European Aviation Safety Agency

ETSO-2C504

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European Technical Standard Order

Subject: HELICOPTER CONSTANT-WEAR LIFEJACKETS FOR OPERATIONS TO OR FROM HELIDECKS LOCATED IN A HOSTILE SEA AREA

1 - Applicability

This ETSO gives the requirements which adult constant-wear lifejackets for use 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.

EN documents may be purchased from the European Committee for Standardisation (CEN), Rue de Stassart 36, B-1050 Brussels, Belgium or any CEN member.

JAA documents may be purchased through Information Handling Services. Addresses of the worldwide IHS offices are listed on the JAA website (www.jaa.nl) and IHS's website (www.global.ihs.com)

APPENDIX 1. EASA STANDARD FOR HELICOPTER CONSTANT-WEAR LIFEJACKETS FOR OPERATIONS TO OR FROM HELIDECKS LOCATED IN A HOSTILE SEA AREA

1. Purpose

1.1 This specification prescribes the minimum standard of design and performance for helicopter constant-wear lifejackets.

2. Scope

2.1 This standard covers adult constant-wear lifejackets for use on helicopters operating to or from helidecks located in a hostile sea area (as defined in JAR-OPS 3.480(a)(12)(ii)(a)). Such lifejackets may therefore be designed to be worn with or without an approved immersion suit.

3. Donning

3.1 The correct method of donning the lifejacket shall be self-evident and means shall be provided to indicate that the lifejacket lobe(s) are correctly oriented. The lifejacket should be fully adjustable for all likely wearers whose significant body dimensions range from the 5th percentile female to the 95th percentile male, and adequate for most of the 5% at each extreme. A means of adjustment to make the lifejacket fit securely shall be provided. The wearer shall be able to make any re-adjustment without removing the lifejacket.

3.2 Subsequent to proper donning, inadvertent release or loosening of the lifejacket such that its flotation characteristics are unacceptably altered, shall be prevented.

3.3 Means shall be provided as necessary in the design of the lifejacket, whether it is worn with or without an approved immersion suit, to prevent it from riding up the body of the wearer.

4. Freedom of movement

4.1 The uninflated lifejacket shall allow the wearer to carry out all normal and emergency functions and movements necessary for the operation of a helicopter and its equipment.

4.2 The wearing of the lifejacket inflated or uninflated shall not prevent the wearer from assisting others while in the water nor from assisting them to board a liferaft from the water.

4.3 The inflated lifejacket shall not significantly hinder the boarding of a liferaft with the sprayhood deployed. This shall be demonstrated by testing to paragraph 3.4 of Appendix 2.

5. Compatibility

5.1 Approval of a lifejacket and sprayhood to this specification shall take into account the compatibility between the lifejacket and any approved immersion suit that is intended to be worn with it. The performance of the lifejacket and immersion suit combination shall be tested in accordance with Appendix 2 of this specification.

5.2 Where a lifejacket is to be approved for use with an immersion suit(s) then it shall be tested with each type of immersion suit that the lifejacket is designed to be compatible with. If it is to be approved for use with more than one type of immersion suit, the performance testing of Appendix 2 shall be repeated with each additional type of immersion suit.

5.3 The lifejacket and its attached equipment, including the sprayhood, shall be designed and the materials used in their construction chosen to have no features which would be likely to have any detrimental effect on the operation of any helicopter or its equipment. In particular any part of the lifejacket which might pose a snagging hazard during flight, emergency egress or recovery, shall be suitably covered, protected or restrained. All materials used shall be compatible with materials used in the construction of any approved immersion suit, or liferaft.

5.4 Any other attached equipment shall be demonstrated as having no adverse effects on the operation, life and performance of the lifejacket.

6. Materials

6.1 All materials used shall be to an acceptable specification which shows the material to be suitable for its intended application. Textile and fabric materials and components shall pass the test requirements of paragraph 4.3 of EN396:1993 or equivalent. Metal components shall pass the test requirements of paragraph 4.4 of EN396:1993 or equivalent.

6.2 The lifejacket and its equipment shall be so designed and constructed as to remain serviceable for the period between scheduled inspections. The choice of materials used shall be such that, when stowed in accordance with the relevant instructions, neither the lifejacket nor its attached equipment shall be liable to become unserviceable through material deterioration or chafing, or from any other likely cause. Due consideration shall be taken of the possible temperature variations during stowage which may range between -30°C and +65°C (-22°F and +149°F). This shall be demonstrated by testing to paragraph 6.1 of EN396:1993 or equivalent. The normal operating temperatures for the lifejacket shall be -5°C to +40°C (23°F to 104°F).

6.3 The materials used for the lifejacket's outer cover and its means of retention on the wearer shall be of low flammability. These materials shall not have a burn rate 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.

7. Evacuation

7.1 A person wearing the uninflated lifejacket shall be able to exit the helicopter through any Emergency Exit or Push-out Window down to the minimum acceptable size of 430mm x 355mm (17in x 14in). This action shall be possible in air or under water. This shall be demonstrated by testing to paragraph 3.3 of Appendix 2.

8. Buoyancy and floating position

8.1 The buoyancy of the inflated lifejacket shall be sufficient to ensure that a person wearing clothing and the inflated lifejacket shall have a floating position such that

the angle between the body and the horizontal is not greater than 60°. This shall be demonstrated by testing to paragraph 3.6 of Appendix 2.

8.2 The mouth must be at least 120mm (4.7in) above the waterline (mouth freeboard) and the nose freeboard shall not be less than the mouth freeboard, even when the wearer is incapacitated. This shall be demonstrated by testing to paragraph 3.5 of Appendix 2.

8.3 The inflated lifejacket shall automatically turn an unconscious wearer from a face down position into the position required by paragraph 8.1 within 5 seconds. This shall be demonstrated by testing to paragraph 6.7.7 of EN 396:1993 or equivalent.

9. Breathing protection

9.1 The shape of the lifejacket shall not restrict breathing. When in the water the lifejacket shall not tend to channel water or spray into the wearer's face.

9.2 A sprayhood shall be fitted.

9.2.1 The wearer shall be able to deploy the sprayhood within 20 seconds when wearing the inflated lifejacket in or out of the water.

9.2.2 The sprayhood will not be considered suitable if it can in any way retain water when deployed.

9.2.3 The angles of vision shall not be unduly restricted, and the ability to swim and manoeuvre shall not be impaired by the lifejacket with the sprayhood deployed.

9.2.4 The lifejacket's light source shall not be masked by the presence of the sprayhood.

9.2.5 The materials used in the hood's construction shall be compatible with those of the lifejacket and shall in no way be able to cause damage to the buoyancy chambers or fabric of the lifejacket or liferaft.

9.2.6 The lifejacket and its sprayhood, whether stowed or deployed, should not cause inconvenience during winching or other rescue and recovery operations.

9.2.7 Means shall be provided to ensure that the level of carbon dioxide in the deployed sprayhood is within safe limits. This shall be demonstrated by testing to paragraph 6.10 of EN 396:1993 or equivalent.

10. Location aids

10.1 A passive light system of retro-reflective material shall be provided. This shall conform to the technical specification detailed in IMO SOLAS 83, Chapter III, Resolution A.658(16), Annex 2 or equivalent. A minimum area of 300cm2 (46in2) shall be provided. This material shall be placed on surfaces which are normally above the water when the lifejacket is in use.

10.2 Each lifejacket shall be fitted with a flashing survivor locator light that meets the requirements of ETSO-C85a. The light shall flash at a rate between 50 and 70 flashes per minute. The location of the light shall be such that maximum practical

conspicuity is achieved with the lifejacket worn in the normal manner when in the water. The light shall activate automatically and have a manually operated on/off switch.

10.3 A whistle shall be provided which complies with the requirements of paragraph 4.3 of EN394:1994 or equivalent.

11. Recoverability

11.1 The lifejacket must be fitted with a lifting becket which complies with the requirements of paragraph 4.15 of EN396:1993 or equivalent.

11.2 The inflated or uninflated lifejacket shall not adversely affect recovery of the wearer by the use of a rescue strop with a circumference of 180cm (70in).

12. Group help

12.1 The lifejacket shall be equipped with a buddy line which complies with the requirements of paragraph 4.6 of EN394:1994 or equivalent.

13. Inflation system

13.1 General

13.1.1 The lifejacket shall have two separate means of inflation, the primary means being a manually-initiated stored gas system and a standby oral inflation system capable of repeated use. The required buoyancy shall be obtainable by either method.

13.1.2 A means of releasing the pressure in the lifejacket is required and shall be of a type capable of repeated use. Protection shall be provided against inadvertent deflation.

13.1.3 After inflation by either method, it shall be possible to deflate the lifejacket and then to reinflate it by using the standby system. The standby inflation system shall be readily accessible, simple and obvious in operation and it shall be impossible for any valve which may be used to be inadvertently left open. It shall be possible to "top up" the lifejacket orally whilst in use and without loss of inflation pressure.

13.2 Stored Gas System

13.2.1 Location of the actuating means of this type of system shall be such that it can be operated by either hand, in or out of the water. The method of releasing the stored gas into the lifejacket shall be obvious; however, suitable marking shall be provided to advise the user.

13.2.2 The amount of stored gas provided shall be capable of inflating the lifejacket to achieve the correct buoyancy as specified in paragraph 8.2 within 5 seconds of actuation at +20°C (68°F).

13.2.3 Adequate protection shall be provided to guard against any inadvertent initiation of an inflation when the wearer is passing through an emergency exit or when the lifejacket is dropped from a height of 1.5m (5 feet).

13.2.4 The force required to manually initiate inflation must be a minimum of 20N (4.5lbf) and a maximum of 120N (27lbf) when tested in accordance with paragraph 6.8.4 of EN396:1993 or equivalent.

13.3 Oral Inflation System

13.3.1 The oral inflation tube shall comply with the requirements of paragraph 4.5 of EN396:1993 or equivalent.

13.3.2 It shall be positioned such that it can readily be used in and out of the water. After use, the device shall return to a position such that it will not produce facial injuries during a jump into the water as specified in paragraph 3.1 of Appendix 2.

14. Testing

14.1 Strength Pressure Test
The lifejacket shall have proof and ultimate factors of not less than 3 and 5 respectively on the pressure at which it is designed to be inflated by the primary means, at a stabilised ambient temperature of +45°C (113°F), and in no case shall the proof and ultimate pressures be less than 15kPa (2lbf/in2) and 25kPa (3.3lbf/in2) respectively.

14.2 Buoyancy
The lifejacket shall retain buoyancy after use of the primary inflation system to such an extent that after a period of 12 hours the requirements of paragraphs 3.5 and 3.6 of Appendix 2 are still met.

14.3 Performance Tests
All lifejackets shall be tested in accordance with Appendix 2. For lifejackets not designed to be used with an immersion suit, the tests shall be carried out with the test subjects wearing only the stipulated clothing.

15. Inspection Testing and Repair

15.1 The procedure for inspecting, testing and repairing lifejackets shall be established by the manufacturer and shall be capable of ensuring that all lifejackets satisfy the requirements of this specification throughout their service lives.

15.2 The procedures for servicing, inspection, repair and testing shall be described in the manufacturer's manual.

15.3 The frequency of servicing and inspections shall be agreed with the manufacturer holding design approval for the lifejacket.

16. Markings

16.1 If lifejackets are designed or manufactured specifically for crew use or passenger use then they shall be marked accordingly.

16.2 Each detachable part of the lifejacket 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 shall be agreed.

16.3 The lifejacket assembly shall be clearly marked with:-

(a) The lifejacket 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.

16.4 The charged inflation cylinder shall be marked in accordance with paragraph 8.2 of EN396:1993 or equivalent, and include its date of manufacture.

APPENDIX 2. IMMERSION SUIT / LIFEJACKET SYSTEM PERFORMANCE TESTING

1. Purpose

1.1 These tests are to demonstrate satisfactory performance of the specified immersion suit/lifejacket combination which together make a unique safety system. They shall be carried out for every immersion suit/lifejacket combination for which approval is required to ensure compatibility for that combination.

2. Test conditions

2.1 The following tests shall be conducted in calm water. The water temperature shall be 25±2°C (77±4°F).

2.2 Pass/fail criteria
All samples shall pass all objective tests for the entire system to meet the requirements of ETSO-2C503 Immersion Suits and ETSO-2C504 Lifejackets. However, due to the high variability between subjects and the difficulty in assessing some subjective measures, it is permitted that an immersion suit / lifejacket combination does not completely meet the requirements of the following subjective tests in a single example and in no more than in one test subject. In these circumstances, two other subjects within the same weight category and with the same sex, should be subjected to the same test. If this additional test is still not clearly passed then the immersion suit / lifejacket combination shall be deemed to have failed, whilst if it is clearly passed then both items may be deemed to have passed the test overall when used in the tested combination.

3. Performance tests

3.1 Jump Test.
Each test subject shall perform a jump test in accordance with paragraph 3.11.6.1 of EN ISO 15027-3:2002.

3.2 Turning Test
Each test subject shall perform a turning test in accordance with paragraph 3.11.6.3 of EN ISO 15027-3:2002.

3.3 Escape Test Underwater
Each test subject shall be required to swim through an opening not greater than 430mm x 355mm (17in x 14in) (minimum acceptable size of helicopter escape window) positioned with the top of the opening at least 300mm (12in) below the surface of the water wearing the uninflated lifejacket. At least one of the subjects for this test shall be required to have a shoulder width measurement of at least 500mm (19.7in).

3.4 Swim Test
Each test subject wearing the immersion suit, clothing and inflated lifejacket shall swim on their back for 20 minutes. The hands and arms shall be kept in the water even if not being used for propulsion. Each test subject shall then board a liferaft fitted with boarding facilities, without undue effort and without assistance, with the suit sealed, the lifejacket inflated and the sprayhood deployed. The pool used shall

be of sufficient size and depth to prevent the subject gaining assistance by "pushing off" from the side or bottom while performing this test.

3.5 Freeboard

Immediately following the swim test, the clearance of each test subject's face above the water shall be measured, with the subject behaving normally and when simulating unconsciousness. The clearance of the mouth (mouth freeboard) shall be a minimum of 120mm (4.7in) above the waterline in both cases. It shall be established that the nose freeboard is not less than the mouth freeboard.

3.6 Floating position

The angle of the test subject's body shall be measured by an appropriate method. The angle between the body and the horizontal shall be recorded and shall not be greater than 60°.

3.7 Field of vision

The wearer's field of vision shall not be unduly restricted when tested in accordance with paragraph 3.11.6.6 of EN ISO 15027-3:2002

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