AVOX INC.
15746 STAGG ST. / VAN NUYS, CA. 91406 / 787-3852 / 873-4373

The Type A-14 Pressure-Demand Regulator is essentially the A-12A regulator modified to permit adjustable spring-loading of the diaphragm so that positive pressure can be supplied. The demand valve spring is controlled manually by turning the pressure control knob, or dial, on the face of the regulator.

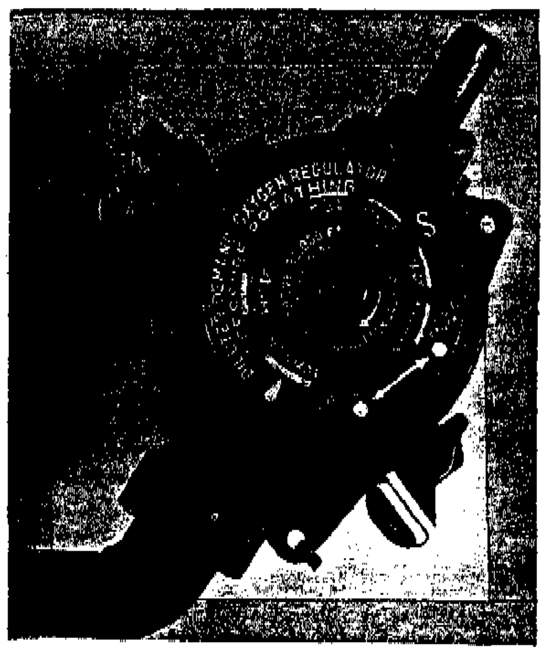
In non-pressurized aircraft the dial is set with reference to flight altitudes. In pressurized aircraft the dial is set with reference to cabin altitude. Advance the dial adjustment until you have reached the altitude.

Up to 30,000 feet, set the pressure control knob at NORMAL and the diluter lever at NORMAL OXYGEN. Use the regulator exactly as you would a straight demand regulator.

Between 30,000 and 40,000 feet, set the dial at SAFETY. This supplies oxygen to your mask at a pressure above that of the surrounding air, especially for protection against leakage of air into the mask.

At 40,000 feet and above, use the following dial settings:

CABIN 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
48,000 feet - Absolute (for emergency use only) ceiling!	



The flow indicator and pressure gage are not included in the regulator but are installed separately. Also, the Type A-14A 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. The use of this knob will result in greatly increased consumption, particularly at altitudes of 30,000 feet and below. When the use of oxygen is discontinued be sure that the regulator dial once again is set on NORMAL.

The Automatic Pressure-Demand Regulators include the features of the Type A-14 regulator. However, the pressure gage and flow meter are integral parts of the regulator.

OXYGEN EQUIPMENT

The development of oxygen equipment has necessarily paralleled the progress in aircraft performance. Without protection from the physiological problems at altitude the human element becomes the limitation on how fast, how high, and how well an aircraft can perform. Oxygen equipment is just one area of development which has enabled us to fly in the hostile environment above 12,000 feet. In this chapter you will learn the basic principles of oxygen equipment. Emphasis will be placed on the equipment currently being used. The proper and effective use of oxygen equipment will be stressed and will include the methods of checking the oxygen equipment prior to and in flight. The opportunity to use and become familiar with this equipment will be afforded you during the chamber flight phase of your training.

OXYGEN STORAGE

Aircraft operators who fly routinely either pressurized or unpressurized at altitudes in excess of 10,000 feet commonly employ a fixed oxygen installation. This consists of containers affixed within the aircraft and serviced through an exterior fuselage valve.

Light aircraft operators who normally fly below 10,000 feet often prefer to use portable O_2 equipment consisting of a container, regulator, mask outlet, pressure guage, etc., as an integral unit which may be taken aboard the aircraft each time a flight is contemplated at altitude. Portable equipment, in order to avoid weight and bulk problems, is limited in oxygen supply duration. Typical breathing time for four people at 18,000 feet is in the range of 1-1/2 hours using a 22 cubic foot container. Fixed O_2 installations usually offer much longer duration times. Actual times will depend upon size of oxygen containers in the system, and the number of people using the system.

OXYGEN STORAGE METHODS

Gaseous oxygen is stored in the containers at a pressure of 1800-2200 PSI. This is termed a high pressure system. The high pressure system is used very extensively in general aviation and commercial aviation.

Latest development in oxygen systems for aircraft make use of chemical action and are termed solid state oxygen systems. Solid state oxygen has come into its own through its use in new jumbo jet transport. It has weight, duration, and storage advantages not found in systems currently in use.

REGULATORS AND MASKS

A. Continuous Flow

The continuous flow O_2 regulator provides a flow of 100% oxygen. The rate of flow is usually measured in liters per minute. Flow rate may be controlled by turning a valve to alter the flow rate. Several regulators are offered which employ an altitude sensing aneroid to change the flow rate automatically.

Continuous flow masks utilize an oronasal face piece to receive the oxygen flow. The face piece does not usually have an air tight or oxygen tight face seal. This permits the user to exhale around the face piece or through small face piece ports or openings designed to dilute the oxygen with ambient air.

Continuous flow masks in use today make use of a *rebreather* bag. This bag is attached to the mask and enables the wearer to reuse a part of the exhaled oxygen. Usually, there is a device in the oxygen hose which enables the wearer to see that oxygen is flowing through the system.

The design of continuous flow systems limits altitude range. In order to accommodate personnel flying in the higher altitude ranges several continuous flow masks are now being marketed that provide an air tight seal with exhalation valves which convert the rebreather bag into a reservoir bag. Very careful attention to system capabilities is required in use of this type equipment above 25,000 feet even though it has been certificated to 41,000 feet.

B. Demand and Pressure Demand

The demand regulator, as the name implies, operates to furnish oxygen only when the user inhales or *demands* it. A lever may also be employed to enable the regulator to automatically give either a mixture of cabin air and oxygen or 100% oxygen. This is referred to as the automix lever. The regulator is set up to give varying amounts of oxygen to the user depending upon the altitude attained.

The demand mask is designed to accommodate an air tight and oxygen tight seal to the face. This mask is expected to retain all of the oxygen thus inhaled into the mask by the user and not be diluted by entry of outside air. The demand regulator and mask provides a higher altitude capability than most continuous flow systems. It may be safely used to altitudes of 40,000 feet.

Pressure demand regulators are designed to furnish oxygen on inhalation either as a mixture of air and oxygen or 100% O_2. This regulator also provides a positive pressure application of oxygen to the mask face piece enabling the users lungs to be pressurized with oxygen. This is of great benefit at extreme altitudes such as 40,000 feet or higher. The oxygen pressure flow may be either manually controlled or function automatically on some regulators at a certain altitude through aneroid action.

The pressure demand masks are designed to create an air tight and oxygen tight seal. The inhalation and exhalation valves are specially designed to permit oxygen pressure build up within the mask face piece and thus supply oxygen under pressure to the lungs.

It is essential that demand and pressure demand masks be properly suspended by an adequate head harness and that the masks be afforded tension adjustments in order for the user to obtain a leak proof seal to the face. The higher you fly, the more critical this adjustment becomes.

PRE-FLIGHT OXYGEN EQUIPMENT CHECK

Prior to flight a person should locate the oxygen mask, practice donning it, and adjust head harness to fit; locate and check function of oxygen pressure gauges, flow indicators and connections; and check quantity of oxygen in the system. The mask should be donned and the O_2 system should be checked for function.

A physical check of the mask and tubing to spot any cracks, tears, or deterioration would also be indicated. If a person is using a mask connection to an individual regulator, check for regulator condition and lever or valve positions as required by that particular system.

GENERAL RULES FOR OXYGEN SAFETY

Do not inspect oxygen equipment with greasy hands. Do not permit accumulation of oily waste or residue in the vicinity of the oxygen system.

Do not use surplus oxygen equipment unless it is inspected by a certified FAA inspection station and approved for use.

Some military components use oxygen containers stressed for a pressure of 450 PSI (low pressure). Needless to say, a hazard exists if a person attempts to put 1800-2200 PSI O_2 pressure in this type container. High pressure O_2 containers should be marked to indicate *1800 PSI* before attempting to fill the container to this pressure. Most individuals do not posses the equipment necessary to fill an aircraft oxygen container from another source of high pressure oxygen. It is recommended that oxygen system servicing be done at FAA certified stations such as are located at some fixed base operations, terminal complexes, etc.

After any use of oxygen, careful attention should be given to ascertain that all flow is shut off before lighting cigarettes, etc.

Oxygen systems must be engineered to protect the individual to the maximum anticipated flight altitude of the aircraft. Before purchasing any oxygen equipment, it is recommended that you brief the distributor on such factors as peak altitude to be flown, number of persons who will use the oxygen system, expected oxygen breathing duration, range of the aircraft, and any other information you think will be helpful in designing a proper oxygen system. Do not make any modification to the system without consulting the supplier or distributor.

Do not place portable oxygen containers in the aircraft unless you fasten them securely to insure against displacement in the event of turbulence, unusual aircraft attitudes, etc.