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Oxygen Equipment

UNIT 3

FLIGHT SURGEON QUALIFICATION COURSE

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Unit 3 Objectives

Identify oxygen systems and equipment components/functions associated with aviation

- Describe the three basic components of oxygen systems (storage, delivery, and mask/components)
- Describe the inspection procedures for individual letters of the PRICE check.

Overview

A basic knowledge of oxygen equipment can be critical since this equipment is the first line of defense against the potentially lethal effects of hypoxia and carbon monoxide poisoning.

It is the responsibility of the pilot that all crewmembers and passengers know how to use the equipment safely and efficiently.

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3 Basic Components of an Oxygen System

- **Storage system**
  - High pressure
  - Low pressure
  - Liquid oxygen (LOX)
  - Solid state (PBE)
  - On-board oxygen generation system (OBOGS)
- **Delivery system**
  - Continuous flow regulators
  - Pressurized Demand System
- **Mask/components**
  - MBU-20/23P
  - Custom
  - Quick-don mask
  - CRU-60/P Connector assembly
  - HGU-55/P Helmet

Oxygen Equipment Storage

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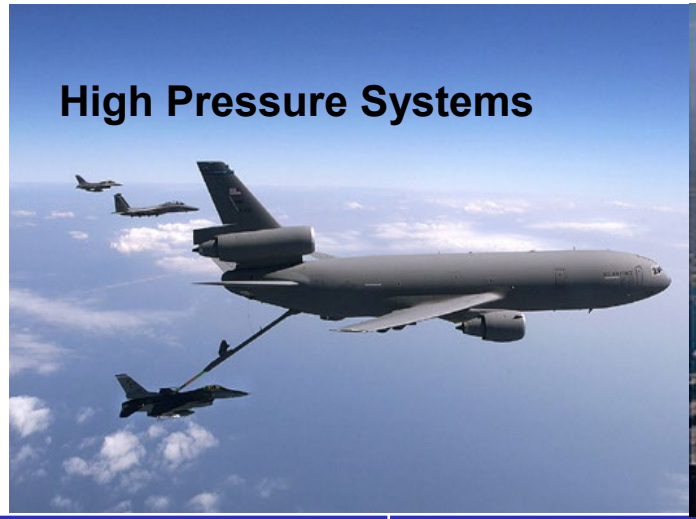
Pure oxygen combines violently with petroleum products creating a significant hazard when handling these materials in close proximity to each other.



	High	Low*
Full	1800 - 2200 psi	400 - 450 psi
Operationally empty at:	200 psi	100 psi
Color code:	Green	Yellow
Aircraft:	KC-10, C-12, C-21, C-130	" The former T-37"

*You must purge the low pressure storage system in order to avoid residual moisture. Water vapor left in the system will flush freeze at higher altitudes.

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Liquid Oxygen (LOX)

LOX (stored at -297 degrees Fahrenheit):

DISADVANTAGES

- **High handling, servicing and operating costs**
- **Working with LOX requires specialized training.**
- **It has no color code.**
- **Can be cleaned and purged by using only heated air.**

ADVANTAGES

- **Storing the oxygen in a liquid state saves 70 percent in space and weight.**
- **1 liquid liter = 860 liters of gaseous oxygen.**
- **95 percent = full, while 10 percent = empty.**

Airman Mackenzie Newman, a cryogenics facilities specialist with the 436th Logistics Readiness Squadron, takes a sample from a liquid oxygen cart in the cryogenics servicing yard Aug. 2, 2012, at Dover Air Force Base, Del. Samples are taken to test the liquid oxygen for impurities. (U.S. Air Force photo by Roland Balik)

LOX

LOX is used on several different aircraft and line pressure varies per usage

- **For example, single or dual seat aircraft (F-15, F-16) will have a line pressure between 70 - 120 psi.**

- **Aircraft with multiple seats (C-17 and B-52) will run the line pressure at 300 psi.**

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Solid State Oxygen Storage

- A solid state oxygen storage system is composed of a Nomex hood with a chlorate candle attached to the back.
- The hood is made of the same material as a fight suit.
- Disadvantages of this system, is that the hood limits your view.
- There is also a 10 – 15 second chlorine odor when you first initialize it.
- This system is used mostly on transport and multi-crew airframes.

On Board Oxygen Generation System (OBOGS) and Molecular Sieve Oxygen Generation System (MSOGS)

- Both these systems capture and store oxygen.
- They both can accommodate various pressures, are low maintenance and low cost.
- However, relying on these solely could cause problems when flying into hostile areas, as chemical or biological agents could contaminate the air.
- OBOGS and MSOGS are used on B-1 bombers and F-15Es.

System Components-
Narrow Panel Automatic Regulator

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The Narrow Panel Automatic Regulator is used with a pressure-demand system. (This is the same system used during altitude chamber training.)

Narrow Panel Automatic Regulator.

- **Flow indicator**
- **Emergency Lever**
- **Diluter Lever**
- **Oxygen Supply Lever**
- **Pressure Gauge**

Narrow panel regulators automatically deliver two stages of positive pressure.

- The first stage is at FL280 – FL320.
- The second stage is FL390 – FL410.
- In an emergency, place the supply lever ON, the diluter lever to 100% OXYGEN and the emergency lever to EMERGENCY.
  - This ensures 100% oxygen under a slight safety pressure.
  - This technique is referred to as “gang-loading” the regulator.
  - It’s used to check the integrity of the mask and equipment, during suspected hypoxia/hyperventilation incidents or during smoke and fumes in the cockpit.

Oxygen Mask/Components

Continuous-flow system

Quick-Don Masks

Pressure-demand flow system

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MBU-20/23 P

- Used for flights up to 50,000 feet MSL, the MBU-20/P oxygen mask is available in four sizes: small narrow, medium narrow, medium wide, and large wide.
- The mask assembly allows for communication and integrates with HGU-series flight helmet assemblies.
- Consists of a hard shell, upper and lower strap assemblies, breathing hose, inhalation valve elbow, and inhalation and exhalation valves.

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CRU-60/P Connector Assembly

The CRU60/P connector assembly serves as an oxygen mask-to-regulator connector assembly. It is essentially a three-way connector providing connection sites for the regulator hose to the mask connector, and the emergency oxygen cylinder hose.

- Push-pull connection
- Neoprene ring
- Two-inch flexible hose
- Mask connector
- Emergency oxygen cylinder hose connection

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HGU-55/P Helmet

- The 55/P helmet is gray, constructed of lightweight material, presents a low profile, and has a detachable visor assembly.
- Provides:
  - Protection from head injury
  - Mounting for the visor assemblies
  - Holds the oxygen mask in place
  - Contains the headset for the communication system
  - Seals off external sounds that cause irritation and fatigue.
- The 55/P helmet is the helmet of choice in the US Air Force and is available in three sizes -- medium, large and extra large.
- It has a two-part liner, the inner most is for increased protection and the outer is custom formed to the individual.

Emergency Oxygen Cylinder

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- The emergency oxygen cylinder is a high pressure gaseous, continuous-flow oxygen system.
- It will provide 100 percent oxygen anytime an alternate source of oxygen is needed due to failure of the aircraft oxygen system, the depletion of other supplemental oxygen sources, suspected aircraft oxygen system contamination or depletion, and/or egress at altitudes up to FL500.
- The unit is usually installed in the parachute or ejection seat and is designed to provide up to 10 minutes of 100 percent oxygen under steadily decreasing pressure.

- It can be manually activated by pulling the green ball-cable assembly (green apple) or green wire.
- The cylinder is also automatically activated upon ejection when using the ACES II ejection seat.
- Once the oxygen flow begins, it cannot be stopped.
- This cylinder can also be found in personal oxygen kits used by passengers on military multi-place aircraft.
- The pressure range is 1,800 psi to 2,200 psi.

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Standard Portable Oxygen Assembly (MA-1)

- The portable oxygen assembly is a low pressure gaseous, manually operated, pressure-demand oxygen system often referred to as a yellow walk-around bottle.
- The system provides 100 percent oxygen under varying degrees of pressure.
- The system is used as an emergency/alternate source of oxygen in the altitude chamber and in military multi-place aircraft.
- The duration of the oxygen supplied depends on altitude, breathing rate, breathing depth, and physical exertion.

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PRICE Check

PRICE is an acronym outlining basic maintenance checks needed prior to using oxygen equipment.

- **P: Pressure** – Includes storage and line pressure.
- **R: Regulator** – Visually check for cracks and dings. Do a functional check to see if it is delivering oxygen.
- **I: Indicator** – Monitor the indicator because it can help gauge rate and depth of breathing; as well as, gaseous flow.
- **C: Connections** – Make sure all connections are secure, including communication connections. Also look for exposed or bare wire.
- **E: Emergency** – Check emergency oxygen, parachutes, and ejection seat controls.

Summary

A basic knowledge of oxygen equipment can be critical since this equipment is the first line of defense against the potentially lethal effects of hypoxia and carbon monoxide poisoning.

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- **Describe the three basic components of oxygen systems (storage, delivery, and mask/components)**
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