

European Technical Standard Order

Subject: HELICOPTER LIFERAFTS FOR OPERATIONS TO OR FROM HELIDECKS LOCATED IN A HOSTILE SEA AREA

1 - Applicability

This ETSO gives the requirements which liferafts required to be carried on helicopters operating to or from helidecks located in a hostile sea area (as defined in JAR-OPS 3.480(a)(12)(ii)(a)), that are manufactured on or after the date of this ETSO, must meet in order to be identified with the applicable ETSO marking.

2 - Procedures

2.1 - General

Applicable procedures are detailed in CS-ETSO Subpart A.

2.2- Specific

This ETSO and the appendices refer to JAR-OPS 3 at Amendment 2 dated 1 January 2002.

3 - Technical Conditions

3.1 - Basic

3.1.1 - Minimum Performance Standard

Standards set forth in Appendix 1 to this ETSO.

3.1.2 - Environmental Standard

None.

3.2 - Specific

None.

4 - Marking

4.1 - General

Marking is detailed in CS-ETSO Subpart A paragraph 1.2.

4.2 - Specific

As given in Appendix 1.

5 - Availability of Referenced Document

See CS-ETSO Subpart A paragraph 3.

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APPENDIX 1. EASA STANDARD FOR HELICOPTER LIFERAFTS FOR OPERATIONS TO OR FROM HELIDECKS LOCATED IN A HOSTILE SEA AREA

1. Purpose

1.1 This standard provides the minimum performance standards for helicopter liferafts.

2. Scope

2.1 This standard covers liferafts required to be carried on helicopters operating to or from helidecks located in a hostile sea area (as defined in JAR-OPS 3.480(a)(12)(ii)(a)).

3. General

3.1 Approval of a liferaft in accordance with this Specification shall take into account the valise or container, the liferaft itself, and any attached or stowed equipment. The liferaft and its associated equipment shall be seaworthy and designed to maximise occupant survivability in all operating conditions.

3.2 With the exception of its floor diaphragm, full inflation of the liferaft shall be achieved by the operation of a single device with the liferaft initially in any attitude. The operation to initiate the automatic inflation of the liferaft shall be within the capability of one person, either in or out of the water.

3.3 Secondary inflatable compartments, e.g. canopy supports, boarding ramps and floor, shall be so designed and arranged that damage to them will not significantly affect the primary buoyancy of the liferaft.

3.4 Provision shall be made to insulate those areas of the floor diaphragm that are in contact with the occupants of the liferaft. The insulation shall be at least equal to that given by a 25mm (1in) air cushion.
N.B. Where the insulation is provided by inflation of the floor diaphragm this Specification takes no account of its buoyancy.

3.5 The attachment of all lines and equipment to the liferaft shall be such that failure or tearing off of the attachment will not damage any inflated compartment or the canopy.

3.6 Retro-reflective Surfaces

3.6.1 The liferaft shall be provided with flexible retro-reflective external surfaces, of a minimum total area of 0.15m² (250in²), for increased conspicuity and to enhance the effectiveness of search lights, during search and rescue operation.

3.6.2 The arranged pattern of the retro-reflective material shall be generally as shown in Figure 1.

3.6.3 The retro-reflective materials shall comply with the Technical Specification for Retro-Reflective Material for use on Life-Saving Appliances (IMO Resolution 658 (16) Annex 2), or equivalent.

3.7 The requirements of this Specification, insofar as they are applicable, should be met for the normal and overload occupancy ratings of the liferaft.

4. Operation and Environment

- 4.1 The packed liferaft shall be suitable for fitment in an aircraft in accordance with the applicable aircraft installation requirements.
- 4.2 The method of packing the liferaft into its valise or container shall be such that the liferaft will successfully deploy in the correct attitude for boarding with a probability of not less than 0.90 under the conditions described in paragraph 16.
- 4.3 The packed liferaft shall be designed to inflate by means of its primary inflation system and be suitable for boarding in respect of buoyancy and stability within 30 seconds of the start of inflation, when soaked at all temperatures between -30°C and +65°C (-22°F and +149°F).
- 4.4 The liferaft, when packed in its valise or container shall be capable of withstanding temperatures of -30°C to +65°C (-22°F to +149°F) without any adverse effects for at least the period between inspections.
- 4.5 The liferaft in its container shall be capable of withstanding without significant deterioration such fluids and greases as it might come into contact with for at least the period between inspections. The liferaft when inflated shall withstand those fluids likely to be spread on the surface of the water in the event of an aircraft ditching. All materials used in construction of the liferaft and its equipment shall be suitably resistant to corrosion and fungus growth.

5. Buoyancy

- 5.1 The liferaft shall incorporate a minimum of two independent primary buoyancy chambers. With all chambers inflated to minimum design pressure the liferaft shall be capable of supporting its occupants up to the normal and overload rated occupancy in fresh water. The following minimum amount of freeboard shall be available: -
 - (a) 300mm (12in) at normal rated occupancy.
 - (b) 150mm (6in) at normal rated occupancy with the most critical chamber deflated.
 - (c) A positive freeboard at overload rated occupancy with the most critical chamber deflated.
- 5.2 The liferaft shall have a high level of tolerance to such accidental damage that may be incurred from contact with the exterior of the helicopter while the liferaft is on the water adjacent to the helicopter. This may be achieved by providing adequate redundancy or damage tolerance. To demonstrate adequate damage tolerance, the liferaft shall withstand puncture when subjected to a 0.794mm (1/32 inch) diameter, flat end metal point under a load of 45N (10lbf).

6. Occupancy Ratings

- 6.1 An average occupant weight of 90kg (200lb) shall be assumed to take account of the weight of the occupant's clothing with water saturation.

- 6.2 The normal rated capacity of the liferaft shall be taken as the number of occupants that can be accommodated when each occupant is provided with a minimum width of back support of 460mm (18ins) and a minimum of 0.33m² (3.6ft²) of floor area.
- 6.3 The minimum overload rating for the liferaft shall be the nearest whole number of occupants to the normal rated capacity times 1.50 with a minimum floor area of 0.22m² (2.4ft²).

7. Inflation Systems and Hand Pump

- 7.1 The primary inflation system shall meet all applicable equipment Specifications and shall be capable of meeting all performance and environmental criteria contained in this Specification. The primary inflation system shall be fully automatic subsequent to initiation. Aspirators shall be protected and designed to preclude ingestion of objects which may prevent the seating of the gas seal. Any water ingested via the aspirator, if used, shall not prejudice the operation of the inflation system and the liferaft's performance.
- 7.2 The inflation system shall be designed to prevent gas flow-back from a primary chamber or between primary chambers.
- 7.3 Protection shall be provided against chamber overpressure. Where this is by means of a relief valve the maximum hysteresis shall not exceed 20% of the valve's cracking pressure.
- 7.4 The means of activating the primary inflation system(s) shall be such that proper inflation of the liferaft can be achieved, even when the liferaft in its valise is submerged, by operating a single mechanism by the application of a force of $110 \pm 20\text{N}$ ($25 \pm 5\text{lbf}$).
- 7.5 Each inflation chamber shall also be provided with a means to enable inflation using a hand operated pump.
- 7.6 The function of every valve fitted in the surface of the liferaft shall be clearly marked in the vicinity of the valve. All such valves shall be located to enable their operation and observation to be carried out by occupants in the liferaft.
- 7.7 The method of operation and positioning of valves shall be such that they will not be operated inadvertently, and such as to minimise the risk of injury to occupants when boarding the liferaft.
- 7.8 Inflation valves to be used with hand operated pumps shall be of the non-metallic friction fit type with a minimum inside diameter of 16mm (5/8in). They shall be fitted with a non-return valve, be located so as to facilitate inflation by hand pump, and shall not interfere with the comfort of the occupants.
- 7.9 Hand-operated inflation pumps shall be capable of easy connection to and disconnection from each inflation valve and of maintaining each inflated compartment at the minimum design pressure.
- 7.10 Hand pumps shall have a minimum displacement of air of 0.5litres (32in³) for each complete cycle of operation, and shall have a means of being attached to the liferaft when stowed and during operation at each inflation point.

8. Strength

- 8.1 All materials, compartments, valves, attached equipment, and seams shall be of sufficient strength and durability to preclude premature failure during operation.
- 8.2 All inflated fabric compartments shall have minimum proof and ultimate strength factors of 2.0 and 3.0 respectively based on the maximum relief value of the pressure relief valves fitted to the primary buoyancy chambers. The design condition shall be assessed at a temperature of +45°C (113°F) and in no case should the proof pressure be less than 20kN/m² (3lbf/in²).
- 8.3 It shall be demonstrated that all fabricated material joints are of sufficient strength and integrity to achieve a declared absolute life. Guidance shall be given in the appropriate manuals regarding the inspection, maintenance and repair information necessary to maintain the serviceability of the liferaft between servicing.

9. Attached Equipment

9.1 General.

Any equipment attached to the liferaft (including that required by JAR-OPS 3) shall be of such design and location that it will not interfere with the liferaft's operation and performance in any way. The attachment shall be such that the equipment will be retained if liferaft inflation occurs in the upright or inverted position.

9.2 Painter Line

9.2.1 A painter line which can be easily attached to the aircraft shall be provided. The line shall be of a length which is compatible with the operation and inflation of the liferaft, but shall be not less than 6m (20ft) nor greater than 20m (65ft) with the inflation initiation point at least 4.5m (15ft) from the free end of the line. The painter line shall be distinctly coloured to indicate to the person inflating the liferaft the position of the inflation initiation point within 3m (10ft).

N.B. The painter line should be a minimum of 9.5mm (3/8in) diameter under load to provide satisfactory graspability.

9.2.2 The painter line shall be manufactured from a material that will float, has resistance to rotting, and has a minimum breaking strength of 5300N (1200lbf). The attachment of the line to the liferaft shall be designed to release the liferaft without damage in the event of either the line being loaded to or beyond its ultimate strength value or the line being loaded to 0.75 times the load required to submerge the liferaft with the critical chamber deflated, whichever is the lower.

9.2.3 The location of the painter line attachment to the liferaft shall be such that it is readily accessible to the occupants of the liferaft and can be easily severed with the knife provided.

9.3 Sea Anchor

9.3.1 A sea anchor, which is permanently attached to the liferaft and is readily accessible to the occupants under all conditions, shall be provided.

9.3.2 Where the sea anchor is a trailing anchor device it must comply with the following:

- (a) The anchor shall have a minimum effective area equivalent to 0.8m² (1200in²).
- (b) The anchor shall be attached to the liferaft by a line of 10.5m (35ft) minimum length with a minimum breaking strength of 2200N (500lbf). Attachment of the sea anchor to the liferaft shall be so designed that the liferaft will be released without damage in the event of the line being loaded to or beyond its ultimate strength.
- (c) The anchor attachment line assembly shall include a swivel link with a strength at least equal to the strength of the anchor attachment line.
- (d) The anchor shall be arranged to minimise the risk of entanglement.

9.3.3 The location of the sea anchor attachment point on the liferaft shall be such that the deployed line does not interfere with boarding or with the operation and manipulation of the painter line.

9.4 Rescue Line and 'Quoit'

9.4.1 At least one rot-resistant rescue line, which will float and of not less than 23m (75ft) in length, shall be provided to enable a survivor to be hauled to the boarding point. It shall be attached to the liferaft in the vicinity of, and accessible from, the primary boarding point. Attached to the free end of the line shall be a floatable device (quoit) of suitable size to be grasped by a survivor in the water.

9.4.2 The rescue line facility shall have a minimum breaking strength of 1300N (300lbf). The line attachment to the liferaft shall withstand 1.5 times the line's minimum breaking strength.

9.5 Lights

The liferaft shall be fitted with an internal and external light source.

9.5.1 Internal Light

9.5.1.1 The internal light shall have an output sufficient to enable all printed instructions on the liferaft's internal surfaces or attached equipment to be read in the hours of darkness by a person with normal eyesight. The internal light source shall have an effective output of at least 1.0 lumen for a continuous period of not less than 12 hours.

9.5.1.2 The light shall be capable of being switched on and off by the occupants of the liferaft in all appropriate environmental conditions.

9.5.2 External Light

- 9.5.2.1 The light shall be fitted to the canopy in such a way as to provide maximum practical conspicuity for search and rescue operations and shall have:
- (i) a vertical light beam with a divergence of at least 5° above the vertical axis of the light fitting; and
 - (ii) a horizontal light beam that is radially continuous and have an emission angle of at least 5° above the horizontal plane of the light bulb element.
- 9.5.2.2 The light shall be switched on automatically as soon as the liferaft is inflated on water.
- 9.5.2.3 The light shall be capable of being switched on and off by the occupants of the liferaft in all appropriate environmental conditions.
- 9.5.2.4 Output of the light shall be such that it is visible at night in clear atmospheric conditions at a distance of not less than 2 nautical miles, for a continuous period of not less than 12 hours.
- 9.5.2.5 If the light is a flashing beacon, the flash rate shall be between 50 and 70 flashes per minute, with an interval between flashes of 1.0 ± 0.15 second.

9.6 Knife

- 9.6.1 A knife which will float shall be provided and located in a position inside the liferaft to enable it to be readily used for cutting the painter line. The knife shall be suitably sheathed and attached to the liferaft by a line of sufficient length to facilitate its use without difficulty.
- 9.6.2 The shape of the knife shall be such that it will not damage the liferaft's fabric if dropped inside the liferaft.

10. Canopy

- 10.1 A canopy, covering the total occupiable area of the liferaft, and supported above the heads of seated occupants shall be provided. If the primary inflation system is used to deploy the canopy via a primary buoyancy chamber the canopy support system shall remain inflated in the event of damage to the buoyancy chamber. The canopy support system shall include a facility for inflation by means of the hand operated pump provided.
- 10.2 The canopy fitted to liferafts with a normal rated occupancy of more than 10 persons shall include a minimum of 2 entry points. Liferafts with a normal occupancy rating of 10 persons or less need only be provided with 1 entry point. The size and positioning of liferaft entry facilities shall be agreed with the Authority.
- 10.3 Each canopy entry point shall have a closing flap which can easily be closed or opened by the occupants. The flap shall be capable of being secured in a fully open

or closed position or in intermediate positions. Where two entry facilities are provided they shall be positioned 180° apart. The painter line attachment and location of the knife shall be adjacent to one entry point.

- 10.4 The canopy, with the flaps open or closed, shall be capable of withstanding winds of 60 km/h (40 mph) with gusts of 90 km/h (60 mph). With the flaps closed the occupants shall be adequately protected from wind, rain, spray and breaking waves.
- 10.5 A facility should be provided for the erection of a radio transmitting aerial.
- 10.6 The deployed canopy shall be able to withstand without damage or permanent collapse the impact of a jump by a person of weight 90kg (200lb) from a height of 3m (10ft) above water level on to the top of the canopy.
- 10.7 The canopy should remain usable in the event of deflation of the most critical buoyancy chamber.

11. Life Lines and Grab Lines

- 11.1 Life lines of a colour contrasting to that of the liferaft shall be provided around the external periphery of the buoyancy chambers. The lines shall be easily identified and readily available to support survivors in the water.
- 11.2 Grab lines of a colour contrasting to that of the liferaft shall be provided around the internal periphery of the buoyancy chambers. The lines shall facilitate use by the occupants to support themselves.
- 11.3 Life lines, grab lines and their attachments shall be capable of withstanding a minimum load of 2200N (500lbf).

12. Boarding Facilities

- 12.1 A boarding facility shall be provided at each entry point, which is self-erecting during the inflation of the liferaft and remains continuously available.
- 12.2 The design of the boarding aid(s) shall be such that a 90kg (200lb) fully clothed person wearing a fully inflated lifejacket can board the liferaft without assistance. It shall also be possible for the liferaft occupants to retrieve unconscious survivors from the water with the aid of the boarding facility.
- 12.3 The strength of attachment of an inflated boarding facility to the liferaft's structure shall be such that excessive load on the facility will not prejudice the integrity of the primary buoyancy chamber.
- 12.4 Markings shall be provided on the external surfaces of the liferaft to indicate to survivors in the water the location of the boarding facility and, if appropriate, the best method of use.

13. Righting

- 13.1 The liferaft shall be fully reversible unless it can be demonstrated that it is self righting in the fully inflated condition.

14. Valise or Container

- 14.1 The liferaft shall be packed into a valise or container which in turn will be stowed and restrained on board the aircraft. The material used for the construction of the

valise or container shall be of low flammability and have a burn rate not greater than 100mm/min (4in/min) when tested in accordance with the horizontal test of JAR 25 Appendix F Part 1 or other approved equivalent method. It shall be durable and chafe resistant. The liferaft packed and ready for stowage shall not support combustion, nor shall it be likely to be rendered unserviceable by inadvertent contact with a lighted match or cigarette.

- 14.2 The packed liferaft shall be capable of being dropped from a height of 3m (10ft) on to a hard surface without adversely affecting the performance of the liferaft as prescribed by this Specification.
- 14.3 The valise or container shall include suitable lifting handles so the packed liferaft can be moved within the aircraft.
- 14.4 The packed liferaft shall have a positive buoyancy in fresh water at a temperature of +20°C (68°F). This shall be demonstrated and the buoyancy value established.
- 14.5 The external dimensions of the packed valise/container shall be established.
- 14.6 Closing of the valise or container shall be by lacing with cord of a minimum breaking strength of 220N (50lbf) or by equivalent means.
- 14.7 Where automatic launching of liferafts is not possible, the weight and dimensions of the packed valise or container shall be such that it can be easily moved to, and launched from, any prescribed ditching emergency exit by one person (male or female).
N.B. It is recommended that the maximum weight should not exceed 36kg (80lb).

15. Materials and Processes

- 15.1 All materials used shall be to an acceptable Specification which shows the material to be suitable for its intended application and compatible with other materials used in the liferaft's construction.
- 15.2 The choice of materials and protective treatments shall be such that, during the period between inspections, corrosion or deterioration will not render the liferaft unserviceable.
- 15.3 The liferaft when fully equipped and stowed in the aircraft shall not cause more than 1° deflection of an aircraft compass reading at a distance of 300mm (1ft).

16. Seaworthiness

- 16.1 The liferaft and its equipment shall be capable of withstanding a marine environment in accordance with this Specification for a minimum period of 14 days when occupied to its prescribed maximum overload rating.
N.B. A shorter time may be agreed between the operator and the Authority for operations within helicopter SAR coverage and where all aircraft occupants wear survival suits.
- 16.2 The liferaft and equipment shall be capable of withstanding, without malfunction, sea and wind conditions of at least Sea State 6 and 60km/h (40mph) respectively.
- 16.3 The design of the liferaft shall be such that the possibility of the liferaft overturning in any sea or wind condition up to the maximum of paragraph 16.2 is minimised.

Any stabilising equipment, e.g. stabilising keels or equivalent, shall be effective by the time the liferaft is ready for boarding, and shall remain automatically effective all the time the liferaft is floating.

16.4 Means shall be provided to enable the occupants (wearing cover-all immersion suits and inflated lifejackets) to propel the liferaft over short distances.

17. Tests

17.1 A liferaft of the type for which approval is sought shall be tested in both calm and disturbed water (e.g. in a swimming pool and in choppy sea or simulated choppy sea conditions). The Manufacturer's evaluation schedule for the liferaft to show compliance with this Specification shall be agreed with the Authority and shall include the following tests or demonstrations.

17.1.1 Inflation Tests

With the valised liferaft floating in the water, operation of the primary inflation system shall be demonstrated as being in compliance with paragraph 7 by a person in the water wearing a lifejacket. A sufficient number of tests shall be carried out to show compliance with paragraph 4.2. Connection, disconnection and satisfactory operation of the hand operated pump shall also be demonstrated.

17.1.2 Freeboard Measurement (Buoyancy)

The liferaft shall be demonstrated to comply with paragraphs 5 and 6 for all prescribed conditions of occupancy and inflation appropriate to the intended application of the liferaft.

17.1.3 Boarding

Compliance with the requirements of paragraph 12 shall be demonstrated by male and female subjects for each boarding facility fitted to the liferaft.

17.1.4 Propulsion

With the liferaft fully inflated and overloaded to the prescribed rating the practicability of its propulsion over short distances, using the paddles or other equipment provided, shall be demonstrated.

17.1.5 Jump Test

Tests shall be made in accordance with the requirements of paragraph 10.7. This test can be simulated by using a weighted bag or equivalent weight.

17.1.6 Righting

Righting of the liferaft shall be demonstrated both fully inflated and with the most critical primary buoyancy chamber deflated in accordance with paragraph 5.1(b).

17.1.7 Strength Test (Refer to paragraph 8.2).

17.1.7.1 A proof pressure test shall be carried out on all inflated fabric components.

17.1.7.2 An ultimate pressure test shall be carried out on the most critical section of all primary buoyancy chambers.

17.1.8 Seaworthiness

Sufficient tests shall be completed to demonstrate that the liferaft can provide a survival capability when subjected to the most adverse combination of temperature, sea and wind states defined in this Specification.

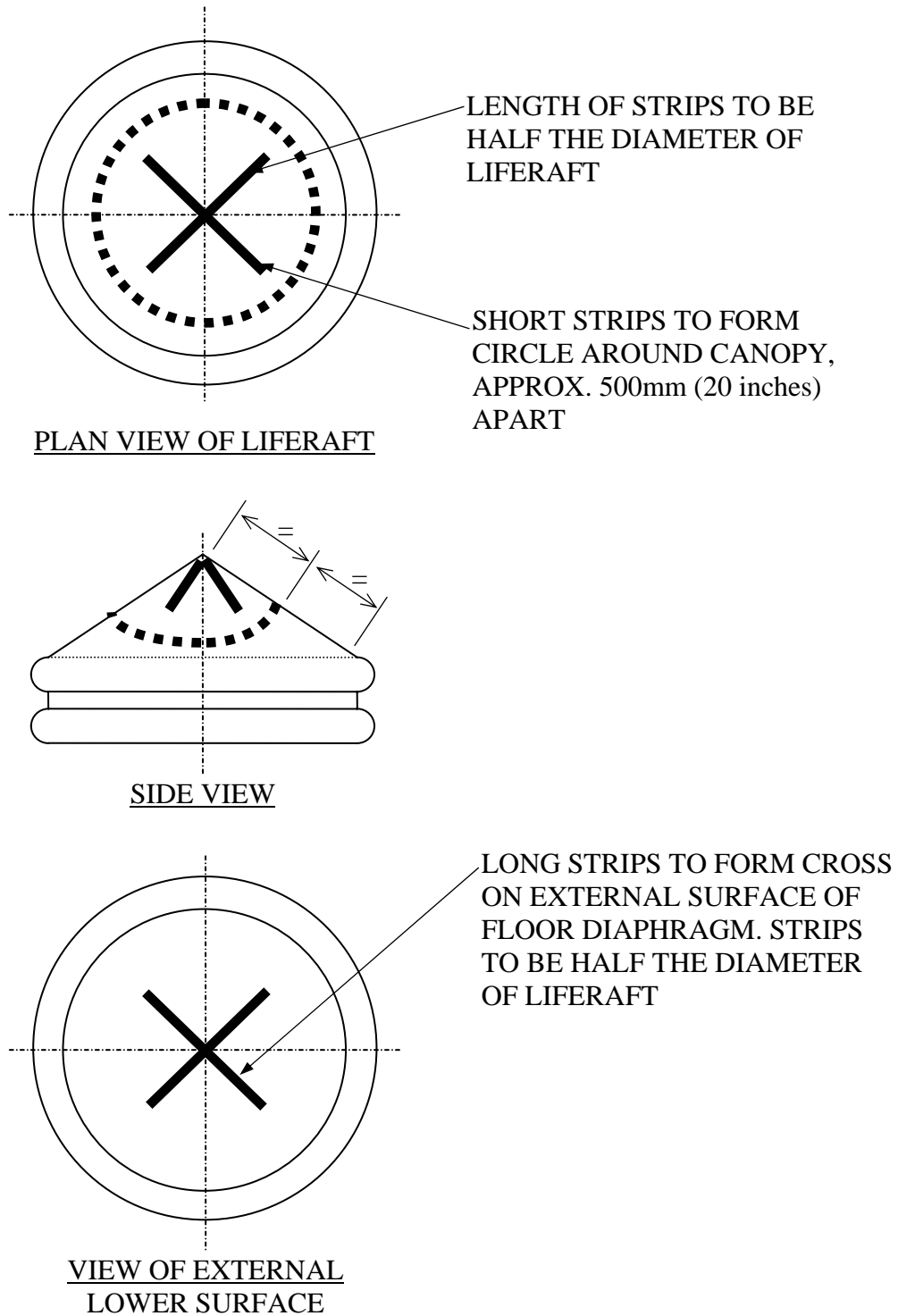
18. Colour, Operational Markings, and Packaging

- 18.1 The predominant colour of the liferaft shall be highly conspicuous.
- 18.2 The valise or container in which the liferaft is to be kept whilst on board the aircraft shall be approved as part of the liferaft's general assembly. The valise or container shall be clearly marked to the effect that a liferaft is contained therein. The method of operating and any precautionary information shall be clearly marked.
- 18.3 Instructions relating to boarding and operation of all equipment shall be provided with the liferaft, shall be bold and readable in low levels of illumination, and shall be kept to a minimum with the purpose of achieving speed of correct operation with minimum confusion.

19. Marking

- 19.1 Each detachable part of the liferaft shall where practicable be marked with:
- (a) The manufacturer's approved inspection stamp.
 - (b) The part number.
 - (c) Date of manufacture or batch record.
- N.B. Where marking is not practicable alternative means may be agreed with the Authority.
- 19.2 The liferaft assembly shall be marked with:
- (a) The liferaft model designation.
 - (b) The manufacturer's name and address.
 - (c) Date of manufacture.
 - (d) Serial Number.
 - (e) Date at which next service and overhaul are due.
- 19.3 The charged inflation cylinder shall be marked with its weight and the weight of charge.
- 19.4 All markings prescribed in 7.6, 12.4, 18.2, 18.3, 19.1, 19.2 and 19.3 shall be made such that they remain legible.

Figure 1 TYPICAL LIFERAFT - ARRANGEMENT OF RETRO-REFLECTIVE TAPE



NOTE:
SHORT STRIPS TO BE 300mm LONG x 50mm WIDE (12 x 2 inches)
LONG STRIPS TO BE 50mm (2 inches) WIDE