

EMERGENCY EQUIPMENT AND SYSTEMS

JAA REQUIREMENTS FOR DOORS

The JAA requirements for aircraft doors are as follows:

- Can be opened from both inside and outside
- Have a means of locking to prevent opening in flight
- Will not jam during minor incident
- Maximum time to door fully open is **10 seconds** (including following the failure of any power booster [usually pneumatic] system)
- Must include a clear visual inspection panel (window!) if not inward opening and must open clear of propellers
- If door not locked, there must be an interlock to prevent pressurisation
- Any door that can be locked by a passenger (eg toilet) must be able to be unlocked by a crew member
- If used as an emergency exit, must have a **RED** exit sign

- Any able bodied individual must be able to open an emergency exit from instructions (posted both inside and outside the exit)
- Emergency exits must be kept clear and gangways to them must be at least **20"** wide
- Any overwing escape hatches must pull inwards and throw outwards. They may be fitted with an escape slide or a rope for assistance (slide down flaps?)
- If internal curtains are on the route to an emergency exit, they must have a means of securing them open and must be open for take-off and landing
- With a passenger capacity of **45 or more** it must be possible to clear the cabin in **90 seconds or less**, assuming only half the escape exits are available
- At least 2 emergency exits must be accessible from each seat

PLUG TYPE DOOR



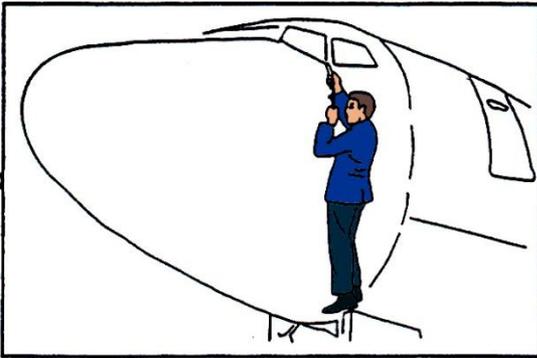
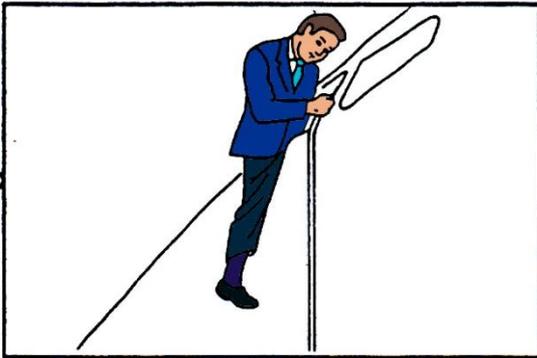
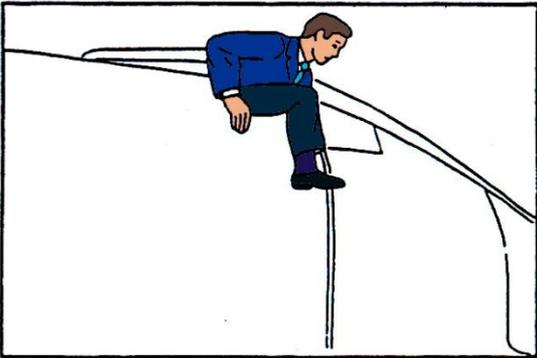
The door is closed when positioned inside the fuselage and the internal pressurisation holds it firmly closed in flight.

To open, the door is pulled inside the fuselage then turned and passed through the door aperture so that when fully open it is outside. Gates at the top and bottom of the door fold to reduce the door height to allow it to pass through the aperture.

The JAA requirements for FLIGHT DECKS are as follows:

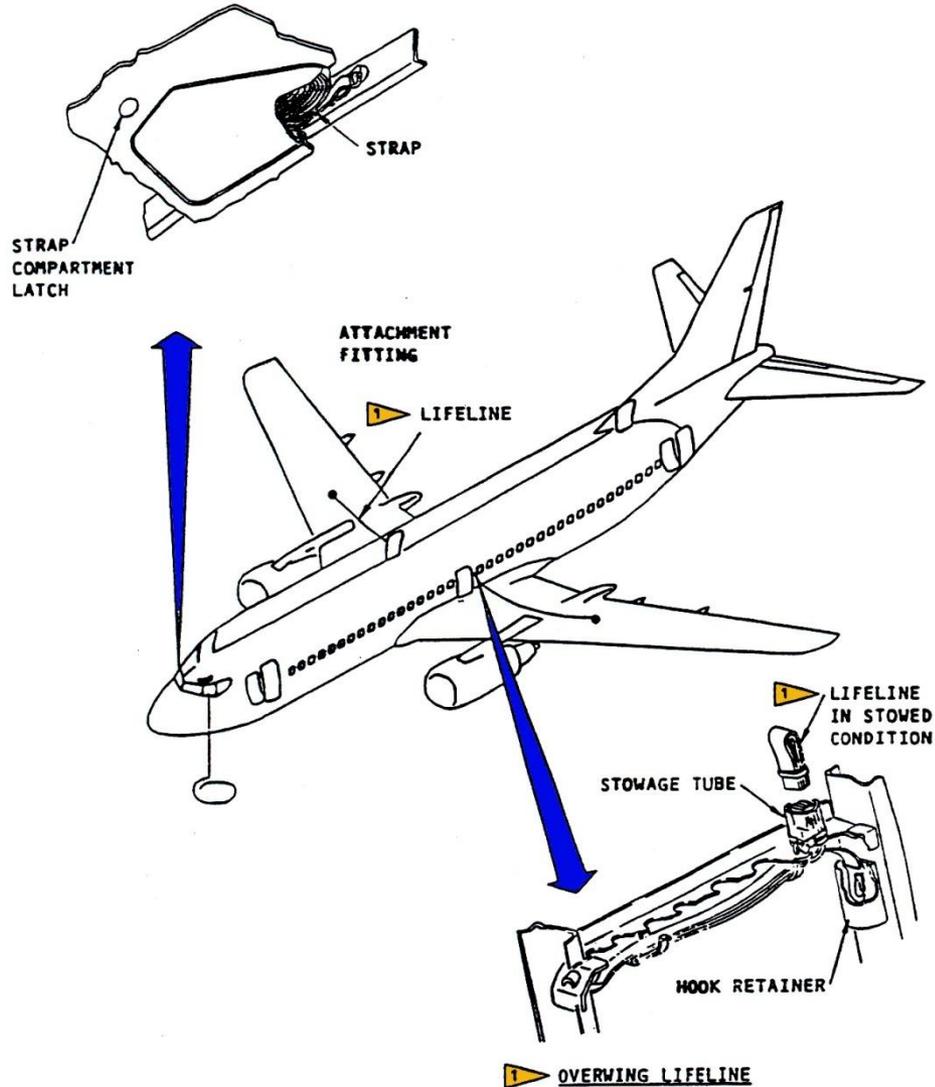
- If the aircraft can carry more than **19 passengers**, the flight deck must have a door with a sign "**CREW ONLY**" which is lockable
- There must be a means of escape, either to the side of each pilot or a roof escape hatch, with a means of being lowered to the ground
- Fixed markers or other guides must be installed at each pilot station to enable the pilots to position themselves in their seats for an optimum combination of outside visibility and instrument scan. The **Eye Reference Position** - standardises the visual attitude especially on a **Low Visibility** approach and landing.

FLIGHT DECK EVACUATION

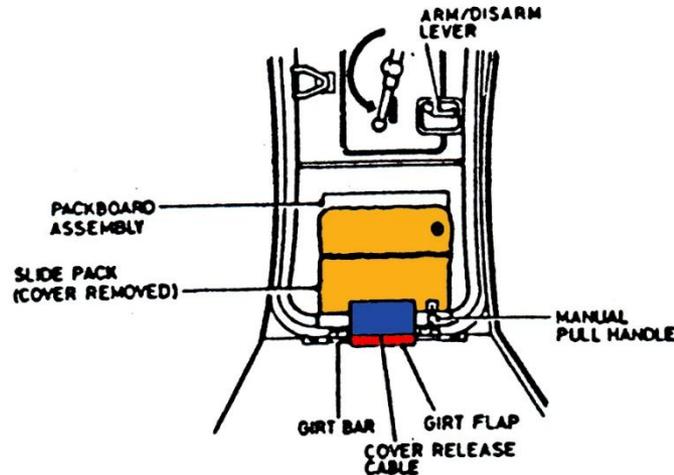


ESCAPE ASSISTANCE

COCKPIT ESCAPE STRAP



EMERGENCY SLIDES



NOTE:
LEFT HAND PASSENGER DOOR SHOWN
RIGHT HAND SERVICE DOORS SIMILAR

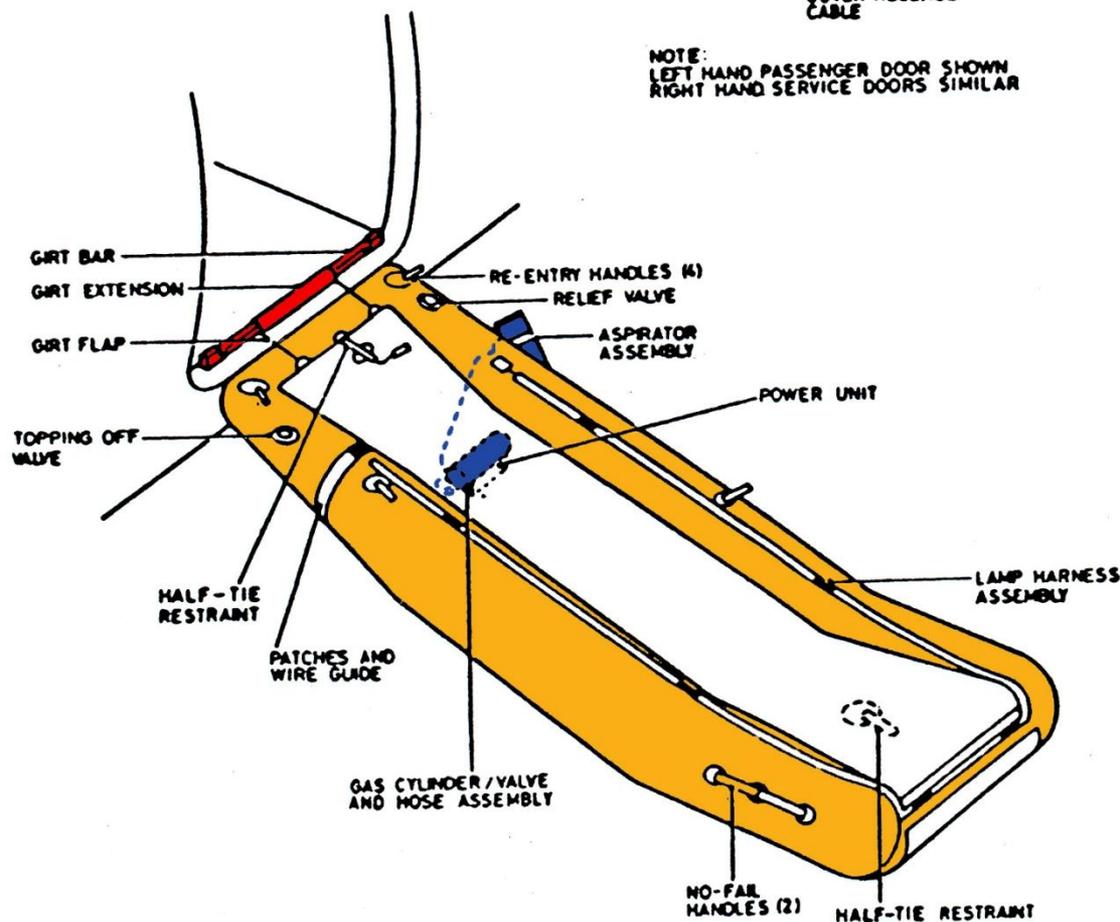
- Any emergency exit with a sill height of **6 feet or more**, with a landing leg collapsed, must be fitted with an escape slide that deploys within **10 seconds**.

- The slide is activated automatically as the door opens and must be capable of being deployed in a **25kt** wind from the worst direction

- Must have manual inflation capability

- Attached to aircraft by a 'girt bar'

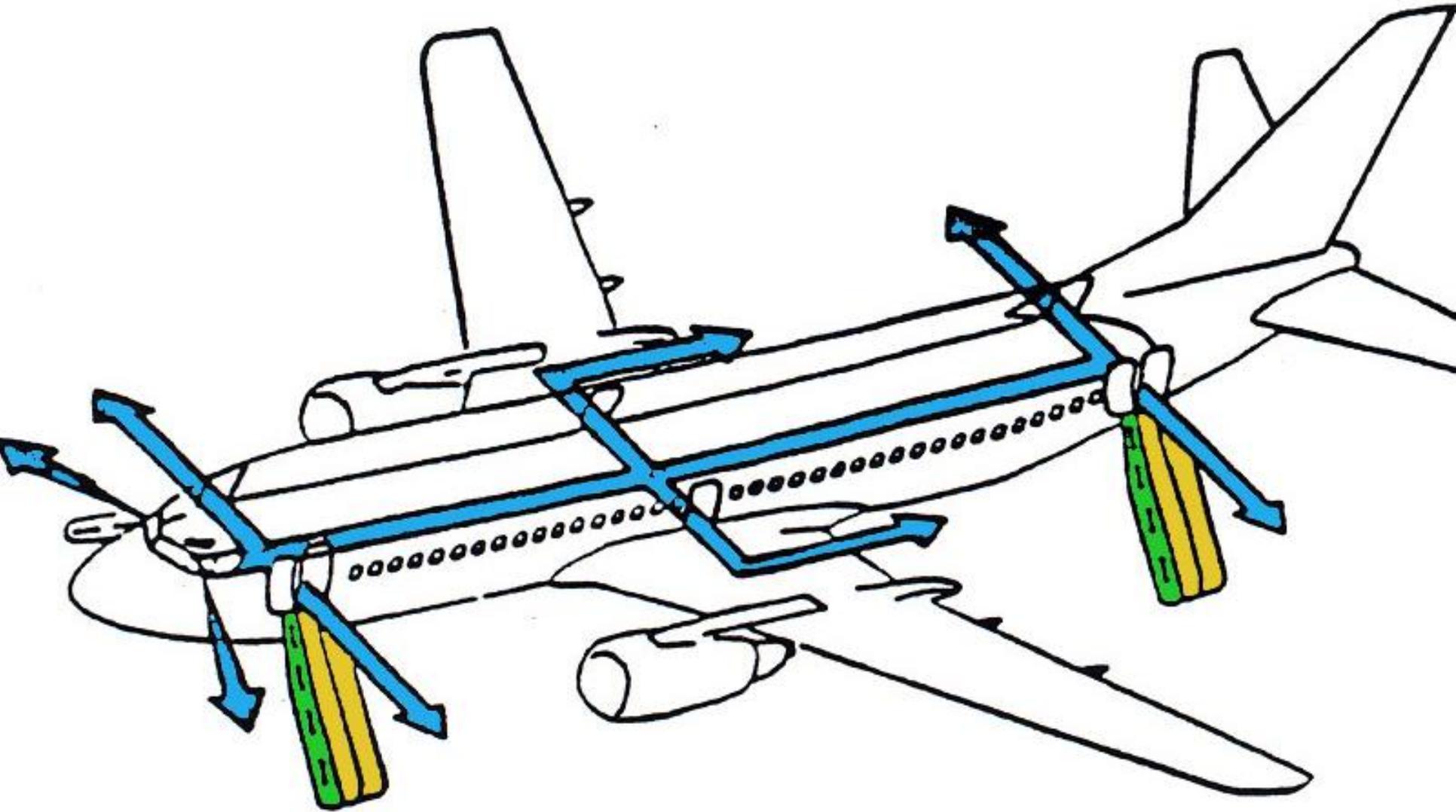
- Automatic system prevents slide deploying when door opened from outside



DOOR and SLIDES



TYPICAL TWIN ESCAPE ROUTES



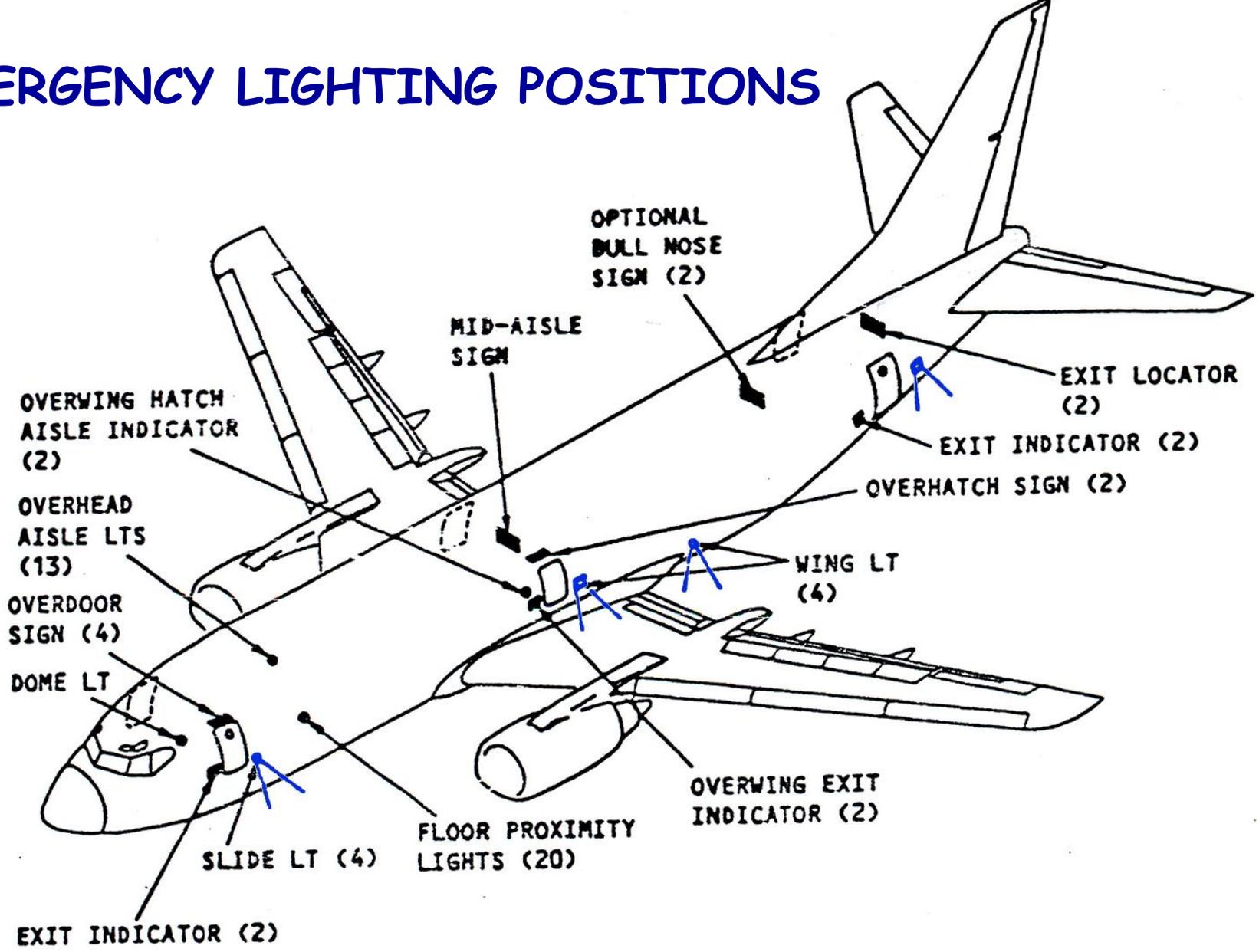
EMERGENCY LIGHTING

- Independent battery system, trickle-charged during flight (red light on whilst charging)
- 3 position master switch on the flight deck
 - on/off/armed (lights turned on by either 3g crash switches or total electrical failure)
- May be turned on/off by the cabin crew
- Floor lighting must be fitted either to the floor or side of seats to indicate the direction to the nearest exit
- Must last for at least 10 minutes (but a lot will last for up to 30 minutes)

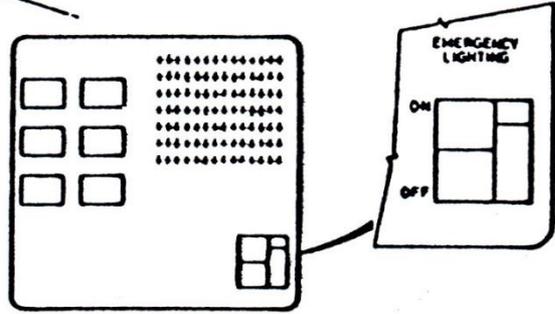
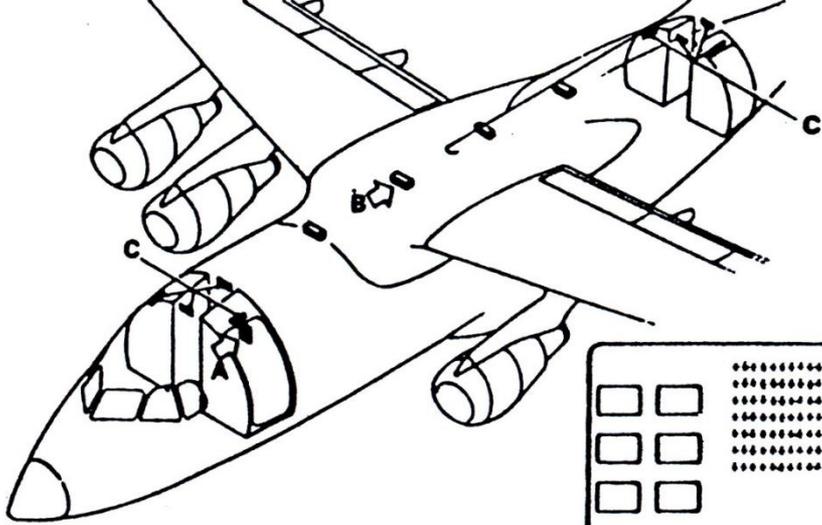
CREW TORCHES

- Torches supplied for each crew member with an additional one at each emergency exit
- Must last for at least 30 minutes

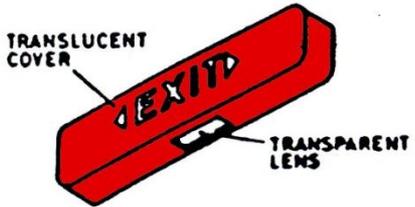
EMERGENCY LIGHTING POSITIONS



● SOLID = INTERIOR
 □ RING = EXTERIOR



A FRONT CABIN ATTENDANTS INTERCOMM PANEL

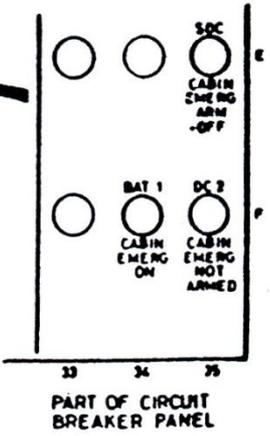
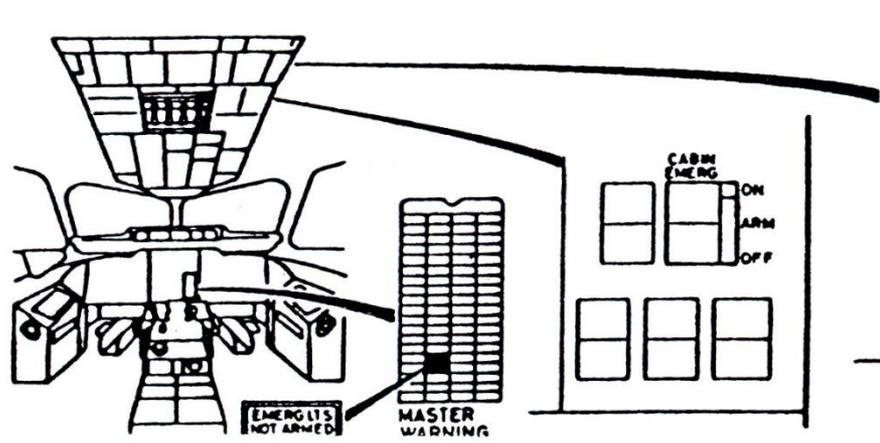


C EXIT SIGN (TYPICAL)

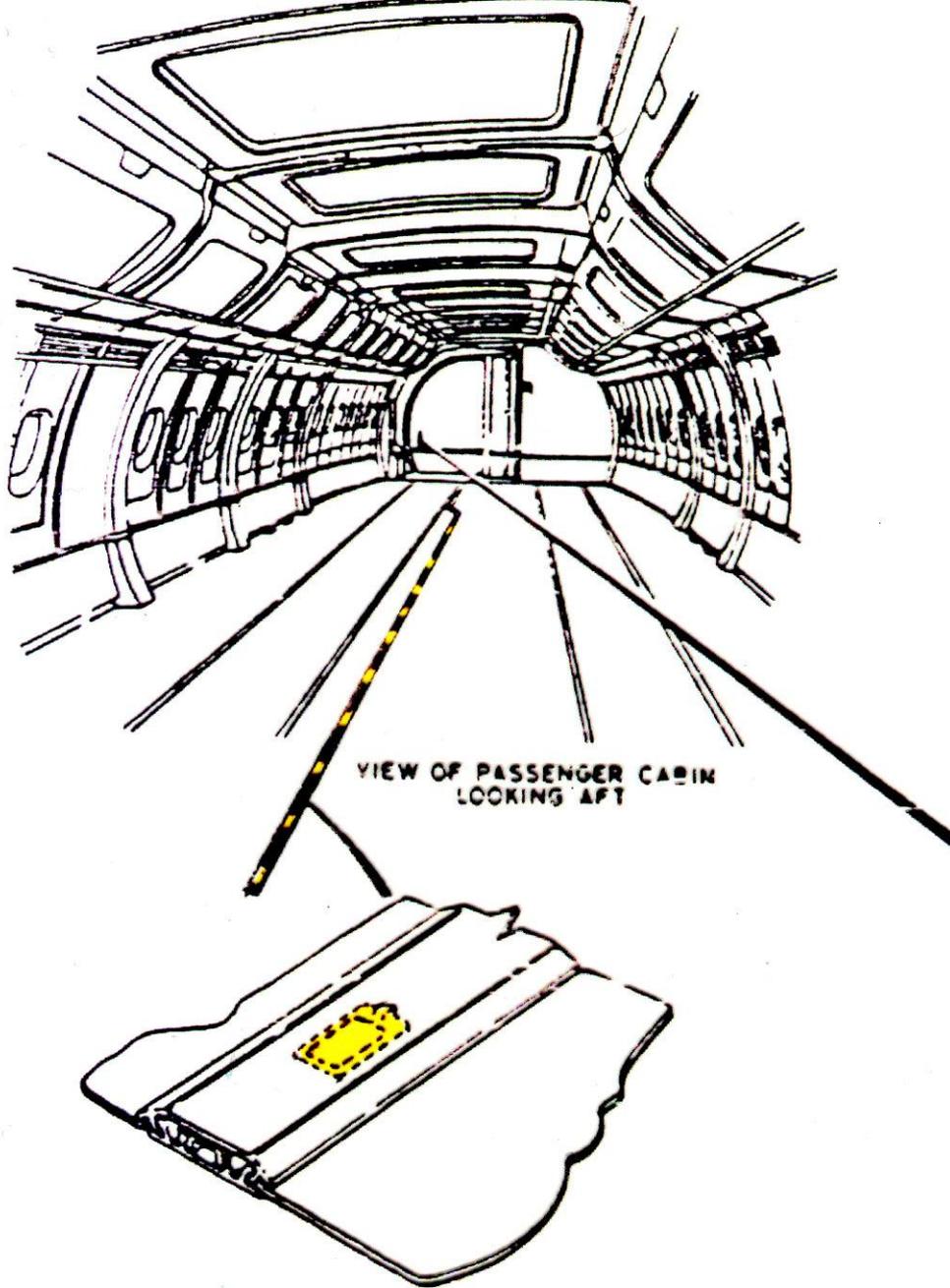


B LOW INTENSITY CABIN EMERGENCY LIGHT UNIT

EMERGENCY LIGHTING



PART OF CIRCUIT BREAKER PANEL



VIEW OF PASSENGER CABIN
LOOKING AFT

FLOOR LIGHTING



E FLOOR PROXIMITY
ESCAPE PATH

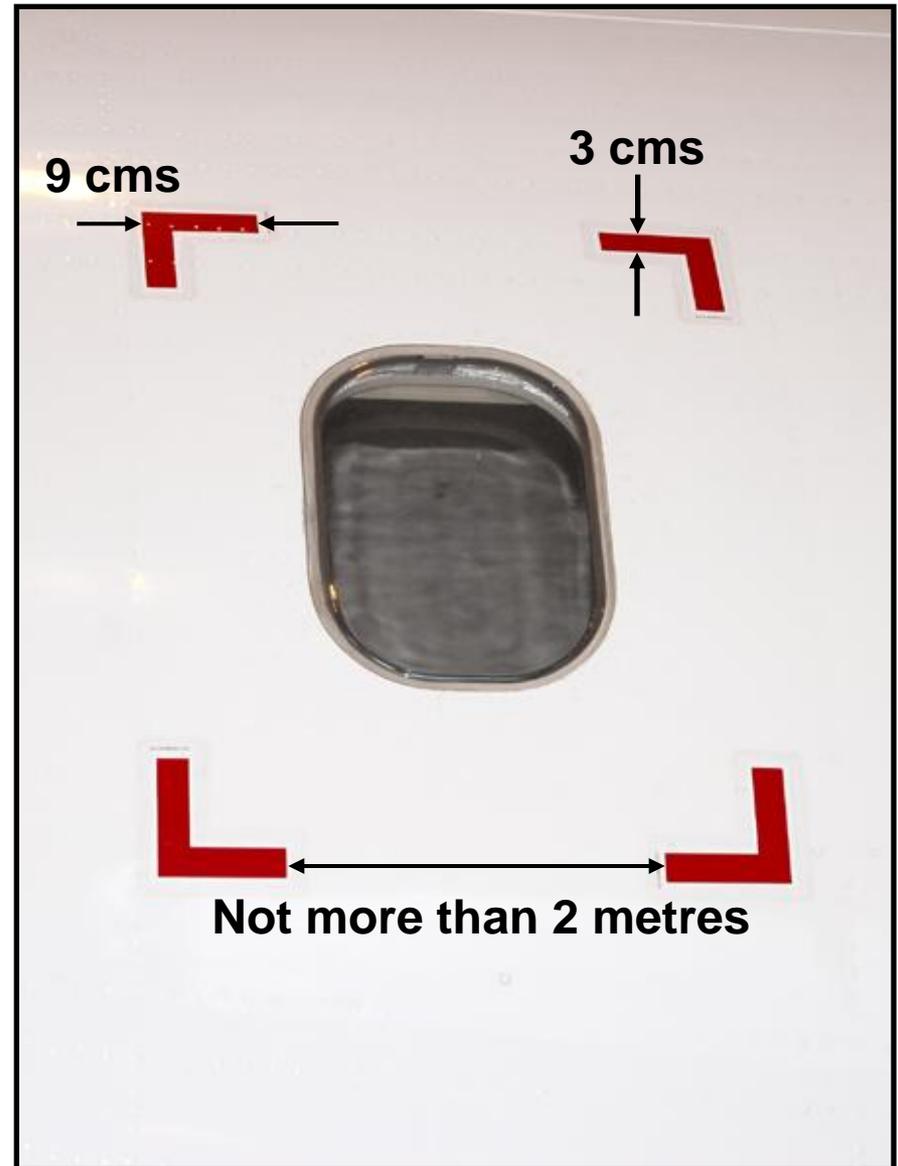
BREAK-IN MARKINGS

Break-in markings are painted at points where the aircraft can be safely cut into to allow emergency services to enter the aircraft when doors cannot be operated

Areas used are where no danger exists from normal aircraft systems such as hydraulics, electrics, oxygen etc

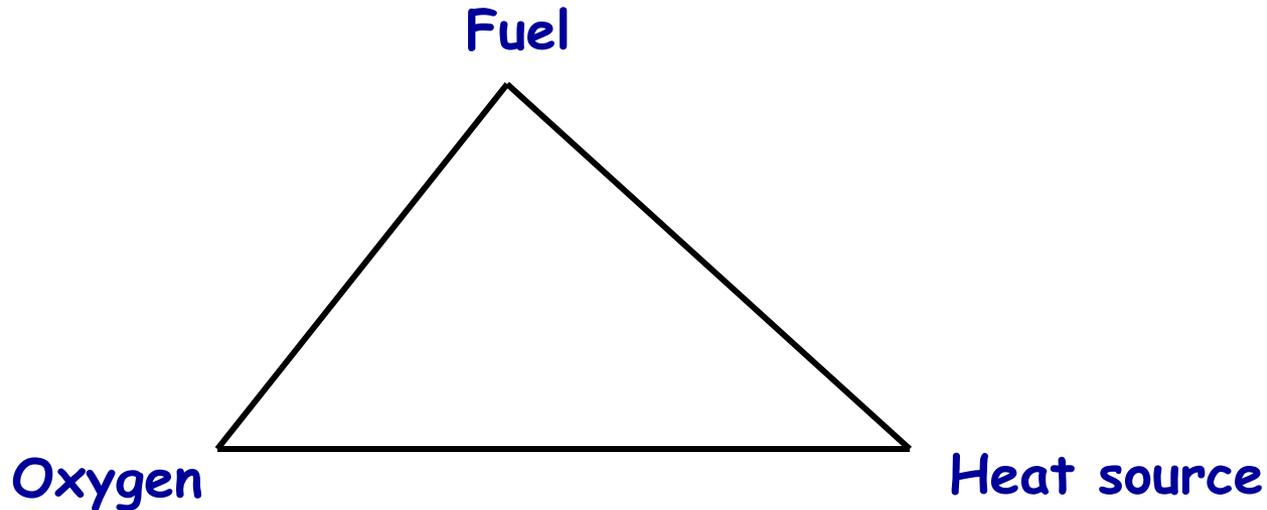
Coloured **red** or **yellow** and, if necessary, outlined in white to provide contrast with the background

Sizes are a JAA stipulation and are as shown



FIRE AND SMOKE

- Fires need 3 items to support them. These are:

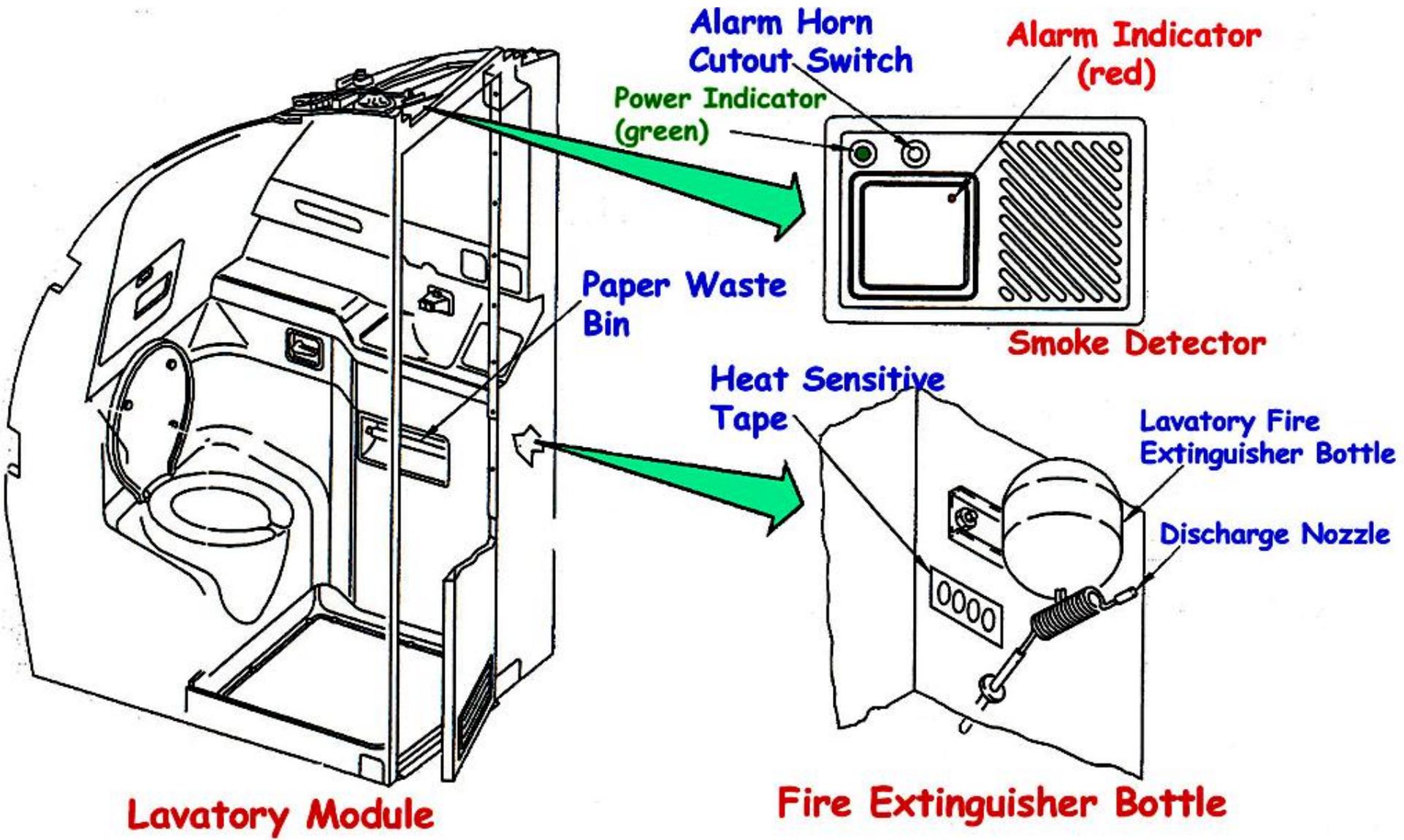


- Remove any one of these and the fire will go out
- A '**FIRE ZONE**' is a manufacturer designated area where there is a perceived risk of fire and may have both fire detection and protection
- Typical fire zones are:
 - **Engine bays/APUs**
 - **Electrical bays**
 - **Hydraulic bays**
 - **Baggage holds**
 - **Toilets and galley areas**

SMOKE DETECTORS

- Smoke detectors come in several forms:
 - CO detectors fitted in cabins
 - Yellow silica gel that turns green in the presence of CO (more CO; more the intensity of the green)
 - Visual smoke detector in which a sample of air is drawn through a tube with a backing light and visually checked by the crew
 - Remote smoke detectors are fitted in underfloor bays where there is a chance of fire (also fitted in toilets)
- Two types of remote detectors are OPTICAL or IONISATION
- Both normally give an aural and/or visual warning
- Nb Remote smoke detectors fitted in toilets give a visual or aural warning in the cabin or a visual warning in the cockpit

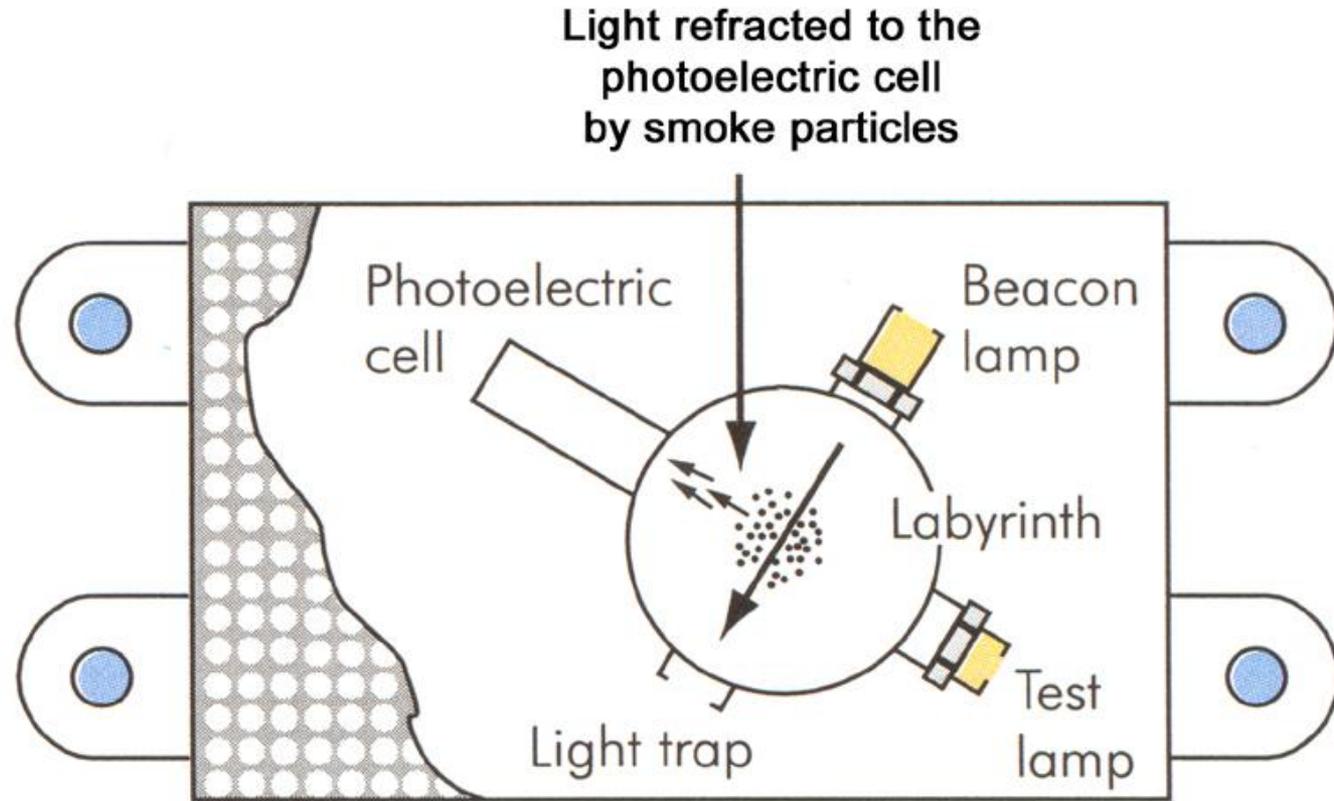
LAVATORY DETECTION AND PROTECTION



Lavatory Module

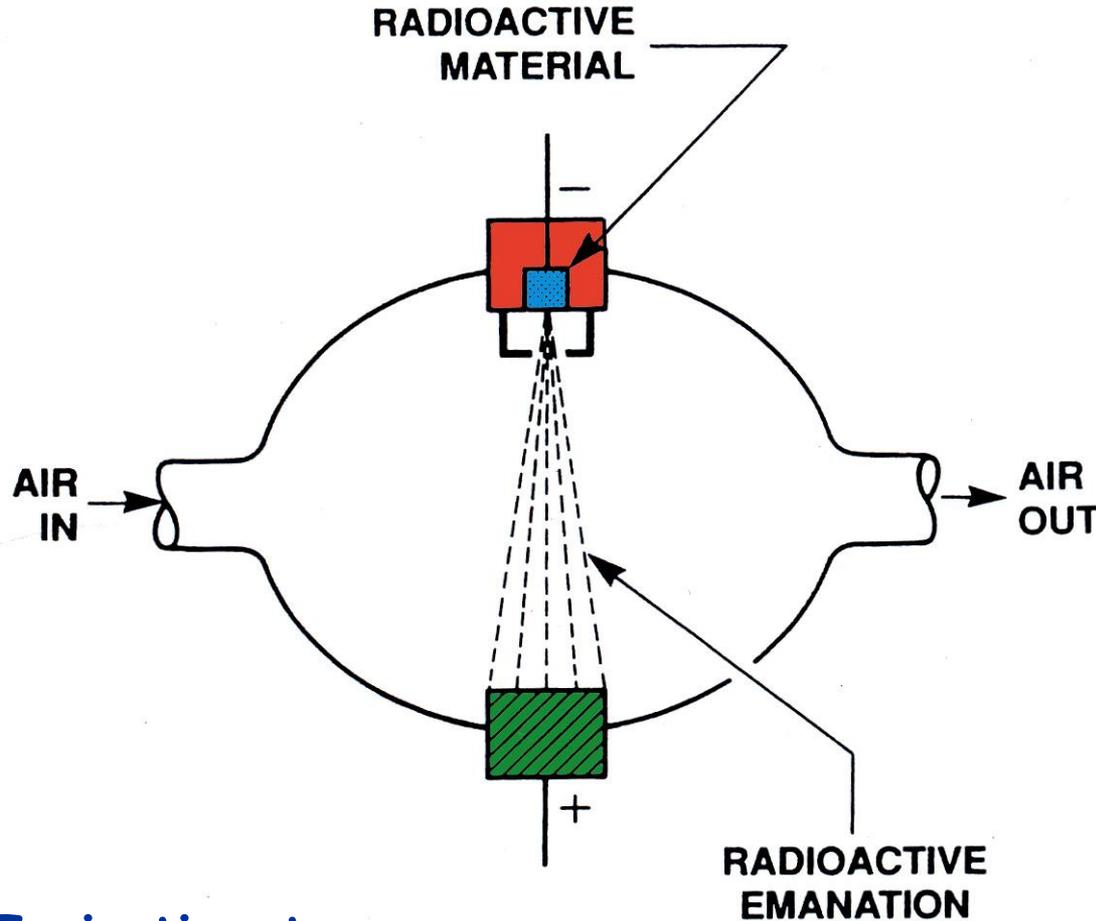
Fire Extinguisher Bottle

REMOTE SMOKE DETECTORS (1)



- Optical or Photo-electric cell type
- Light refracted by the presence of smoke particles into a photo-electric cell
- Sets off bell and/or light

REMOTE SMOKE DETECTORS (2)



- Ionisation-type
- Uses a small quantity of radio-active material to ionise O_2 and N_2 molecules and this allows a small current to pass between the terminals
- Presence of smoke reduces the current and, at a pre-set level an alarm (light and/or bell) is activated

FIRE EXTINGUISHERS

- All types of hand-held fire extinguishers are coloured red and have different coloured labels as shown in the following table:

TYPE	LABEL COLOUR	TYPE OF FIRE	ACTION
WATER	RED	MATERIAL	Removes heat
DRY POWDER	BLUE	FLUID/BRAKES	Isolates O ₂
HALON (BCF)	GREEN	ALL CLASSES	Stops chemical reaction between O ₂ and fuel
CO ₂	BLACK	ELECTRICAL/ ENGINE	Removes heat

PORTABLE FIRE EXTINGUISHERS

TYPE OF FIRE	APPROPRIATE FIRE EXT	REMARKS
ORDINARY COMBUSTIBLES	WATER, CHEMICAL FOAM, DRY CHEMICAL	RISK OF FLARE UP AFTER USING DRY CHEMICAL ON THIS CLASS OF FIRE
FLAMABLE OR COMBUSTIBLE LIQUIDS	HALON, DRY CHEMICAL, CO ₂ , CHEMICAL FOAM	HALON IS TOXIC AND VENTILATION MUST BE CONSIDERED
ENERGISED ELECTRICAL EQUIPMENT	HALON, DRY CHEMICAL, CO ₂	DRY CHEMICAL CAN BE CORROSIVE. IT CAN ALSO BE A RESPIRATORY IRRITANT
COMBUSTIBLE METALS	DRY POWDER	SAND CAN BE USED FOR A MAGNESIUM FIRE

DRY CHEMICAL SUITABLE FOR FIRST 3 TYPES OF FIRE (MULTI-PURPOSE)

ENGINE FIRE EXTINGUISHANTS

- There are a number of extinguishants used for engine fire suppression. Their effect on the engine is shown below:

EXTINGUISHANT	HARM TO ENGINE
CO ₂ /BCF/HALON/ METHYLBROMIDE	NONE, AS LONG AS ENGINE TURNED OVER FOLLOWING USE
FOAM OR DRY POWDER	ENGINE STRIP AND REBUILD

FIRE EXTINGUISHERS

AT LEAST THE FOLLOWING NUMBER ARE REQUIRED IN THE CABIN:

Maximum approved passenger seating configuration	Number of Extinguishers
7 to 30	1 ANY TYPE
31 to 60	2 (1 HALON)
61 to 200	3
201 to 300	4
301 to 400	5
401 to 500	6
501 to 600	7
601 or more	8

IN ADDITION TO THE TABLE FIGURES:

AT LEAST 1 HALON ON THE FLIGHT DECK

AT LEAST 1 IN ANY GALLEY NOT IN THE PASSENGER COMPARTMENT

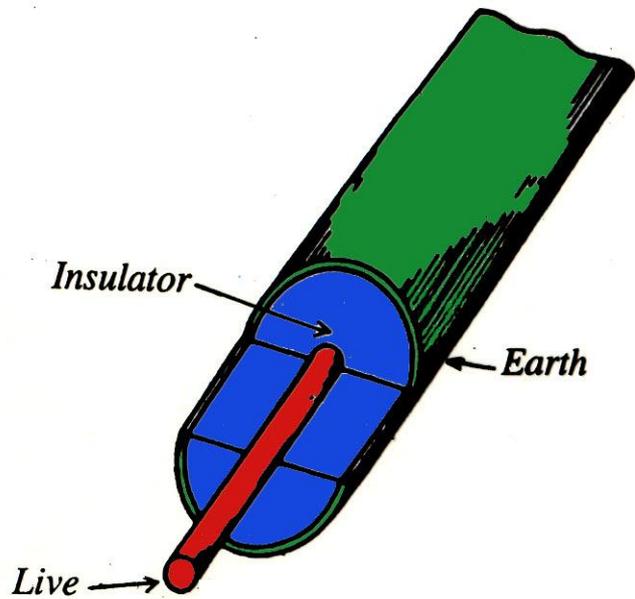
AT LEAST 1 AVAILABLE FOR USE IN EACH CARGO COMPARTMENT

2 HALON

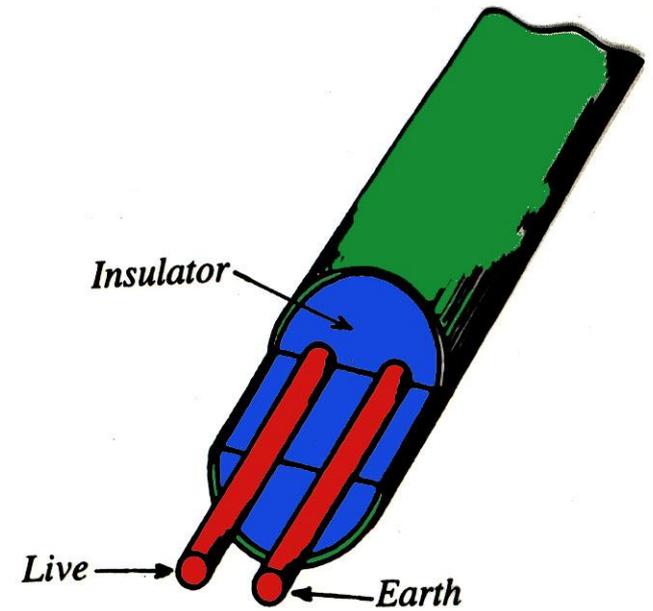
ENGINE FIRE SUPPRESSION

- Detectors cover a large area and need to give rapid warning within **5 seconds** of a **large temperature rise**
- Will reset within **30** seconds once temperature reduces
- Warning system has an individual red light for each engine and a bell that is common to all engines
- Main type of fire detection system is termed **Fault Free Fire Detection (FFFD)**
- There are 2 types of FFFD; one uses a continuous loop wire with a **negative coefficient of resistance**, the other with a **positive coefficient of capacitance**
- Both systems are **ac** electrically powered, but their test circuits are **dc**
- As the materials in the FFFD are affected by the heat, a current will flow and, at a predetermined level, will operate both the bell and the appropriate engine light
- Systems usually have 2 independent loops with both being needed to initiate a warning
- A break in a loop will not affect the operation of the system

FIRE WIRES

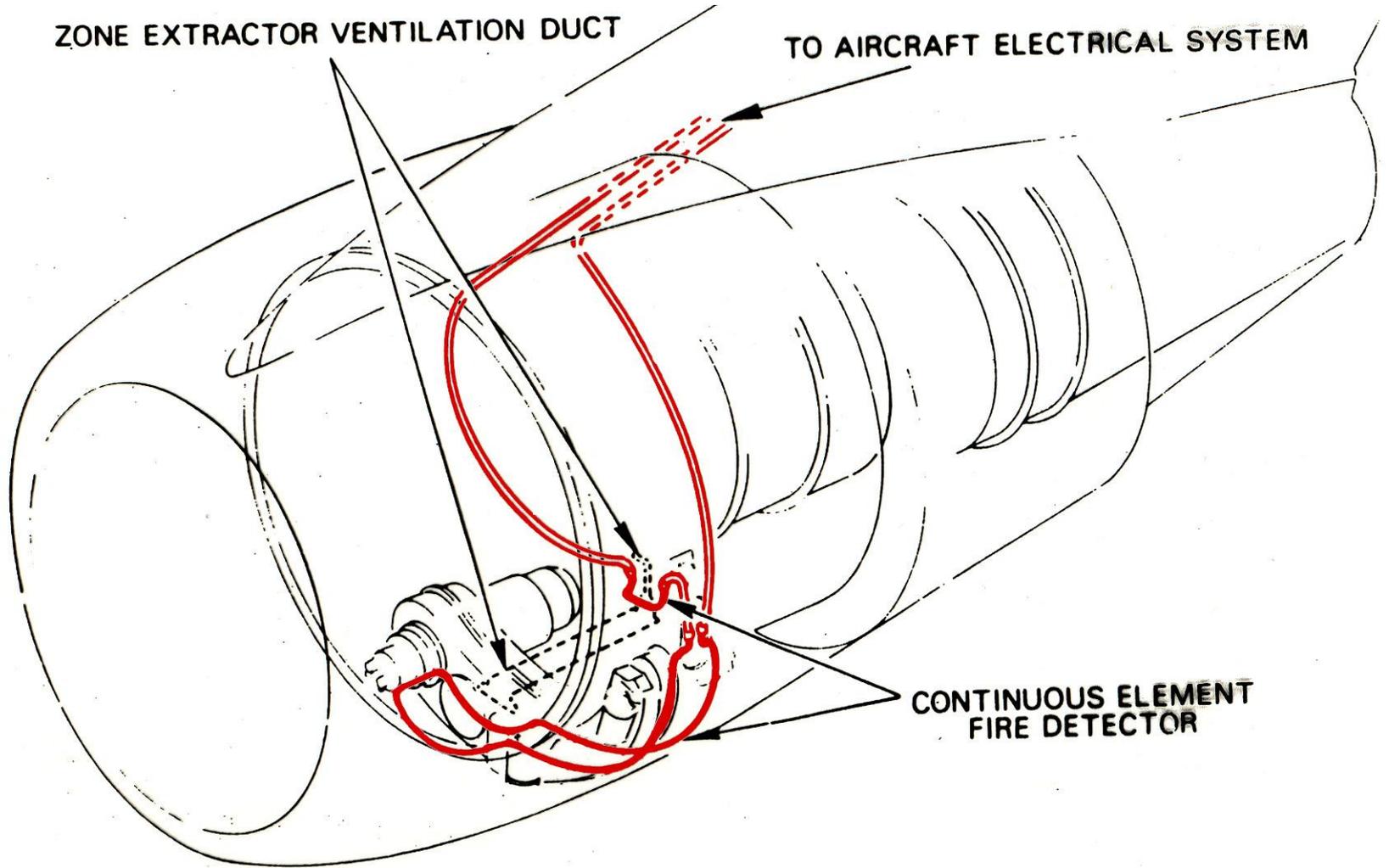


Fenwal Sensing Element

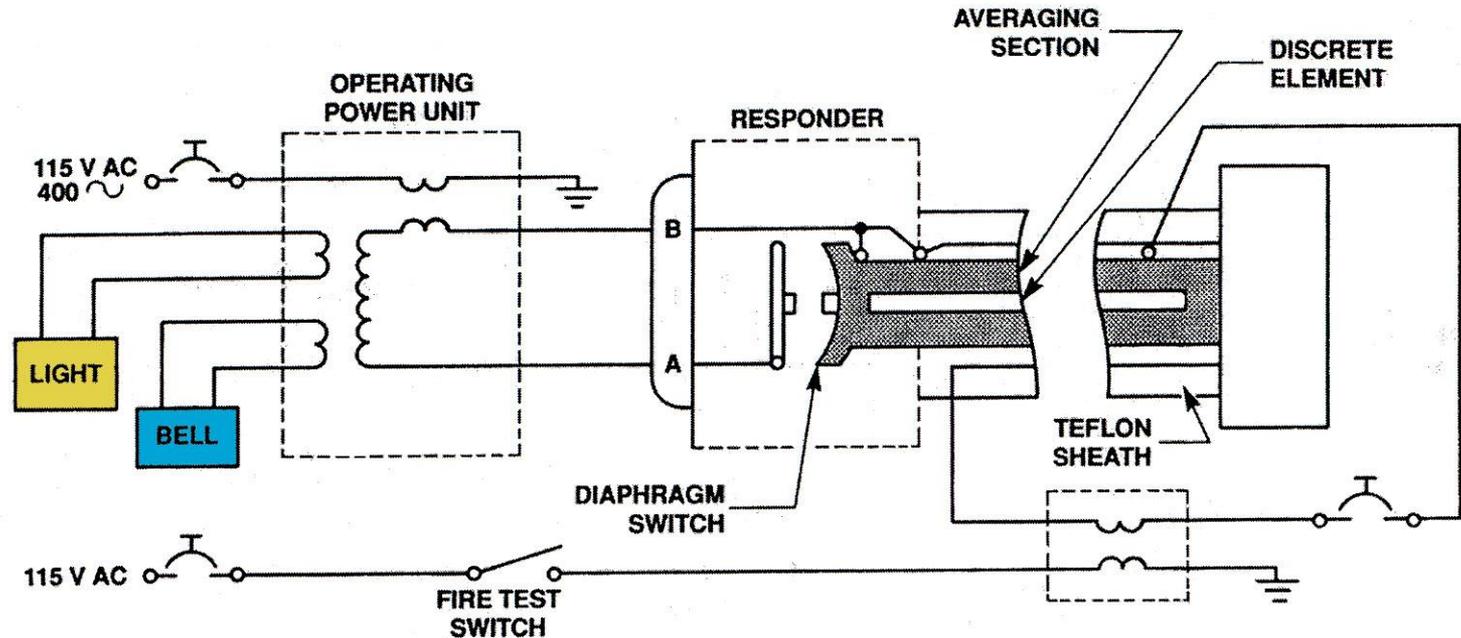


Kidde Sensing Element

CONTINUOUS ELEMENT FIRE WIRE

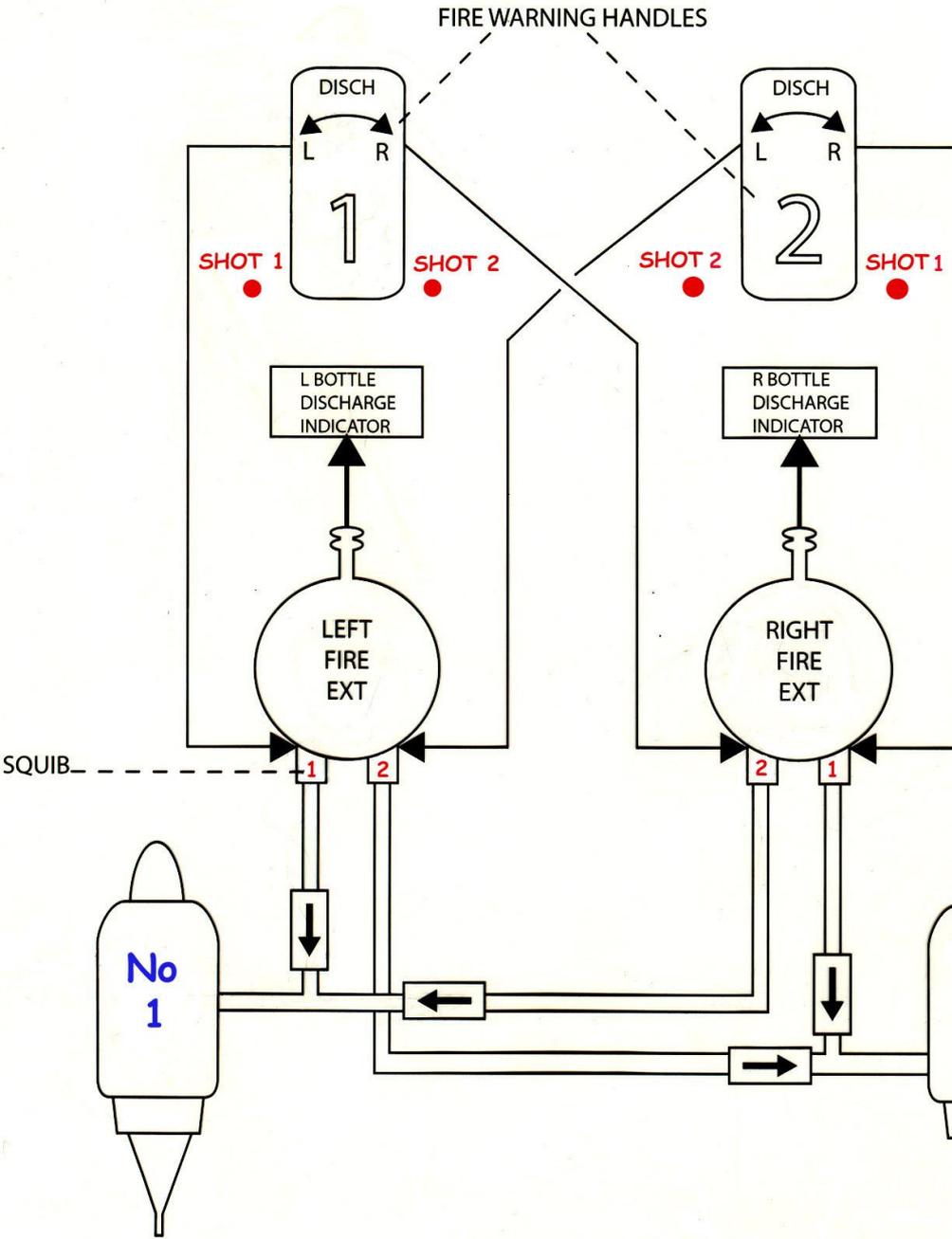


LINDBERG FIRE DETECTION SYSTEM



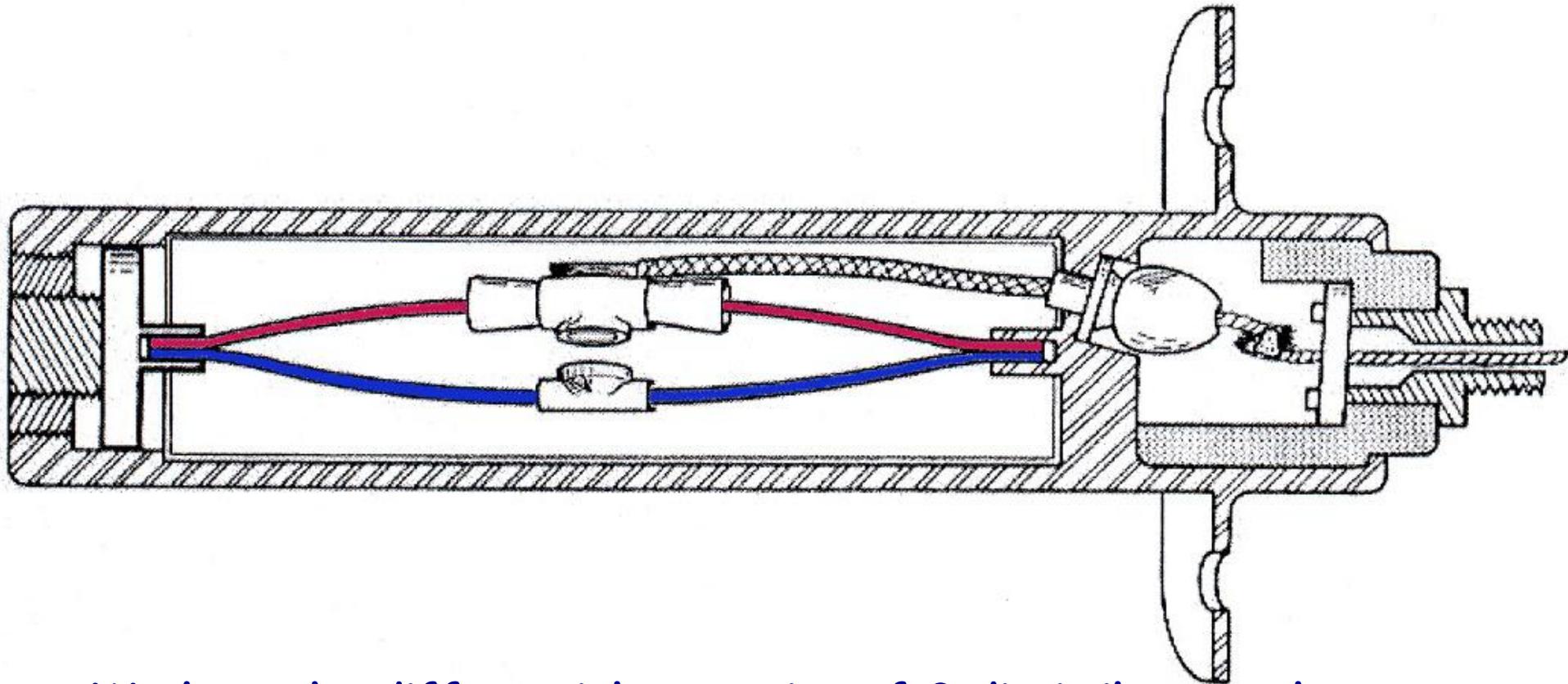
- Continuous stainless steel tube around engine
- Gas forced into tube during construction and partially absorbed by the titanium core before sealing
- When heated, gas is released from core and a switch in the responder unit makes and initiates a warning
- On test, pressurised gas causes the warning

ENGINE FIRE SUPPRESSION



- Has to discharge in between $\frac{1}{2}$ and 2 seconds
- 2 available for each engine
- Thermal discharge disc on outside of engine to indicate if bottles have self-discharged thermally

FLAME SWITCHES



- Work on the differential expansion of 2 dissimilar metals
- May be found more in areas of hot gases rather than fire
- Differential expansion causes an electrical contact to make and this sets off an alarm

FIRE DRILL

STANDARD ENGINE FIRE DRILL (GAS TURBINE)

CANCEL THE FIRE BELL

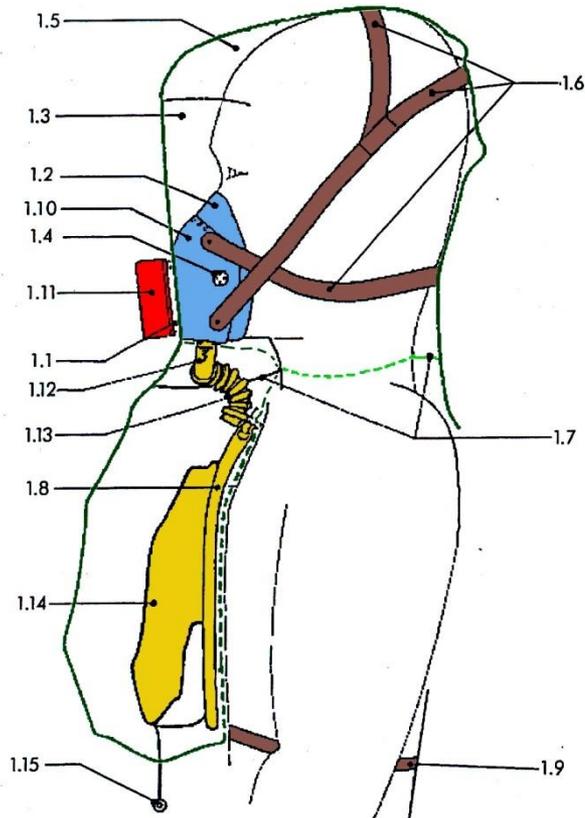
CLOSE THE THROTTLE

SHUT THE HP COCK

PULL THE FIRE HANDLE (LP cock off, Hydraulic shut off
cock operated, Generator off line, all bleeds off)

DISCHARGE THE FIRE EXTINGUISHER

SMOKE MASKS AND HOODS



- Provided for each of the crew
- Most contain chemical converter to produce O₂ and are used for fire-fighting
- Supply must last for a minimum of **15 minutes**
- 2-way communications must be available when wearing the hoods
- **Protects the whole face**

DRAGER OXYCREW – ILLUSTRATION 1

1.1	speech transmitter	1.8	cartridge
1.2	inner mask	1.9	belt
1.3	visor	1.10	hardshell
1.4	location of anti-suffocation valve used as inhalation valve	1.11	megaphone connector
1.5	hood	1.12	exhalation valve
1.6	straps	1.13	breathing hose
1.7	neck seal	1.14	breathing bag
		1.15	activation lanyard

OTHER FIRE-FIGHTING EQUIPMENT

- Portable oxygen:
 - 120 litre bottles last about **20 minutes** dependent on rate of breathing
 - Flow rates are normal (2 ltrs/min), high (4ltrs/min) and emergency (10 ltrs/min)
- Fire axe/crowbar
 - At least **one** located on the flight deck (> 5700 kg or > 9 seats)
 - > 200 seats a second one is required in the rear of the aircraft and must be hidden from passengers
- Fire-proof gloves
 - At least one set stowed on the flight deck

FIRST AID KITS

MINIMUM NUMBER OF FIRST AID KITS ARE:

Number of passenger Seats installed	Number of First-Aid Kits required
0 to 99	1
100 to 199	2
200 to 299	3
300 and more	4

THEY MUST BE REGULARLY INSPECTED AND REPLENISHED.

- If the aircraft has more than 30 seats and operates on routes that are more than 1 hour's flight time from a suitable aerodrome, then it must also carry an emergency medical kit
- Kits contain specialist medical drugs and equipment and can only be used by a qualified person
- Commander decides how and when used; must also be regularly replenished and inspected

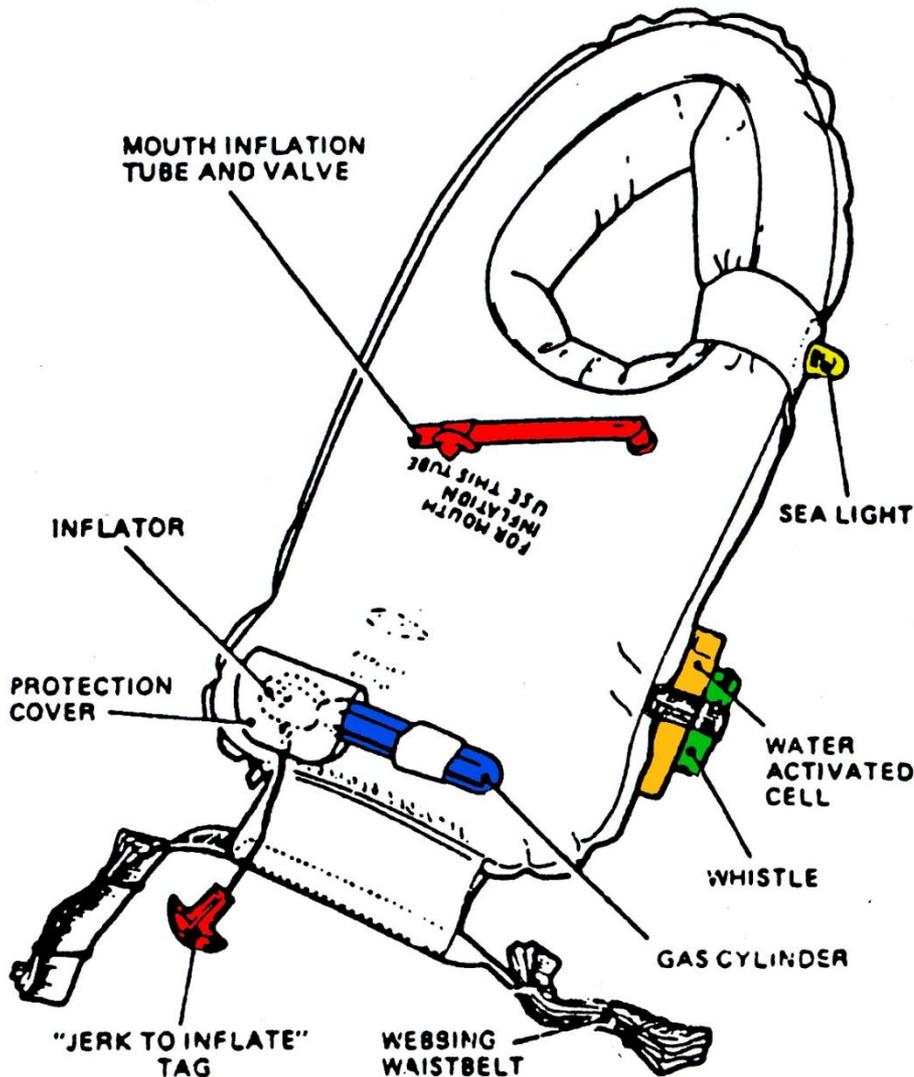
PA AND INTERPHONE SYSTEM

- If the aircraft carries **more than 19 passengers**, the aircraft must be fitted with a public address system
- If the aircraft carries **more than 19 passengers and has a maximum certified weight in excess of 15 000 kg** it must have an interphone system

MEGAPHONE

- To be used if PA system fails or in an emergency
 - 61 - 99 seats only carry one portable, battery-powered megaphone**
 - 100+ seats, 2 are required**

LIFE JACKETS



- If aircraft flying more than **50 nm** from land, or **departing/arriving over water**, life jackets must be carried
- Must be stowed to be easily accessible (normally below seat)
- Operating instructions must be displayed in the aircraft, on a safety leaflet or card and printed on the jacket
- Jackets are one size and are unsuitable for children under **4** who must have infant life jackets (or cot)
- **Must** have an oral inflation tube and a light. **May** have whistle/shark repellent/dye marker/signalling device
- Any damaged or used in sea water must be rejected

LIFE RAFTS

- If operating to ETOPS standard or greater (ie can fly to a suitable diversion from any point on route with critical engine inoperative), need to fly up to **400nm** or **2 hours** at cruising speed, whichever is lesser, from land before life-rafts need to be carried
- If operating to a lesser standard, the limits are **100nm** or **30 minutes**
- Must carry sufficient that, should the largest dinghy fail, still enough space for everyone
- Inflated by a CO₂ bottle and carry a number of life-saving items

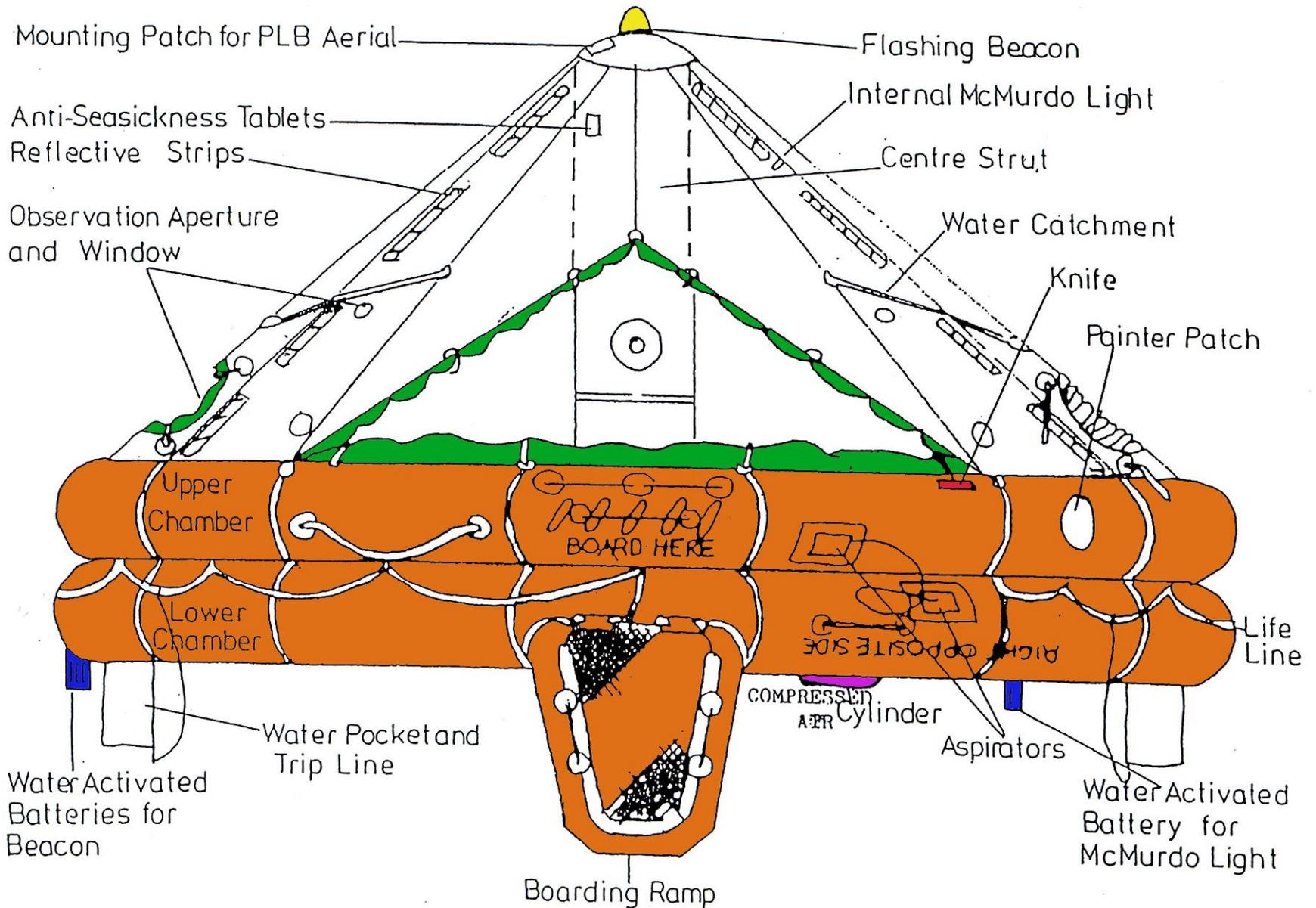
EMERGENCY LOCATOR TRANSMITTERS (ELTs)

- Operate on **121.5 and 406 MHz**
- If life rafts need to be carried, aircraft must have **2 ELTs**
- If no life rafts necessary, aircraft must carry at least **1 ELT**
- ELTs must last a minimum of **48 hours**

ADDITIONAL EMERGENCY EQUIPMENT

- JAR 25 certified aircraft, when flying in areas considered to be difficult for SAR (eg arctic/desert), must carry additional safety equipment suitable for the area being overflown or be within **90 minutes** of a suitable landing airfield (must include **signalling pyrotechnics**)

LIFE RAFTS



SEAT HARNESSSES

- All passengers above the age of 2 must have their own seats
- Passengers have lap straps
- Crew must have full harnesses, fastened for take-off and landing