19-1-2
ADAPTER—LOW-PRESSURE OXYGEN FILLER VALVE .... Contains a check valve; used on portable equipment for recharging from airplane oxygen system.	03-K	5500-005650	Schrader 9607A	S	NR	
ADAPTER ASSEMBLY—OXYGEN MASK TO BRITISH OXYGEN OUTLET .... Used in connecting A-8 series masks to British Mask III series bayonet sockets.	03-K	5500-006950	42B13342	S	NR	03-50-10
ADAPTER—OXYGEN REGULATOR TUBE .... Used in adapting A-9A regulator to 5/16-inch flared tube connections.	03-K	5500-027660	41A9199	S	NR	
ADAPTER—OXYGEN 5/16-INCH FLARED TUBE TO 1/8-INCH PIPE THREAD (3)	03-K	5500-020000	43A18438	S	NR	
ADAPTER—OXYGEN 5/16-INCH FLARED TUBE TO 1/4-INCH PIPE THREAD (4)	05-B	7800-001000	43A12528			
BUSHING—REDUCER (5) .... Alum. alloy, 1/4- to 1/8-inch pipe thread.	04-A	6500-244600	AN912-1D	S	NR	
BUSHING—REDUCER (5) .... Bronze, 1/4- to 1/8-inch pipe thread.	04-A	6500-244700	AN912-1	S	NR	
CAP—PRESSURE SEAL FLARED TUBE FITTING (6) .... For capping male flared tube fittings.	04-A	6500-282016	AN929-5	S	NR	

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
COUPLING—PIPE THREAD (7) Alum. alloy, 1/8-inch thread.	04-A	6500-344956	AN910-1D	S	NR
COUPLING—PIPE THREAD (7) Alum. alloy, 1/4-inch thread.	04-A	6500-344956-3	AN910-2D	S	NR
COUPLING—PIPE THREAD (7) Bronze, 1/8-inch thread.	04-A	6500-344960	AN910-1	S	NR
COUPLING—PIPE THREAD (7) Bronze, 1/4-inch thread.	04-A	6500-344962	AN910-2	S	NR
CROSS—FLARED TUBE (8) Alum. alloy.	04-A	6500-349710	AN827-5D	S	NR
CROSS—ALUMINUM ALLOY (INTERNAL PIPE THREAD) (9) 1/8-inch thread.	04-A	6500-348800	AN918-1D	S	NR
CROSS—ALUMINUM ALLOY (INTERNAL PIPE THREAD) (9) 1/4-inch thread.	04-A	6500-348810	AN918-2D	S	NR
CROSS—BRONZE (INTERNAL PIPE THREAD) (9) 1/8-inch thread.	04-A	6500-348950	AN918-1	S	NR
CROSS—BRONZE (INTERNAL PIPE THREAD) (9) 1/4-inch thread.	04-A	6500-349050	AN918-2	S	NR
ELBOW—FLARED TUBE AND PIPE THREAD 45 DEGREE (12) Alum. alloy, 5/16-inch flared tube fitting and 1/8-inch pipe thread.	04-A	6500-361215	AN823-5D	S	NR
ELBOW—FLARED TUBE 90 DEGREE (10) Alum. alloy, 5/16-inch flared tube fitting.	04-A	6500-361115	AN821-5D	S	NR
ELBOW—FLARED TUBE BULKHEAD AND UNIVERSAL, ALUMINUM ALLOY 90 DEGREE	04-A	6500-361660-6	AN833-5D	S	NR
ELBOW—FLARED TUBE BULKHEAD AND UNIVERSAL ALUMINUM ALLOY 45 DEGREE 5/16-inch flared tube fitting.	04-A	6300-361660-2518	AN837-5D	S	NR
ELBOW—FLARED TUBE AND PIPE THREAD ALUMINUM ALLOY 90 DEGREE (11) 5/16-inch flared tube fitting and 1/8-inch pipe thread.	04-A	6500-361315	AN822-5D	S	NR
ELBOW—FLARED TUBE AND PIPE THREAD 90 DEGREE (11) 5/16-inch flared tube fitting and 1/4-inch pipe thread.	04-A		AN822-5-4D		
ELBOW—INTERNAL AND EXTERNAL PIPE THREAD 90 DEGREE (13) Alum. alloy, 1/8-inch thread.	04-A	6500-368781	AN914-1D	S	NR
ELBOW—INTERNAL AND EXTERNAL PIPE THREAD 90 DEGREE (13) Alum. alloy, 1/4-inch thread.	04-A	6500-368782	AN914-2D	S	NR
ELBOW—INTERNAL AND EXTERNAL PIPE THREAD 90 DEGREE (13) Bronze, 1/8-inch thread.	04-A	6500-368800	AN914-1	S	NR
ELBOW—INTERNAL AND EXTERNAL PIPE THREAD 90 DEGREE (13) Bronze, 1/4-inch thread.	04-A	6500-368810	AN914-2	S	NR

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
ELBOW—INTERNAL AND EXTERNAL PIPE THREAD 45 DEGREE (14) .... Alum. alloy, 1/8-inch thread.	04-A	6500-368766	AN915-1D	S	NR
ELBOW—INTERNAL AND EXTERNAL PIPE THREAD 45 DEGREE (14) .... Alum. alloy, 1/4-inch thread.	04-A	6500-368767	AN915-2D	S	NR
ELBOW—INTERNAL AND EXTERNAL PIPE THREAD 45 DEGREE (14) .... Bronze, 1/8-inch thread.	04-A	6500-368772	AN915-1	S	NR
ELBOW—INTERNAL AND EXTERNAL PIPE THREAD 45 DEGREE (14) .... Bronze, 1/4-inch thread.	04-A	6500-368773	AN915-2	S	NR
ELBOW—ALUMINUM ALLOY 90 DEGREE (15) .... 1/8-inch internal pipe thread.	04-A	6500-354708	AN916-1D	S	NR
ELBOW—ALUMINUM ALLOY 90 DEGREE (15) .... 1/4-inch internal pipe thread.	04-A	6500-354710	AN916-2D	S	NR
ELBOW—BRONZE 90 DEGREE (15) .... 1/8-inch internal pipe thread.	04-A	6500-357700	AN916-1	S	NR
ELBOW—BRONZE 90 DEGREE (15) .... 1/4-inch internal pipe thread.	04-A	6500-357710	AN916-2	S	NR
NIPPLE—FLARED TUBE AND PIPE THREAD (16) .... Alum. alloy, 5/16-inch flared tube fitting and 1/8-inch pipe thread.	04-A	6500-451856	AN816-5D	S	NR
NIPPLE—FLARED TUBE AND PIPE THREAD (2) .... 5/16-inch tube and 1/4-inch external pipe thread.	04-A		AN816-5-4D		
NIPPLE—ALUMINUM ALLOY (17) .... 1/8-inch pipe thread.	04-A	6500-449700	AN911-1 D	S	NR
NIPPLE—ALUMINUM ALLOY (17) .... 1/4-inch pipe thread.	04-A	6500-449720	AN911-2D	S	NR
NIPPLE—BRONZE (17) .... 1/8-inch pipe thread.	04-A	6500-450500	AN911-1	S	NR
NIPPLE—BRONZE (17) .... 1/4-inch pipe thread.	04-A	6500-450510	AN911-2	S	NR
NIPPLE—HOSE ADAPTER	19-C	5152-43A14288	43A14288	S	NR
NUT—COUPLING (18) .... Alum. alloy.	04-A	6500-496015	AN818-5D	S	NR
NUT—FLARED TUBE UNIVERSAL .... Used with 5/16-inch flared tube fittings.	04-A	6500-500788	AN924-5D	S	NR
PLUG—PIPE THREAD, SQUAREHEAD (19) ... Alum. alloy, 1/8-inch thread.	04-A	6500-619104	AN913-1D	S	NR
PLUG—PIPE THREAD, SQUAREHEAD (19) ... Alum. alloy, 1/4-inch thread.	04-A	6500-619105	AN913-2D	S	NR
PLUG—PIPE THREAD, SQUAREHEAD (19) ... Bronze, 1/8-inch thread.	04-A	6500-619110	AN913-1	S	NR
PLUG—PIPE THREAD, SQUAREHEAD (19) ... Bronze, 1/4-inch thread.	04-A	6500-619115	AN913-2	S	NR

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
PLUG—FLARED TUBE ALUMINUM ALLOY (20) For plugging flared tube line.	04-A	6500-617150	43A18949	S	NR
SLEEVE—OXYGEN COUPLING (21) Copper silicon, to be used in preference to AN819-5D.	03-K	5500-802500	44A25450	S	
TEE—FLARED TUBE, ALUMINUM ALLOY (22) 5/16-inch flared tube fitting.	04-A	6500-919525	AN824-5D	S	NR
TEE—FLARED TUBE WITH PIPE THREAD ON SIDE (23) Alum. alloy.	04-A	6500-920038	AN825-5D	S	NR
TEE—FLARED TUBE WITH PIPE THREAD ON RUN (24) Alum. alloy.	04-A	6500-919978	AN826-5D	S	NR
TEE—FLARED TUBE BULKHEAD AND UNIVERSAL Alum. alloy.	04-A	6500-919661	AN834-5D	S	NR
TEE—INTERNAL PIPE THREAD (25) Alum. alloy, 1/8-inch thread.	04-A	6500-920165	AN917-1D	S	NR
TEE—INTERNAL PIPE THREAD (25) Alum. alloy, 1/4-inch thread.	04-A	6500-920166	AN917-2D	S	NR
TEE—INTERNAL PIPE THREAD (25) Bronze, 1/8-inch thread.	04-A	6500-920170	AN917-1	S	NR
TEE—INTERNAL PIPE THREAD (25) Bronze, 1/4-inch thread.	04-A	6500-920172	AN917-2	S	NR
UNION—FLARED TUBE ALUMINUM ALLOY (26)	04-A	6500-967215	AN815-5D	S	NR
UNION—FLARED TUBE ALUMINUM ALLOY 3/4-INCH BULKHEAD AND UNIVERSAL	04-A	6500-967245	AN832-5D	S	NR

TABLE 4

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
HOSE					
HOSE ASSEMBLY—OXYGEN LOW-PRESSURE 5/16-INCH OD, SPEC. 26579					
14-inch length	03-K	5500-504875	42D19277-5-14	S	NR
24-inch length	03-K	5500-504900	42D19277-5-24	S	NR
32-inch length	03-K	5500-504915	42D19277-5-32	S	NR
40-inch length	03-K	5500-504925	42D19277-5-40	S	NR
48-inch length	03-K	5500-504950	42D19277-5-48	S	NR
72-inch length	03-K	5500-505000	42D19277-5-72	S	NR
HOSE ASSEMBLY—OXYGEN HIGH-PRESSURE, 5/16-INCH OD Has flared tube fittings to connect reducing regulator of servicing trailers to recharging valve.					
180-inch length	19-C	5126-42D6957-5-180	42D6957-5-180	S	NR

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
HOSE ASSEMBLY—OXYGEN HIGH-PRESSURE Has 1-1/8-inch coupling nut for manifolding high-pressure oxygen cylinders to reducing regulator on servicing trailers.					
24-inch length	19-C	5152-44B27648 -24	44B27648 -24	S NR	
48-inch length	19-C	5152-44B27648 -48	44B27648 -48	S NR	
180-inch length	19-C	5152-44B27648 -180	44B27648 -180	S NR	
RECHARGER ASSEMBLY—TURRET OXYGEN 48 INCH Hose and filler valve assembly for recharging cylinders mounted in turrets.	03-K	5500-717480	43B18436	S NR	
TABLE 5					
INDICATORS					
INDICATOR—OXYGEN FLOW, TYPE A-1, SPEC. NO. 40389 Bouncing-ball type.	03-K	5500-513950		LS R	03-50-13
INDICATOR—OXYGEN FLOW, TYPE A-3, SPEC. NO. AN-I-12 Blinker type.	03-K	5500-513975	AN6029-1	S R	03-50-19
GAGE—OXYGEN PRESSURE, TYPE K-1 For use with low-pressure system. (When exhausted use 5500-453600.)	03-K	5500-453500		LS R	03-50D-5
GAGE—PANEL MOUNTING LOW-PRESSURE OXYGEN, SPEC. NO. AN-G-13	03-K	5500-453600	AN6021-1A	S NR	
TABLE 6					
INSPECTION AND MAINTENANCE EQUIPMENT					
DETECTOR ASSEMBLY—DEMAND OXYGEN MASK LEAK	13	8300-190500	44B27226	S R	
GAGE—GO, NO GO For testing female oxygen connector.		(See fig. 9-2 in this Handbook.)			
KIT—OXYGEN MASK MAINTENANCE, TYPE Z-1, SPEC. NO. 40622-A Tools, parts, and instructions for fitting, conversion, maintenance, and repair of all current types of continuous-flow and demand oxygen masks.	13	8300-559292		S R	00-30-158
KIT—OXYGEN SYSTEM MAINTENANCE For first and second echelon repairs.	17-D	(order by T.O. Number)		S	00-30-157
KIT—OXYGEN TEST TYPE K-2, SPEC. NO. 40760 SQUADRON AIRCRAFT	05-B	7800-461765		S NR	03-50-26
KIT—UNIT OXYGEN OFFICER'S TEST SET, TYPE K-1, SPEC. No. 40487 Used for testing demand masks for leakage.	05-B	7800-462000		S NR	03-50-26
KIT—UNIT OXYGEN OFFICER'S TEST SET, TYPE K-2, SPEC. No. 40487 Same use as Type K-1.	05-B	7800-461780		S NR	03-50-26
LEAK TESTER—DEMAND REGULATOR PORTABLE For measuring allowable leakage from A-12 demand regulator.		(FABRICATE LOCALLY)	(Drawing) 43B15132	S	
LEAK TESTER—TROOP SYSTEM For testing leakage between A-11 regulator and automatic couplings.		(FABRICATE LOCALLY)	(Drawing) 44B10627	S	

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
METER—OXYGEN GROUND FLOW CHECK, SPEC. NO. 40400	05-B	7800-528100		S NX	05-1-2
Used for testing A-8A and A-9A regulators for proper flow.					
STAND ASSEMBLY—TEST FOR DILUTER DEMAND REGULATOR ARO EQUIPMENT OT122 OR EQUAL	05-B	7800-734300		S NX	05-95D-1
TOOL—DOUBLE LAP FLARING, SPEC. NO. 50448	17-B	7900-788000		S NX	
TOOL—SPREADER		(FABRICATE LOCALLY)	Drawing No. 44A1325		
Used to spread prongs of male part of mask connector. (See figure 10-12.)					
COMPOUND—ANTI-SEIZE AND SEALING SPEC. NO. AN-C-86	06-B	7500-050200		S NR	03-50-28
For oxygen system pipe threads.					
CARBON TETRACHLORIDE SPEC. NO. 4-503-110	24	8500-278000		S NR	
FLUID—ANTI-ICING ISOPROPYL ALCOHOL, SPEC. NO. AN-F-13	24	8500-494500		S NR	

TABLE 7

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
MASKS					
MASK—OXYGEN TYPE A-7A, SPEC. NO. 3166	13	8300-595725	43G22376	S R	03-50B-3
Nasal rebreather, continuous-flow; to be replaced by A-7B.					
MASK—OXYGEN, TYPE A-8B, SPEC. NO. 94-3107	13	8300-595770	42G4764	LS R	03-50B-4
With two valve turrets and provision for microphone.					
MASK—OXYGEN, TYPE A-10A, SPEC. NO. 3134A					
Large	13	8300-595870		SS R	03-50B-1
Medium	13	8300-595873		SS R	03-50B-1
Small	13	8300-595876		SS R	03-50B-1
MASK—OXYGEN, TYPE A-13A, SPEC. NO. 3165					
Large	13	8300-595885		LP R	03-50-31
Medium	13	8300-595888		LP R	03-50-31
Small	13	8300-595890		LP R	03-50-31
MASK—OXYGEN, TYPE A-14, SPEC. NO. 3163					
Demand Type.					
Extra Small	13	8300-595895		S R	03-50B-6
Large	13	8300-595900		S NR	03-50B-6
Medium	13	8300-595905		S R	03-50B-6
Small	13	8300-595910		S R	03-50B-6
MASK—OXYGEN, TYPE A-15, SPEC. NO. 3209					
Large	13	8300-595925		LP R	
Medium	13	8300-595930		LP R	
Small	13	8300-595935		LP R	

Item	*Class Symbol*	*Stock No.*	*Part No.*	*Status*	*Applicable Technical Orders*
TABLE 8					
MASK ACCESSORIES					
CONNECTOR ASSEMBLY—OXYGEN MASK TO REGULATOR MALE .... Prong-type quick-disconnect fitting at end of demand mask tubing.	13	8300-126560	42B5341-1	LS R	
DETECTOR ASSEMBLY—DEMAND OXYGEN MASK LEAK	13	8300-190500	44B27226	S R	
FITTING ASSEMBLY—OXYGEN MASK TO REGULATOR CONNECTOR MALE (1) .... C-ring type quick-disconnect fitting at end of mask tubing. Spec. No. AN-C-134.	13	8300-214685	(AN6043-1) 44A13481	S R	
FITTING ASSEMBLY—OXYGEN MASK COUPLING .... Bayonet connector for attaching continuous-flow masks to continuous-flow regulators or to automatic couplings. Also used to attach emergency oxygen cylinder to demand or pressure-demand masks.	13	8300-214650	41A2988	S R	
GAGE—GO, NO GO .... For testing female oxygen connector.	(See figure 9-2 in this Handbook.)				
HEATER ASSEMBLY—ELECTRIC A-14 OXYGEN MASK—GE	13	8300-384500		S NR	
KIT—OXYGEN MASK MAINTENANCE, TYPE Z-1, SPEC. NO. 40622-A .... (See INSPECTION AND MAINTENANCE EQUIPMENT* TABLE 6)	13	8300-559292		S R	
LOCK—OXYGEN MASK REGULATOR CONNECTOR—MALE	03-K	8300-588625 or fabricate locally	Drawing No. 45A19527	S R	
MERTHIOLATE—TINCTURE .... 1-pint bottle, used as a disinfectant for oxygen masks.	Medical Supply Catalog No. 1285705				
MICROPHONE, T-44A .... Magnetic.	16A	2-B-1644A		S NX	
MICROPHONE, ANB-M-C1 .... Carbon.	16A	2-B-1660		S NX	
SHIELD ASSEMBLY—TYPE A-8B OXYGEN MASK .... Fabric bag to reduce freezing.	13	8300-700650	43D14899	LS R	
TEMPLATE—SIZING MASK OXYGEN .... (See figure 9-4 of this Handbook.)	(FABRICATE LOCALLY)				
TOOL—SPREADER .... Used to spread prongs of male part of mask-to-regulator connector. (See figure 10-12.)		(FABRICATE LOCALLY)	Drawing No. 44A1325		
VALVE—OXYGEN MASK EXHALATION COMPENSATED	(These three items, parts of the standard pressure demand mask assembly, are carried at present as components of KIT—OXYGEN MASK MAINTENANCE, class 13, stock No. 8300-559292. A separate stock listing is planned.)				
VALVE—OXYGEN MASK INLET CHECK					
SHIELD—PLASTIC, OXYGEN MASK INLET CHECK VALVE					
TABLE 9					
OXYGEN					
OXYGEN—GAS BREATHING, SPEC. NO. AN-0-1	06-B	7500-82600		S NR	

Item	Class Symbol	Stock No.	Part No.	Status		Applicable Technical Orders
TABLE 10						
PORTABLE AND EMERGENCY EQUIPMENT						
ADAPTER ASSEMBLY—OXYGEN EMERGENCY CYLINDER TYPE H-2 TO DEMAND MASK Replaced by CONNECTOR-HOSE, COMBINATION MASK AND BAIL-OUT.	13	8300-001200	44A6796	S	NR	03-50C-5
ADAPTER—OXYGEN REGULATOR To connect the A-9A regulator to 1/4-inch female pipe thread fitting.	03-K	5500-027655	43A16646	S	NR	
CLAMP—HOSE 1 to 1-1/4 ID. Used to fasten mask-to-regulator tubing to regulator outlet elbow.	04-A	6500-293358	QS100M12	S		
CLIP—RECHARGER ASSEMBLY—PORTABLE OXYGEN Spring clip for installation in demand system, to which portable recharger hose is attached when not in use.	03-K	(FABRICATE LOCALLY)	43A13594	S		
CONNECTOR—HOSE, COMBINATION, MASK AND BAIL-OUT ASSEMBLY	13	8300-126562	WD10-DC-20	S	R	03-50B-14
CONTROLLER—CERAMIC FLOW, H-2 BAIL-OUT	13	8300-132720	113A6	S	NR	03-50C-6
CYLINDER AND REGULATOR ASSEMBLY—OXYGEN PORTABLE A-6 cylinder and A-9A regulator assembly being installed for passenger use in cargo aircraft.	03-K	5500-	44B24619	S		
CYLINDER AND REGULATOR ASSEMBLY—OXYGEN PORTABLE D-2 cylinder, continuous-flow, A-9A regulator, filler valve, and filler valve adapter to permit recharging in airplane. Fabricate sling. Drawing No. 44D9736 locally.	(order separate items and assemble locally)		44B24620	S		
CYLINDER AND REGULATOR ASSEMBLY—OXYGEN PORTABLE A-4 cylinder, A-13 regulator.	03-K	5500-340200	AN6020-1	LS	R	03-50A-9
CYLINDER AND REGULATOR ASSEMBLY—DILUTER DEMAND, OXYGEN A-6 cylinder and A-15 regulator. (See REGULATOR AND CYLINDER ASSEMBLY—DILUTER DEMAND OXYGEN—Part No. 44D22201 below.)						
CYLINDER AND REGULATOR ASSEMBLY—OXYGEN PORTABLE HIGH-PRESSURE B-1 cylinder, A-8A regulator, and sling 5500-804540. Used in aircraft with no oxygen system.	03-K	(Assemble locally)	41G9673	LS		
CYLINDER AND REGULATOR ASSEMBLY—OXYGEN PORTABLE HIGH-PRESSURE A-2 cylinder, A-8A regulator, and sling 5500-804520. Walk-around unit for aircraft with high- or low-pressure continuous-flow system.	03-K	(Assemble locally)	41G2437	LS		
CYLINDER AND SLING ASSEMBLY—PORTABLE OXYGEN A-13 regulator and D-2 cylinder with sling assembly 43C16247(5500-804505).	03-K	5500-340500	44C7367	S	R	03-50A-9
NIPPLE—EMERGENCY OXYGEN CYLINDER VALVE BREAK OFF For use with the H-2 bail-out cylinder.	13	8300-601375	43A25029	S	NR	03-50C-5
CYLINDER ASSEMBLY—EMERGENCY OXYGEN, TYPE H-2 (See Table II.)						

Item	Class Symbol	Stock No.	Part No.	Status		Applicable Technical Orders
RECHARGER ASSEMBLY—PORTABLE OXYGEN .... Hose, orifice and filler valve assembly installed in airplanes with demand system. For recharging portable demand units before and during flight.	03-K	5500-717450	AN6041-1	S	NR	
RECHARGER ASSEMBLY—PORTABLE OXYGEN, 48-INCH .... Used to recharge low-pressure cylinders on gun turrets.	03-K	5500-717480	43B18436	S	NR	
REGULATOR AND CYLINDER ASSEMBLY—DILUTER DEMAND OXYGEN .... A-6 low-pressure oxygen cylinder (Spec. No. 40754) with A-15 regulator. Portable unit for airplanes having demand oxygen systems.	03-K	5500-717640	44D22201	S	R	03-50A-23
VALVE AND HOSE ASSEMBLY—EMERGENCY OXYGEN CYLINDER	13	8300-935100	43D25012	S	R	

TABLE 11

REGULATORS

Item	Class Symbol	Stock No.	Part No.	Status		Applicable Technical Orders
REGULATOR—OXYGEN, TYPE A-8A .... Improved high-pressure, manual, for continuous-flow mask.	03-K	5500-717750	2806-1D-B1	S	R	03-50A-1
REGULATOR—OXYGEN, TYPE A-9A .... Improved low-pressure, manual, continuous-flow.	03-K	5500-721120	2805-3B-B1	LS	R	03-50A-1
REGULATOR—OXYGEN, TYPE A-11, SPEC. NO. AN-R-15 .... Low-pressure, automatic, continuous-flow.	03-K	5500-721160	AN6010-1	S	R	03-50A-10
REGULATOR—OXYGEN, TYPE A-12, SPEC. NO. 40370 .... Low-pressure diluter demand.	03-K	5500-721200		LS	R	03-50A-8
REGULATOR—DILUTER DEMAND OXYGEN, TYPE A-12A, SPEC. NO. 40370A .... Low-pressure diluter demand similar to A-12, but with more economical oxygen concentrations.	03-K	5500-717645	AN6004-1	LS	R	03-50A-8
REGULATOR—OXYGEN, TYPE A-13, SPEC. NO. 40382 .... Low-pressure, 100 percent oxygen demand for use on portable unit.	03-K	5500-721275	AN6022-1	LS	R	03-50A-9
REGULATOR—DILUTER DEMAND OXYGEN, TYPE A-14 (Pressure Breathing) .... Spec. No. 40465A. For use in aircraft capable of flying above 35,000 feet.	03-K	5500-717641	O-616A	LS	R	03-50A-22
REGULATOR—OXYGEN, TYPE A-15, SPEC. NO. 40466 .... Listed as a component of REGULATOR AND CYLINDER ASSEMBLY-DILUTER DEMAND OXYGEN.						03-50A-23

TABLE 12

REGULATOR ATTACHMENTS

Item	Class Symbol	Stock No.	Part No.	Status		Applicable Technical Orders
ADAPTER—OXYGEN REGULATOR .... To connect the A-9A regulator to an A-6 cylinder, which assembly is used as a portable unit. The fitting is tapped for insertion of a filler valve, used for recharging the cylinder.	03-K		Drawing No. 44A13703			
CLIP ATTACHMENT STRAP .... Fabric strap for installation in demand system, to which mask-to-regulator tubing is attached when not in use.	(Fabricate locally)		43A17636	S		

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
CONNECTOR—OXYGEN MASK-TO-REGULATOR, FEMALE Quick-disconnect. Spec. No. AN-C-134.	03-K	5500-216900	AN6002-1B	S R	
KIT—CONNECTOR, A-12 OXYGEN REGULATOR For use with Airco design A-12 regulators to relocate A-3 flow indicator tap.	03-K	5500-525000	43D3552	S NR	03-50A-8
LOCK—OXYGEN MASK REGULATOR CONNECTOR—MALE	(Fabricate locally)		44A26409		03-50B-9
TAB—NECK SUSPENSION FOR ATTACHING OXYGEN MASK-TO-REGULATOR TUBING CONNECTOR	(Fabricate locally)				03-50B-9
TUBE ASSEMBLY—OXYGEN MASK-TO-REGULATOR, SPEC. NO. AN-T-23a Large diameter reinforced flexible tubing attached to A-12 regulator. Has female quick-disconnect and clip at one end for demand mask connector.					
2-foot length	03-K	5500-915728	AN6003-2	S NR	
4-foot length	03-K	5500-915745	AN6003-4	S NR	
6-foot length	03-K	5500-915775	AN6003-6	S NR	

TABLE 13

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
SERVICING EQUIPMENT					
DESICCANT—OXYGEN DRYING AND PURIFYING. 2-LB CARTRIDGE Dryer element in purifiers used in recharging carts and trailers. Should be replaced after using 18 storage cylinders.	24	8500-396500		S NR	19-1-2
HOSE—HIGH-PRESSURE OXYGEN 15-foot length.	19-C	5152-42D-6957-5-180	42D6957-5-180	S	
PURIFIER ASSEMBLY—OXYGEN, TYPE A-3, SPEC. NO. 40352 Container for purifier cartridge used in recharging cart and trailer.	19-C	5152-120-07D	42D1381	S	19-1-2
PURIFIER ASSEMBLY—OXYGEN, TYPE A-5	19-C	45D19395	Drawing No. 45D19395		19-25-85
TRAILER—OXYGEN SERVICING, TYPE E-2, SPEC. NO. 30168 6-cylinder, 2-wheel steel trailer for charging high- or low-pressure oxygen systems. Drawings 44G26395 and 44J26396.	19-A	8200-953520		S NX	19-25-85
TRAILER—OXYGEN SERVICING, TYPE E-1, SPEC. NO. 30155	19-A	8200-953599	42J14275	LS NX	19-25-73
YOKE ASSEMBLY—RECHARGER OXYGEN For recharging H-2 cylinders.	19-C	5126-250	Ohio Chemical 250	S	03-50C-5

TABLE 14

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
TUBING					
ALUMINUM ALLOY—TUBING 5/16 x .032-inch soft, rigid tubing for low-pressure oxygen systems.	23-A	6800-153050		S NR	
COPPER TUBING, TYPE N 5/16 x .032-inch rigid tubing for low-pressure oxygen systems.	23-A	6800-285850		S NR	
COPPER TUBING, TYPE N 3/16 x .032-inch rigid tubing for high-pressure oxygen systems.	23-A	6800-285350		S NR	

Item	Class Symbol	Stock No.	Part No.	Status	Applicable Technical Orders
TABLE 15					
VALVES					
VALVE ASSEMBLY—OXYGEN FILLER, LOW-PRESSURE, TYPE 1, SPEC. NO. AN-V-14a	03-K	5500-955330	AN6024-3	S R	
VALVE ASSEMBLY—OXYGEN FILLER, LOW-PRESSURE Without flange. Contains valve core. Used on end of portable recharger hose.	03-K	5500-955250	AN6024-5	S NR	
VALVE ASSEMBLY—OXYGEN CHECK, TUBE-TO-TUBE, STYLE A, SPEC. NO. AN-V-15 Tube 5/16.	03-K	5500-955070	AN6030-1	S NR	
VALVE ASSEMBLY—OXYGEN DUAL CHECK, END PIPE THREAD TEE, STYLE B, SPEC. NO. AN-V-15 Thread 1/4, tubes 5/16.	03-K	5500-955125	AN6031-1	S NR	
VALVE ASSEMBLY—OXYGEN DUAL CHECK, SIDE PIPE THREAD TEE, STYLE C, SPEC. NO. AN-V-15 Thread 1/4, tubes 5/16.	03-K	5500-955128	AN6032-1	S NR	
VALVE ASSEMBLY—OXYGEN DUAL CHECK, TEE, STYLE D, SPEC. NO. AN-V-15 Three tubes 5/16.	03-K	5500-955129	AN6033-1	S NR	
VALVE ASSEMBLY—OXYGEN TRIPLE CHECK, CROSS, STYLE E, SPEC. NO. AN-V-15 Four tubes 5/16.	03-K	5500-956000	AN6034-1	S NR	
VALVE ASSEMBLY—OXYGEN CHECK, TUBE-TO-PIPE THREAD, STYLE G, SPEC. NO. AN-V-15 Tube 5/16, thread 1/4.	03-K	5500-955065	AN6036-1	S NR	
VALVE—LOW-PRESSURE OXYGEN CHECK, TEE, STYLE H, SPEC. NO. AN-V-15 Two tubes 5/16, to pipe thread 1/4, single check.	03-K	5500-957564-A	AN6037-1	S NR	
VALVE—OXYGEN LINE LOW-PRESSURE, SPEC. NO. 40386 Hand shut-off.	03-K	5500-959360		S R	03-50E-3