2A-35-10: General

The Gulfstream IV is designed to operate at altitudes up to and including 45,000 feet. Both the airplane structure and pressurization system are designed using fail-safe criteria in order to minimize any possibility of exposing the crew and passengers to these critical altitudes. Should the need arise, however, high-pressure gaseous oxygen systems are installed to provide oxygen to all occupants. There are two types of oxygen systems installed on the GIV airplanes: the crew and passenger oxygen system and the portable oxygen system. On airplanes 1500 and subsequent, however, there are also production provisions for a therapeutic oxygen system.

In accordance with Federal Aviation Administration regulations, there must be at least one portable oxygen system (commonly referred to as a “walkaround” cylinder or bottle) aboard the airplane for flight crew use while disconnected from the airplane system. The exact type of system and its location are selected by the operator and installed by the outfitting agency. Specific information describing the portable oxygen system would thus be supplied to the operator by the outfitting agency. Provisions exist to place this data in Chapter 2C, Outfitted Systems, of this manual.

2A-35-20: Crew and Passenger Oxygen Systems

1. **General Description:**

   Two types of production standard gaseous oxygen systems are installed in Gulfstream IV airplanes. Airplanes Serial Number (SN) 1000 through 1289 have only for a single-cylinder crew oxygen system installed. For these airplanes, the outfitting agency selected by the operator installs the passenger oxygen system and performs modifications, if any, to the crew oxygen system. Specific information describing the outfitted oxygen system would thus be supplied to the operator by the outfitting agency. Provisions exist to place this data in Chapter 2C, Outfitted Systems, of this manual.

   Airplanes SN 1290 and subsequent have both the crew and passenger oxygen systems installed. Both types of configurations are discussed in this description.

   The crew oxygen system is a pressure-demand type system, while the passenger oxygen system is a continuous flow type system. When in use, they provide an emergency oxygen source to the flight crew, jump seat observer and cabin passengers. The following units and components compose the system:

   - Oxygen Cylinder and Regulator Assembly
   - Oxygen Servicing Panel
   - Oxygen System Control Panel
   - Passenger Oxygen Control Panel
   - Crew Mask/Regulator Assembly

   All GIV oxygen systems use only aviator’s breathing oxygen conforming to MIL-O-27210. Use of medical oxygen is strictly forbidden due to its high moisture content. This moisture could freeze in the supply lines, rendering the system inoperative.

2. **Description of Subsystems, Units, and Components:**

   A. Oxygen Cylinder and Regulator Assembly:

   (1) Airplanes SN 1000 through 1289:

(See Figure 1.)

The crew oxygen cylinder is constructed of a seamless aluminum liner with a filament overwrap of Kevlar. It has a gaseous capacity of 50 cubic feet (1,416 liters) and is normally pressurized to 1800 psi at 70° F (21° C). The observed pressure reading when fully serviced varies with temperature, however, and may fall in a range between 1,485 psi at 0° F (-18° C) to 2015 psi at 120° F (49° C). The crew oxygen cylinder is installed underneath the forward cabin floor, in the area approximately between the second set of cabin windows.

A regulator assembly is attached to the neck of the cylinder. The primary function of the regulator is to reduce high cylinder pressure to a nominal delivery pressure of approximately 70 psi. A manual ON/OFF knob is installed on the regulator to allow or inhibit oxygen flow directly from the cylinder. The knob is accessible from the cabin through an access panel cut into the floorboard.

In addition to controlling oxygen supply and its delivery pressure, the regulator assembly provides ports for the following connections:

(a) Oxygen Cylinder Direct Reading Gauge:

A direct reading gauge is installed on each regulator assembly in order to obtain oxygen cylinder pressure directly from the cylinder.

(b) Supply Line:

A supply line exiting the cylinder pressure regulator routes oxygen to the crew oxygen system control panel where flow can be controlled by the panel's ON/OFF toggle switch. When the toggle switch is selected ON, flow is routed to the three crew mask/regulator assemblies. A check valve is installed on the supply line to prevent system backflow.

A pressure switch is installed between the cylinder pressure regulator and check valve to monitor supply line pressure. If the switch senses a line pressure below approximately 50 psi, a discrete is sent to Data Acquisition Unit (DAU) #1. DAU #1 in turn causes the Crew Alerting System (CAS) to display an amber CREW OXYGEN OFF caution message. The purpose of this message is to caution the flight crew that the oxygen cylinder may have been manually shut off at the cylinder.

(c) Fill Line:

A fill line is installed to transfer oxygen from an external source connected to the oxygen servicing panel (left forward nose section) to the oxygen cylinder.

(d) Gauge Line:

A dedicated gauge line is installed to allow viewing of cylinder pressure. Leaving the regulator assembly, the gauge line connects to the direct reading gauges on the oxygen servicing panel (left forward nose section) and the crew oxygen system control panel (pilot's skirt panel). Flow restrictors are incorporated so that should a gauge line rupture, the resulting oxygen loss rate would be limited to

approximately one liter per minute.

(e) Overboard Discharge Line:

An overboard discharge line is installed to vent oxygen overboard through a port located on the left fuselage, forward of the wing leading edge. The cylinder regulator will allow overboard discharge under the following conditions:

- Regulated oxygen pressure exceeds 90 psi, activating the regulator's relief valve
- Oxygen cylinder pressure exceeds 2775 psi, rupturing the regulator's high pressure burst disk
- Oxygen temperature exceeds 225 (±5)° F, melting the regulator's high pressure burst disk

The overboard discharge port is covered by a overboard discharge disk. See Figure 3. In addition to preventing contaminants from entering the overboard discharge line, the disk serves as a visual indicator to the flight crew that an overboard discharge has occurred, by being blown out and off the discharge port. It is green in color and labeled OXY. H.P. RELIEF.

(2) Airplanes SN 1290 and Subsequent:

(See Figure 2.)

Each of the three oxygen cylinders (one crew and two passenger) is constructed as a seamless aluminum liner with a filament overwrap of Kevlar. Each cylinder is normally pressurized to 1800 psi at 70° F (21° C). The observed pressure reading when fully serviced varies with temperature, however, and may fall in a range between 1,485 psi at 0° F (-18° C) to 2015 psi at 120° F (49° C). All three cylinders are installed underneath the forward cabin floor. The two passenger cylinders each have a gaseous capacity of 115 cubic feet (3,257 liters) and are installed side by side in the area approximately between the first set of cabin windows. The crew cylinder has a gaseous capacity of 50 cubic feet (1,416 liters) and is installed just aft of the passenger cylinders. Provisions exist for an optional second crew cylinder to be installed beside the standard crew cylinder if selected by the operator during outfitting.

A regulator assembly is attached to the neck of each cylinder. The primary function of the regulator is to reduce high cylinder pressure to a nominal delivery pressure of approximately 70 psi. A manual ON/OFF knob is installed on each regulator to allow or inhibit oxygen flow directly from that cylinder. These knobs are accessible from the cabin through access panels cut into the floorboard.

In addition to controlling oxygen supply and its delivery pressure, each regulator assembly provides ports for the following connections:

(a) Oxygen Cylinder Direct Reading Gauge:

A direct reading gauge is installed on each oxygen cylinder regulator in order to obtain oxygen cylinder pressure directly from the cylinder.

(b) Supply Lines:

A supply line exits each passenger cylinder pressure regulator, later joining to form a common passenger supply line. A check valve is installed on each passenger cylinder supply line (before joining occurs) to prevent system backflow. The common passenger supply line routes oxygen to the oxygen control panel where flow can be controlled by the panel's ON/OFF toggle switch. When the toggle switch is selected ON, flow is routed through a common supply line that is subsequently divided into two lines. One line delivers oxygen to the passenger oxygen control panel, where it may be further distributed to the left and right side passenger masks. The other line connects to the crew oxygen supply line downstream of the CREW OXYGEN ON/OFF toggle switch. This line enables the passenger oxygen system to deliver oxygen to the crew oxygen system. A check valve installed on this line prevents crew oxygen flow into the passenger oxygen system.

Provisions also exist for the passenger cylinder supply line to deliver oxygen to therapeutic oxygen outlets, when such optional outlets are installed.

A supply line exiting the crew cylinder pressure regulator routes oxygen to the oxygen control panel where flow can be controlled by the panel's ON/OFF toggle valve switch. When the switch is selected ON, flow is routed to the three crew mask/regulator assemblies. A check valve is installed on the supply line to prevent system backflow.

A pressure switch is installed between each cylinder pressure regulator and check valve to monitor supply line pressure. If the switch senses a line pressure below approximately 50 psi, a discrete is sent to DAU #1. DAU #1 in turn causes CAS to display an amber CREW OXYGEN OFF and/or PAX OXYGEN OFF caution message. The purpose of these messages is to caution the flight crew that the oxygen cylinder may have been manually shut off at the cylinder.

(c) Fill Lines:

Fill lines are installed to transfer oxygen from an external source connected to the oxygen servicing panel (left forward nose section) to the oxygen cylinders via the regulator assemblies. The passenger oxygen system fill line begins as a single line at the servicing panel. The line is then divided into a dedicated line for each passenger cylinder. The crew oxygen system uses a single fill line dedicated to the crew cylinder.

(d) Gauge Lines:

Dedicated gauge lines are installed to allow viewing of cylinder pressure. The crew cylinder gauge line begins as a single line leaving the regulator assembly. It is then divided downstream into two lines: one line connecting to the direct reading gauge on the oxygen servicing panel (left forward

nose section); the other line connecting to the direct reading gauge on the oxygen control panel (pilot's skirt panel).

The passenger cylinder gauge line begins as a single line leaving each regulator assembly. Both lines then join to form a common line. Further downstream, the single line is divided into two lines: one line connecting to the direct reading gauge on the oxygen servicing panel (left forward nose section); the other line connecting to the direct reading gauge on the oxygen control panel (pilot's skirt panel).

Flow restrictors are incorporated so that should a gauge line rupture, the resulting oxygen loss rate would be limited to approximately one liter per minute.

(e) Overboard Discharge Line:

Two overboard discharge lines (passenger and crew) are installed to vent oxygen overboard through ports located on the left fuselage, forward of the wing leading edge. The forward discharge port is used by the passenger oxygen system; the aft discharge port is used by the crew oxygen system. The cylinder regulator will allow overboard discharge under the following conditions:

- Regulated oxygen pressure exceeds 90 psi, activating the regulator's relief valve
- Oxygen cylinder pressure exceeds 2775 psi, rupturing the regulator's high pressure burst disk
- Oxygen temperature exceeds 225 (±5)° F, melting the regulator's high pressure burst disk

Each overboard discharge port is covered by a overboard discharge disk. See Figure 3. In addition to preventing contaminants from entering the overboard discharge line, the disk serves as a visual indicator to the flight crew that an overboard discharge has occurred, by being blown out and off the discharge port. It is green in color and labeled OXY. H.P. RELIEF.

B. Oxygen Servicing Panel:

(1) Airplanes SN 1000 through 1289:

(See Figure 4.)

The oxygen servicing panel is located under an access door on the left forward nose section. The panel consists of an external high pressure filler valve and a direct reading pressure gauge for the crew oxygen system. The filler valve, with chain and cap, is connected via a single fill line to the oxygen cylinder regulator and provides a point for servicing the system. The direct reading pressure gauge allows the crew oxygen system pressure to be checked at the panel.

(2) Airplanes SN 1290 and Subsequent:

(See Figure 5.)

The oxygen servicing panel is located under an access door on the left forward nose section. The panel consists of two external high

pressure filler valves and two direct reading pressure gauges: the upper set for the passenger oxygen system; the lower set for the crew oxygen system.

The passenger oxygen system filler valve, with chain and cap, provides a point for servicing the system. It is connected to what begins as a single fill line. Downstream, however, this single line divides into two lines, one line dedicated to each passenger oxygen cylinder. The associated direct reading pressure gauge allows the passenger oxygen system pressure to be checked at the servicing panel. The gauge line is constructed in the same manner as the fill line, i.e., a single line at the gauge dividing into two lines, one line dedicated to each passenger oxygen cylinder.

The crew oxygen system filler valve, with chain and cap, is connected via a single fill line to the crew oxygen cylinder regulator and provides a point for servicing the system. The associated direct reading pressure gauge allows the crew oxygen system pressure to be checked at the servicing panel.

C. Oxygen System Control Panel:

(See Figure 6.)

(1) Airplanes SN 1000 through 1289:

The crew oxygen system control panel is located on the pilot's skirt panel. It contains an ON/OFF toggle valve switch that controls oxygen flow to the three crew mask/regulator assemblies. The control panel also contains a pressure gauge that displays crew oxygen system pressure on the oxygen gauge line. Lighting for the control panel is supplied by the cockpit lighting system.

(2) Airplanes SN 1290 and Subsequent:

The crew and passenger oxygen control panel is located on the pilot's forward instrument panel. It contains both crew and passenger pressure gauges, each displaying oxygen system pressure on the respective oxygen gauge line. The control panel also contains two ON/OFF toggle valve switches, each controlling oxygen flow to the respective oxygen systems. Lighting for the control panel is supplied by the cockpit lighting system.

D. Passenger Oxygen Control Panel (All GIV Aircraft):

(See Figure 7.)

The passenger oxygen control panel, located on the copilot's right console panel, controls and annunciates oxygen flow and displays system pressure to the passenger oxygen masks. (The type, quantity and location of passenger masks is selected by the aircraft owner and installed during aircraft outfitting.) Lighting for the control panel is supplied by the cockpit lighting system. The passenger oxygen control panel has the following components:

(1) OFF / AUTO / MAN Knob:

The OFF / AUTO / MAN knob controls the oxygen flow to the passenger oxygen masks. In the OFF position, oxygen flow to the passenger oxygen masks is inhibited. The AUTO position allows the passenger oxygen control panel to deploy (drop) the passenger

oxygen masks automatically when sensed cabin altitude reaches 13,000 ±500 feet. Oxygen flow to the passenger oxygen masks is then regulated based on cabin altitude. Manual selection to the MAN position deploys the passenger oxygen masks and provides a constant preset flow.

(2) PASS OXYGEN ON Annunciator:

When oxygen flow through the passenger oxygen control panel is sensed, a pressure switch inside the passenger oxygen control panel closes, causing a discrete to be sent to DAU #1. DAU #1 in turn causes the CAS to display an amber CABIN OXYGEN ON caution message. The pressure switch also causes the PASS OXYGEN ON annunciator to illuminate amber.

(3) OXYGEN SUPPLY PRESSURE Gauge:

The OXYGEN SUPPLY PRESSURE gauge displays oxygen system pressure available to the passenger oxygen masks.

(4) ALT TEST Port:

The ALT TEST port is used by maintenance personnel to check the automatic operation of the passenger oxygen control panel.

(5) Passenger Oxygen TEST Button (Airplanes 1457 and Subs):

Currently, there are production provisions for a PASS OXY test button on the TEST panel (copilot side of center console).

The passenger oxygen system is normally operated by **first** ensuring the OFF / AUTO / MAN knob is set to OFF on the passenger oxygen control panel. Next, passenger oxygen is selected ON at the oxygen system control panel. (This sequence ensures the passenger oxygen masks do not inadvertently deploy.) **After** passenger oxygen is selected ON, the OFF / AUTO / MAN knob is then set to AUTO. In this configuration, the passenger oxygen control panel will deploy the passenger oxygen masks automatically when sensed cabin altitude reaches 13,000 ±500 feet.

When the passenger oxygen masks are deployed, an amber CABIN OXYGEN ON will be displayed on CAS, along with the associated aural caution tone. In addition, the NO SMOKING signs in the cabin and lavatory areas will illuminate and the cabin chime will sound momentarily.

E. Crew Mask/Regulator Assembly (All GIV Aircraft):

(Descriptions and illustrations in this section are limited to the EROS MXP 300 crew mask/regulator. For further details on the EROS MXP 100 and MXP 300 crew mask/regulators, refer to EROS Operating and Maintenance Instructions, EROS document number 4NUT0045A, dated October 15, 1999 or later approved version. See Figure 8.)

The mask/regulators are normally kept in stowage compartments located on the pilot's side console, copilot's side console and left hand radio rack. The mask is removed from the stowage compartment by grasping the regulator with three fingers (middle, ring and small), while keeping the thumb and forefinger open, and withdrawing the mask. When the mask/regulator is removed from the stowage compartment, the open doors activate a shutoff valve, making oxygen available to the mask. The blinker will display a yellow cross when oxygen is flowing.

In order to prevent inflating the mask harness before it is withdrawn from

the stowage compartment, the inflation valve (red ears) is not depressed until after the mask is out of the stowage compartment. The inflation valve can then be depressed with the thumb and forefinger, inflating the harness. Releasing the inflation valve vents the harness to ambient, allowing the elastic in the harness to create a snug fit over the nose and mouth.

Each mask/regulator stowage unit contains a PRESS TO TEST AND RESET control lever (left door) and a flow indicator (blinker) that displays a yellow cross (+) for oxygen flow and black for no flow. The mask/regulator may be tested while in the stowed position as described at the end of this section.

The PRESS TO TEST AND RESET control lever allows leak testing of the regulator while stowed. When the control lever is depressed, the blinker will display a yellow cross and then return to black, indicating that the regulator is leak-tight. If the blinker remains yellow, a leak in the system should be assumed and investigated. The PRESS TO TEST AND RESET control lever also can be used to shut off oxygen flow to the mask/regulator and blinker in the event of a system failure. If the left door on the stowage compartment is first closed and then followed by depressing the PRESS TO TEST AND RESET control lever, oxygen flow will cease.

Each mask/regulator has an inflating harness, inflation valve (red ears), N-100% control lever, PRESS TO TEST/EMERGENCY control knob, microphone, hose with quick-disconnect fitting and a communication harness.

The N-100% control lever provides diluted oxygen, regulated by altitude and demand, while in the “N” (normal) position. As cabin altitude increases, an aneroid capsule in the mask/regulator expands to decrease ambient airflow the wearer breathes. This action increases the oxygen to ambient air ratio until the cabin altitude reaches 35,000 feet. At this cabin altitude, the aneroid capsule has completely shut off ambient airflow and the wearer is now breathing 100% oxygen. 100% oxygen flow is also supplied when the N-100% control lever is depressed to the “100%” position.

The PRESS TO TEST/EMERGENCY control knob has three functions. When momentarily depressed, it verifies the regulator valve will supply oxygen under constant pressure. In the NORMAL position, it allows the regulator’s aneroid capsule to regulate positive pressure to assist breathing at cabin altitudes between 36,000 feet and 45,000 feet. In the EMERGENCY position, 100% oxygen is supplied in a “positive pressure on demand” mode to assist breathing.

3. Controls and Indications:

For airplanes SN 1000 through 1289, see Figure 1, Figure 3, Figure 4 and Figure 6 through Figure 8. For airplanes SN 1290 and subsequent, see Figure 2, Figure 3 and Figure 5 through Figure 8.

A. Caution (Amber) CAS Messages:

CAS Message	Cause or Meaning
CABIN OXYGEN ON	Passenger oxygen system has been activated by either manual or automatic means.
CREW OXYGEN OFF	Crew oxygen bottle is shut off at the bottle.
PAX OXYGEN OFF	Passenger oxygen bottle is shut off at the bottle.

B. Advisory (Blue) CAS Messages:

CAS Message	Cause or Meaning
AUX OXYGEN ON **(1)**	Auxiliary oxygen source is on.
MED OXYGEN ON **(1)**	Medical oxygen is on.
OXY SRVC DR OPEN **(1)**	Oxygen servicing panel access door is open.

NOTE(S):

(1) These are custom programmable messages activated as desired during outfitting.

C. Other Annunciations:

Indication	Cause or Meaning
Amber PAX OXYGEN ON light on passenger oxygen control panel.	Passenger oxygen system has been activated by either manual or automatic means.
Yellow cross (+) indicator (blinker) visible on crew mask/regulator assembly.	Oxygen is flowing to crew mask/regulator assembly.

4. Limitations:

A. Flight Manual Limitations:

(1) Oxygen Departure Pressures:

The quantity of oxygen required varies with the flight profile. The method of determining minimum oxygen quantity is shown in Figure 9.

B. Crew Mask/Regulator Preflight Check:

This procedure allows the flight crew the ability to perform a complete preflight check without removing the mask/regulator from its stowage compartment.

(1) Select the crew oxygen system toggle valve switch to ON.

(2) Check the crew oxygen system supply pressure.

(3) On the crew mask/regulator stowage compartment, perform the following based upon the type of crew mask/regulator installed:

(a) For the EROS MXP 100, slide the RESET TEST control lever (left hand door) aft.

(b) For the EROS MXP 300, depress the PRESS TO TEST AND RESET control lever (left hand door).

(4) Observe that a white band is visible at the top of the RESET TEST control lever (left hand door, MXP 100 only).

(5) Observe that the flow indicator (blinker) momentarily displays a yellow cross (+), then returns to black. This indicates the regulator is leak-tight. If the blinker continuously displays the yellow cross, a leak in the system should be assumed and investigated.

(6) While holding the MXP 100 RESET TEST control lever aft (or MXP 300 PRESS TO TEST AND RESET control lever depressed), depress and hold the red PRESS TO TEST button on the mask regulator.

(a) Observe that the blinker momentarily displays a yellow cross, then returns to black. This indicates the regulator demand mechanism is working properly.

(b) If a headset is being worn while performing this test, mask microphone operation can be checked by listening for oxygen flow noise.

(7) Release the PRESS TO TEST button on the mask regulator.

(8) Release the MXP 100 RESET TEST control lever (or MXP 300 PRESS TO TEST AND RESET control lever).

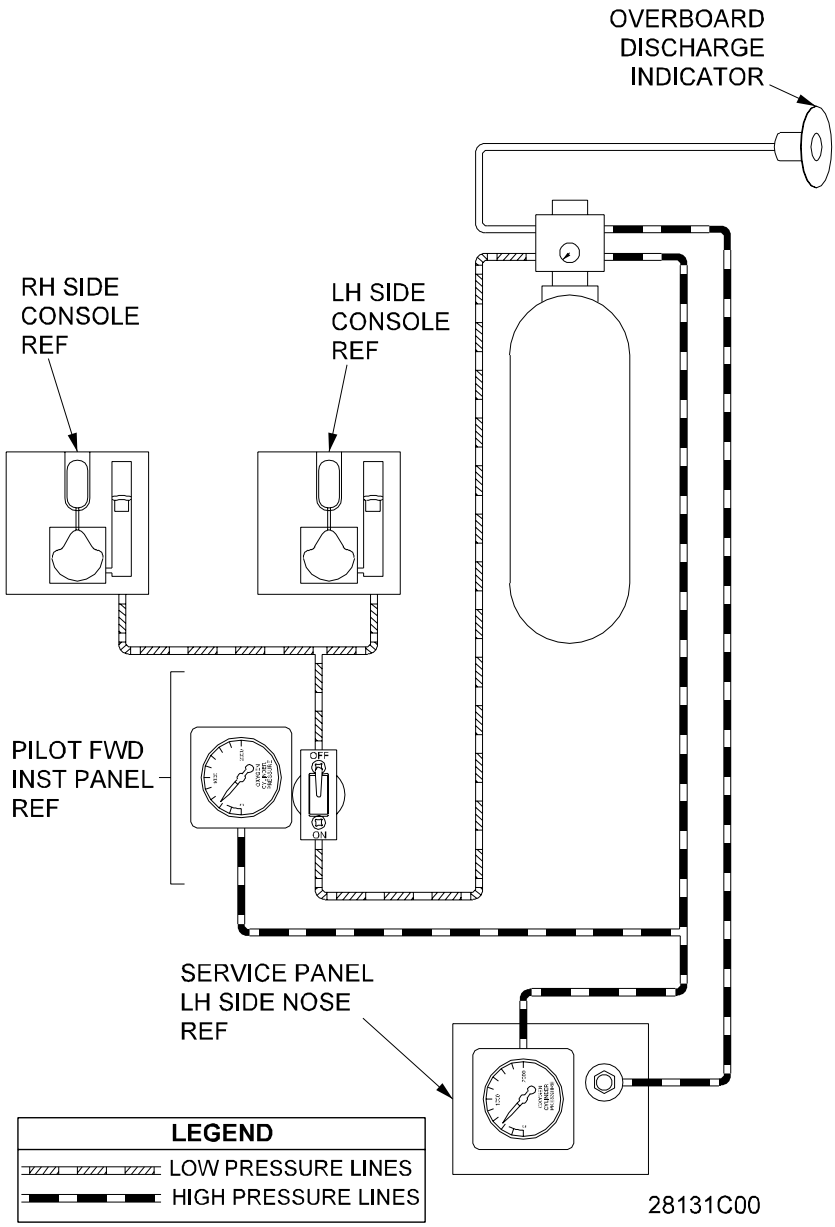
(a) Observe the white band (top of RESET TEST control lever, left hand door, MXP 100 only) is no longer visible.

(b) Observe that oxygen flow ceases.

(9) Select the crew oxygen system toggle valve switch to OFF, if desired.

C. Average Time of Useful Consciousness:

- 15,000 to 18,000 feet = 30 minutes or more
- 22,000 feet = 5 to 10 minutes
- 25,000 feet = 3 to 5 minutes
- 28,000 feet = 2½ to 3 minutes
- 30,000 feet = 1 to 2 minutes
- 35,000 feet = 30 to 60 seconds
- 40,000 feet = 15 to 20 seconds
- 45,000 feet = 9 to 15 seconds
- 51,000 feet = less than 9 seconds



Crew Oxygen System Simplified Block Diagram: Airplanes SN 1000 Through 1289
Figure 1

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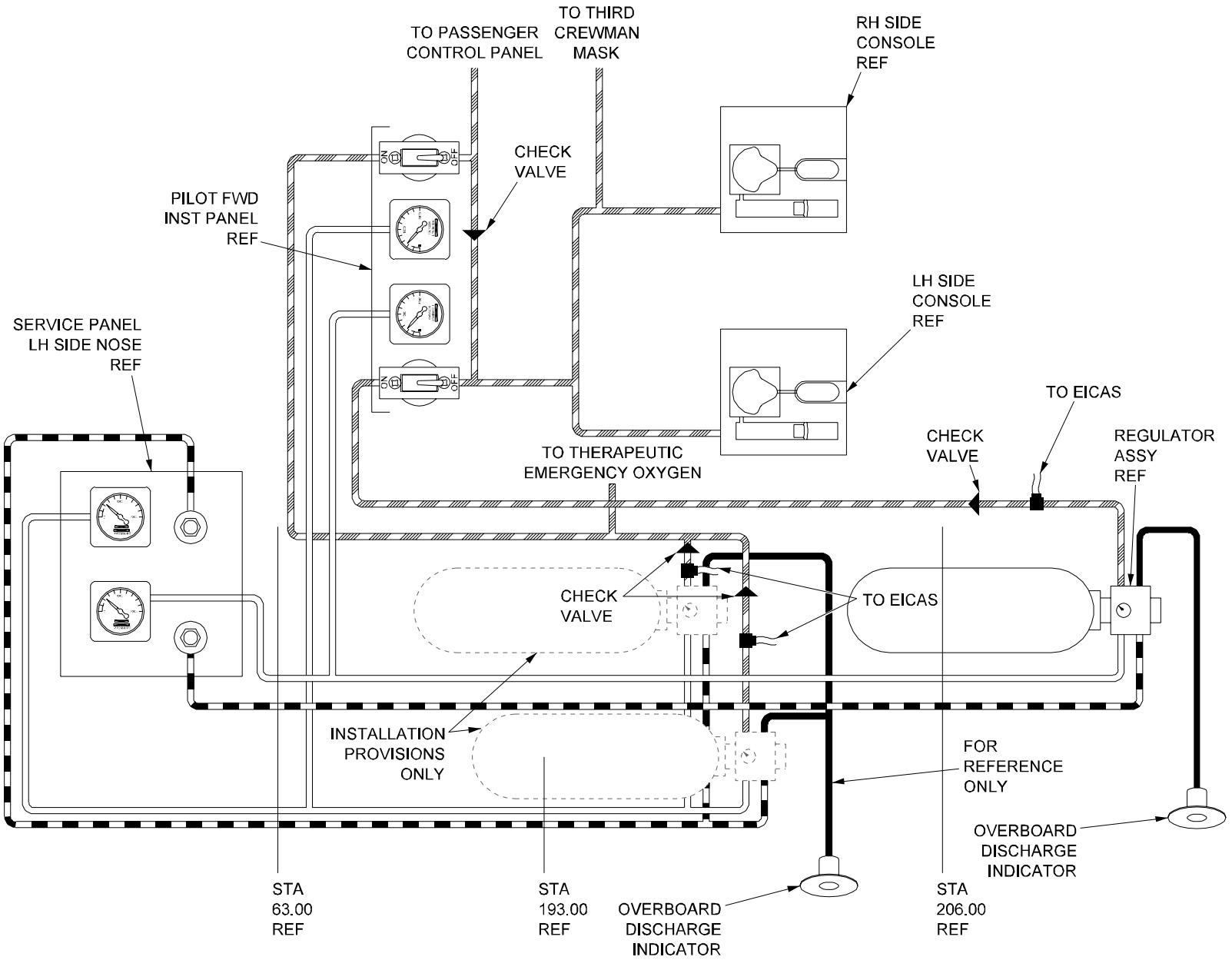

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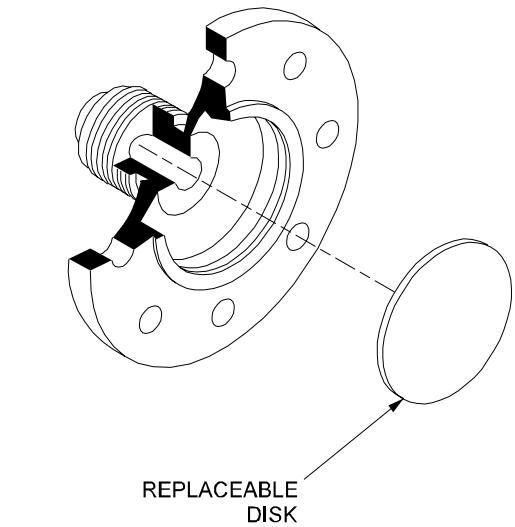
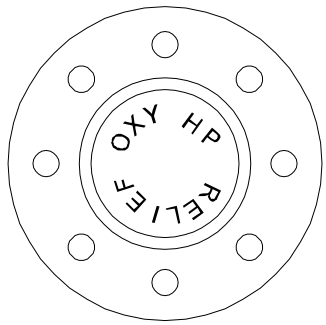
Crew and Passenger Oxygen System Simplified Block Diagram: Airplanes SN 1290 and Subsequent
Figure 2





OVERBOARD
DISCHARGE
INDICATOR

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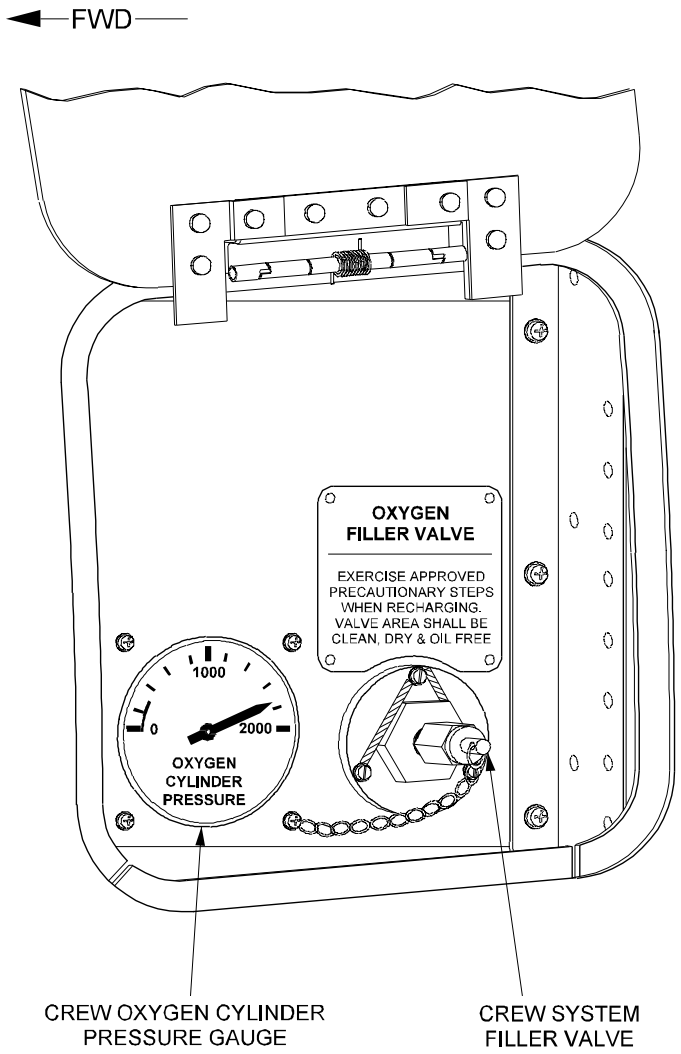
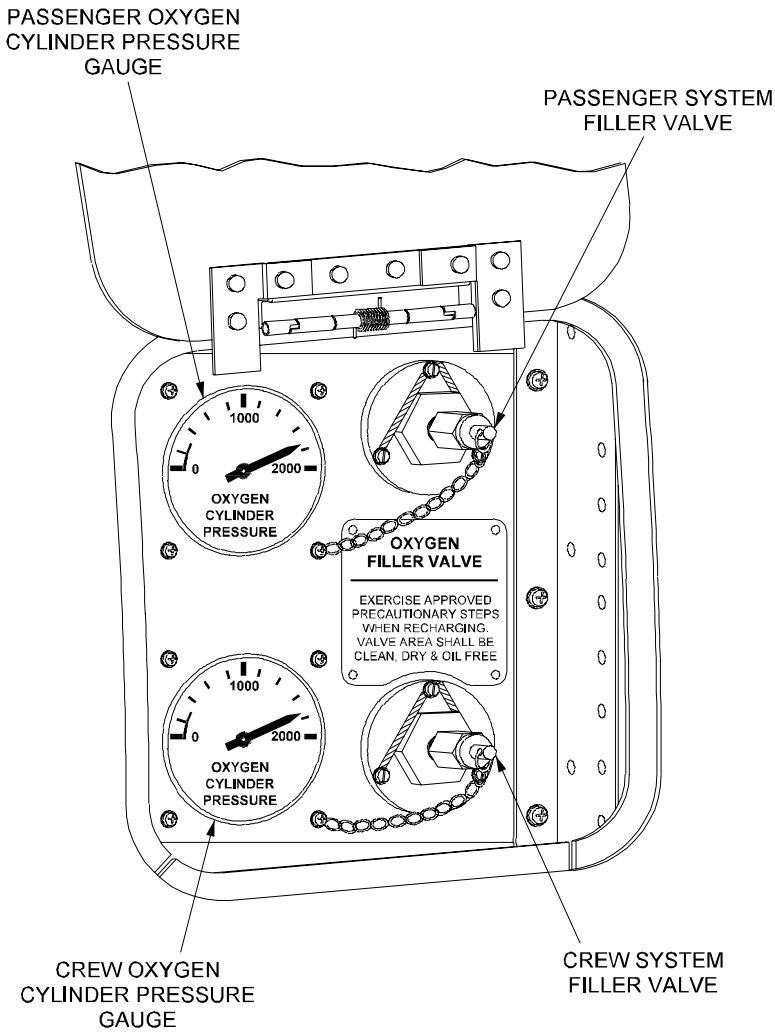
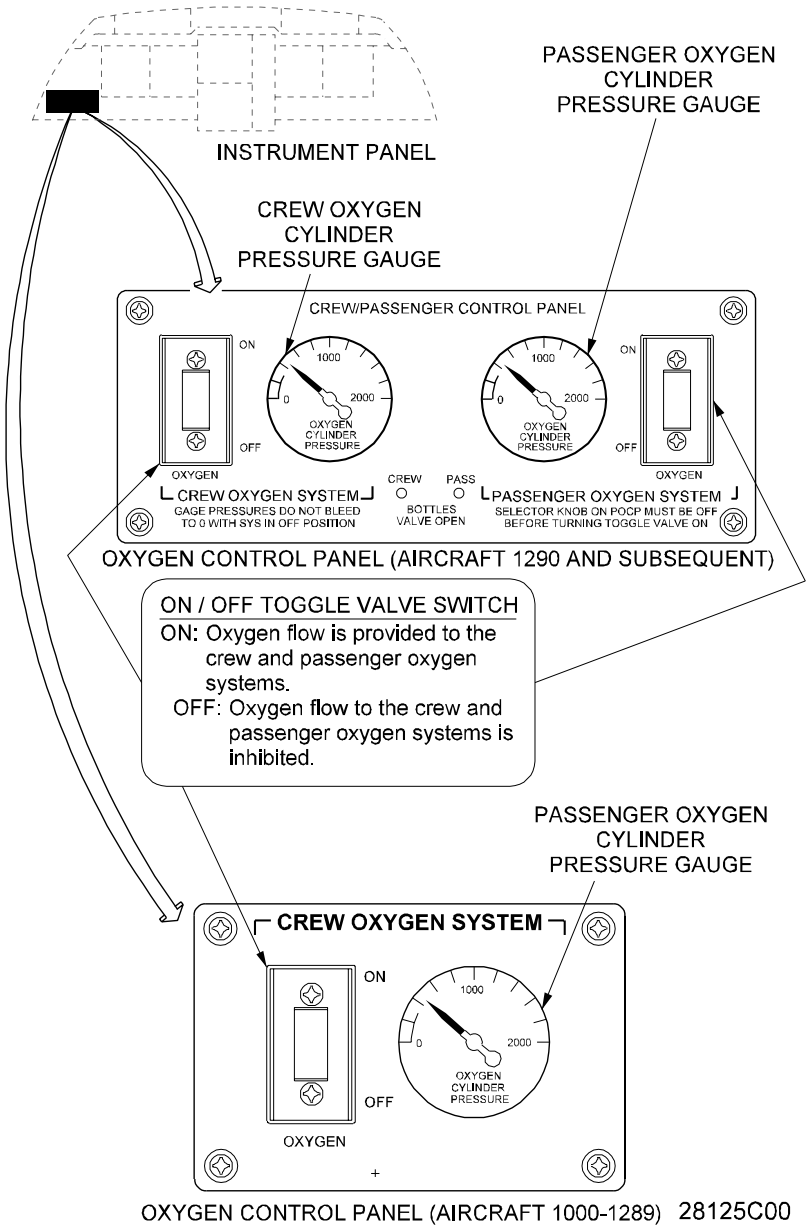
Overboard Discharge Indicator
Figure 3



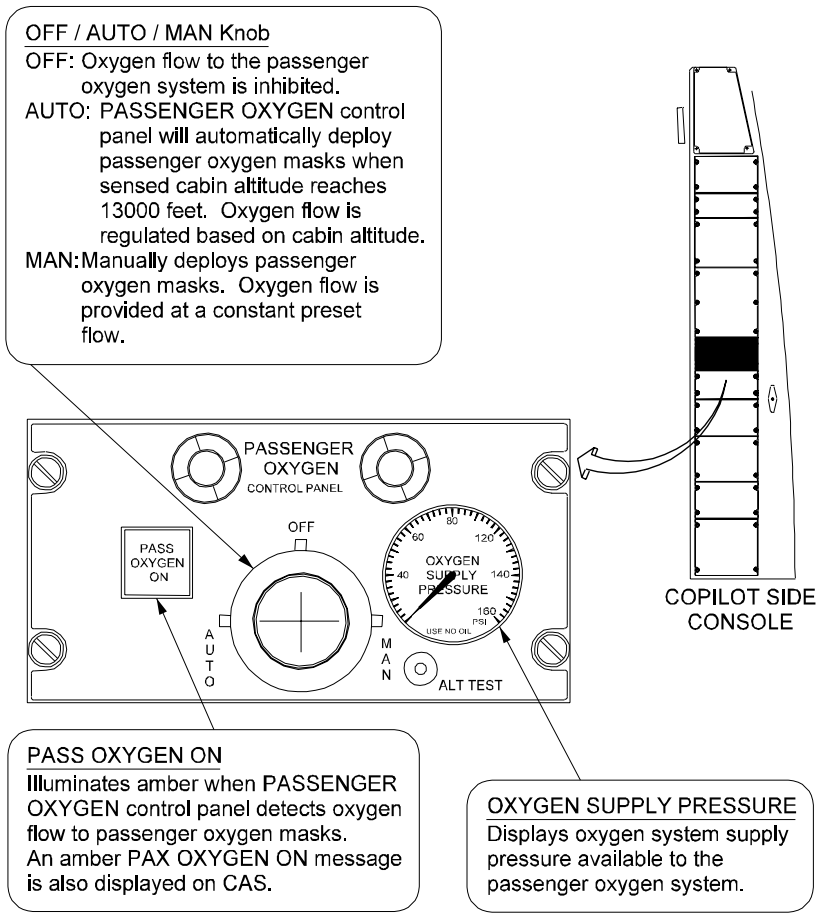
Oxygen Servicing Panel: Airplanes SN 1000 Through 1289
Figure 4



Oxygen Servicing Panel: Airplanes SN 1290 and Subsequent
Figure 5



Oxygen System Control Panels
Figure 6



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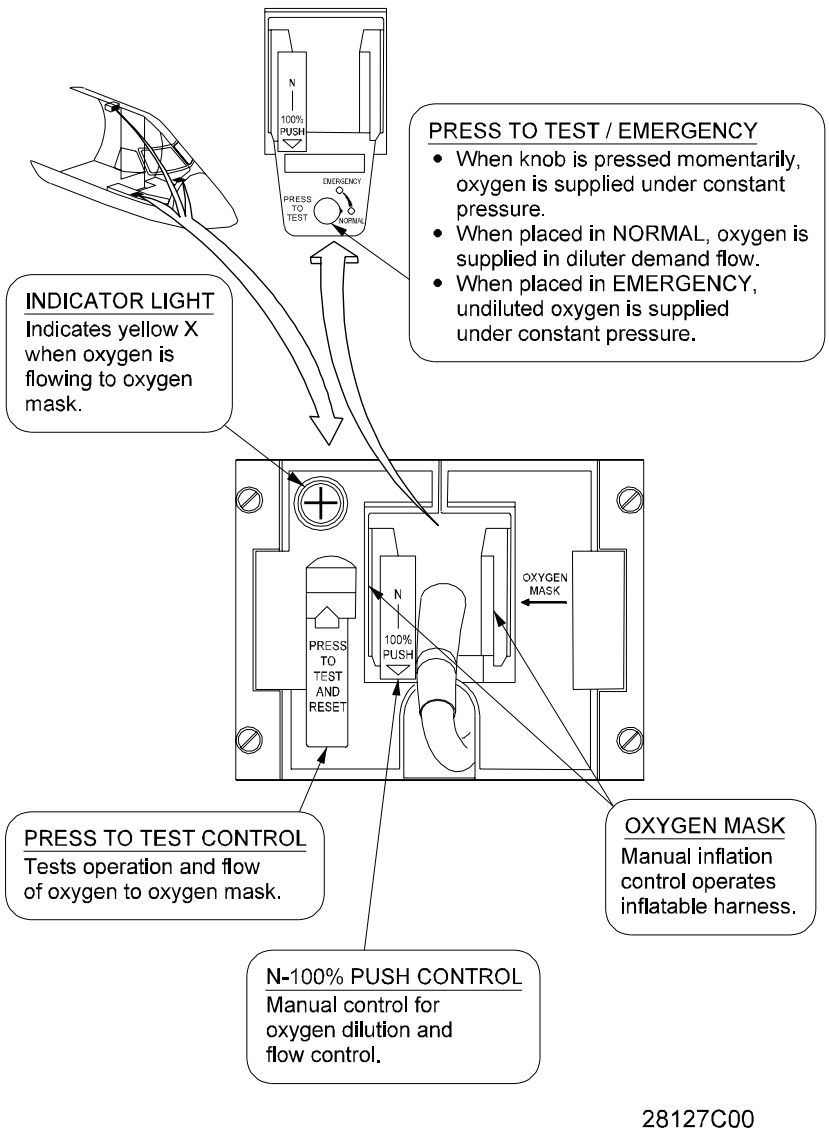
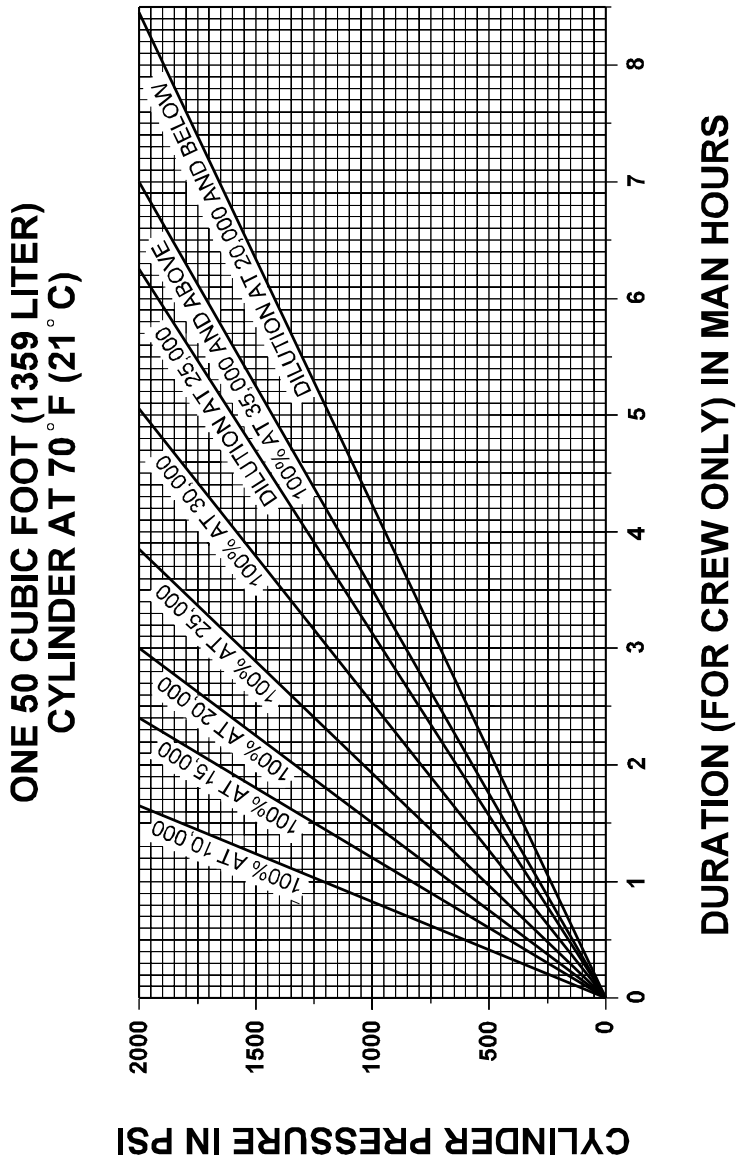
Passenger Oxygen Control Panel
Figure 7



EROS MXP 300 Crew Mask/Regulator Assembly
Figure 8



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Oxygen Duration Versus Cabin Altitude
Figure 9

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