

**European
Aviation
Safety
Agency**

ETSO-2C503

Date: 18.07.06

European Technical Standard Order

**Subject: HELICOPTER CREW AND PASSENGER
IMMERSION SUITS FOR OPERATIONS TO OR
FROM HELIDECKS LOCATED IN A HOSTILE SEA
AREA**

1 - Applicability

This ETSO gives the requirements which immersion suits 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 CREW AND PASSENGER IMMERSION SUITS 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 crew and passenger immersion suits that are designed to be used with an approved lifejacket.

2. Scope

2.1 This standard covers immersion suits 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)).

2.2 The immersion suit shall comprise at least the following:-

- a) A dry coverall
- b) Hand and head coverings

2.3 Where applicable any additional or optional items designed to be used with the suit (but excluding the lifejacket) e.g. thermal liner, shall be considered as part of the immersion suit as far as this specification is concerned.

3. Donning

3.1 It is assumed for the purpose of this specification that the suit is donned prior to boarding the aircraft and is worn with an approved lifejacket.

3.2 The immersion suit and any attached equipment shall be capable of being donned without assistance and shall be capable of being sealed and adjusted by the wearer without assistance prior to boarding the aircraft.

3.3 Air retained inside the suit after donning which could adversely affect egress, the manoeuvrability or flotation attitude, shall be capable of being exhausted, either automatically or by the wearer.

3.4 It must be possible to complete all actions required to don the head covering required by paragraph 2.2(b) and seal the suit within 10 seconds. These actions shall be possible both when seated with harness fastened and wearing the uninflated lifejacket and when in the water while wearing the inflated lifejacket.

3.5 The wearer shall be able to complete all actions required to don the hand covering required by paragraph 2.2(b) when tested in accordance with paragraph 3.11.6.5 of EN ISO 15027-3:2002 except that this shall be demonstrated by each subject after immersion in water at a temperature no higher than 10°C (50°F) for a period of 3 minutes.

4. Freedom of movement

4.1 The immersion suit shall be designed to a standard which will 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 design of the immersion suit shall allow tailoring to fit the individual wearer or, where suits are not individually tailored, the size range must be satisfactory for all 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.
- 4.3 The immersion suit, when correctly donned and adjusted, shall not prevent the wearer from having an acceptable field of vision. This shall be demonstrated by testing to paragraph 3.7 of Appendix 2.
- 4.4 The immersion suit when worn with the inflated lifejacket shall allow the wearer to turn from a face down position into a stable face up floating position within 5 seconds. This shall be demonstrated by testing to paragraph 3.2 of Appendix 2.

5. Comfort

- 5.1 The design of the immersion suit shall minimise any discomfort to the wearer so as to avoid jeopardising safety. Particular attention should be given to the level of thermal comfort afforded the wearer on long into-sun flights in summer.

6. Compatibility

- 6.1 Approval of an immersion suit to this specification shall take into account the compatibility between the suit and any approved lifejacket and sprayhood that is intended to be worn with it. The performance of the suit and lifejacket combination shall be tested in accordance with Appendix 2 of this specification.
- 6.2 The immersion suit shall be tested with each type of lifejacket that the suit is designed to be compatible with. If it is to be approved for use with more than one type of lifejacket, the performance testing of Appendix 2 shall be repeated with each additional type of lifejacket.
- 6.3 The immersion suit shall be designed, and the materials used in its 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 suit 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 the appropriate approved lifejacket, sprayhood or liferaft.
- 6.4 Any attached equipment shall not compromise the basic survival function of the immersion suit by causing puncturing, fretting or distortion of the material, or changes in its mechanical properties.

7. Materials

- 7.1 All materials used shall be to an acceptable specification which shows the material to be suitable for its intended application. The materials used shall meet the requirements of paragraph 4.14 of EN ISO 15027-1:2002, with the exception of paragraph 4.14.3 of EN ISO 15027-3:2002 Resistance to illumination test.
- 7.2 The immersion suit 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 immersion suit nor its attached equipment shall be liable to

become unserviceable through material deterioration or chafing, or from any other 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 3.9 of EN ISO 15027-3:2002. The normal operating temperatures for the immersion suit shall be -5°C to +40°C (23°F to 104°F).

7.3 The outer fabric used in the construction of the suit shall be of low flammability. It 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.

8. Buoyancy

8.1 The trapped buoyancy due to the suit and recommended clothing, with the suit fully vented, shall be no more than 150N (33.7lbf) when measured in accordance with paragraph 3.11.7.2 of EN ISO 15027-3:2002.

9. Thermal protection

9.1 The suit shall provide the user with thermal protection in the water that at least satisfies the test requirements of paragraph 3.8 of EN ISO 15027-3:2002 as a class B suit system.

10. Water ingress

10.1 The immersion suit shall be so constructed that not more than 200g (7oz) of water shall leak into the suit when measured in accordance with paragraph 3.7 of EN ISO 15027-3:2002.

11. Conspicuity

11.1 Passenger Immersion Suits

To facilitate search and rescue operations, those parts of the suit which will be visible when in the water shall be of a highly conspicuous colour and comply with paragraph 4.5 of EN ISO 15027-1:2002.

11.2 Crew Immersion Suits

Where possible immersion suits for crew use shall meet the requirements of 11.1. However, the choice of suit colour may vary to minimise the risk of the suit reflecting on surfaces within the flight deck.

11.3 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, distributed in accordance with paragraph 4.12 of EN ISO 15027-1:2002.

12. Inspection Testing and Repair

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

As part of the procedure, suits shall be inspected at intervals to ensure they are always ready for immediate and effective use in the water. Special attention shall be paid to seals and fasteners. Suits shall be required to be immediately removed from service for repair or replacement if damage or deterioration is discovered that may lead to the suit failing to satisfy a routine leak test when one is next carried out.

- 12.2 The procedures for servicing, inspection, repair and testing shall be described in the manufacturer's manual.
- 12.3 The frequency of servicing and inspections shall be agreed with the manufacturer holding design approval for the suit.

13. Marking

- 13.1 Each detachable part of the immersion suit assembly shall, where reasonably practicable, be marked with:-
 - (a) The manufacturer's approved inspection stamp.
 - (b) The part number.
 - (c) Date of manufacture or batch record.
 - (d) Serial number
- 13.2 In the case of passenger immersion suits, the immersion suit shall be marked with:-
 - (a) Suit model designation
 - (b) The manufacturer's name and address
 - (c) Date of manufacture and Serial Number
 - (d) Date at which next scheduled service and overhaul are due
 - (e) Modification standard
- 13.3 In the case of crew immersion suits, the immersion suit shall be marked with:-
 - (a) The name of the crew member to whom it has been allocated
 - (b) Rank of crew member marked externally, e.g. epaulettes.
 - (c) Suit model designation
 - (d) The manufacturer's name and address
 - (e) Date of manufacture and Serial Number
 - (f) Date at which next scheduled service and overhaul are due
 - (g) Modification standard
- 13.4 When marking is not practicable alternative means must be agreed.

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 $25\pm 2^{\circ}\text{C}$ ($77\pm 4^{\circ}\text{F}$).

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