CHAPTER 35 - OXYGEN

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Intentionally Left Blank

GENERAL

The aircraft includes two oxygen supply systems: one fixed and one portable, thus providing adequate means in case of pressurization system failure, smoke on board or similar emergency.

– ***Fixed Oxygen System:*** this system uses gaseous oxygen to feed three sockets located in the cockpit.

– ***Portable Oxygen System:*** includes four bottles of gaseous oxygen that enable to breathe while at emergency conditions, as well as for therapeutically use.

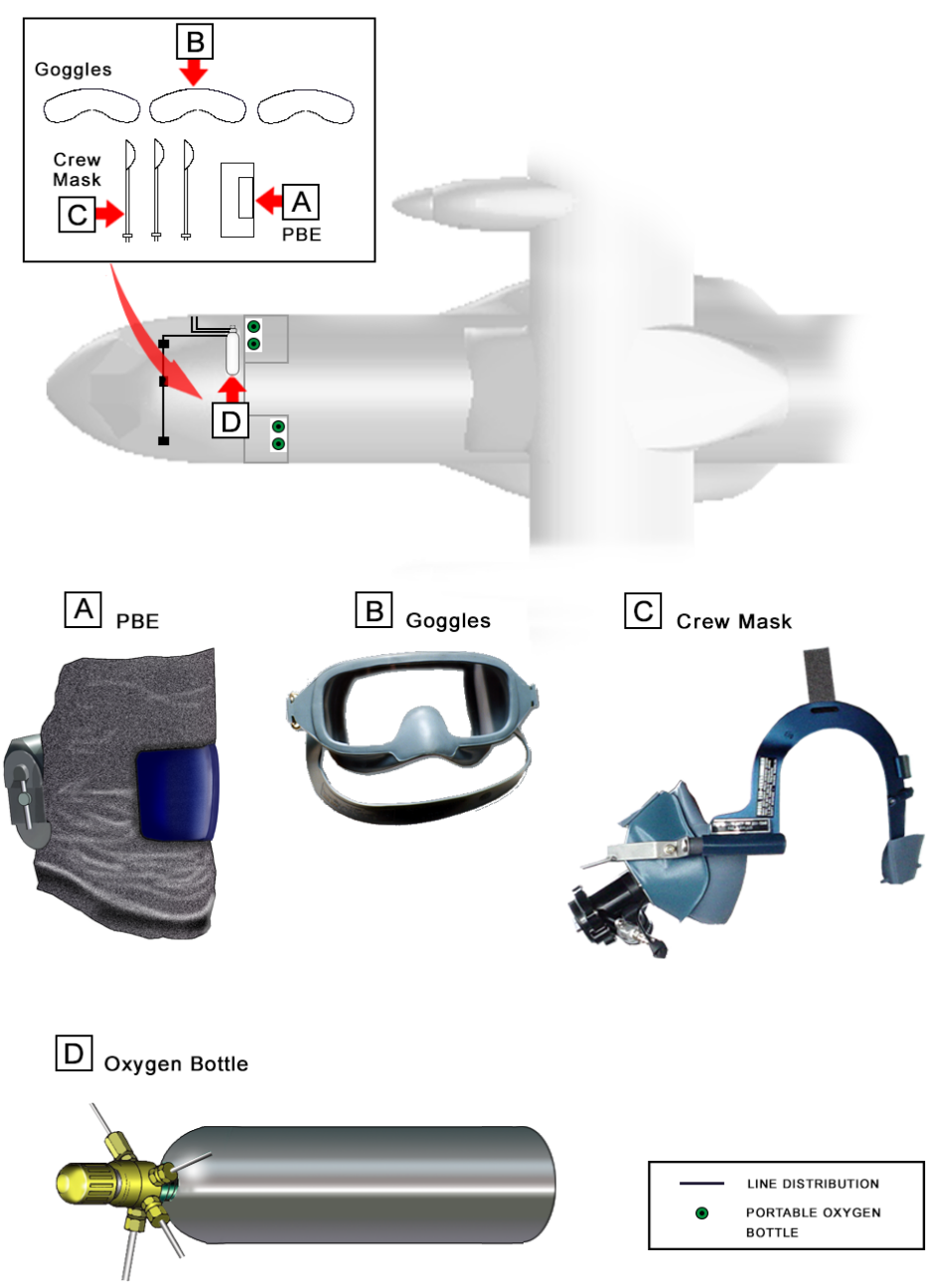


Figure 35-1 Oxygen System - Components

FIXED OXYGEN SYSTEM

Fixed oxygen system is intended to provide adequate oxygen supply at any normal flight altitude. In particular it is intended for normal supply at cabin altitudes above 8000 ft, in case of smoke or toxic gases presence, fire on board or if pressurization system fails.

DESCRIPTION

The system uses pressurized gaseous oxygen. It includes a fixed installation to store oxygen and feed three supply connections in the cockpit. Oxygen can be supplied to the pilot, copilot and a third crew member.

Main system components are:

- ***Oxygen Bottle:*** it consists of a storage bottle and a pressure regulator valve for oxygen supply, adjustment and filling. It is located under the floor at the forward part of the fuselage. It is green-coloured and has a bonded nameplate in which gas specification and related cylinder data are displayed. Capacity of the bottle is 1275 litres. Maximum weight is 6.37 kg when filled at 20ºC. Pressure must be between 500 and 1850 psi. In case of dangerous overpressure condition, between 2700 and 3000 psi at 60ºF (190 and 210 kg/cm^2 at 15ºC), a safety disc in the regulator valve breaks and pressure is released through the discharge indicator.

- ***Shutoff Valve:*** it is a toggle lever operated valve. It provides manual ON/OFF control of oxygen flow from the regulator valve to the outlets. This valve is controlled by means of a switch at the oxygen control unit at C/M-2 console

- ***Three Masks Sockets:*** located one at the pedestal and at C/M-1 and C/M-2 consoles. Each socket has a small push-fit valve which prevents the oxygen flowing unless any mask tube is connected. All sockets are protected with a spring-loaded cover to prevent dirt or undesired bodies getting into.

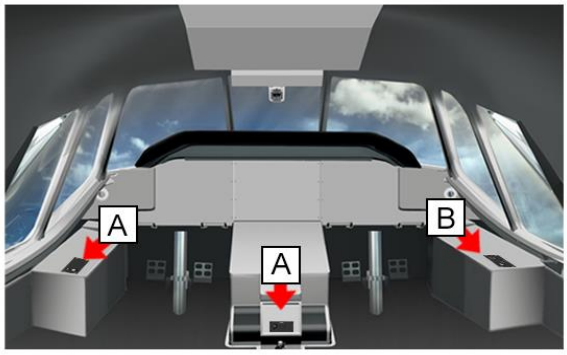
- ***Contents gauge:*** it is a bourdon pressure gauge connected to the high pressure side of the regulator valve. It is calibrated to indicate pressures from 0 to 2000 psi. This gauge is installed at the C/M-2 console and provides the crew with the bottle pressure information.

- ***Filling Valve:*** it is a check valve installed in a body attached to a bracket with three mounting holes. A protection cap and a chain assembly prevents the dirt or moisture entering the filling connection.

- ***Overpressure Discharge Indicator:*** it is a green-coloured disc, installed and attached with a snap ring to a light alloy red-coloured body. It is connected to the high pressure safety valve on the oxygen bottle. The green disc breaks when the safety valve operates and then the red colour comes into view to indicate overpressure in the bottle.

- ***Crew Masks:*** there are three oxygen crew masks with microphone connector, two behind the C/M-1 and one behind the C/M-2. The oxygen mask is a folding quick-don type with a pressure vent valve to remove the smokes or fumes. It also includes a diluter-demand regulator with emergency pressure, operational up to 40000 ft, a flow indicator and a CESSNA type connector. Masks hang over the flight compartment walls (near to each crewmember and are easily unhooked).

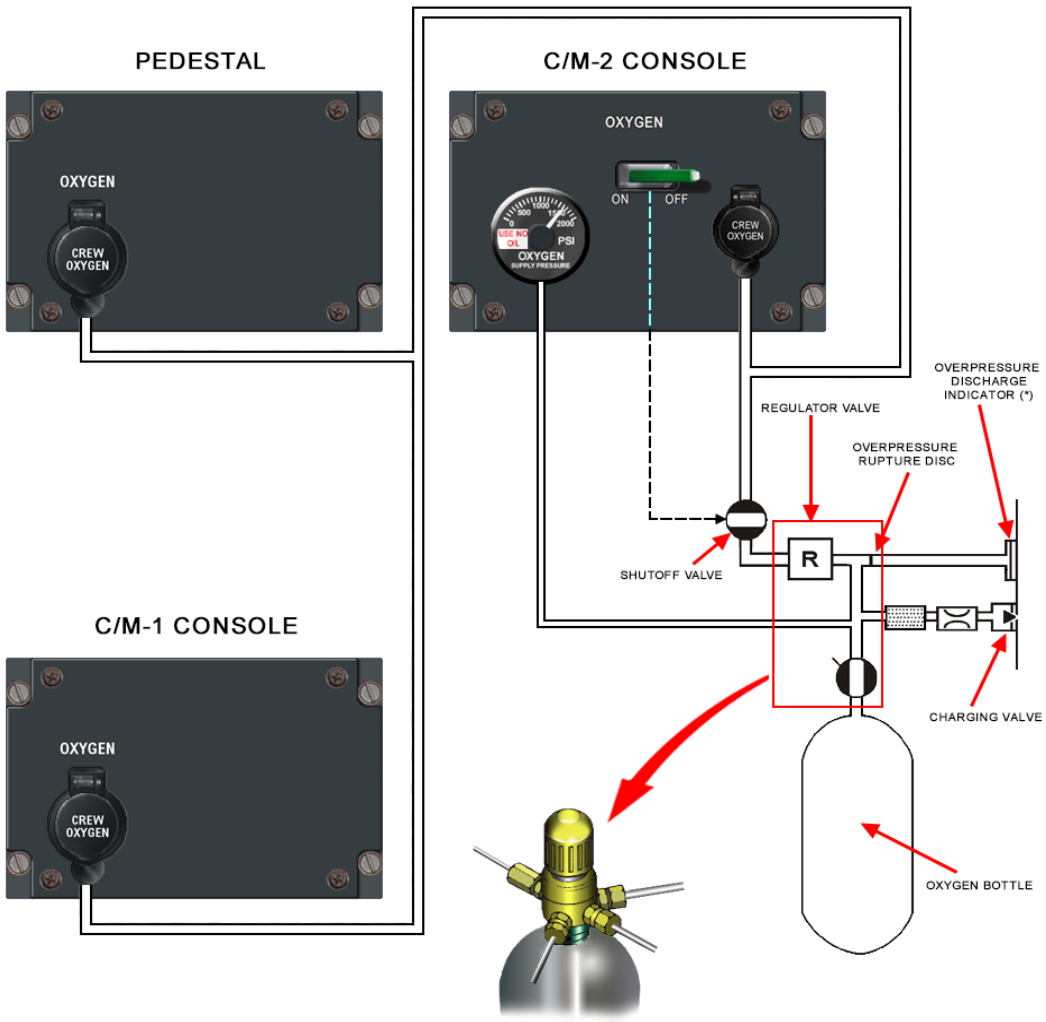
– ***Smoke Protection Goggles:*** there are three smoke goggles located inside protection boxes, two behind the C/M-1, and one behind the C/M-2. They can be used on the regular glasses and provide a clear panoramic vision along emergency operations when there is smoke on board. They have compatibility with the oxygen crew masks. When the mask vent valve is pushed, air enters the goggles cavity and removes the smoke.



A C/M-1 CONSOLE AND PEDESTAL

B C/M-2 CONSOLE

Figure 35-2 Fixed Oxygen System - Components



(*) Green disc - normal
Red disc - bottle discharged through overpressure

Figure 35-3 Fixed Oxygen System - Architecture

OPERATION

In the usual or standby operation, the permanent oxygen system for the crew is continuously pressurized from the regulator valve. When oxygen is necessary for the crew, the manual shutoff valve is set to ON. Then, crew masks are connected to the oxygen sockets and let the oxygen flow to the diluter-demand regulator valve in the masks. A selector on the demand valve controls the quantity and rate of oxygen flow. Agreed with the cabin altitude and crew requirements, the selector can be set to supply an oxygen/air mixture flow as follows:

- ***Normal Operation:*** Supplies a percentage of oxygen in proportion to the user air intake in relation to cabin altitude on inhaling.
- ***100% Position:*** Supplies 100% oxygen on demand to the user.
- ***Emergency Position:*** Supplies 100% oxygen continuously to the mask.

When the mask bayonet connection is disconnected, the socket check valve closes and closes oxygen flow.

To close oxygen flow to all sockets, shutoff valve must be set to OFF.

Oxygen filling is performed through the filling valve. Contents gauge indicates level of pressure.

Maximum oxygen duration can be calculated from the table below:

NOTE

Durations in hours, to be divided by the number of crew members.

	COCKPIT MANOMETER READING (PSI)									
ALTITUDE (kft)	1850		1500		1200		1000		800	
5	5.69	1.02	3.96	0.71	2.47	0.44	1.48	0.27	0.49	0.09
10	4.52	1.25	3.14	0.87	1.96	0.54	1.18	0.33	0.39	0.11
15	4.03	1.57	2.80	1.09	1.75	0.68	1.05	0.41	0.35	0.14
20	3.73	1.96	2.59	1.37	1.62	0.85	0.97	0.51	0.32	0.17
25	3.11	2.54	2.16	1.76	1.35	1.10	0.81	0.66	0.27	0.22
	NOR	100%	NOR	100%	NOR	100%	NOR	100%	NOR	100%
	MASK REGULATOR SETTING									

NOTES:
- Oxygen pressure reading taken at 15ºC (59ºF) oxygen temperature.
- Average breathing rate: 20 litres/ minute BTPS (Body Temperature and Pressure Saturated with water vapour).
- Portable oxygen installation not taken into account.
- 390 litres NTPD (Normal Temperature and Pressure Dry) taken as reserve for firefighting at 10000 ft.
- Minimum bottle pressure at 200 psig.

Table 35-1 Fixed Oxygen System - Maximum Duration

CONTROLS AND INDICATORS

(1) CREW OXYGEN Connector:

the pipe fitting to supply oxygen to the masks. It is covered with a spring-loaded cap, to prevent dirt penetrating when there is no mask nose attached. There is one socket at the pedestal and two at the C/M-1 and C/M-2 consoles.

(2) OXYGEN Switch:

- *ON:* enables oxygen supply to the crew sockets.
- *OFF:* closes oxygen supply to the crew sockets.

(3) OXYGEN SUPPLY PRESSURE Gauge:

shows the pressure in the oxygen bottle on a scale from 0 to 2000 psi. This gauge is located next to the oxygen socket on the C/M-2 console.

(4) Smoke Glasses Purge Button:

used with the smoke glasses on.

- *Pressed:* if the emergency button is ON, introduces oxygen into the smoke goggles to expel the smoke inside.

(5) Flow Indicator:

- *Red mark:* inadequate or no supply.
- *Clear mark:* adequate supply.

(6) Audio Connector:

allows the mask to be connected to the audio system.

(7) Oxygen Connector:

allows the mask to be connected to the oxygen socket. Oxygen only flows when a mask is connected.

(8) Oxygen Regulator:

- *NORMAL:* the regulator supplies, on inhaling, a mixture of oxygen and air from the cabin, optimized according to the cabin altitude.
- *100%:* the regulator supplies 100% oxygen on demand to the user.

(9) Emergency Switch:

- *ON:* gives pure (100%) oxygen at pressure continuously.

(10) Goggles:

the goggles protect eyes from irritant ambient, smoke, etc.

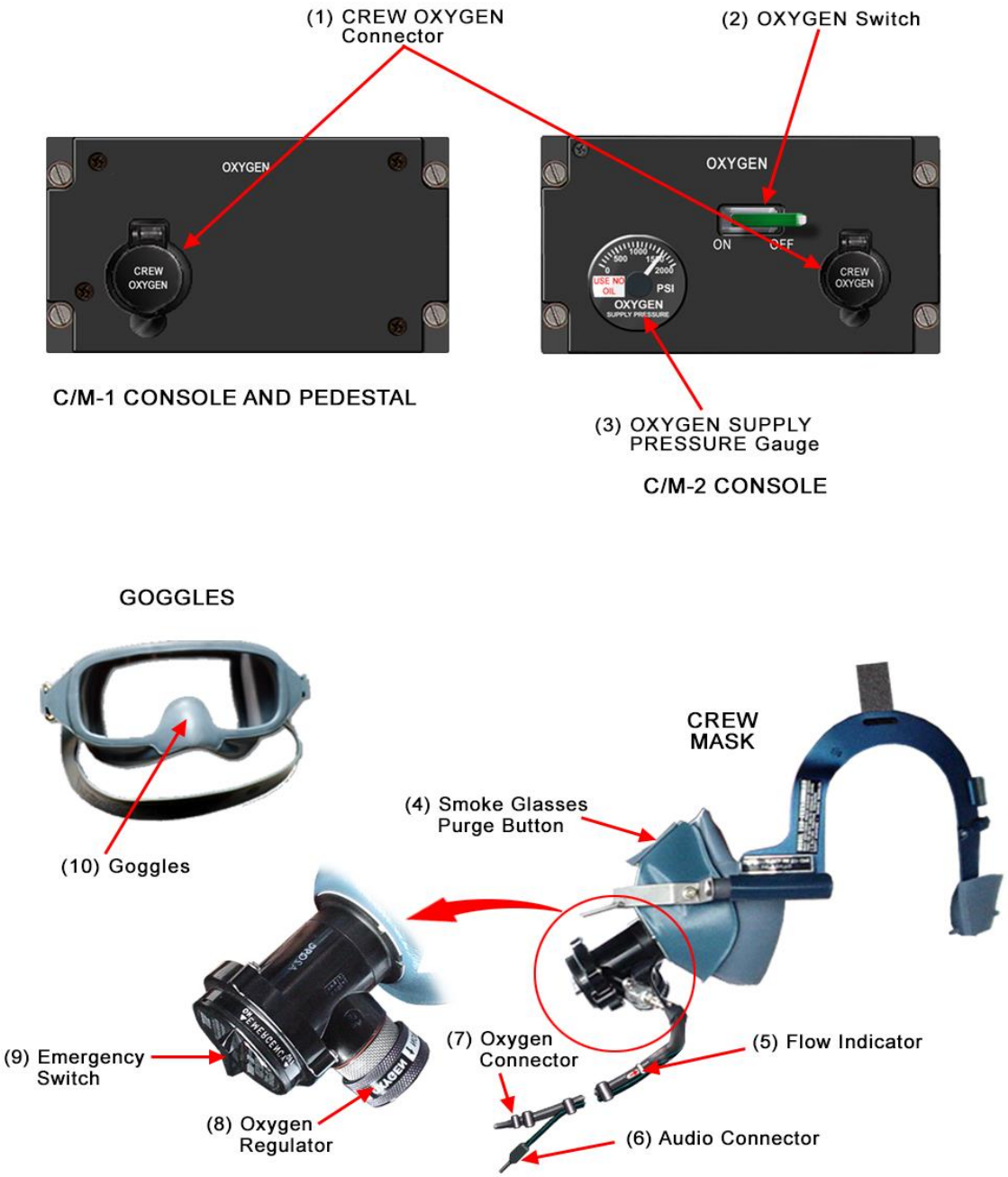


Figure 35-4 Fixed Oxygen System - Controls and Indicators

PORTABLE OXYGEN SYSTEM

Portable oxygen system is intended to enable crew-members breath while moving around the cargo cabin while at emergency conditions caused by low cabin pressure, smoke, etc. It can also be used to provide passengers with oxygen, for therapeutic purposes.

DESCRIPTION

There are four portable bottles containing gaseous oxygen at high-pressure (1800 psi) to be used with either passenger or therapeutic masks.

Main system components are:

– ***Oxygen Bottles:*** four green portable bottles with a pressure regulator. They are located at the forward main compartment. Two bottles are at the rack in frame 10. The other two are on the toilet panel at FR12. Each one has a shutoff valve, a pressure gauge calibrated to indicate pressure from 0 to 2000 psi and oxygen outlet. Full bottle weight is 3.63 kg containing 312 litres of gaseous oxygen at 1800 psi.

WARNING

Do not use the bottle if internal pressure is less than 500 psi.

– ***Protective Breathing Equipment (PBE):*** This is located at the flight compartment. PBE provides respiratory and eye protection when there is no oxygen enough, under smoke conditions or under other poisonous ambient. It has an autonomous oxygen generator and allows low pressure oxygen 15 minutes supply. It has a light weight of 2.33 kg. This equipment can be used only one time. After using cannot be charged again.

– ***Passenger Masks:*** passenger mask provides the passenger with continuous oxygen above 10000 ft cabin altitude to avoid hypoxia (recommended) although the masks can be used above 8000 ft. The passenger mask has a replaceable face seal and an elastic headband. The mask connects with the outlet of the portable oxygen bottle through a flexible hose assembly and a connector. The flexible hose assembly has a flow indicator.

– ***Therapeutic Mask:*** the therapeutic passenger mask provides the passenger with continuous oxygen flow at any altitude for first aid or therapeutic purposes. The mask connects with the outlet of the portable oxygen bottle through a flexible hose assembly and a quick-connect bayonet. The flexible hose assembly has a flow indicator.

– ***Tote Bags:*** Two tote bags are in front of the two portable oxygen bottles at frame 10 rack. Each bag includes two oxygen passenger masks. Other two bags are adjacent to the two portable oxygen bottles, on the toilet panel at frame 12. Each bag contains one oxygen passenger and one therapeutic mask.

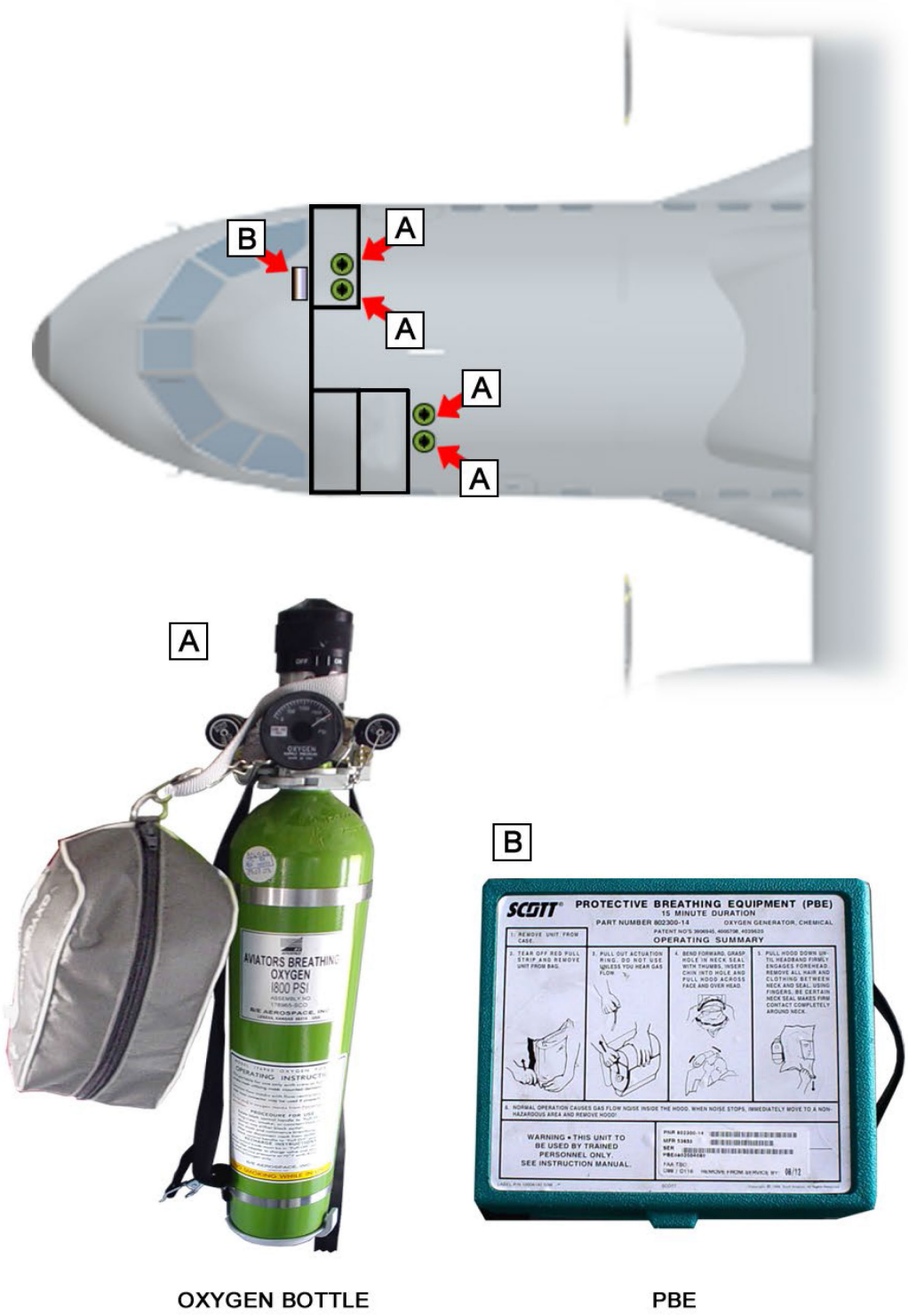


Figure 35-5 Portable Oxygen System - Components

OPERATION

PORTABLE OXYGEN BOTTLE

If oxygen is required for passengers under emergency (cabin de-pressurization above 10000 ft), remove the bottle from the mounting support and extract the passenger or the therapeutic mask. Put on the mask, by means of adjusting the face seal and the elastic headband, as necessary. Insert the quick-connect bayonet connector into the oxygen outlet of the bottle. Slowly turn the pressure regulator and shutoff the valve to fully open position, and then the flow indicator turns green. Normal breathing action causes oxygen to flow from reservoir bag through inhalation/exhalation and mixing valve to face mask on demand.

If it is necessary to provide a continuous oxygen flow for first aid of therapeutic purposes, the therapeutic mask shall be used. Operation is performed in the same way as with passenger mask. Do not use the passenger mask for therapeutic or first aid purposes.

WARNING

Do not use the bottle if internal pressure is less than 500 psi.

Maximum duration (minutes) of each portable system oxygen bottle (when full) can be calculated from the following table:

Altitude (kft)	Crew member mask		1 Passenger mask	2 Passenger masks	1 Therapeutic mask	2 Therapeutic masks	1 passenger + 1 Therapeutic mask
	Normal	100%					
5	116	21	178	89	82	41	56
8	101	23	178	89	82	41	56
10	92	25	178	89	82	41	56
15	82	32	178	89	82	41	56
20	76	40	178	89	82	41	56
25	62	51	178	89	82	41	56

NOTES:
- Portable bottles considered to fully charged.
- Average breathing rate: 20 liters/minute BTPS (crew mask)
- No oxygen content taken as reserve for firefighting
- Minimum bottle pressure at 70 psig

Table 35-2 Portable Oxygen System - Maximum Duration

If it is necessary to use the protective breathing equipment (PBE) in emergency conditions, these operations must be correctly performed:

– Open the protection case and remove the protection sealed bag.

– Pull the ring and put on the hood with the life support pack behind the head. Do a good adjustment between the hood and the neck for most comfort and safety.

WARNING

Do not use the protective breathing equipment if the transparent bag is previously open, the bag is soft or if it does not conform tightly to the package or if the humidity indicator has changed from blue to pink.

Do not use the protective breathing equipment if the oxygen flow cannot be heard.

An oxygen generator supplies low pressure oxygen.

The oxygen flows from the generator through the ventury nozzle and mixes with the fumes filtered in the chemical scrubber.

CONTROLS AND INDICATORS

(1) Pressure Regulator and Shutoff Valve:

it enables oxygen to flow from the bottle to the Oxygen Regulator.

(2) Connector Outlets:

the masks are connected here.

(3) Pressure Indicator:

shows the pressure in the system on a scale from 0 to 2000 psi.

(4) Mask Box:

it contains one passenger mask and one therapeutic mask.

(5) Instructions Table:

shows the gas specification, type and related cylinder data.

(6) Replaceable Face Seal:

to be applied on nose and mouth.

(7) Inhalation/Exhalation and Mixing Valve:

supplies oxygen to the face mask on demand.

(8) Connector:

inserted into the oxygen outlet of the bottle.

(9) Flow Indicator:

- *Green mark:* Adequate supply.
- *Red mark:* Inadequate supply.

(10) Life Support Pack:

It contains:

- An oxygen supply source in solid condition
- A chemical scrubber for CO2 and water vapour
- A venturi nozzle
- A relief valve
- A vent valve

(11) "Pull to Activate" Ring:

pull this ring in order to start oxygen generation

(12) Clear Visor:

provides good vision and eyes protection

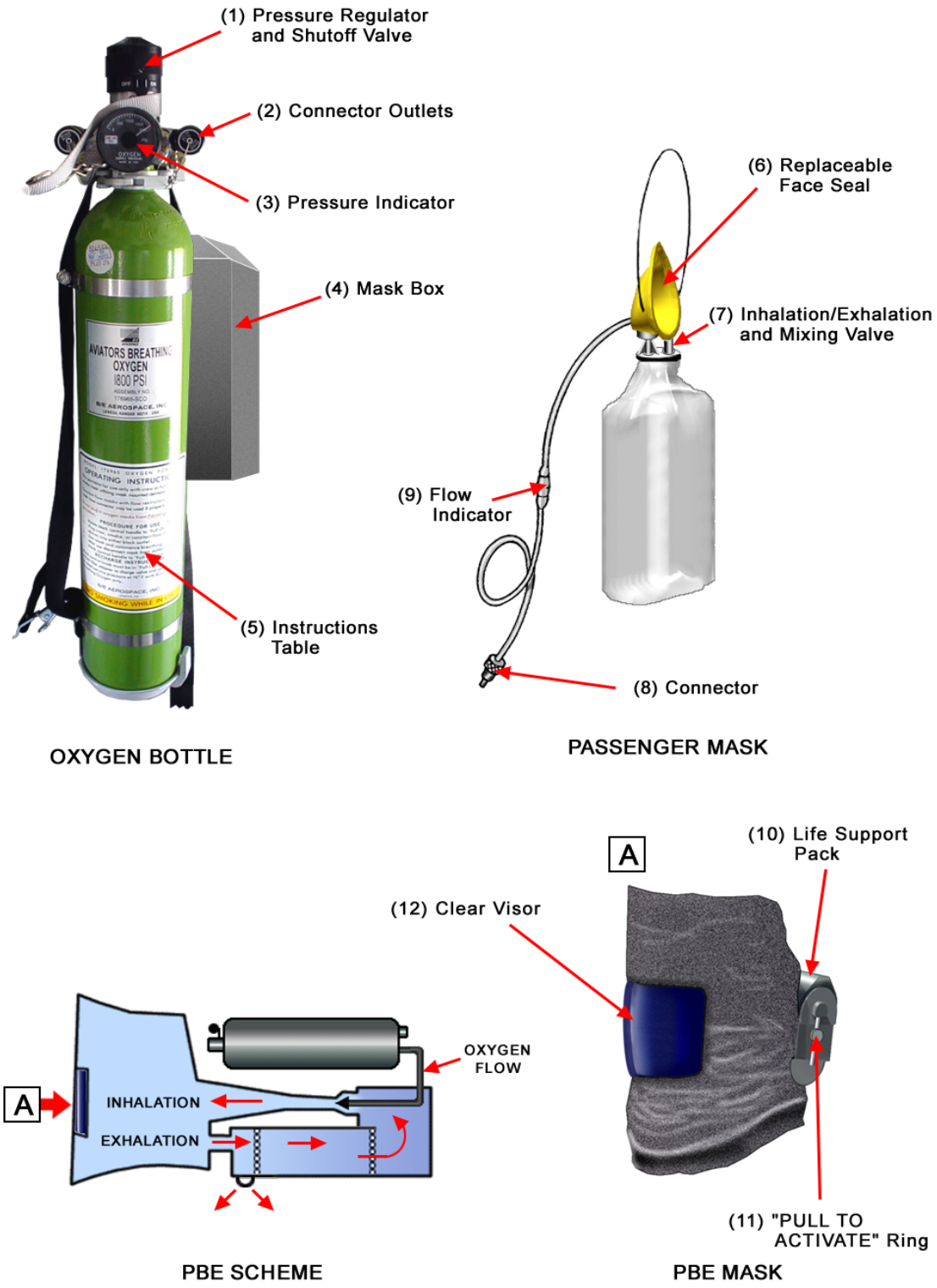


Figure 35-6 Portable Oxygen System - Controls and Indicators

Intentionally Left Blank