



CHAPTER 8

EMERGENCY EQUIPMENT

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CHAPTER 8

EMERGENCY EQUIPMENT

GENERAL

This chapter describes the systems and equipment which are essential to the safety of passengers and crew during a fire, rapid decompression, ditching, and emergency evacuation. Related provisions include the following equipment:

- Oxygen equipment (portable and fixed)
- Evacuation devices (crash axe, escape path marking system, emergency lighting, and emergency exits)
- Fire fighting equipment (portable and fixed)
- Over water emergency equipment (life vests)

Data on airplane doors and emergency exits is in Chapter 1, “Airplane General.” Data on the emergency lighting system is in Chapter 16, “Lighting.”



Placards associated with emergency equipment are shown in Figure 8-1. Emergency equipment locations are shown in Figure 8-2.

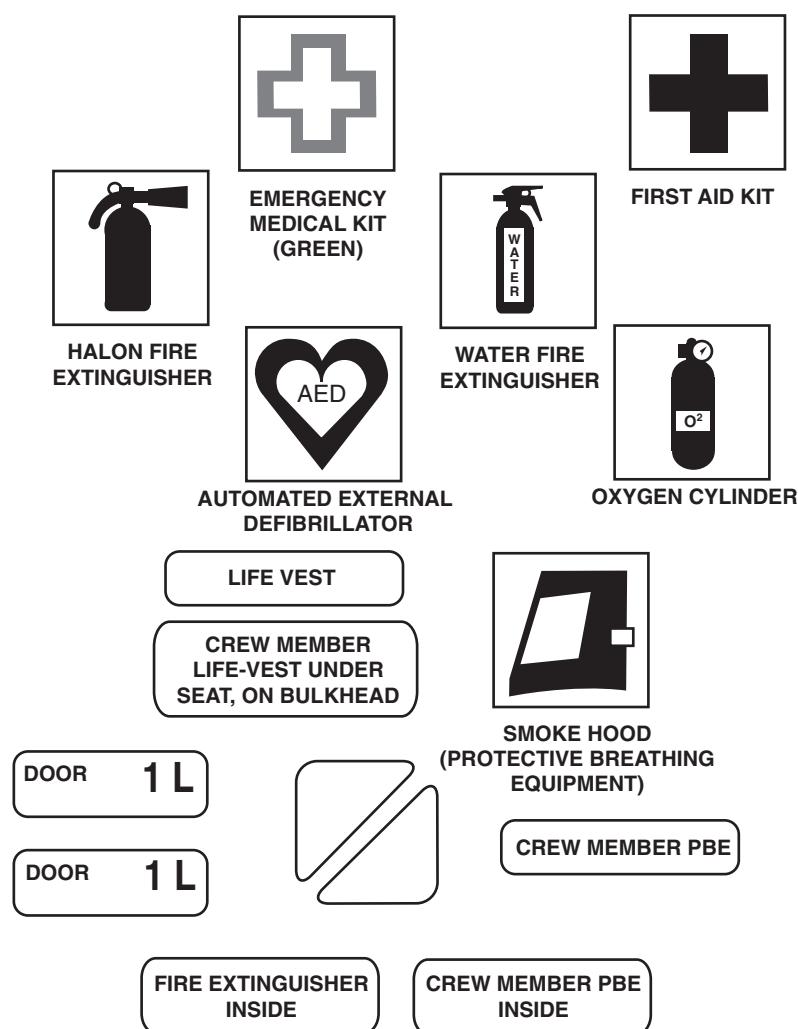


Figure 8-1 Emergency Equipment Placards

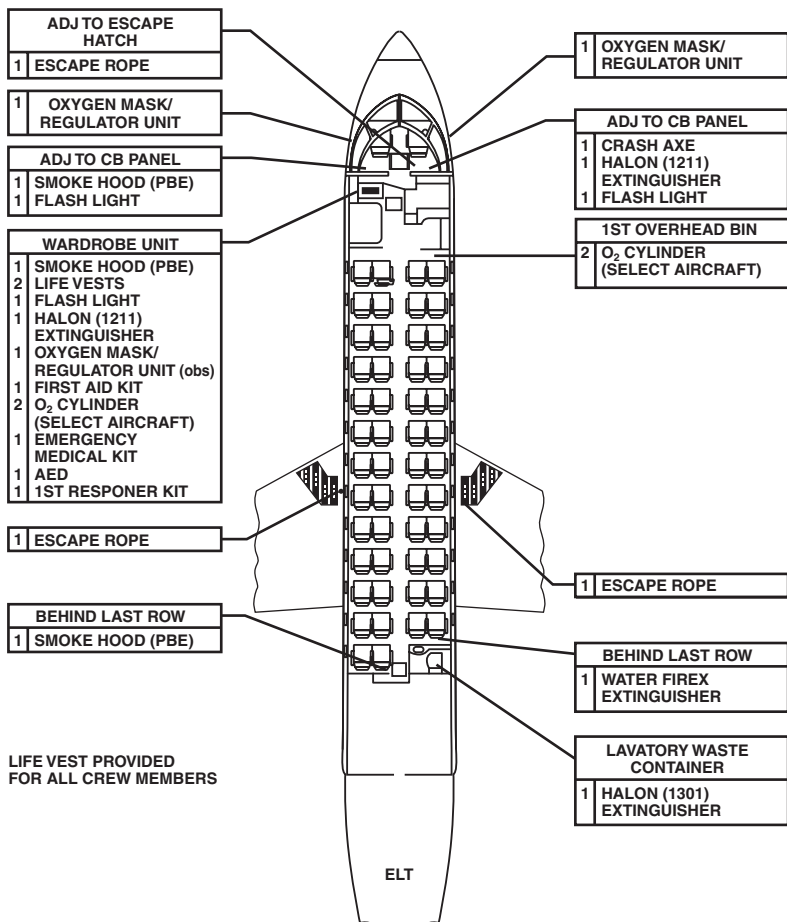


Figure 8-2 Emergency Equipment Locations



SYSTEM DESCRIPTION

OXYGEN SYSTEM

Flight Compartment Oxygen System

Oxygen is supplied by one independent system for the flight compartment crew members. In addition, a portable oxygen bottle and protective breathing equipment (smoke hood with oxygen generator) are in the flight compartment. The system consists of the following (Figure 8-3):

- One oxygen bottle (with a pressure regulator/transmitter unit, bottle gage, and shutoff valve)
- Ground servicing panel (with a gage and filler valve)
- Fuselage-mounted relief valve (frangible disc)
- Three oxygen mask/regulator units (quick-donning, single-piece, full-face mask type or type with separate smoke goggles)
- One smoke hood with an integral oxygen supply system (protective breathing equipment)

Oxygen Bottle

The oxygen bottle is in the right forward fuselage underfloor area. Charge pressure is indicated as follows:

- Gage on the bottle shutoff valve
- Gage on the ground servicing panel
- Status page on the EICAS secondary display

When bottle pressure becomes excessive, approximately 2,800 psi (193 bar), all oxygen is vented overboard by a pressure regulator/transmitter unit. The oxygen vents through a fuselage-mounted relief valve causing the OXY HP RELIEF disc to fragment.

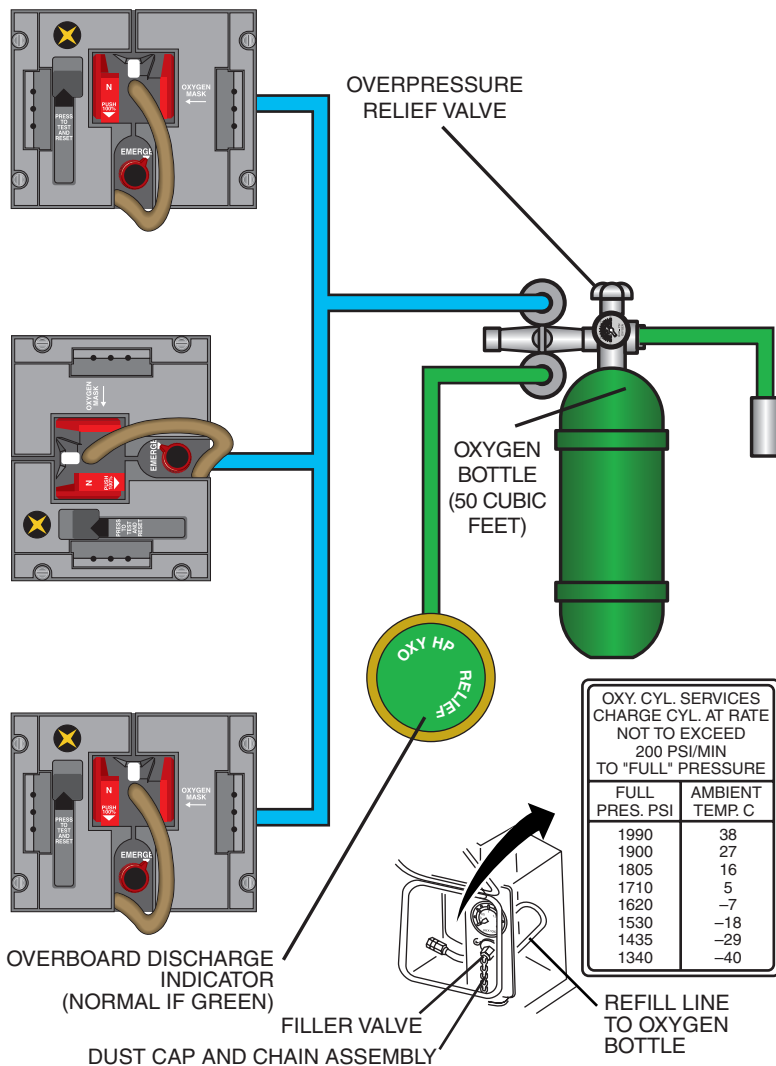


Figure 8-3 Crew Oxygen System



The pressure regulator/transmitter unit (Figure 8-4) regulates flow to the crew mask regulator unit. The unit's strain gage transmits pressure signals to the EICAS.

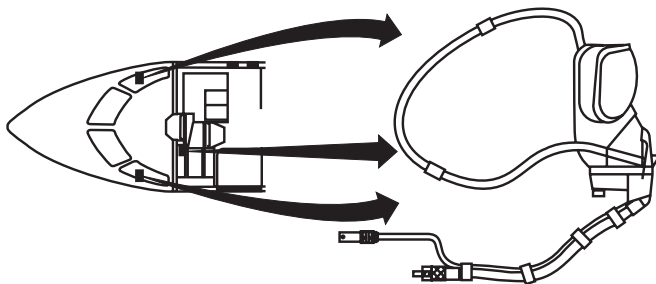
The crew mask/regulator unit regulates the flow to the crew masks. Oxygen is supplied via the regulator at either ambient or slightly over ambient pressure dependent upon crew setting of the flow controls.

The flight crew oxygen system is a diluter demand system. The three flight crew oxygen masks are of the quick-donning, inflatable-harness full-face mask type. Each mask is stowed in a quick-access container adjacent to each flight station (one each at the side consoles and observer's station). Some aircraft contain the type of oxygen mask with separate smoke goggles. The smoke goggles mate with the mask cavity to receive venting and can be worn over standard glasses (Figure 8-4).

A regulator in each mask provides, by pilot selection, for three oxygen supply modes:

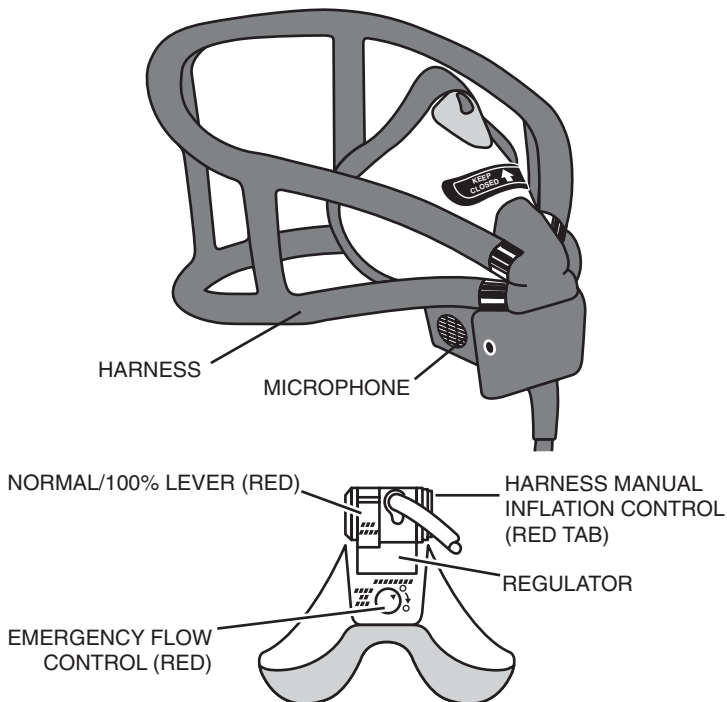
- Normal diluted demand mode
- 100% oxygen on demand mode
- 100% oxygen continuous flow/variable pressure mode

When stowed in the container, oxygen flow through the regulator can be tested by pressing the test lever. Each mask has a microphone.



FULL FACE MASK

Figure 8-4 Flight Crew Oxygen Mask (1 of 2)



SMOKE GOGGLES

Figure 8-4 Flight Crew Oxygen Mask (2 of 2)



Minimum Flight Crew Oxygen Pressure

Table 8-1 defines the oxygen system pressure before departure. This table corresponds to the quantity of oxygen necessary to perform an emergency descent followed by a continuous cruise at 10,000 feet (FAR 121.333) with normal (N) mask setting.

Table 8-1 DEPARTURE OXYGEN PRESSURE FOR EMERGENCY DESCENT AND CONTINUOUS CRUISE

OAT		MINIMUM PRESSURE (PSI)	
°C	°F	2 Crew	2 Crew + 1 OBS
−40	−40	889	1,208
−30	−22	938	1,282
−20	−4	987	1,357
−10	14	1,035	1,431
0	32	1,084	1,505
10	50	1133	1579
20	68	1,182	1,654
30	86	1,230	1,728
40	104	1,279	1,802
50	122	1,328	1,877

Use the above table as follows:

- If oxygen pressure is greater than that given in Table 8-1, then there is enough oxygen to perform an emergency descent from 41,000 feet to 10,000 feet in 10 minutes, followed by 110 minutes of cruise at 10,000 feet.



- If oxygen pressure is between the values given in Tables 8-1 and 8-2, then there is enough oxygen to cruise at 10,000 feet for 15 minutes in an unpressurized cabin.
- If oxygen pressure is lower than that given in Table 8-1, the oxygen bottle has to be refilled.

Crew Oxygen Consumption Data

The following tables (Table 8-2, 8-3, 8-4, and 8-5) show the total time (hours, minutes, and seconds) that oxygen is available at various mask settings, during various flight conditions. The times are based on an initial bottle pressures of 1,400 psi and 1,850 psi. A margin of safety of 10% was subtracted from the full charge of 1,850 psi in all cases.

Table 8-2 LEVEL FLIGHT AT CABIN PRESSURE ALTITUDE OF 8,000 FEET

CREW	2		3	
Initial Bottle Pressure	1,400 psi	1,850 psi	1,400 psi	1,850 psi
Normal Mask Setting	2h 27' 14"	3h 20' 60"	1h 37' 00"	2h 12' 50"
100% Mask Setting	0h 33' 18"	0h 45' 27"	0h 21' 56"	0h 30' 03"
Emergency Mask Setting	0h 30' 29"	0h 41' 37"	0h 20' 05"	0h 27' 30"



Table 8-3 DESCENT (10 MIN.) FROM 41,000 FEET TO LEVEL FLIGHT AT SAFE ALTITUDE (NOTE 1)

CREW		2		3	
Initial Bottle Pressure		1,400 psi	1,850 psi	1,400 psi	1,850 psi
Cabin Pressure Altitude	10,000 Feet	2h 45' 53"	3h 51' 44"	1h 44' 20"	2h 28' 15"
	14,000 Feet	2h 39' 14"	3h 41' 57"	1h 40' 38"	2h 22' 27"
	18,000 Feet	2h 16' 34"	3h 09' 53"	1h 26' 44"	2h 02' 17"
	21,000 Feet	1h 53' 22"	2h 37' 17"	1h 12' 19"	1h 41' 36"
Note 1: Normal mask setting for both descent and level flight					

Table 8-4 DESCENT (10 MIN.) FROM 41,000 FEET TO LEVEL FLIGHT AT SAFE ALTITUDE (NOTE 2)

CREW		2		3	
Initial Bottle Pressure		1,400 psi	1,850 psi	1,400 psi	1,850 psi
Cabin Pressure Altitude	10,000 Feet	2h 34' 45"	3h 40' 39"	1h 33' 12"	2h 17' 02"
	14,000 Feet	2h 32' 55"	3h 35' 39"	1h 34' 19"	2h 16' 08"
	18,000 Feet	2h 13' 58"	3h 07' 18"	1h 24' 09"	1h 59' 42"
	21,000 Feet	1h 52' 26"	2h 36' 22"	1h 11' 24"	1h 40' 41"
Note 2: Mask setting: 100% for descent, normal for level flight					



Table 8-5 DESCENT (10 MIN.) FROM 41,000 FEET TO LEVEL FLIGHT AT SAFE ALTITUDE (NOTE 3)

CREW		2		3	
Initial Bottle Pressure		1,400 psi	1,850 psi	1,400 psi	1,850 psi
Cabin Pressure Altitude	10,000 Feet	0h 31' 28"	0h 44' 52"	0h 18' 57"	0h 27' 53"
	14,000 Feet	0h 38' 32"	0h 54' 21"	0h 23' 46"	0h 34' 18"
	18,000 Feet	0h 47' 51"	1h 06' 53"	0h 30' 03"	0h 42' 45"
	21,000 Feet	0h 56' 59"	1h 19' 14"	0h 36' 11"	0h 51' 01"
Note 3: 100% mask setting for descent and level flight					

Protective Breathing Equipment

Protective breathing equipment (smoke hoods) (Figure 8-5) is in the flight compartment and cabin for smoke and fire fighting. This equipment is stowed in a vacuum-sealed bag, inside a container, mounted aft of the captain's seat on the CB-panel wall.

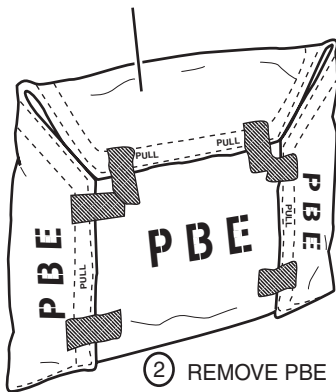
The smoke hood consists of an air-regeneration system and a hood with a clear visor. The air-regeneration system is a chemical process that forms oxygen and absorbs carbon dioxide. Before donning the hood, an actuation cord (lanyard) must be pulled. Use of a hand microphone, intercom handset, or megaphone is possible while wearing the hood. Use of a headset is not possible (operation causes significant airflow noise within the hood). The hood must be removed when airflow noise stops and breathing becomes labored.

WARNING

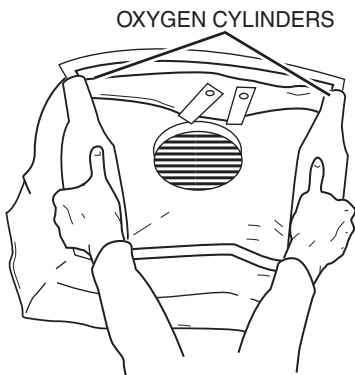
Suffocation may occur if the hood is used without oxygen supply.



① OPEN EQUIPMENT CONTAINER



② REMOVE PBE



③ REMOVE FROM POUCH
 ACTIVATE OXYGEN FLOW BY SNAPPING
 THE TWO CYLINDERS APART



④ DON HOOD
 (APPROXIMATELY 15 MINUTES
 OF RESPIRATION PROTECTION)

Figure 8-5 Protective Breathing Equipment



Passenger Oxygen System

The passenger oxygen system provides chemically generated oxygen for all cabin occupants in the event of cabin depressurization. The oxygen generators and oxygen masks are in overhead compartments. Masks are available at all passenger seats, in the lavatory, and at flight attendant station (Figure 8-6).

All oxygen compartment doors open to present the oxygen masks automatically if cabin altitude reaches approximately 14,000 feet. The PASS OXY switchlight on the flight compartment overhead panel comes on to indicate that oxygen compartment doors are open.

If the automatic system fails to open the doors, or if it is necessary to override the automatic system, the flight crew can operate the PASS OXY switch. The switch opens the oxygen compartment doors and deploys the masks.

When the oxygen compartment doors open, the passengers pull the oxygen mask to their face, pulling the lanyard and pin from the generator. This initiates oxygen flow to the passenger's oxygen mask. The chemical oxygen generator supplies approximately 13 minutes of oxygen to each mask.

As a backup to the electrically opening doors, each individual oxygen compartment door can be opened manually.

WARNING

The oxygen generator surface temperature may reach 500°F (260°C) when generating oxygen. Do not touch or attempt to remove the generator. Burn injury can result. If an active generator is inadvertently removed from the compartment, the generator must be placed in a metal container such as a lavatory or galley sink. The generator's heat will scorch other materials or fabrics.



TO OPEN OXYGEN COMPARTMENT MANUALLY:

TO RELEASE THE OXYGEN SYSTEM MANUALLY USE A PAPERCLIP, LOCATED IN THE PASSENGER SERVICE KIT

MAINTENANCE TAB (RED) INDICATES DOOR DISABLED

LATCH RELEASE SLOT

LANYARD (APPROX 5 IN.)

MASKS

DOOR

PAPERCLIP

FLOW INDICATOR

3 MASK UNIT (LEFT AND RIGHT SIDE PASSENGER ROWS)

RESERVOIR BAG

NOTE

OXYGEN COMPARTMENT DOOR LATCHES ELECTRICALLY OPENED BY CPAM (CABIN ALT AT 14,000 FT) OR PILOT OPERATION OF PASS OXY SWITCH/LIGHT

POTASSIUM SUPEROXIDE (KO_2) GENERATOR (13 MINUTES)

LANYARD (APPROX 5 IN.)

MASKS

FLOW INDICATOR

2 MASK UNIT (LAVATORY AND FLIGHT ATTENDANT STATION)

RESERVOIR BAG

Figure 8-6 Passenger Oxygen Equipment



NOTE

Odor similar to scorched cloth may be created by activation of generator. The odor does not affect purity of oxygen supply and there is no fire hazard.

Portable Oxygen Bottles

Portable oxygen bottles (Figure 8-7) and masks for use by the flight attendant and for first aid are located in the forward entrance compartment or first overhead bin on the first officers side. The portable oxygen regulator is an ON/OFF type and a gage monitors the cylinder pressure. The cylinder is equipped with two constant flow outlets and two masks. Oxygen is regulated by the mask attached to the cylinder. The masks will appear identical except for a colored band around the bayonet fitting that connects each mask to the oxygen bottle. The mask with a red band around the bayonet fitting regulates oxygen at two liters per minute (LPM). The mask with a blue band around the bayonet fitting regulates oxygen at four liters per minute (LPM). When providing first aid oxygen, the two-LPM mask will be used for infants and passengers with emphysema. The four-LPM mask will be used for all other passengers requiring first aid oxygen.

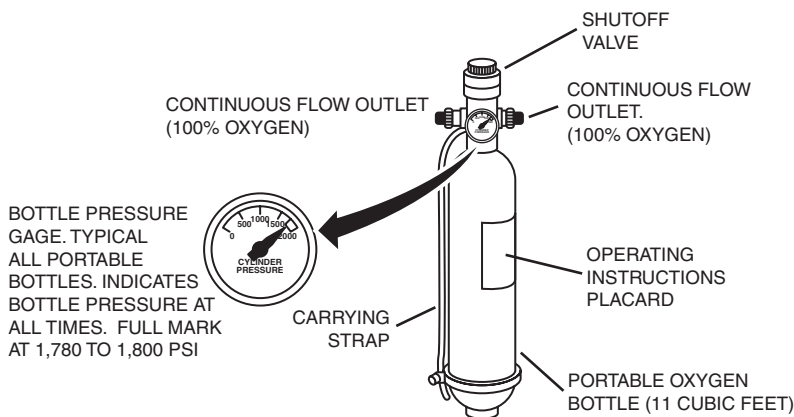


Figure 8-7 Portable Oxygen Bottle



WARNING

Take precautions to ensure that oxygen bottles do not come into contact with oil, grease, or other contaminants during handling. An explosion could result if this happens.

EVACUATION DEVICES

For emergency escape and rescue operations, the following are provided (Figure 8-8):

- Crash axe (behind first officer's seat)
- Flight compartment escape rope (in the ceiling panel above first officer)
- Cabin escape ropes (1 each side, in the access panel adjacent to overwing exits)

Exit Lighting

The airplane's emergency lighting system includes the following:

- Floodlights (4) for passenger cabin illumination
- Internal floodlights at the passenger door and galley service door
- Lighted exit signs at the cabin ceiling, mid wall, and floor levels
- Exterior evacuation floodlights at the passenger door, galley service door, and overwing exit areas
- An escape path marking system at the floor level



- The system is powered by four 28-volt rechargeable, battery packs that supply power for approximately 15 minutes when charged (see Chapter 16, “Lighting,” for details).

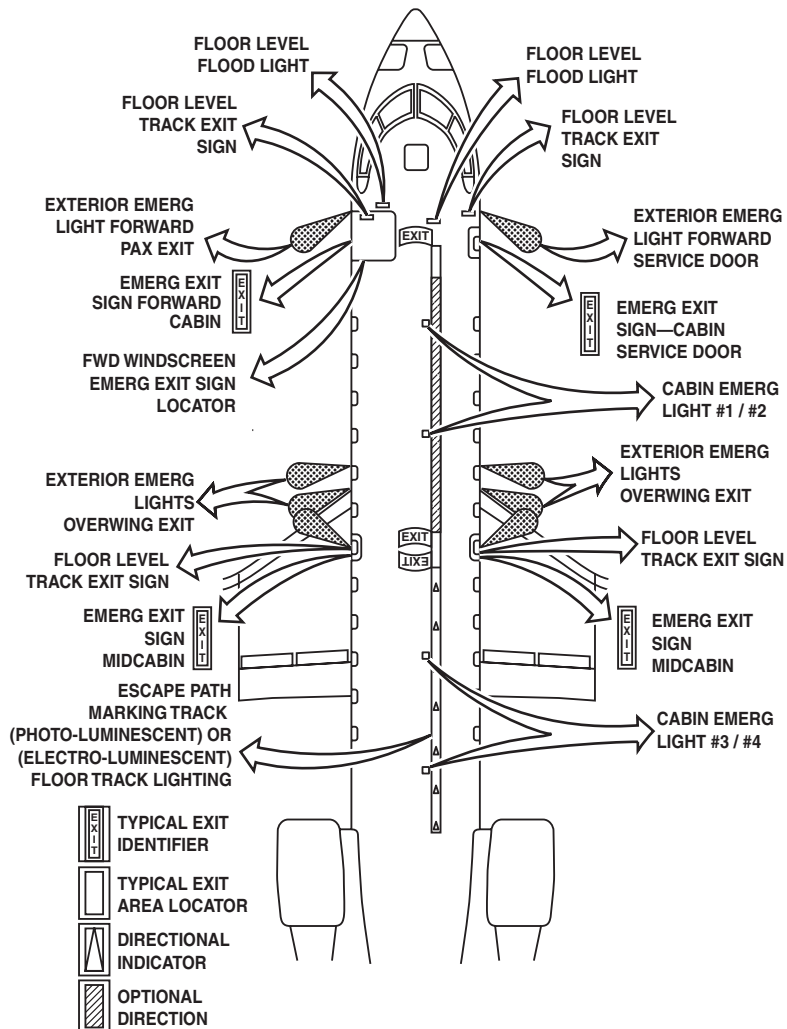


Figure 8-8 Evacuation Lights and Signs



Passenger and Galley Service Door

These floor level doors provide the most normal means of Type I emergency exits and should be used if possible.

Emergency Window Exits

There are two Type III emergency exit windows over the wing of the airplane that provide access to the upper wing surface. Each exit opens inward from the top with a pull handle on the inside and a push plate on the outside. Escape ropes are provided at each over-wing exit.

Flight Compartment Escape Hatch

The hatch in the flight compartment ceiling, immediately aft of the overhead panel, is opened from the inside or the outside. The hatch opens downward and is removed by pushing up and aft. An escape rope is in a compartment at the ceiling panel above the first officer.

For door system controls and flight compartment indications see Chapter 1, “Airplane General.”

RESCUE CREW BREAK-IN

For rescue crew entry into the passenger compartment, the upper fuselage area at approximately row 11 is designated as a break-in area and is marked as such (Figure 8-9).

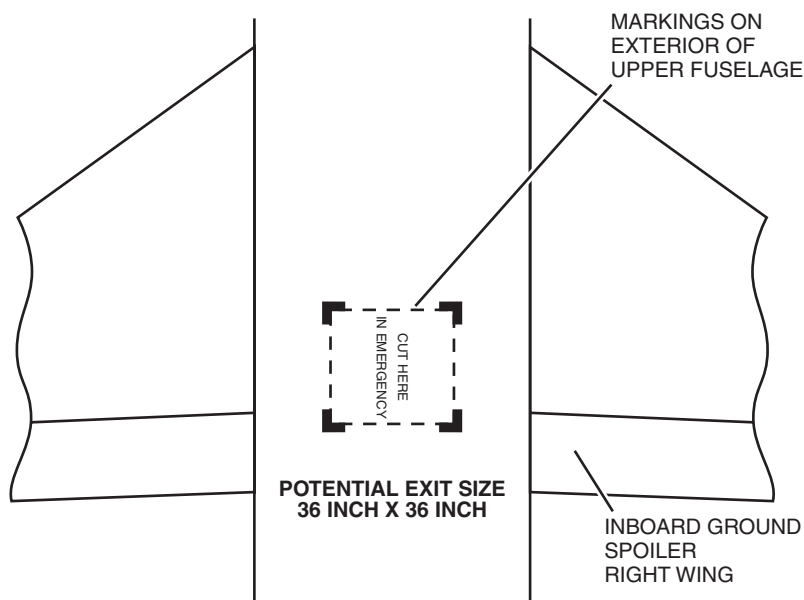


Figure 8-9 Rescue Crew Break-In



FIRE FIGHTING EQUIPMENT

To fight a fire occurring inside the flight compartment and/or in the passenger cabin, the following equipment is provided:

- Portable fire extinguishers
- Crash axe (behind first officer's seat)
- Smoke hoods (PBE)

Three hand-operated fire extinguishers are provided: one water FIREX and two halon 1211. The water FIREX is effective on paper and fabric fires. Halon 1211 is effective on electrical, oil, and fuel fires.

To operate the halon extinguisher, unstrap the “quick release” mounting strap and remove from the bracket. Hold the extinguisher upright, pull locking pin which will break the nylon tie. Stand at least six feet away from the fire and aim discharge at the base of the flame. Squeeze lever and use a sweeping motion from side to side at the base of the fire. Move closer as fire is being extinguished. Ventilate as promptly as possible (see Chapter 9, “Fire Protection” for details).

WARNING

If a fire extinguisher is discharged in the flight compartment, all flight crew must wear oxygen masks with EMERGENCY selected (100% oxygen).

NOTE

Crew exposure to high levels of Halon vapors may result in dizziness, impaired coordination, and reduced mental sharpness.



The aft cabin fire extinguisher is a water type extinguisher. The extinguisher uses carbon dioxide (CO₂) to spray the water up to 20 feet via pressure from a CO₂ cartridge in the handle. When the handle is turned clockwise, the cartridge is punctured which pressurizes the bottle. Direct the extinguisher at the base of the flames and push the thumb lever (Figure 8-10).

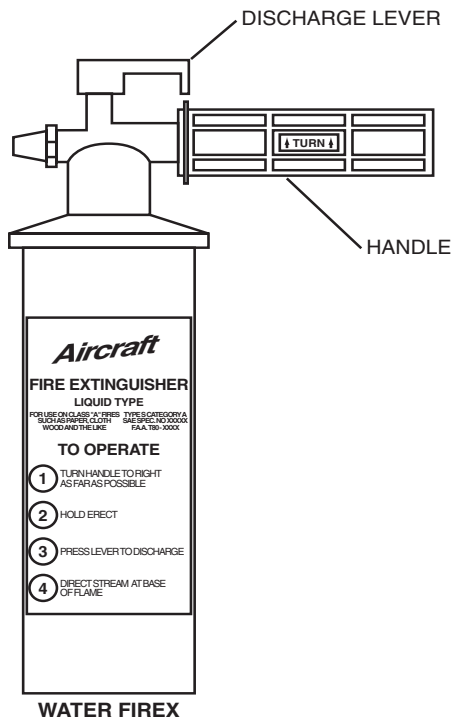


Figure 8-10 Water Fire Extinguisher

Protective breathing equipment (smoke hoods) is in the flight compartment and cabin areas for crew use.



LAVATORY FIRE EXTINGUISHER

An automatic Halon 1301 fire extinguisher (0.12 kg), fitted with a heat detector, is in the lavatory trash bin (Figure 8-11). The bottle charge or discharge condition is indicated on the bottle. The EICAS provides a SMOKE TOILET caution when the smoke detector in the lavatory detects smoke.

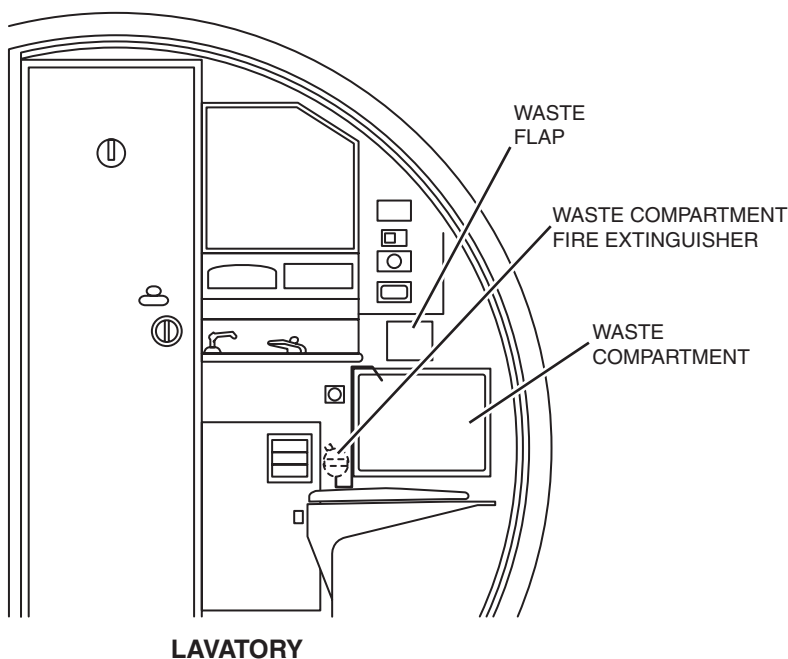


Figure 8-11 Lavatory Fire Extinguisher



OVER WATER EMERGENCY EQUIPMENT

A life vest is provided for each occupant of the flight compartment (Figure 8-12). Each life vest includes a manual and an oral inflation system and a locator light.

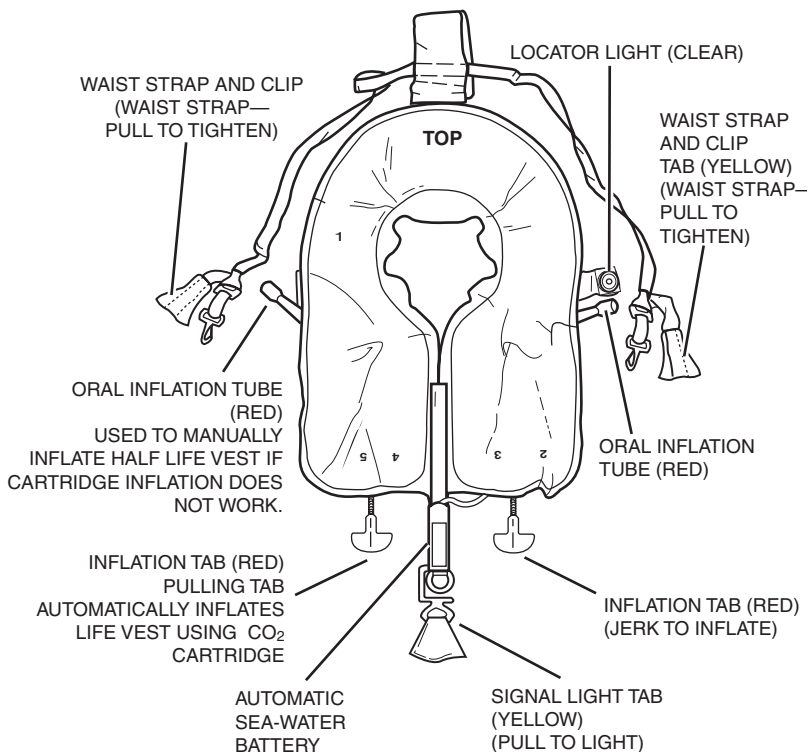


Figure 8-12 Life Vest



The cabin attendant's life vest is stowed beside the attendant's seat. The flight crew's life vests are stowed in a pocket beneath the crew member's seat. Instructions for donning life vests are in Figure 8-13. The seat cushion in each passenger seat serves as a flotation device for the passengers.



INFLATE LIFE VEST JUST
 BEFORE JUMPING OUT OF
 THE AIRPLANE!
 USING OVERWING
 EMERGENCY EXIT INFLATE
 LIFE VEST WHEN ON THE
 WING.

Figure 8-13 Life Vest Donning

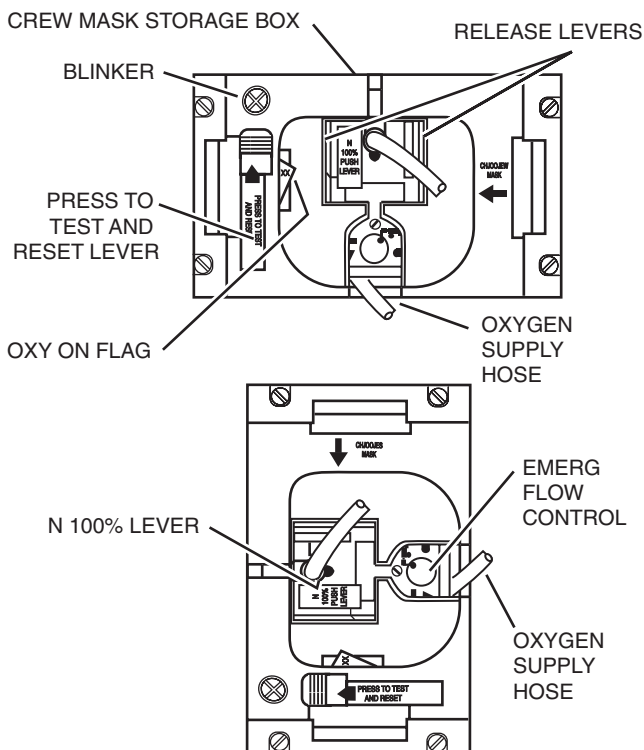


CONTROLS AND INDICATIONS

OXYGEN SYSTEM

Crew Mask

Blinker—The blinker (Figure 8-14) is black when no oxygen is flowing. The blinker shows a yellow cross when oxygen is flowing or when the harness is inflated.



NOTE

OPERATING THE TEST/RESET LEVER TO RESET WILL STOP THE FLOW OF OXYGEN TO THE MASKS. CLOSING THE DOORS ON THE MASK STORAGE COMPARTMENTS WILL ALSO STOP THE FLOW OF OXYGEN TO THE MASKS.

Figure 8-14 Crew Mask Controls



PRESS TO TEST AND RESET lever—The lever is momentarily pressed to test oxygen flow through the regulator. The lever is spring loaded to the reset position

OXY ON flag—The white OXY ON flag comes into view when the mask is out of its storage box, indicating the oxygen shutoff valve is open. The reset position shuts off the oxygen supply to the mask regulator and blinker unit.

N 100% lever—The lever has the following positions:

- **N (normal)**—This position provides a mixture of ambient air with oxygen on demand.
- **100%**—Pushing the lever provides 100% oxygen on demand.

Release lever—Squeezing the red levers unlocks the storage box door. Grasping the levers and pulling withdraws the mask from the storage box.

EMERG flow control—This control, operates in the following manner:

- Rotate the control in the direction of the arrow to supply a continuous 100% oxygen flow.
- Rotate the control to adjust the pressure supply.
- Press the control to check whether a continuous flow is available.

Overhead Control Panel

PASS OXY override switchlight—This switch (Figure 8-15) is normally not on (blanked). It is used if the passenger oxygen system autodeploy fails, or to override the autodeploy system. The switchlight comes on white to indicate the oxygen system has deployed. Pressing the switch operates the passenger oxygen compartment door latches to deploy the masks.

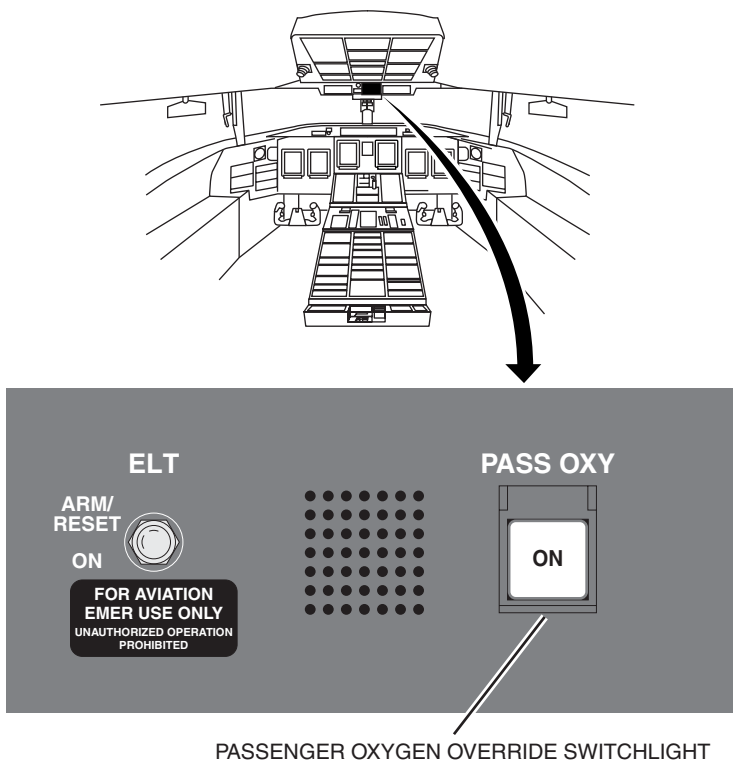


Figure 8-15 PASS OXY Override Switchlight



EICAS Primary Display—Primary Page

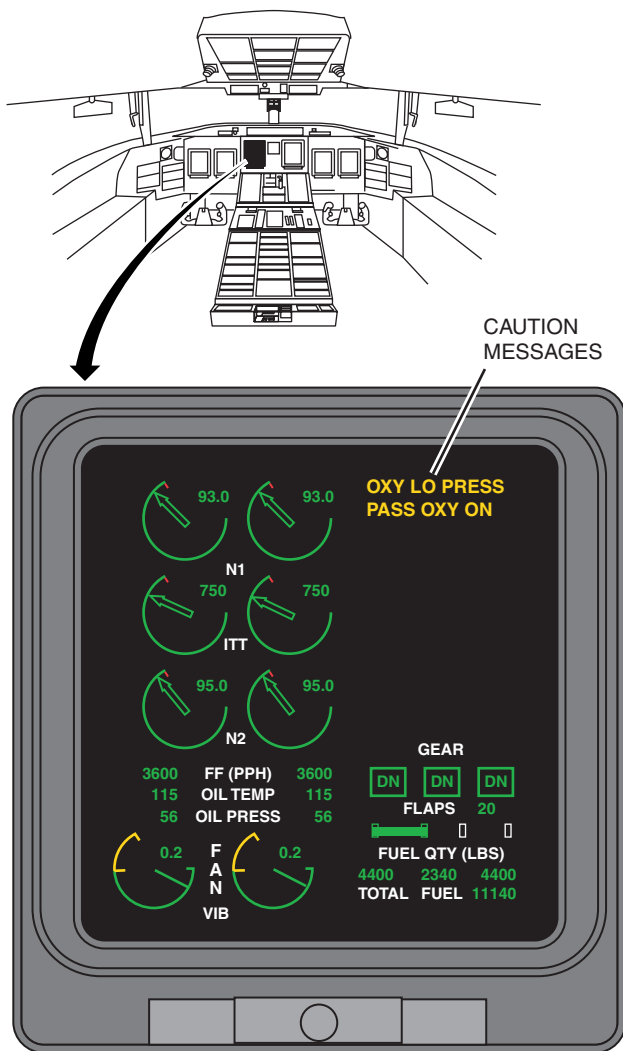
Caution Message

OXY LO PRESS—This amber caution message comes on if the crew oxygen bottle pressure drops below 1,410 psi. Check dispatch requirements (Figure 8-16).

PASS OXY ON—The amber **PASS OXY ON** caution messages comes on to indicate a passenger oxygen system deployment.

Aural Message

The EICAS caution messages are accompanied by an aural single-chime alert.



**Figure 8-16 EICAS Primary Display—Primary Page
Oxygen System Caution Messages**



EICAS Secondary Display—Status Page

Crew oxygen system pressure readout—The readout (Figure 8-17) indicates the crew oxygen system pressure in increments of 10 psi. The readout is green if pressure is equal to or greater than 1,410 psi, and amber if less than 1,410 psi.

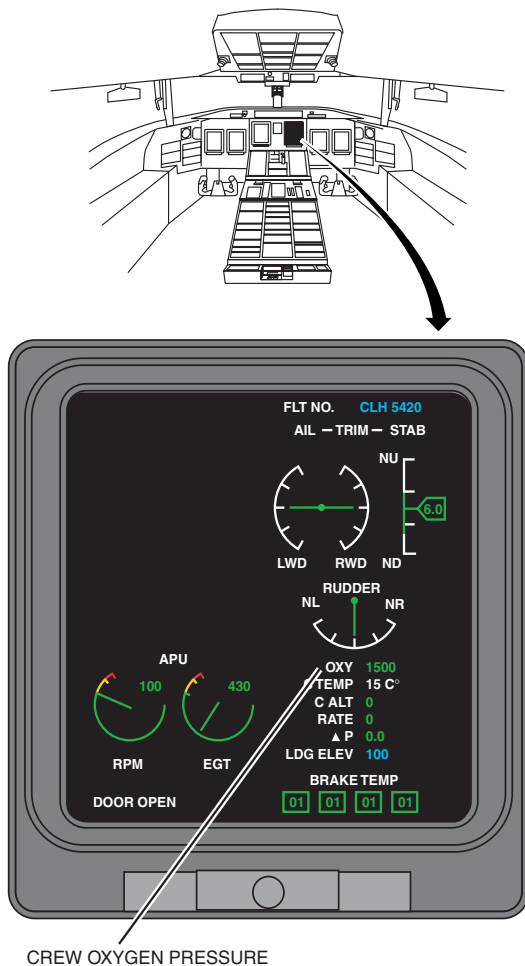


Figure 8-17 EICAS Secondary Display—Status Page Oxygen Crew Pressure Indication



EVACUATION DEVICES

EMER LTS Panel

ON/OFF/ARM Switch

ON—With power available, this switch (Figure 8-18) position turns on the emergency lights and illuminates the EMER LTS ON message on the EICAS secondary display status page.

OFF—When set to OFF, the adjacent OFF switchlight illuminates and the EICAS primary display primary page shows an EMER LTS OFF caution message.

ARM—If there is no 28-volt DC power available, the emergency lights come on with EMER LTS in ARM.

OFF indicator light—This light illuminates if the ON/OFF/ARM switch is set to OFF.

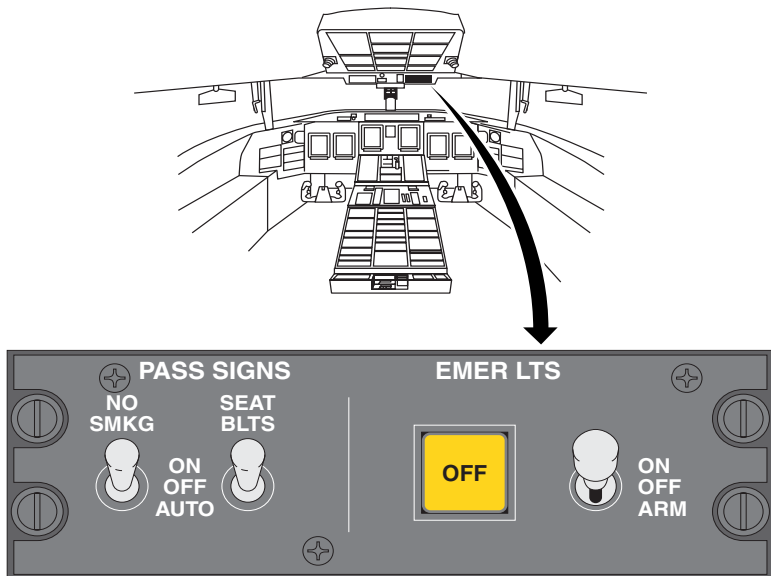


Figure 8-18 EMERG LTS Panel



Flight Attendant's Panels

EMERG LTS ON/OFF switchlights—The EMER LTS switch, on the forward attendant's panel, is used to operate the emergency lights (Figure 8-19). The switch also overrides the flight compartment EMER LTS OFF switch position.

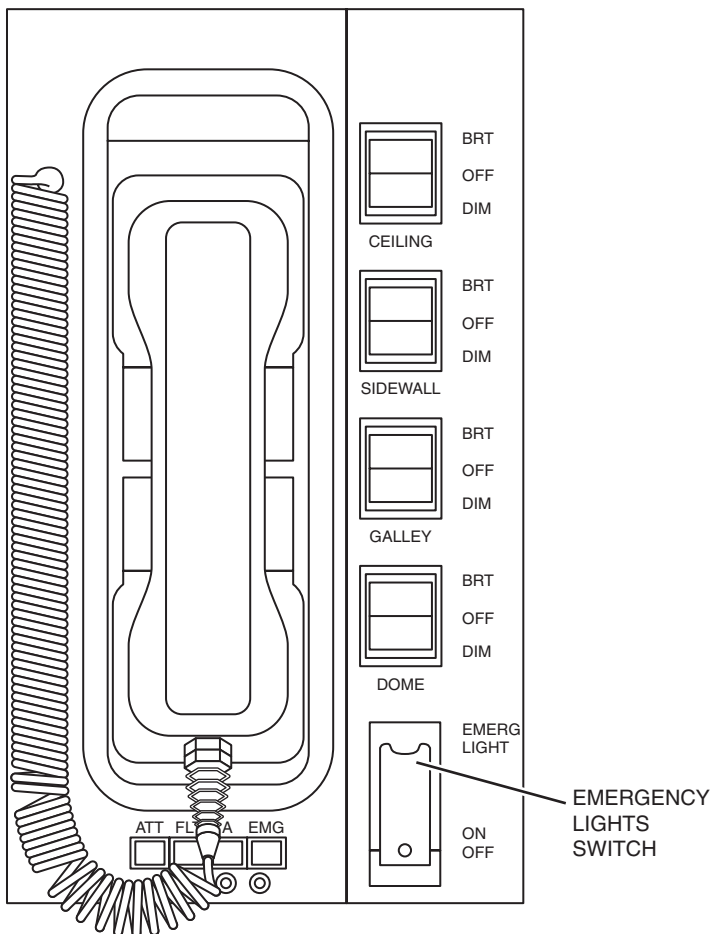


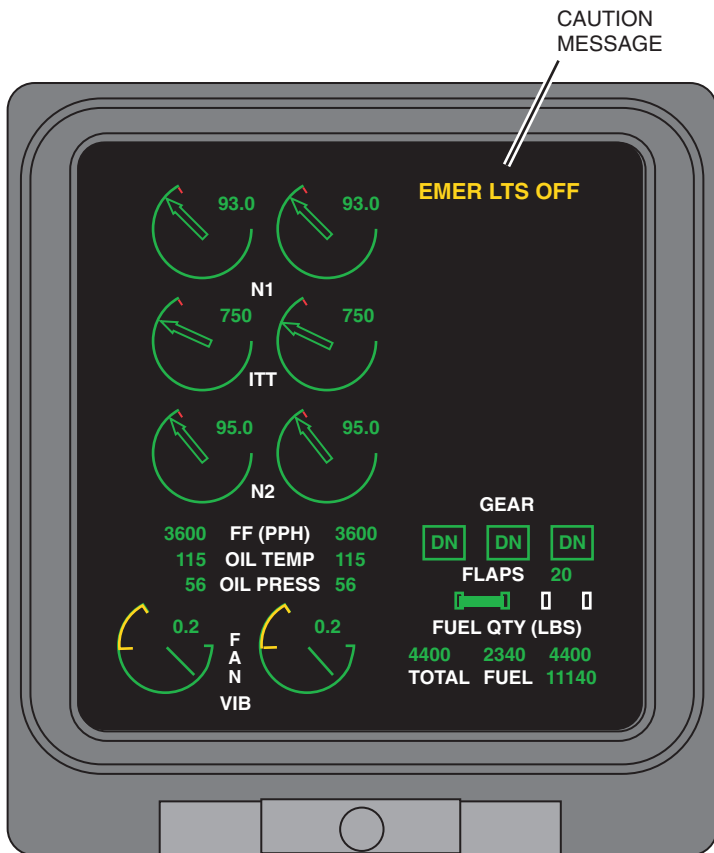
Figure 8-19 Flight Attendant's Panel EMERG LTS Switch



EICAS Primary Display—Primary Page

Caution Message

EMER LTS OFF—This amber caution message comes on if the EMERG LTS panel ON/OFF/ARM switch is set to OFF (Figure 8-20).



**Figure 8-20 EICAS Primary Display—Primary Page
Caution Message**



EICAS Secondary Display—Status Page

Status Message

EMER LTS ON—This white status message illuminates when the EMER LTS switch is selected to ON (Figure 8-21).



Figure 8-21 EICAS Secondary Display—Status Page Status Message



Power Distribution and Circuit-Breaker Summary

Table 8-6 shows the power distribution and circuit-breaker summary for the oxygen system.

Table 8-6 OXYGEN SYSTEM CIRCUIT PROTECTION

SYSTEM	SUB-SYSTEM	CB	BUS BAR	PANEL NO.	CB LOCATION
Crew oxygen system	Oxygen indicator	CREW OXYGEN MONITOR	DC BAT	2	P10
Pass. oxygen system	CPAM deploy	PASS OXYGEN/AUTO DEPLOY			P11
	PASS OXY ON switch deploy	PASS OXYGEN/MANUAL DEPLOY		1	P11
	Latch relay (RH)	PASS OXYGEN/RIGHT PASS		2	P12
	Latch relay (LH)	PASS OXYGEN/LEFT PASS		1	P12



INTENTIONALLY LEFT BLANK