Democratic Socialist Republic of Sri Lanka

Civil Aviation Authority of Sri Lanka

Implementing Standards

(Issued under Sec. 120, Civil Aviation Act No. 14 of 2010)

Title: Compliance to Annex-6-Part 1 – Chapter 6- Aeroplane Instruments, Equipment and Flight Documents

Reference No. : CA-IS-6-(i)-06 **SLCAIS**: 015 **Date**: 14th March 2018

Pursuant to Sec. 120 of the Civil Aviation Act No.14 of 2010, Director General of Civil Aviation shall have the power to issue, whenever he considers it necessary or appropriate to do so, such Implementing Standards for the purpose of giving effect to any of the provisions of the Civil Aviation Act, any regulations or rules made thereunder including the Articles of the Convention on International Civil Aviation which are specified in the Schedule to the Act.

Accordingly, I being the Director General of Civil Aviation do hereby issue the Implementing Standards on **Annex 6- Part 1- Chapter 06- Aeroplane Instruments, Equipment and Flight Documents** as mentioned in the Attachment hereto (Ref: IS-6-(i)-06), for the purpose of giving effect to the provisions in the aforementioned Act and Standards & Procedures described under Article 37 of the Convention, which are specified in the Attachment.

This document supersedes the Implementing Standard 058 and shall be treated as null and void.

These Implementing Standards shall come into force with immediate effect and remain in force unless revoked.

H.M.C. Nimalsiri
Director General of Civil Aviation and
Chief Executive Officer

Civil Aviation Authority of Sri Lanka
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Enclosure: Attachment No. CA-IS-6-(i)-06-Att-01

Implementing Standards

Title: Compliance to Annex-6-Part 1 – Chapter 6- Aeroplane Instruments, Equipment and Flight Documents

GENERAL:

i. Requirements contained in this document are based on amendments up to 42 of the 10th Edition of ICAO Annex 6 (Part 1) – "Operation of Aircraft" Chapter 6 – Aeroplane Instruments, Equipment and Flight Documents.

ii. Holders of Air Operator Certificate issued by the DGCA for commercial air transportation shall comply with the requirements published in this document and are hereby instructed to forward to the DGCA a "Declaration of Conformance" which indicates the degree of compliance with each item detailed in the document.

iii. This document supersedes Implementing Standard 058 which shall be treated as null and void.

iv. This document may be amended from time to time and the amendments will be reflected with the vertical line on the right side of the text.

Reference Documents

Aviation Safety Notices 086, 102, 103 and 104
Gazette notification number 1882/49 dated 03rd October 2014

REQUIREMENTS FOR AEROPLANE INSTRUMENTS, EQUIPMENTS AND FLIGHT DOCUMENTS

1. General

1.1. In addition to the minimum equipment necessary for the issuance of a certificate of airworthiness, the instruments, equipment and flight documents prescribed in the following paragraphs shall be installed or carried, as appropriate, in aeroplanes according to the aeroplane used and to the circumstances under which the flight is to be conducted. The prescribed instruments and equipment, including their installation, shall be approved or accepted by the Director-General of Civil Aviation in respect of aircraft registered in Sri Lanka.

1.2. An aeroplane shall carry a certified true copy of the Air Operator Certificate specified in paragraph 2.1 of Implementing Standards 013 and a copy of the Operations Specifications relevant to the aeroplane type, issued in conjunction with the certificate. The DGCA will issue Air Operator Certificate and the associated Operations Specifications in English language. When the Air Operator Certificate and the associated operations specifications are issued by a State other than Sri Lanka and in a language other than English, an English translation shall be included.

1.3 The operator shall include in the Operations Manual a Minimum Equipment List (MEL), approved by the Director-General of Civil Aviation which will enable the Pilot In Command to determine whether a flight may be commenced or continued from any intermediate stop should any instrument, equipment or systems become inoperative. The operator shall follow

the procedures contained in SLCAP 4215 "MMEL/MEL Procedures Manual" published by the Civil Aviation Authority of Sri Lanka when preparing the operators Minimum Equipment List (MEL) for the approval of DGCA. In respect of aeroplanes that are not registered in Sri Lanka but operated in Sri Lanka, the Director-General of Civil Aviation shall ensure that the MEL does not affect the aeroplane's compliance with the airworthiness requirements applicable in the State of Registry.

1.4 The operator shall provide operations staff and flight crew with an Aircraft Operating Manual (AFM), for each aircraft type operated, containing the normal, abnormal and emergency procedures relating to the operation of the aircraft. The manual shall include details of the aircraft systems and of the checklists to be used. The design of the manual shall observe Human Factors principles. The operator is advised that Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (Doc 9683).

2 All aeroplanes on all flights

2.1 An aeroplane shall be equipped with instruments which will enable the flight crew to control the flight path of the aeroplane, carry out any required procedural maneuvers and observe the operating limitations of the aeroplane in the expected operating conditions.

2.2 An aeroplane shall be equipped with:

a. Accessible and adequate medical supplies;

Medical supplies should comprise:

1. one or more first-aid kits for the use of cabin crew in managing incidents of ill health; and
2. for aeroplanes required to carry cabin crew as part of the operating crew, one universal precaution kit (two for aeroplanes authorized to carry more than 250 passengers) for the use of cabin crew members in managing incidents of ill health associated with a case of suspected communicable disease, or in the case of illness involving contact with body fluids; and
3. for aeroplanes authorized to carry more than 100 passengers, on a sector length of more than two hours, a medical kit, for the use of medical doctors or other qualified persons in treating in-flight medical emergencies. Guidance on the types, number, location and contents of the medical supplies is given in **Appendix 1.**

b. Portable fire extinguisher of a type which, when discharge, will not cause dangerous contamination of the air within the aeroplane. At least one shall be located in;

1. the pilots compartment and
2. each passenger compartment that is separate from the pilot compartment and not readily accessible to the flight crew. Any portable fire extinguisher so fitted in accordance with the C of A may count as one prescribed. Refer paragraph 2.2.1 for fire extinguishing agents. The number of fire extinguishers required shall be as follows;

Maximum approved passenger seating configuration	**Number of Extinguishers required**
7-30	1
31-60	2
61-200	3
201-300	4
301-400	5
401-500	6
501-600	7
601 or more	8

3. at least one of the fire extinguishers located in the flight deck and in the passenger compartment shall contain Helon 1211 (Bromochloro difluoro methane, CBrCIF2) or equivalent as the extinguishing agent.

4. At least one readily accessible fire extinguisher must be available for use in each class A or class B cargo or baggage compartment and in each class E cargo compartment that is accessible to crew members inflight.

c. 1. a seat or berth for each person who is aged two years or more;

2. a seat belt for each seat and restraining belts for each berth; and

3. a safety a supplementary loop belt (kangaroo belt), or other restrain device for each infant.

4. a safety harness for each flight crew seat. The safety harness for each pilot seat shall incorporate device, which will automatically restrain the occupant's torso in the event of rapid deceleration; the safety harness for each pilot seat shall incorporate a device to prevent a suddenly incapacitated pilot from interfering with the flight controls. The safety harness includes shoulder straps and a seat belt, which may be used independently.

5. a seat belt with shoulder harness for each cabin crew seat and observer seat.

6. all seat belts with shoulder harness shall have a single point release.

d. Means of ensuring that the following information and instructions are conveyed to passengers through a safety briefing card in each passenger seat pocket and a oral safety briefing announcement prior to each take-off;

1. When and how seat belt are to be fastened including child restrain devices;
2. When and how oxygen equipment is to be used if the carriage of oxygen is required;
3. Restrictions on smoking;
4. Location and use of life jackets or equivalent individual floatation devices where their carriage is required;
5. Location and method of operating emergency exits;
6. Emergency exit path lighting system;
7. When and where carry-on baggage must be stowed; and
8. Correct positioning of seat backs and chair tables for take-off and landing

Note: *any instructions used for passenger information shall be in English language as well.*

e. Spare electrical fuses of appropriate ratings for the replacement of those accessible in flight.

f. One crash axe or crowbar shall be located in the flight deck. If the maximum approved passenger seats are more than 200 an additional crash axe or crowbar shall be carried and located in or near the most rearward galley area. Crash axes and crowbar located in the passenger compartment shall not be visible to passengers.

g. Mega phones to be carried as follows;

h. i. An operator shall not operate an aeroplane unless it has equipment to protect the eyes nose and mouth or each flight crew member while on flight deck duty and to provide oxygen for a period of not less than 15 minutes. In addition when the flight crew is more than one and a cabin crew member is not carried Portable Breathing Equipment (PBE) must be carried to protect the eyes, nose and mouth of one member of the flight crew and to provide breathing gas for a period of not less than 15 minutes.

ii. It has sufficient portable PBE to protect the eyes, nose and mouth of all required cabin crew member and to provide breathing gas for a period of not less than 15 minutes.

Passenger seating configuration	**No. of mega phones required**
61-99	1
100 or more	2

iii. PBE intended of flight crew used must be conveniently located on the flight deck and be easily accessible for immediate use by each required flight crew member at their assigned duty station.

iv. PBE intended for cabin crew used must be installed adjacent to each required cabin crew member duty station.

v. PBE while in use must not prevent communication where required.

2.2.1 Any agent used in a built-in fire extinguisher for each lavatory disposal receptacle for towels, paper or waste in an aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2011 and any extinguishing agent used in a portable fire extinguisher in an aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2016 shall;

a. the type and quantity of extinguishing agent must be suitable for the kinds of fire likely to occur in the compartment where the extinguisher to be intended to be used for personnel compartments must minimize the hazard of toxic gas concentration; and

b. not be of a type listed in Annex A, Group II of the Montreal Protocol on Substances That Deplete the Ozone Layer, 8th Edition, 2009

Note:- *Information concerning extinguishing agents is contained in the UNEP Halons Technical Options Committee Technical Note No. 1 – New Technology Halon Alternatives and FAA Report No. DOT/FAA/AR-99-63, Options to the Use of Halons for Aircraft Fire Suppression Systems*.

2.3 An aeroplane shall carry

a. the Operations Manual prescribed in paragraph 2.3 of Implementing Standards 013, or those parts of it that pertain to flight operations;

b. the flight manual for the aeroplane, or other documents containing performance data required for the application of Implementing Standards 014 and any other information necessary for the operation of the aeroplane within the terms of its certificate of airworthiness, unless these data are available in the operations manual; and

c. current and suitable charts to cover the route of the proposed flight and any route along which it is reasonable to expect that the flight may be diverted.

2.4 Marking of break-in points

2.4.1 If areas of the fuselage suitable for break-in by rescue crews in an emergency are marked on an aeroplane such areas shall be marked as shown in **Appendix-2**. The colour of the markings shall be red or yellow, and if necessary they shall be outlined in white to contrast with the background.

2.4.2 If the corner markings are more than 2 m apart, intermediate lines 9 cm x 3 cm shall be inserted so that there is no more than 2 m between adjacent markings. This requirement does not require any aeroplane to have break-in areas.

3 Flight recorders

Crash protected flight recorders comprise one or more systems, a flight data recorder (FDR), a cockpit voice recorder (CVR), an airborne image recorder (AIR) and/or a data link recorder (DLR). Image and data link information may be recorded on either the CVR or the FDR. Lightweight flight recorders comprise four systems, an aircraft data recording system (ADSR), a cockpit audio recording system (CARS), an airborne image recording system (AIRS) and a data link recording system (DLRS). Image and data link information may be recorded on either the CARS or the ADRS. Lightweight flight recorders comprise one or more systems, an aircraft data recording system (ADRS), a cockpit audio recording system (CARS), an airborne image recording system (AIRS) and/or a data link recording system (DLRS). Image and data link information may be recorded on either the CARS or the ADRS. Detailed guidance on flight recorders is contained in ASN 102.

3.1 Flight data recorders – and aircraft data recording systems

3.1.1 Types

3.1.1.1 Types I and IA FDR shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power, configuration and operation.

3.1.1.2 Types II and IIA FDRs shall record the parameters required to determine accurately the aeroplane flight path, speed, attitude, engine power and configuration of lift and drag devices.

3.1.2 Operation

3.1.2.1 All turbine- engined aeroplanes of a maximum certificated take-off mass of 5700 kg or less for which the application for type certification is submitted to the DGCA on or after 1 January 2016 shall be equipped with;

a. a Type II FDR; or

b. a Class C AIR or AIRS capable of recording flight path and speed parameters displayed to the pilots; or

c. an ADRS capable of recording the essential parameters defined in ASN 102.

Note 1:- *"The application for type certification is submitted to the DGCA "refers to the date of application of the original "Type certificate" for the aeroplane type, not the date of certification of particular aeroplane variants or derivate models.*

Note 2:- *AIR or AIRS classification is defined in 4.1.of Appendix 3 of this IS.*

3.1.2.2 All turbine-engined aeroplanes of a maximum certificated take-off mass of 5 700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 2016 should be equipped with;

a. a Type II FDR; or

b. a Class C AIR or AIRS capable of recording flight path and speed parameters displayed to the pilots; or

c. an ADRS capable of recording the essential parameters defined in ASN 102.

3.1.2.3 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1989 shall be equipped with a Type I FDR.

3.1.2.4 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg, up to and including 27 000 kg, for which the individual certificate of airworthiness is first issued on or after 1 January 1989, shall be equipped with a Type II FDR.

3.1.2.5 All multi-engined turbine- engined aeroplanes of a maximum certificated take-off mass of 5 700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 1990 should be equipped with a Type IIA FDR.

3.1.2.6 All turbine-engined aeroplanes for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989, with a maximum certificated take-off mass of over 5 700 kg, except those in 3.1.2.8 of this IS, shall be equipped with a FDR which shall record time, altitude, airspeed, normal acceleration, and heading.

3.1.2.7 All turbine engine aeroplanes for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989, with a maximum certificated take-off mass of over 5700kg, except those in paragraph 3.1.2.8 of this IS, should be equipped with an FDR which shall record time, altitude, airspeed, normal acceleration, heading and such additional parameters as are necessary to determine pitch attitude, roll attitude, radio transmission keying and power on each engine.

3.1.2.8 All turbine-engined aeroplanes for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989, with a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the DGCA after 30 September 1969 shall be equipped with a Type II FDR.

3.1.2.9 All turbine-engined aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 5 700 kg shall be equipped with a FDR which shall record time, altitude, airspeed, normal acceleration and heading.

3.1.2.10 All turbine-engined aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1987, with a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the DGCA after 30 September 1969 should be equipped with a FDR which should record, in addition to time, altitude, airspeed, normal acceleration and heading, such additional parameters as are necessary to meet the objectives of determining:

a. the attitude of the aeroplane in achieving its flight path; and

b. the basic forces acting upon the aeroplane resulting in the achieved flight path and the origin of such basic forces.

3.1.2.11 All aeroplanes of a maximum certificated take-off mass of over 5 700kg for which the individual certificate of airworthiness is first issued after 1 January 2005 shall be equipped with a Type IA FDR.

3.1.2.12 All aeroplanes which are required to record normal acceleration, lateral acceleration and longitudinal acceleration for which the application for type certification is submitted to the DGCA on or after 1 January 2016 and which are required to be fitted with a FDR shall record those parameters at a maximum sampling and recording interval of 0.0625 seconds.

3.1.2.13 All aeroplanes which are required to record pilot input and/or control surface position of primary controls (pitch, roll, yaw) for which the application for type certification is submitted to a State on or after 1 January 2016 and which are required to be fitted with a FDR shall record those parameters at a maximum sampling and recording interval of 0.125 seconds.

Note: - *For aeroplane with control systems in which movement of a control surface will back drive the pilot's control, "or" applies. For aeroplane with control systems in which movement of a control surface will not back drive the pilot's control, "and" applies. In aeroplanes with independent movable surface, each surface need to be recorded separately in aeroplanes with independent pilot input on primary controls, each pilot input on primary controls needs to be recorded separately.*

3.1.3 Discontinuation

3.1.3.1 The use of engraving metal foil FDRs shall be discontinued.

3.1.3.2 The use of analogue FDRs using Frequency Modulation (FM) shall be discontinued.

3.1.3.3 The use of photographic film FDRs shall be discontinued from.

3.1.3.4 The use of magnetic tape FDRs should be discontinued.

3.1.3.5 The use of magnetic tape FDRs shall be discontinued by January 2016.

3.1.4 Duration

All FDRs shall be capable of retaining the information recorded during at least the last 25 hours of their operation, except for the Type IIA FDR which shall be capable of retaining the information recorded during at least the last 30 minutes of its operation.

3.2 Cockpit voice recorders and cockpit audio recording systems

3.2.1 Operation

3.2.1.1 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 2 250 kg, up to and including 5 700 kg for which the application for type certification is submitted to the DGCA on or after 1 January 2016 and required to be operated by more than one pilot shall be equipped with either a CVR or a CARS.

3.2.1.2 All turbine-engined aeroplanes of a maximum certificated take- off mass of 5 700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 2016 and required to be operated by more than one pilot should be equipped with either a CVR or a CARS.

3.2.1.3 All aeroplanes of a maximum certificated take-off mass of over 5 700kg for which the individual certificate of airworthiness is first issued on or after 1 January 2003, shall be equipped with a CVR capable of retaining the information recorded during at least the last two hours of its operation.

3.2.1.4 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 shall be equipped with a CVR.

3.2.1.5 All turbine-engined aeroplanes for which the individual certificate of airworthiness is first issued before 1 January 1987, with a maximum certificated take-off mass of over 27 000 kg that are of types of which the prototype was certificated by the DGCA after 30 September 1969 shall be equipped with a CVR.

3.2.1.6 All turbine-engined aeroplanes for which the individual certificate of airworthiness is first issued before 1 January 1987, with a maximum certificated take-off mass of over 5 700 kg up to and including 27000 kg that are of types of which the prototype was certificated by the DGCA after 30 September 1969 should be equipped with a CVR.

3.2.2 Discontinuation

3.2.2.1 The use of magnetic tape and wire CVRs shall be discontinued by 1 January 2016.

3.2.2.2 The use of magnetic tape and wire CVRs should be discontinued.

3.2.3 Duration

3.2.3.1 All CVR shall be capable of retaining the information recorded during at least the last 30 minutes of their operation.

3.2.3.2 From 1 January 2016, all CVRs shall be capable of retaining the information recorded during at least the last two hours of their operation.

3.2.3.3 All aeroplanes, for which the individual certificate of airworthiness is first issued on or after 1 January 1990, and that are required to be equipped with a CVR, should have a CVR capable of retaining the information recorded during at least the last two hours of their operation.

3.2.4 Cockpit Voice Recorder alternate power

3.2.4.1 An alternate power source shall automatically engage and provide ten minutes, plus or minus one minute, of operation whenever aeroplane power to the recorder ceases, either by normal shutdown or by any other loss of power. The alternate power source shall power the CVR and its associated cockpit area microphone components. The CVR shall be located as close as practicable to the alternate power source. "Alternate" means separate from the power source that normally provides power to the CVR. The use of aeroplane batteries or other power sources is acceptable provided that the requirements above are met and electrical power to essential and critical loads is not compromised. When the CVR function is combined with other recording functions within the same unit, powering the other functions is allowed.

3.2.4.2 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the application for type certification is submitted to the appropriate National Authority on or after 1 January 2018 shall be provided with an alternate power source, as defined in 3.2.4.1 of this IS that powers the forward CVR in the case of combination recorders.

3.2.4.3 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2018 should be provided with an alternate power source, as defined in 3.2.4.1 of this IS that powers at least one CVR.

3.3 Data link recorders

Data link recorders performance requirements are as contained in the EUROCAE ED-112, Minimum Operational Performance Specifications (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.

3.3.1 Applicability

3.3.1.1 All aeroplanes for which the individual certificate of airworthiness is first issued on or after 1January 2016, which utilize any of the data link communications applications listed in ASN 102, and are required to carry a CVR, shall record on a flight recorder the data link communications messages.

3.3.1.2 All aeroplanes which are modified on or after 1 January 2016 to install and utilize any of the data link communications applications listed below and are required to carry a CVR shall record on a flight recorder the data link communications messages. Data link communications are currently conducted by either ATN-based or FANS 1/A-equipped aircraft. A Class B AIR could be a means for recording data link communications applications messages to and from the aeroplanes where it is not practical or is prohibitively expensive to record those data link communications applications messages on FDR or CVR.

a. Data link initiation capability
b. Controller-pilot data link communications

c. Data link-flight information services
d. Automatic dependent surveillance – contract
e. Automatic dependent surveillance – broadcast*
f. Aeronautical operational control*

Messages applying to the applications listed above shall be recorded. Applications without the asterisk (*) are mandatory applications which shall be recorded regardless of the system complexity. Applications with an (*) shall be recorded only as far as is practicable given the architecture of the system.

3.3.2 Duration

The minimum recording duration shall be equal to the duration of the CVR.

3.3.3 Correlation

Data link recording shall be able to be correlated to the recorded cockpit audio.

3.4 Flight recorders – general

3.4.1 Construction and installation

Flight recorders shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed. Flight recorders shall meet the prescribed crashworthiness and fire protection specifications.

3.4.2 Operation

3.4.2.1 Flight recorders shall be serviceable at the commencement of the flight and not be switched off during flight time.

3.4.2.2 To preserve flight recorder records, flight recorders shall be de-activated upon completion of flight time following an accident or incident. The flight recorders shall not be re-activated before their disposition as determined by the DGCA. The need for removal of the flight recorder records from the aircraft will be determined by the investigation authority in the State conducting the investigation with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation. The operator's responsibilities regarding the retention of flight recorder records are contained in paragraph 6 of Implementing Standards 020.

3.4.3 Continued serviceability

Operational checks and evaluations of recordings from the flight recorder systems shall be conducted as per the requirements stipulated in ASN 102, to ensure the continued serviceability of the recorders.

3.4.4 Flight recorder electronic documentation

The documentation requirement concerning FDR and DRS parameters provided by operators to accident investigation authorities should be in electronic format and take account of industry specifications.

3.4.5 Combination recorders

3.4.5.1 All aeroplanes of a maximum certificated take-off mass of over 5 700kg for which the application for type certification is submitted to the appropriate National Authority on or after 1 January 2016 and which are required to be equipped with both a CVR and an FDR, should be equipped with two combination recorders (FDR/CVR).

3.4.5.2 All aeroplanes of a maximum certificated take-off mass of over 15 000kg for which the application for type certification is submitted to the DGCA on or after 1 January 2016 and which are required to be equipped with both a CVR and an FDR, shall be equipped with two combination recorders (FDR/CVR). One recorder shall be located as close to the cockpit as practicable and the other recorder located as far aft as practicable.

3.4.5.3 All aeroplanes of a maximum certificated take-off mass over 5 700kg, required to be equipped with an FDR and a CVR, may alternatively be equipped with two combination recorders (FDR/CVR). This requirement of 3.4.5 may be satisfied by equipping the aeroplanes with two combination recorders (one forward and one aft) or separate devices.

3.4.5.4 All multi-engined turbine-powered aeroplanes of a maximum certificated take-off mass of 5 700kg or less, required to be equipped with an FDR and/or a CVR, may alternatively be equipped with one combination recorder (FDR/CVR).

4 All aeroplanes operated as VFR flights

4.1 All aeroplanes when operated as VFR flights shall be equipped with:

a. magnetic compass;
b. accurate timepiece indicating the time in hours, minutes and seconds;
c. sensitive pressure altimeter;
d. airspeed indicator; and
e. Such additional instruments or equipment as may be prescribed by the DGCA.

4.2 VFR flights, which are operated as controlled flights, shall be equipped in accordance with paragraph 9.

5 All aeroplanes on flights over water

5.1 Seaplanes : All seaplanes for all flights shall be equipped with:

a. one life jacket, or equivalent individual flotation device, for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided;

b. equipment for making the sound signals prescribed in the International Regulations for Preventing Collisions at Sea, where applicable; and

c. One sea anchor (drogue) and other equipment necessary to facilitate mooring, anchoring or maneuvering on water, appropriate with size, weight and handling characteristics.

Note; - *"Seaplanes" includes amphibians operated as seaplanes.*

5.2 Landplanes

5.2.1 Landplanes shall carry the equipment prescribed in paragraph 5.2.2 of this IS:

a. when flying over water and at a distance of more than 93 km (50 NM) away from the shore, in the case of landplanes operated in accordance with paragraphs 2.9 or 2.10 of Implementing Standards 014;

b. when flying en route over water beyond gliding distance from the shore, in the case of all other landplanes; and

c. when taking off or landing at an aerodrome where, in the opinion of the Director-General of Civil Aviation, the take-off or approach path is so disposed over water that in the event of a mishap there would be a likelihood of a ditching.

5.2.2 The equipment referred to in paragraph 5.2.1 shall comprise one life jacket equipped with a survivor locater light or equivalent individual flotation device for each person on board, stowed in a position easily accessible from the seat or berth of the person for whose use it is provided. Life Jackets for infants may be substituted by other approved floatation devices equipped with a survivor locater light. "Landplanes" includes amphibians operated as landplanes.

5.3 All aeroplanes on long-range over-water flights

5.3.1 In addition to the equipment prescribed in paragraphs 5.1 or 5.2 whichever is applicable, the following equipment shall be installed in all aeroplanes when used over routes on which the aeroplane may be over water and at more than a distance corresponding to 120 minutes at cruising speed or 740 km (400 NM), whichever is the lesser, away from land suitable for making an emergency landing in the case of aircraft operated in accordance with Implementing Standard 014, paragraphs 2.9 or 2.10, and 30 minutes or 185 km (100 NM), whichever is the lesser, for all other aeroplanes:

a. life-saving rafts with locater lights in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such life-saving equipment including means of sustaining life as is appropriate to the flight to be undertaken;

b. equipment for making the pyrotechnical distress signals specified in ASN 086.

c. at the earliest practicable date but not later than 1 January 2018, on all aeroplanes of a maximum certificated take-off mass of over 27 000 kg, a securely attached underwater locating device operating at a frequency of 8.8 kHz. This automatically activated underwater locating device shall operate for a minimum of 30 days and shall not be installed in wings or empennage. Underwater Locator Beacon (ULB) performance requirements are as contained in the SAE AS6254, Minimum Performance Standard for Underwater Locating Devices (Acoustic) (Self- Powered), or equivalent documents

5.3.2 Each life jacket and equivalent individual flotation device, when carried in accordance with paragraphs 5.1 a), 5.2.1 and 5.2.2 of this IS, shall be equipped with a means of electric illumination for the purpose of facilitating the location of persons, except where the requirement of paragraph 5.2.1 c) of this IS is met by the provision of individual flotation devices other than life jackets.

6 All aeroplanes on flights over designated land areas:

Aeroplanes, when operated across land areas, which have been designated by the State concerned as areas in which search and rescue would be especially difficult, shall be equipped with such signaling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area overflown.

7 All aeroplanes on high altitude flights

Approximate altitude in the Standard Atmosphere corresponding to the value of absolute pressure used in this text is as follows:

Absolute pressure	Meters	Feet
700 hPa	3 000	10 000
620 hPa	4 000	13 000
376 hPa	7 600	25 000

7.1 An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 700 hPa in personnel compartments shall be provided with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in the Requirements published under paragraph 3.9.1 of Implementing Standard 013.

7.2 An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 700 hPa but which is provided with means of maintaining pressures greater than 700hpa in personnel compartments shall be provided with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in the Requirements published under paragraph 3.9.2 of Implementing Standard 013.

7.3 Pressurized aeroplanes newly introduced in to service on or after 1st July 1962 and intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa shall be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.

7.4 Pressurized aeroplanes introduced into service before 1 July 1962 and intended to be operated at flight altitudes at which the atmospheric pressure is less than 376hpa should be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurization.

7.5 An aeroplane intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa, or which, if operated at flight altitudes at which the atmospheric pressure is more than 376 hPa, cannot descend safely within four minutes to a flight altitude at which the atmospheric pressure is equal to 620 hPa and for which the individual certificate of airworthiness is first issued on or after 9 November 1998, shall be provided with automatically deployable oxygen equipment to satisfy the Requirements Published under paragraph 3.9.2 of Implementing Standard 013.The total number of oxygen dispensing units shall exceed the number of passenger and cabin crew seats by at least 10 per cent.

8 All aeroplanes in icing conditions:

All aeroplanes shall be equipped with suitable de-icing and/or anti-icing devices when operated in circumstances in which icing conditions are reported to exist or are expected to be encountered.

9 All aeroplanes operated in accordance with instrument flight rules

9.1 All aeroplanes when operated in accordance with the instrument flight rules, or when the aeroplane cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:

a. a magnetic compass;
b. an accurate timepiece indicating the time in hours, minutes and seconds;
c. two sensitive pressure altimeters with counter drum-pointer or equivalent presentation; (Neither three-pointer nor drum-pointer altimeters satisfy this requirement in)
d. an airspeed indicating system with means of preventing malfunctioning due to either condensation or icing;
e. a turn and slip indicator;
f. an attitude indicator (artificial horizon);
g. a leading indicator (directional gyroscope); (The requirements of paragraphs 9.1 e), f) and g) of this IS may be met by combinations of instruments or by integrated flight director systems provided that the safeguards against total failure, inherent in the three separate instruments, are retained.)
h. a means of indicating whether the power supply to the gyroscopic instrument is adequate;
i. a means of indicating in the flight crew compartment the outside air temperature;
j. a rate-of-climb and descent indicator; and
k. Such additional instruments or equipment as may be prescribed by the DGCA.

9.2 All aeroplanes over 5 700 kg- Emergency power supply for electrically operated attitude indicating instruments.

9.2.1 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg newly introduced into service after 1 January 1975 shall be fitted with an emergency power supply, independent of the main electrical generating system, for the purpose of operating and illuminating, for a minimum period of 30 minutes, an attitude indicating instrument (artificial horizon), clearly visible to the pilot-in-command. The emergency power supply shall be automatically operative after the total failure of the main electrical generating system and clear indication shall be given on the instrument panel that the attitude indicator(s) is being operated by emergency power.

9.2.2 Those instruments that are used by any one pilot shall be so arranged as to permit the pilot to see their indications readily from his or her station, with the minimum practicable deviation from the position and line of vision normally assumed when looking forward along the flight path.

10 All aeroplanes when operated at night:

All aeroplanes, when operated at night shall be equipped with:

a. all equipment specified in paragraph 9;
b. the lights required by the ASN 086 for aircraft in flight or operating on the movement area of an aerodrome;
c. two landing lights; (Aeroplanes not certificated in accordance with the requirements specified by the DGCA which are equipped with a single landing light having two separately energized filaments will be considered to have complied with this requirement).
d. illumination for all instruments and equipment that are essential for the safe operation of the aeroplane that are used by the flight crew;

e. lights in all passenger compartments; and
f. an independent portable light for each crew member station.

11 **Pressurized aeroplanes when carrying passengers – weather radar**: Pressurized aeroplanes when carrying passengers should be equipped with operative weather radar whenever such aeroplanes are being operated in areas where thunderstorms or other potentially hazardous weather conditions, regarded as detectable with airborne. Weather radar, may be expected to exist along the route either at night or under instrument meteorological conditions.

12 **All aeroplanes operated above 15 000 m (49 000 ft) – radiation indicator**: All aeroplanes intended to be operated above 15 000 m (49 000 ft) shall carry equipment to measure and indicate continuously the dose rate of total cosmic radiation being received (i.e. the total of ionizing and neutron radiation of galactic and solar origin) and the cumulative dose on each flight. The display unit of the equipment shall be readily visible to a flight crewmember.

13 **All aeroplanes complying with the noise certification Standards in Annex 16, Volume I:** An aeroplanes shall carry a document attesting noise certification issued by the DGCA and that document shall include an English translation if it's not issued in the English language.

14 **Mach number indicator:** All aeroplanes with speed limitations expressed in terms of Mach number, shall be equipped with a Mach number indicator. This does not preclude the use of the airspeed indicator to derive Mach number for ATS purposes.

15 **Aeroplanes required to be equipped with Ground Proximity Warning Systems (GPWS)**

15.1 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers shall be equipped with a ground proximity warning system.

15.2 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg or authorized to carry more than 30 passengers shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.

15.3 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers, for which the individual certificate of airworthiness is first issued on or after 1 January 2004, shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.

15.4 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers, shall be equipped with a ground proximity warning system which has a forward looking terrain avoidance function.

15.5 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than five but not more than nine passengers should be equipped with a ground proximity warning system which provides the warnings of paragraph 15.8 a) and c) of this IS, warning of unsafe terrain clearance and a forward looking terrain avoidance function.

15.6 All piston-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers shall be equipped with a ground proximity warning system which provides the warnings in 15.8 a) and c) of this IS, warning of unsafe terrain clearance and a forward looking terrain avoidance function.

15.7 A ground proximity warning system shall provide automatically a timely and distinctive warning to the flight crew when the aeroplane is in potentially hazardous proximity to the earth's surface. Operators shall be guided by ASN 103 for maintaining the effectiveness of ground proximity warning system equipment.

15.8 A ground proximity warning system shall provide, unless otherwise specified herein, warnings of the following circumstances:

a. excessive descent rate;
b. excessive terrain closure rate;
c. excessive altitude loss after take-off or go-around;
d. unsafe terrain clearance while not in landing configuration;
   I) gear not locked down;
   II) flaps not in a landing position; and
e. excessive descent below the instrument glide path.

16 Aeroplanes carrying passengers –cabin crew seats

16.1 Aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1981:

All aeroplanes shall be equipped with a forward or rearward facing (within 15 degrees of the longitudinal axis of the aeroplane) seat, fitted with a safety harness for the use of each cabin crew member required to satisfy the intent of Implementing Standards No. 021 in respect of emergency evacuation.

16.2 Aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1981:

All aeroplanes should be equipped with a forward or rearward facing (within 15 degrees of the longitudinal axis of the aeroplane) seat, fitted with a safety harness for the use of each cabin crew member required to satisfy the intent of Implementing Standards No. 021 in respect of emergency evacuation.

Note: *Safety harness includes shoulder straps and a seat belt which may be used independently.*

16.3 Cabin crew seats provided in accordance with paragraph 16.1 and 16.2 of this IS shall be located near floor level and other emergency exits as required by the Director-General of Civil Aviation for emergency evacuation.

17 Emergency Locator Transmitter (ELT)

17.1 All aeroplanes should carry an automatic ELT.

17.2 Except as provided for in paragraph 17.3 of this IS, all aeroplanes authorized to carry more than 19 passengers shall be equipped with at least one automatic ELT or two ELTs of any type.

17.3 All aeroplanes authorized to carry more than 19 passengers for which the individual certificate of airworthiness is first issued after 1 July 2008 shall be equipped with at least two ELTs, one of which shall be automatic.

17.4 Excepted as provided in paragraph 17.5 of this IS, all aeroplanes authorized to carry 19 passengers or less shall be equipped with at least one ELT of any type.

17.5 All aeroplanes authorized to carry 19 passengers or less for which the individual certificate of airworthiness is first issued after 1 July 2008 shall be equipped with at least one automatic ELT.

17.6 ELT equipment carried to satisfy the requirements of paragraphs 17.1, 17.2, 17.3, 17.4 and 17.5 of this IS shall operate in accordance with the relevant provisions of ICAO Annex 10, Volume III.

Note: *the judicious choice of numbers of ELTs, their type and placement on aircraft and associated floatable life support systems will ensure the greatest chance of ELT activation in the event of an accident for aircraft operating over water or land, including areas especially difficult for search and rescue, Placement of transmitter units is a vital factor in ensuring optimal crash and fire protection. The placement of the control and switching devices (activation monitors) of automatic fixed ELTs and their associated operational procedures will also take into consideration the need for rapid detection of inadvertent activation and convenient manual switching by crew members.*

18 LOCATION OF AN AEROPLANE IN DISTRESS

18.1 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2021, shall autonomously transmit information from which a position can be determined by the operator at least once every minute, when in distress, in accordance with Appendix 9.

18.2 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2021, should autonomously transmit information from which a position can be determined at least once every minute, when in distress, in accordance with Appendix 9.

18.3 The operator shall make position information of a flight in distress available to the appropriate organizations, as established by the State of the Operator.

Note.— *Refer to 4.2.1.3.1 for operator responsibilities when using third parties.*

19 Aeroplanes required to be equipped with an airborne collision avoidance system (ACAS II)

19.1 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg or authorized to carry more than 30 passengers shall be equipped with an airborne collision avoidance system (ACAS II).

19.2 From 1 January 2005, all turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than 19 passengers shall be equipped with an airborne collision avoidance system (ACAS II).

19.3 All aeroplanes should be equipped with an airborne collision avoidance system (ACAS II).

19.4 An airborne collision avoidance system shall operate in accordance with the relevant provisions of ICAO Annex 10, Volume IV. Operational procedures and training requirements of airborne collision avoidance system (ACAS) equipment are contained in ASN 104.

20 Requirements for pressure-altitude reporting transponders:

20.1 All aeroplanes shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of ICAO Annex 10, Volume IV.

20.2 All aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2009 shall be equipped with a data source that provides pressure-altitude information with a resolution of 7.62 m (25ft), or better

20.3 All aeroplanes shall be equipped with a data source that provides pressure-altitude information with a resolution of 7.62 m (25ft), or better.

20.4 The Mode S transponder should be provided with the airborne/on-the-ground status if the aeroplane is equipped with an automatic means of detecting such status.

Note 1: *These provisions will improve the effectiveness of airborne collision avoidance systems as well as air traffic services that employ Mode S radar. In particular, tracking processes are significantly enhanced with a resolution of 7.62m (25ft), or better.*

Note 2: *Mode C replies of transponders always report pressure altitude in 30.50m (100ft) increments irrespective of the resolution of the data source.*

21 Microphones:

All flight crewmembers required to be on flight deck duty shall communicate through boom or throat microphones below the transition level/altitude.

22 Turbo-jet aeroplanes forward-looking wind shear warning system

22.1 All turbo-jet aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorized to carry more than nine passengers should be equipped with a forward-looking wind shear warning system.

22.2 A forward-looking wind shear warning system should be capable of providing the pilot with a timely aural and visual warning of wind shear ahead of the aircraft, and the information required to permit the pilot to safely commence and continue a missed approach or go-around or to execute an escape maneuver if necessary. The system should also provide an indication to the pilot when the limits specified for the certification of automatic landing equipment are being approached, when such equipment is in use.

23 All Aeroplanes operated by a single pilot under the Instrument Flight Rules (IFR) or at night

For approval in accordance with paragraph 9.1 of the Implementing Standard 013, all aeroplanes operated by a single pilot under the IFR or at night shall be equipped with:

a. a serviceable autopilot that has at least altitude hold and heading select modes;
b. a headset with a boom microphone or equivalent; and

c. Means of displaying charts that enables them to be readable in all ambient light conditions.

24 Aeroplanes equipped with Automatic Landing Systems, a Head Up Display (HUD) or equivalent displays, Enhanced Vision Systems (EVS), Synthetic Vision Systems (SVS) and/or Combined Vision Systems (CVS)

24.1 Where aeroplanes are equipped with automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS, or any combination of those systems into a hybrid system, the use of such systems for the safe operation of an aeroplane shall be approved by the State of the Operator.

Note.— *Information regarding a HUD or equivalent displays, including references to RTCA and EUROCAE documents, Reference is contained in the IS 013 and SLCAP 4510 Manual of All-Weather Operations.*

24.2 In approving the operational use of automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS, the State of the Operator shall ensure that:

a) the equipment meets the appropriate airworthiness certification requirements;

b) the operator has carried out a safety risk assessment of the operations supported by the automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS;

c) the operator has established and documented the procedures for the use of, and training requirements for, automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS.

Note 1.— *Guidance on safety risk assessments is contained in the Safety Management Manual (SMM) (Doc 9859).*

Note 2.— *Guidance on operational approvals is contained in Appendix 4 of this IS.*

25 Electronic flight bags (EFBs)

Note.— *Guidance on EFB equipment, functions and operational approval is contained in the Manual on Electronic Flight Bags. Refer IS 027 and SLCAP 4535.*

25.1 EFB equipment

Where portable EFBs are used on board an aeroplane, the operator shall ensure that they do not affect the performance of the aeroplane systems, equipment or the ability to operate the aeroplane.

25.2 EFB functions

25.2.1 Where EFBs are used on board an aeroplane the operator shall:

a) assess the safety risk(s) associated with each EFB function;

b) establish and document the procedures for the use of, and training requirements for, the device and each EFB function; and

c) ensure that, in the event of an EFB failure, sufficient information is readily available to the flight crew for the flight to be conducted safely.

Note.— *Guidance on safety risk assessments is contained in the Safety Management Manual (SMM) (Doc 9859 and Gazette Notification number 1882/49 dated 03rd October 2014).*

25.2.2 The State of the Operator shall approve the operational use of EFB functions to be used for the safe operation of aeroplanes.

25.3 EFB operational approval

In approving the use of EFBs, the State of the Operator shall ensure that:

a) the EFB equipment and its associated installation hardware, including interaction with aeroplane systems if applicable, meet the appropriate airworthiness certification requirements;

b) the operator has assessed the safety risks associated with the operations supported by the EFB function(s);

b) the operator has established requirements for redundancy of the information (if appropriate) contained in and displayed by the EFB function(s);

d) the operator has established and documented procedures for the management of the EFB function(s) including any database it may use; and

e) the operator has established and documented the procedures for the use of, and training requirements for, the EFB and the EFB function(s).

Note.— *Guidance on safety risk assessments is contained in the Safety Management Manual (SMM) (Doc 9859 and Gazette Notification number 1882/49 dated 03rd October 2014).*

APPENDIX 1

TYPES, NUMBER, LOCATION AND CONTENTS OF MEDICAL SUPPLIES

1. Types

1.1. The different types of medical supplies should be provided as follows: first-aid kit(s) for carriage on all aeroplanes, universal precaution kit(s) for carriage on all aeroplanes that require a cabin crew member, and a medical kit for carriage where the aeroplane is authorized to carry more than 100 passengers on a sector length of more than two hours. Where national regulations allow it, operators may elect to carry the recommended medication in the first-aid kit.

1.2. Based on the limited available evidence, only a very small number of passengers are likely to benefit from the carriage of Automated External Defibrillators (AED) on aeroplanes. However, many operators carry them because they offer the only effective treatment for cardiac fibrillation. The likelihood of use, and therefore of potential benefit to a passenger, is greatest in aircraft carrying a large number of passengers, over long duration sector lengths. The carriage of AEDs should be determined by operators on the basis of a risk assessment taking into account the particular needs of the operation.

2. Number of first-aid and universal precaution kits

2.1. First-aid kits

The number of first-aid kits should be appropriate to the number of passengers which the aeroplane is authorized to carry:

Passenger	First-aid kits
0-100	1
101-200	2
201-300	3
301-400	4
401-500	5
More than 500	6

2.2. Universal precaution kits

For routine operations, one or two universal precaution kits should be carried on aircraft that are required to operate with at least one cabin crew member. Additional kit(s) should be made available at times of increased public health risk, such as during an outbreak of a serious communicable disease having pandemic potential. Such kits may be used to clean up any potentially infectious body contents such as blood, urine, vomit and faeces and to protect the cabin crew members who are assisting potentially infectious cases of suspected communicable disease.

3. Location

3.1. First-aid and universal precaution kits should be distributed as evenly as practicable throughout the passenger cabins. They should be readily accessible to cabin crew members.

3.2. The medical kit, when carried, should be stored in an appropriate secure location.

4. Contents

4.1. The following provides guidance on typical contents of first-aid, universal precaution and medical kits.

4.1.1. First-aid kit:

- List of contents
- Antiseptic swabs (10/pack)
- Bandage: adhesive strips
- Bandage: gauze 7.5 cm × 4.5 m
- Bandage: triangular; safety pins
- Dressing: burn 10 cm × 10 cm
- Dressing: compress, sterile 7.5 cm × 12 cm
- Dressing: gauze, sterile 10.4 cm × 10.4 cm
- Tape: adhesive 2.5 cm (roll)
- Steri-strips (or equivalent adhesive strip)
- Hand cleanser or cleansing towelettes
- Pad with shield, or tape, for eye
- Pair of Scissors: 10 cm (if allowed by national regulations)
- Tape: Adhesive, surgical 1.2 cm × 4.6 m
- Pair of Tweezers: splinter
- Disposable gloves (multiple pairs)
- Thermometers (non-mercury)
- Mouth-to-mouth resuscitation mask with one-way valve
- First-aid manual, current edition
- Incident record form

The following medications may be included in the first-aid kits:

- Mild to moderate analgesic
- Antiemetic
- Nasal decongestant
- Antacid
- Antihistamine

4.1.2. Universal precaution kit:

- Dry powder that can convert small liquid spill into a sterile granulated gel
- Germicidal disinfectant for surface cleaning
- Skin wipes
- Face/eye mask (separate or combined)
- Gloves (disposable)
- Protective apron
- Large absorbent towel
- Pick-up scoop with scraper
- Bio-hazard disposal waste bag
- Instructions

4.1.3. Medical kit:

Equipment

- List of contents
- Stethoscope
- Sphygmomanometer (electronic preferred)
- Airways, oropharyngeal (three sizes)
- Syringes (appropriate range of sizes)

- Needles (appropriate range of sizes)
- Intravenous catheters (appropriate range of sizes)
- Antiseptic wipes
- Gloves (disposable)
- Needle disposal box
- Urinary catheter
- System for delivering intravenous fluids
- Venous tourniquet
- Sponge gauze
- Tape – adhesive
- Surgical mask
- Emergency tracheal catheter (or large gauge intravenous cannula)
- Umbilical cord clamp
- Thermometers (non-mercury)
- Basic life support cards —Bag-valve mask
- Flashlight and batteries

Medication

- Epinephrine 1:1 000
- Antihistamine – injectable
- Dextrose 50% (or equivalent) – injectable: 50 ml
- Nitroglycerin tablets, or spray
- Major analgesic
- Sedative anticonvulsant – injectable
- Antiemetic – injectable
- Bronchial dilator – inhaler
- Atropine – injectable
- Adrenocortical steroid – injectable
- Diuretic – injectable
- Medication for postpartum bleeding
- Sodium chloride 0.9% (minimum 250 ml)
- Acetyl salicylic acid (aspirin) for oral use
- Oral beta blocker

If a cardiac monitor is available (with or without an AED) add to the above list:

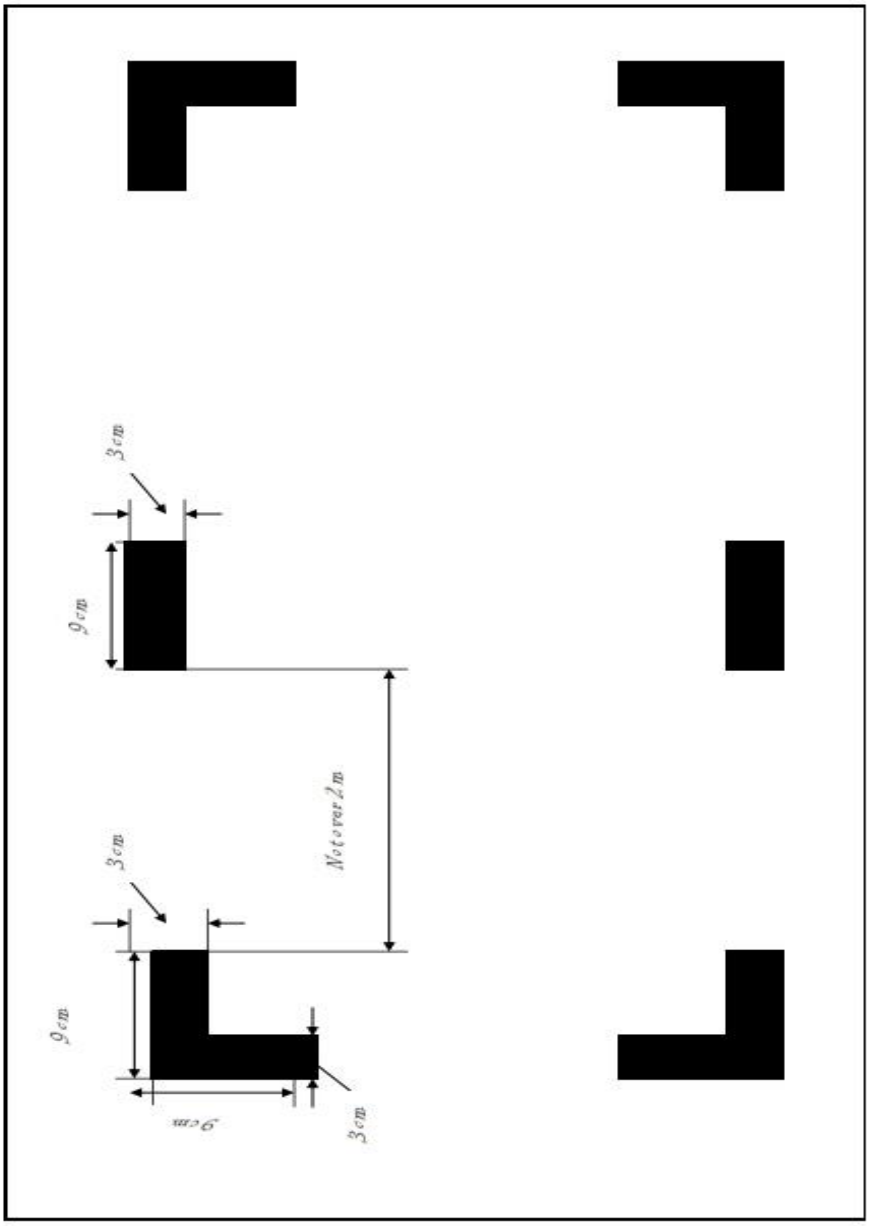
- Epinephrine 1:10 000 (can be a dilution of epinephrine

Note.— *The United Nations Conference for Adoption of a Single Convention on Narcotic Drugs in March 1961 adopted such a Convention, Article 32 of which contains special provisions concerning the carriage of drugs in medical kits of aircraft engaged in international flight.*

APPENDIX 2

Appendix - 2

MARKING OF BREAK-IN POINTS



APPENDIX 3.

FLIGHT RECORDERS

The material in this Appendix concerns flight recorders intended for installation in aeroplanes engaged in international air navigation. Crash protected flight recorders comprise one or more of the following systems: a flight data recorder (FDR), a cockpit voice recorder (CVR), an airborne image recorder (AIR) and/or a data link recorder (DLR). Lightweight flight recorders comprise one or more of the following systems: an aircraft data recording system (ADRS), a cockpit audio recording system (CARS), an airborne image recording system (AIRS) and/or a data link recording system (DLRS).

1. General requirements

1.1 Non-deployable flight recorder containers shall:

a) be painted a distinctive orange or yellow colour;

b) carry reflective material to facilitate their location; and

c) have securely attached an automatically activated underwater locating device operating at a frequency of 37.5 kHz. At the earliest practicable date, but not later than 1 January 2018, this device shall operate for a minimum of 90 days.

Note. — *Current industry practice is to phase out yellow flight recorder containers at the end of the service life of the flight recorder*.

1.2 Automatic deployable flight recorder containers shall:

a) be painted a distinctive orange colour, however the surface visible from outside the aircraft may be of another colour;
b) carry reflective material to facilitate their location; and
c) have an integrated automatically activated ELT.

1.3 The flight recorder systems shall be installed so that:

a) The probability of damage to the recordings is minimized;

b) They receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardizing service to essential or emergency loads;

c) There is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and

d) If the flight recorder systems have a bulk erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact.

1.4 The flight recorder systems, when tested by methods approved by the appropriate certificating authority, shall be demonstrated to be suitable for the environmental extremes over which they are designed to operate.

1.5 Means shall be provided for an accurate time correlation between the flight recorder systems recordings.

1.6 The manufacturer shall provide the appropriate certificating authority with the following information in respect of the flight recording systems:

a) manufacturer's operating instructions, equipment limitations and installation procedures;

b) parameter origin or source and equations which relate counts to units of measurement; and

c) manufacturer's test reports.

2. Flight Data Recorder (FDR)

2.1 The flight data recorder shall start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power.

2.2 Parameters to be recorded

2.2.1 Flight data recorders shall be classified as Type I, Type IA, Type II and Type IIA depending upon the number of parameters to be recorded and the duration required for retention of the recorded information.

2.2.2 The parameters that satisfy the requirements for FDRs are listed in the paragraphs below. The number of parameters to be recorded shall depend on aeroplane complexity. The parameters without an asterisk (*) are mandatory parameters which shall be recorded regardless of aeroplane complexity. In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by aeroplane systems or the flight crew to operate the aeroplane. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

2.2.2.1 The following parameters shall satisfy the requirements for flight path and speed:

— Pressure altitude
— Indicated airspeed or calibrated airspeed
— Air-ground status and each landing gear air-ground sensor when practicable
— Total or outside air temperature
— Heading (primary flight crew reference)
— Normal acceleration
— Lateral acceleration
— Longitudinal acceleration (body axis)
— Time or relative time count
— Navigation data*: drift angle, wind speed, wind direction, latitude/longitude
— Groundspeed*
— Radio altitude*

2.2.2.2 The following parameters shall satisfy the requirements for attitude:

— Pitch attitude
— Roll attitude
— Yaw or sideslip angle*
— Angle of attack*

2.2.2.3 The following parameters shall satisfy the requirements for engine power:

- Engine thrust/power: propulsive thrust/power on each engine, cockpit thrust/power lever position
- Thrust reverse status*
- Engine thrust command*
- Engine thrust target*
- Engine bleed valve position*
- Additional engine parameters*: EPR, N1, indicated vibration level, N2, EGT, TLA, fuel flow, fuel cut-off lever position, N3

2.2.2.4 The following parameters shall satisfy the requirements for configuration:

- Pitch trim surface position
- Flaps*: trailing edge flap position, cockpit control selection
- Slats*: leading edge flap (slat) position, cockpit control selection
- Landing gear*: landing gear, gear selector position
- Yaw trim surface position*
- Roll trim surface position*
- Cockpit trim control input position pitch*
- Cockpit trim control input position roll*
- Cockpit trim control input position yaw*
- Ground spoiler and speed brake*: Ground spoiler position, ground spoiler selection, speed brake position, speed brake selection
- De-icing and/or anti-icing systems selection*
- Hydraulic pressure (each system)*
- Fuel quantity in CG trim tank *
- AC electrical bus status*
- DC electrical bus status*
- APU bleed valve position*
- Computed center of gravity*

2.2.2.5 The following parameters shall satisfy the requirements for operation:

- Warnings
- Primary flight control surface and primary flight control pilot input: pitch axis, roll axis, yaw axis
- Marker beacon passage
- Each navigation receiver frequency selection
- Manual radio transmission keying and CVR/FDR synchronization reference
- Autopilot/auto throttle/AFCS mode and engagement status*
- Selected barometric setting*: pilot, first officer
- Selected altitude (all pilot selectable modes of operation)*
- Selected speed (all pilot selectable modes of operation)*
- Selected Mach (all pilot selectable modes of operation)*
- Selected vertical speed (all pilot selectable modes of operation)*
- Selected heading (all pilot selectable modes of operation)*
- Selected flight path (all pilot selectable modes of operation)*: course/DSTRK, path angle
- Selected decision height*
- EFIS display format*: pilot, first officer
- Multi-function/engine/alerts display format*

- GPWS/TAWS/GCAS status*: selection of terrain display mode including pop-up display status, terrain alerts, both cautions and warnings, and advisories, on/off switch position
- Low pressure warning*: hydraulic pressure, pneumatic pressure
- Computer failure*
- Loss of cabin pressure*
- TCAS/ACAS (traffic alert and collision avoidance system/airborne collision avoidance system)*
- Ice detection*
- Engine warning each engine vibration*
- Engine warning each engine over temperature*
- Engine warning each engine oil pressure low*
- Engine warning each engine over speed*
- Wind shear warning*
- Operational stall protection, stick shaker and pusher activation*
- All cockpit flight control input forces*: control wheel, control column, rudder pedal cockpit input forces
- Vertical deviation*: ILS glide path, MLS elevation, GNSS approach path
- Horizontal deviation*: ILS localizer, MLS azimuth, GNSS approach path
- DME 1 and 2 distances*
- Primary navigation system reference*: GNSS, INS, VOR/DME, MLS, Loran C, ILS
- Brakes*: left and right brake pressure, left and right brake pedal position
- Date*
- Event marker*
- Head up display in use*
- Para visual display on*

Note.— *It is not intended that aeroplanes issued with an individual certificate of airworthiness before 1 January 2016 be modified to meet the range, sampling, accuracy or resolution guidance detailed in this Appendix.*

2.2.2.6 Type IA FDR. This FDR shall be capable of recording, as appropriate to the aeroplane, at least the 78 parameters in Table A8-1.

2.2.2.7 Type I FDR. This FDR shall be capable of recording, as appropriate to the aeroplane, at least the first 32 parameters in Table A8-1.

2.2.2.8 Types II and IIA FDRs. These FDRs shall be capable of recording, as appropriate to the aeroplane, at least the first 16 parameters in Table A8-1.

2.2.2.9 The parameters that satisfy the requirements for flight path and speed as displayed to the pilot(s) are listed below. The parameters without an (*) are mandatory parameters which shall be recorded. In addition, the parameters designated by an (*) shall be recorded if an information source for the parameter is displayed to the pilot and is practicable to record:

- Pressure altitude
- Indicated airspeed or calibrated airspeed
- Heading (primary flight crew reference)
- Pitch attitude
- Roll attitude
- Engine thrust/power
- Landing-gear status*
- Total or outside air temperature*

— Time*
— Navigation data*: drift angle, wind speed, wind direction, latitude/longitude
— Radio altitude*

2.3 Additional information

2.3.1 A Type IIA FDR, in addition to a 30-minute recording duration, shall retain sufficient information from the preceding take-off for calibration purposes.

2.3.2 The measurement range, recording interval and accuracy of parameters on installed equipment shall be verified by methods approved by the appropriate certificating authority.

2.3.3 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator. The documentation needs to be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

3. Cockpit Voice Recorder (CVR) and Cockpit Audio Recording System (CARS)

3.1 Signals to be recorded

The CVR and CARS shall start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the CVR and CARS shall start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

3.1.1 The CVR shall record on four separate channels, or more, at least the following:

a) voice communication transmitted from or received in the aeroplane by radio;
b) aural environment on the flight deck;
c) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed;
d) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker; and
e) voice communication of flight crew members using the passenger address system, if installed

3.1.2 The CARS shall record on two separate channels, or more, at least the following:

a) voice communication transmitted from or received in the aeroplane by radio;
b) aural environment on the flight deck; and
c) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed.

3.1.3 The CVR shall be capable of recording on at least four channels simultaneously. On a tape-based CVR, to ensure accurate time correlation between channels, the CVR is to record in an in-line format. If a bi-directional configuration is used, the in-line format and channel allocation shall be retained in both directions.

3.1.4 The preferred channel allocation shall be as follows: Channel 1 — co-pilot headphones and live boom microphone Channel 2 — pilot headphones and live boom microphone Channel 3

— area microphone Channel 4 — time reference plus the third and fourth crew members' headphone and live microphone, if applicable.

Note 1.— *Channel 1 is located closest to the base of the recording head.*

Note 2.— *The preferred channel allocation presumes use of current conventional magnetic tape transport mechanisms, and is specified because the outer edges of the tape have a higher risk of damage than the middle. It is not intended to preclude use of alternative recording media where such constraints may not apply.*

4. Airborne Image Recorder (AIR) and Airborne Image Recording System (AIRS)

4.1 Classes

4.1.1 A Class A AIR or AIRS captures the general cockpit area in order to provide data supplemental to conventional flight recorders.

Note 1.— *To respect crew privacy, the cockpit area view may be designed as far as practical to exclude the head and shoulders of crew members whilst seated in their normal operating position.*

Note 2.— *There are no provisions for Class A AIR or AIRS in this document.*

4.1.2 A Class B AIR or AIRS captures data link message displays.

4.1.3 A Class C AIR or AIRS captures instruments and control panels.

Note.— *A Class C AIR or AIRS may be considered as a means for recording flight data where it is not practical or is prohibitively expensive to record on an FDR or an ADRS, or where an FDR is not required.*

4.2 Operation

The AIR or AIRS must start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the AIR or AIRS must start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

5. Data Link Recorder (DLR)

5.1 Applications to be recorded

5.1.1 Where the aircraft flight path is authorized or controlled through the use of data link messages, all data link messages, both uplinks (to the aircraft) and downlinks (from the aircraft), shall be recorded on the aircraft. As far as practicable, the time the messages were displayed to the flight crew and the time of the responses shall be recorded.

Note.— *Sufficient information to derive the content of the data link communications message and the time the messages were displayed to the flight crew is needed to determine an accurate sequence of events on board the aircraft.*

5.1.2 Messages applying to the applications listed below shall be recorded. Applications without the asterisk (*) are mandatory applications which shall be recorded regardless of the system complexity. Applications with an (*) shall be recorded only as far as is practicable given the architecture of the system.

— Data link initiation capability
— Controller-pilot data link communications
— Data link flight information services
— Automatic dependent surveillance — contract
— Automatic dependent surveillance — broadcast*
— Aeronautical operational control*.

Note. — *Descriptions of the applications are contained in Table A8-2.*

6. Aircraft Data Recording Systems (ADRS)

6.1 Parameters to be recorded

ADRS shall be capable of recording, as appropriate to the aeroplane, at least the essential (E) parameters in Table A8-3.

6.2 Additional information

6.2.1 The measurement range, recording interval and accuracy of parameters on installed equipment is usually verified by methods approved by the appropriate certificating authority.

6.2.2 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator. The documentation needs to be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

7. Inspections of flight recorder systems

7.1 Prior to the first flight of the day, the built-in test features for the flight recorders and Flight Data Acquisition Unit (FDAU), when installed, shall be monitored by manual and/or automatic checks.

7.2 FDR systems or ADRS, CVR systems or CARS, and AIR systems or AIRS shall have recording system inspection intervals of one year; subject to the approval from the appropriate regulatory authority, this period may be extended to two years provided these systems have demonstrated a high integrity of serviceability and self-monitoring. DLR systems or DLRS shall have recording system inspection intervals of two years; subject to the approval from the appropriate regulatory authority, this period may be extended to four years provided these systems have demonstrated high integrity of serviceability and self-monitoring.

7.3 Recording system inspections shall be carried out as follows:

a) An analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;

b) the analysis of the FDR or ADRS shall evaluate the quality of the recorded data to determine if the bit error rate (including those errors introduced by recorder, the acquisition unit, the source of the data on the aeroplane and by the tools used to extract

the data from the recorder) is within acceptable limits and to determine the nature and distribution of the errors;

c) A complete flight recording from the FDR or ADRS shall be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention shall be given to parameters from sensors dedicated to the FDR or ADRS. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;

d) The readout facility shall have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;

e) An examination of the recorded signal on the CVR or CARS shall be carried out by replay of the CVR or CARS recording. While installed in the aircraft, the CVR or CARS shall record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards;

f) Where practicable, during the examination, a sample of in-flight recordings of the CVR or CARS shall be examined for evidence that the intelligibility of the signal is acceptable; and

g) An examination of the recorded images on the AIR or AIRS shall be carried out by replay of the AIR or AIRS recording. While installed in the aircraft, the AIR or AIRS shall record test images from each aircraft source and from relevant external sources to ensure that all required images meet recording quality standards.

7.4 A flight recorder system shall be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.

7.5 A report of the recording system inspection shall be made available on request to regulatory authorities for monitoring purposes.

7.6 Calibration of the FDR system:

a) for those parameters which have sensors dedicated only to the FDR and are not checked by other means, recalibration shall be carried out at least every five years or in accordance with the recommendations of the sensor manufacturer to determine any discrepancies in the engineering conversion routines for the mandatory parameters and to ensure that parameters are being recorded within the calibration tolerances; and

b) When the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there shall be a recalibration performed as recommended by the sensor manufacturer, or at least every two years.

Table A -3-1. Parameter Guidance for Crash Protected Flight Data Recorders

Table A8-1. Parameter Guidance for Crash Protected Flight Data Recorders

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
1	Time (UTC when available, otherwise relative time count or GPS time sync)	24 hours	4	±0.125% per hour	1 second
2	Pressure-altitude	–300 m (–1 000 ft) to maximum certificated altitude of aircraft +1 500 m (+5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)	1.5 m (5 ft)
3	Indicated airspeed or calibrated airspeed	95 km/h (50 kt) to max V_{So} *(Note 1)* V_{So} to 1.2 V_D *(Note 2)*	1	±5% ±3%	1 kt (0.5 kt recommended)
4	Heading (primary flight crew reference)	360°	1	±2°	0.5°
5	Normal acceleration (*Note 3*)	–3 g to +6 g	0.125	±1% of maximum range excluding datum error of ±5%	0.004 g
6	Pitch attitude	±75° or usable range whichever is greater	0.25	±2°	0.5°
7	Roll attitude	±180°	0.25	±2°	0.5°
8	Radio transmission keying	On-off (one discrete)	1		
9	Power on each engine *(Note 4)*	Full range	1 (per engine)	±2%	0.2% of full range or the resolution required to operate the aircraft
10*	Trailing edge flap and cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
11*	Leading edge flap and cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
12*	Thrust reverser position	Stowed, in transit, and reverse	1 (per engine)		
13*	Ground spoiler/speed brake selection (selection and position)	Full range or each discrete position	1	±2% unless higher accuracy uniquely required	0.2% of full range
14	Outside air temperature	Sensor range	2	±2°C	0.3°C
15*	Autopilot/auto throttle/AFCS mode and engagement status	A suitable combination of discretes	1		
16	Longitudinal acceleration (*Note 3*)	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
Note.— The preceding 16 parameters satisfy the requirements for a Type II FDR.					
17	Lateral acceleration (*Note 3*)	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
18	Pilot input and/or control surface position-primary controls (pitch, roll, yaw) *(Note 5) (Note 6)*	Full range	0.25	±2° unless higher accuracy uniquely required	0.2% of full range or as installed
19	Pitch trim position	Full range	1	±3% unless higher accuracy uniquely required	0.3% of full range or as installed
20*	Radio altitude	–6 m to 750 m (–20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)	0.3 m (1 ft) below 150 m (500 ft) 0.3 m (1 ft) + 0.5% of full range above 150 m (500 ft)
21*	Vertical beam deviation (ILS/GPS/GLS glide path, MLS elevation, IRNAV/IAN vertical deviation)	Signal range	1	±3%	0.3% of full range
22*	Horizontal beam deviation (ILS/GPS/GLS localizer, MLS azimuth, IRNAV/IAN lateral deviation)	Signal range	1	±3%	0.3% of full range
23	Marker beacon passage	Discrete	1		
24	Master warning	Discrete	1		
25	Each NAV receiver frequency selection *(Note 7)*	Full range	*4*	As installed	
26*	DME 1 and 2 distance (includes Distance to runway threshold (GLS) and Distance to missed approach point (IRNAV/IAN)) *(Notes 7 and 8)*	0 – 370 km (0 – 200 NM)	4	As installed	1 852 m (1 NM)
27	Air/ground status	Discrete	1		
28*	GPWS/TAWS/GCAS status (selection of terrain display mode including pop-up display status) and (terrain alerts, both cautions and warnings, and advisories) and (on/off switch position)	Discrete	1		
29*	Angle of attack	Full range	0.5	As installed	0.3 % of full range
30*	Hydraulics, each system (low pressure)	Discrete	2		0.5% of full range
31*	Navigation data (latitude/longitude, ground speed and drift angle) *(Note 9)*	As installed	1	As installed	
32*	Landing gear and gear selector position	Discrete	4	As installed	

Note.— The preceding 32 parameters satisfy the requirements for a Type I FDR.

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
33*	Groundspeed	As installed	1	Data should be obtained from the most accurate system	1 kt
34	Brakes (left and right brake pressure, left and right brake pedal position)	(Maximum metered brake range, discretes or full range)	1	±5%	2% of full range
35*	Additional engine parameters (EPR, N_1, indicated vibration level, N_2, EGT, fuel flow, fuel cut-off lever position, N_3)	As installed	Each engine each second	As installed	2% of full range
36*	TCAS/ACAS (traffic alert and collision avoidance system)	Discretes	1	As installed	
37*	Windshear warning	Discrete	1	As installed	
38*	Selected barometric setting (pilot, co-pilot)	As installed	64	As installed	0.1 mb (0.01 in-Hg)
39*	Selected altitude (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
40*	Selected speed (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
41*	Selected Mach (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
42*	Selected vertical speed (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
43*	Selected heading (all pilot selectable modes of operation)	As installed	1	As installed	Sufficient to determine crew selection
44*	Selected flight path (all pilot selectable modes of operation) (course/DSTRK, path angle, final approach path (IRNAV/IAN))		1	As installed	
45*	Selected Decision Height	As installed	64	As installed	Sufficient to determine crew selection
46*	EFIS display format (pilot, co-pilot)	Discrete(s)	4	As installed	
47*	Multi-function/engine/alerts display format	Discrete(s)	4	As installed	
48*	AC electrical bus status	Discrete(s)	4	As installed	
49*	DC electrical bus status	Discrete(s)	4	As installed	
50*	Engine bleed valve position	Discrete(s)	4	As installed	
51*	APU bleed valve position	Discrete(s)	4	As installed	
52*	Computer failure	Discrete(s)	4	As installed	
53*	Engine thrust command	As installed	2	As installed	
54*	Engine thrust target	As installed	4	As installed	2% of full range
55*	Computed centre of gravity	As installed	64	As installed	1% of full range

Serial number	Parameter	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)	Recording resolution
56*	Fuel quantity in CG trim tank	As installed	64	As installed	1% of full range
57*	Head up display in use	As installed	4	As installed	
58*	Para visual display on/off	As installed	1	As installed	
59*	Operational stall protection, stick shaker and pusher activation	As installed	1	As installed	
60*	Primary navigation system reference (GNSS, INS, VOR/DME, MLS, Loran C, localizer glideslope)	As installed	4	As installed	
61*	Ice detection	As installed	4	As installed	
62*	Engine warning each engine vibration	As installed	1	As installed	
63*	Engine warning each engine over temperature	As installed	1	As installed	
64*	Engine warning each engine oil pressure low	As installed	1	As installed	
65*	Engine warning each engine over speed	As installed	1	As installed	
66*	Yaw Trim Surface Position	Full range	2	±3% unless higher accuracy uniquely required	0.3% of full range
67*	Roll Trim Surface Position	Full range	2	±3% unless higher accuracy uniquely required	0.3% of full range
68*	Yaw or sideslip angle	Full range	1	±5%	0.5°
69*	De-icing and/or anti-icing systems selection	Discrete(s)	4		
70*	Hydraulic pressure (each system)	Full range	2	±5%	100 psi
71*	Loss of cabin pressure	Discrete	1		
72*	Cockpit trim control input position, Pitch	Full range	1	±5%	0.2% of full range or as installed
73*	Cockpit trim control input position, Roll	Full range	1	±5%	0.2% of full range or as installed
74*	Cockpit trim control input position, Yaw	Full range	1	±5%	0.2% of full range or as installed
75*	All cockpit flight control input forces (control wheel, control column, rudder pedal)	Full range (±311 N (±70 lbf), ± 378 N (±85 lbf), ± 734 N (±165 lbf))	1	±5%	0.2% of full range or as installed
76*	Event marker	Discrete	1		
77*	Date	365 days	64		
78*	ANP or EPE or EPU	As installed	4	As installed	

Note.— The preceding 78 parameters satisfy the requirements for a Type IA FDR.

Notes.—

1. *V_{So} stalling speed or minimum steady flight speed in the landing configuration is in Section "Abbreviations and Symbols".*

2. *V_D design diving speed.*

3. *Refer to 3.1.2.11 for increased recording requirements.*

4. *Record sufficient inputs to determine power.*

5. *For aeroplanes with control systems in which movement of a control surface will back drive the pilot's control, ''or'' applies. For aeroplanes with control systems in which movement of a control surface will not back drive the pilot's control, ''and'' applies. In aeroplanes with split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately.*

6. *Refer to 3.1.2.12 for increased recording requirements.*

7. *If signal available in digital form.*

8. *Recording of latitude and longitude from INS or other navigation system is a preferred alternative.*

9. *If signals readily available.*

If further recording capacity is available, recording of the following additional information should be considered:

a) operational information from electronic display systems, such as Electronic Flight Instrument Systems (EFIS), Electronic Centralized Aircraft Monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority:

1) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and auto flight system engagement and mode indications if not recorded from another source;

2) Display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, ETC.;

3) Warnings and alerts;

4) The identity of displayed pages for emergency procedures and checklists; and

b) Retardation information including brake application for use in the investigation of landing overruns and rejected take-offs.

Table A-3-2. Description of Applications for Data Link Recorders

Table A8-2. Description of Applications for Data Link Recorders

Item No.	Application type	Application description	Recording content
1	Data link initiation	This includes any applications used to log on to or initiate data link service. In FANS-1/A and ATN, these are ATS facilities notification (AFN) and context management (CM) respectively.	C
2	Controller/pilot communication	This includes any application used to exchange requests, clearances, instructions and reports between the flight crew and controllers on the ground. In FANS-1/A and ATN, this includes the CPDLC application. It also includes applications used for the exchange of oceanic (OCL) and departure clearances (DCL) as well as data link delivery of taxi clearances.	C
3	Addressed surveillance	This includes any surveillance application in which the ground sets up contracts for delivery of surveillance data. In FANS-1/A and ATN, this includes the automatic dependent surveillance — contract (ADS-C) application. Where parametric data are reported within the message they shall be recorded unless data from the same source are recorded on the FDR.	C
4	Flight information	This includes any service used for delivery of flight information to specific aircraft. This includes, for example, data link aviation weather report service (D-METAR), data link-automatic terminal service (D-ATIS), digital Notice to Airmen (D-NOTAM) and other textual data link services.	C
5	Aircraft broadcast surveillance	This includes elementary and enhanced surveillance systems, as well as automatic dependent surveillance — broadcast (ADS-B) output data. Where parametric data sent by the aeroplane are reported within the message they shall be recorded unless data from the same source are recorded on the FDR.	M*
6	Aeronautical operational control data	This includes any application transmitting or receiving data used for aeronautical operational control purposes (per the ICAO definition of operational control).	M*

Key:
C: Complete contents recorded.
M: Information that enables correlation to any associated records stored separately from the aeroplane.
*: Applications to be recorded only as far as is practicable given the architecture of the system.

Table A-3-3. Parameter Guidance for Aircraft Data Recording Systems

Table A8-3. Parameter Guidance for Aircraft Data Recording Systems

No.	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
1	Heading (Magnetic or True)	R*	±180 degrees	1	±2 degrees	0.5 degree	* If not available, record rates
2	Pitch attitude	E*	±90 degrees	0.25	±2 degrees	0.5 degree	* If not available, record rates
3	Roll attitude	E*	±180 degrees	0.25	±2 degrees	0.5 degree	* If not available, record rates
4	Yaw rate	E*	±300 degrees/s	0.25	±1% + drift of 360°/hr	2 degree/s	* Essential if no heading available
5	Pitch rate	E*	±300 degrees/s	0.25	±1% + drift of 360°/hr	2 degree/s	* Essential if no pitch attitude available
6	Roll rate	E*	±300 degrees/s	0.25	±1% + drift of 360°/hr	2 degree/s	* Essential if no roll attitude available
7	Positioning system : latitude/longitude	E	Latitude:±90 degrees Longitude:±180 degrees	2 (1 if available)	As installed (0.00015 degree recommended)	0.00005 degree	
8	Positioning system estimated error	E*	Available range	2 (1 if available)	As installed	As installed	* If available
9	Positioning system : altitude	E	–300 m (–1 000 ft) to maximum certificated altitude of aeroplane +1 500 m (5 000 ft)	2 (1 if available)	As installed (±15 m (±50 ft) recommended)	1.5 m (5 ft)	
10	Positioning system : time*	E	24 hours	1	±0.5 second	0.1 second	* UTC time preferred where available.
11	Positioning system : ground speed	E	0–1 000 kt	2 (1 if available)	As installed (±5 kt recommended)	1 kt	
12	Positioning system : channel	E	0–360 degrees	2 (1 if available)	As installed (± 2 degrees recommended)	0.5 degrees	
13	Normal acceleration	E	–3 g to + 6 g (*)	0.25 (0.125 if available)	As installed (± 0.09 g excluding a datum error of ±0.45 g recommended)	0.004 g	
14	Longitudinal acceleration	E	±1 g (*)	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of ±0.05 g recommended)	0.004 g	
15	Lateral acceleration	E	±1 g (*)	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of ±0.05 g recommended)	0.004 g	

No.	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
16	External static pressure (or pressure altitude)	R	34.4 mb (3.44 in-Hg) to 310.2 mb (31.02 in-Hg) or available sensor range	1	As installed (±1 mb (0.1 in-Hg) or ±30 m (±100 ft) to ±210 m (±700 ft) recommended)	0.1 mb (0.01 in-Hg) or 1.5 m (5 ft)	
17	Outside air temperature (or total air temperature)	R	−50° to +90°C or available sensor range	2	As installed (±2°C recommended)	1°C	
18	Indicated air speed	R	As the installed pilot display measuring system or available sensor range	1	As installed (±3 % recommended)	1 kt (0.5 kt recommended)	
19	Engine RPM	R	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	
20	Engine oil pressure	R	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
21	Engine oil temperature	R	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
22	Fuel flow or pressure	R	Full range	Each engine each second	As installed	2% of full range	
23	Manifold pressure	R	Full range	Each engine each second	As installed	0.2% of full range	
24	Engine thrust/power/torque parameters required to determine propulsive thrust/power*	R	Full range	Each engine each second	As installed	0.1% of full range	* Sufficient parameters e.g. EPR/N1 or torque/Np as appropriate to the particular engine shall be recorded to determine power in both normal and reverse thrust. A margin for possible overspeed should be provided.
25	Engine gas generator speed (Ng)	R	0-150%	Each engine each second	As installed	0.2% of full range	
26	Free power turbine speed (Nf)	R	0-150%	Each engine each second	As installed	0.2% of full range	
27	Coolant temperature	R	Full range	1	As installed (±5°C recommended)	1 degree Celsius	
28	Main voltage	R	Full range	Each engine each second	As installed	1 Volt	
29	Cylinder head temperature	R	Full range	Each cylinder each second	As installed	2% of full range	
30	Flaps position	R	Full range or each discrete position	2	As installed	0.5 degree	

No.	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
31	Primary flight control surface position	R	Full range	0.25	As installed	0.2 % of full range	
32	Fuel quantity	R	Full range	4	As installed	1% of full range	
33	Exhaust gas temperature	R	Full range	Each engine each second	As installed	2% of full range	
34	Emergency voltage	R	Full range	Each engine each second	As installed	1 Volt	
35	Trim surface position	R	Full range or each discrete position	1	As installed	0.3% of full range	
36	Landing gear position	R	Each discrete position*	Each gear every two seconds	As installed		* Where available, record up-and-locked and down-and-locked position
37	Novel/unique aircraft features	R	As required	As required	As required	As required	

Key:

E: Essential parameters
R: Recommended parameters

APPENDIX 4.

AUTOMATIC LANDING SYSTEMS, HEAD-UP DISPLAY (HUD) OR EQUIVALENT DISPLAYS AND VISION SYSTEMS
(Supplementary to IS 013, 2.8.1.1, and Chapter 24 of this IS)

INTRODUCTION

The material in this attachment provides guidance for certified automatic landing systems, HUD or equivalent displays and vision systems intended for operational use in aeroplanes engaged in international air navigation. These systems and hybrid systems may be installed and operated to reduce workload, improve guidance, reduce flight technical error and enhance situational awareness and/or obtain operational credits. Automatic landing systems, HUD or equivalent displays and vision systems may be installed separately or together as part of a hybrid system. Any operational credit for their use requires a specific approval from the DGCA.

Note 1.— *"Vision systems" is a generic term referring to the existing systems designed to provide images, i.e. Enhanced Vision Systems (EVS), Synthetic Vision Systems (SVS) and combined vision systems (CVS).*

Note 2.— *Operational credit can be granted only within the limits of the airworthiness approval.*

Note 3.— *Currently, operational credit has been given only to vision systems containing an image sensor providing a real-time image of the actual external scene on the HUD.*

Note 4.— *More detailed information and guidance on automatic landing systems, HUD or equivalent displays and vision systems is contained in the Manual of All-Weather Operations (Doc 9365). This manual should be consulted in conjunction with this attachment.*

1. HUD AND EQUIVALENT DISPLAYS

1.1 General

1.1.1 A HUD presents flight information into the pilot's forward external field of view without significantly restricting that external view.

1.1.2 Flight information should be presented on a HUD or an equivalent display, as required for the intended use.

1.2 Operational applications

1.2.1 Flight operations with a HUD can improve situational awareness by combining flight information located on head-down displays with the external view to provide pilots with more immediate awareness of relevant flight parameters and situation information while they continuously view the external scene. This improved situational awareness can also reduce errors in flight operations and improve the pilot's ability to transition between instrument and visual references as meteorological conditions change.

1.2.2 A HUD may be used to supplement conventional flight deck instrumentation or as a primary flight display if certified for this purpose.

1.2.3 An approved HUD may:

a) qualify for operations with reduced visibility or reduced RVR; or

b) replace some parts of the ground facilities such as touchdown zone and/or centre line lights.

1.2.4 The functions of a HUD may be provided by a suitable equivalent display. However, before such systems can be used, the appropriate airworthiness approval should be obtained.

1.3 HUD training

Training and recent experience requirements for operations using HUD or equivalent displays should be established by the State of the Operator. Training programmes should be approved by the State of the Operator and the implementation of the training should be subject to oversight by that State. The training should address all flight operations for which the HUD or equivalent display is used.

2. VISION SYSTEMS

2.1 General

2.1.1 Vision systems can display electronic real-time images of the actual external scene achieved through the use of image sensors, i.e. EVS, or display synthetic images, which are derived from the on-board avionic systems, i.e. SVS. Vision systems can also consist of a combination of these two systems, called combined vision systems (i.e. CVS). Such a system may display electronic real-time images of the external scene using the EVS component of the system. The information from vision systems may be displayed head-up and/or head-down. Operational credit may be granted to vision systems which are appropriately qualified.

2.1.2 Light Emitting Diode (LED) lights may not be visible to infrared-based vision systems. Operators of such vision systems will need to acquire information about the LED implementation programmes at aerodromes where they intend to operate. More details about the consequences of LED lights are contained in the Manual of All-Weather Operations (Doc 9365).

2.2 Operational applications

2.2.1 Flight operations with EVS allow the pilot to view an image of the external scene obscured by darkness or other visibility restrictions. The use of EVS will also allow acquisition of an image of the external scene earlier than with natural, unaided vision, hence providing for a smoother transition to references by natural vision. The improved acquisition of an image of the external scene may improve situational awareness. It may also qualify for operational credit if the information from the vision system is presented to the pilots in a suitable way and the necessary airworthiness approval and specific approval by the State of the Operator have been obtained for the combined system.

2.2.2 Vision system imagery may also enable pilots to detect other aircraft on the ground, terrain or obstructions on or adjacent to runways or taxiways.

2.3 Operational concepts

2.3.1 Instrument approach operations include an instrument phase and a visual phase. The instrument phase ends at the published MDA/H or DA/H unless a missed approach is initiated. Using the EVS or CVS does not change the applicable MDA/H or DA/H. The continued approach to landing from MDA/H or DA/H will be conducted using visual references. This also applies to operations with vision systems. The difference is that the visual references will be acquired by use of an EVS or CVS, natural vision or the vision system in combination with natural vision (see Figure H-1).

2.3.2 Down to a defined height in the visual segment, typically at or above 30 m (100 ft), the visual references may be acquired solely by means of the vision system. The defined height depends on the airworthiness approval and specific approval by the State of the Operator. Below this height the visual references should be solely based on natural vision. In the most advanced applications, the vision system may be used down to touchdown without the requirement for natural vision acquisition of visual references. This means that such a vision system may be the sole means of acquiring visual references and can be used without natural vision.

2.4 Vision systems training

Training and recent experience requirements should be established by the State of the Operator. Training programmes should be approved by the State of the Operator and the implementation of the training should be subject to oversight by that State. Training should address all flight operations for which the vision system is used.

2.5 Visual references

2.5.1 In principle, the required visual references do not change due to the use of an EVS or CVS, but those references are allowed to be acquired by means of either vision system until a certain height during the approach as described in 2.3.1 of this Appendix.

2.5.2 In States that have developed requirements for operations with vision systems, the use of visual references have been regulated and examples of this are provided in the Manual of All-Weather Operations (Doc 9365).

3. HYBRID SYSTEMS

A hybrid system generically means that two or more systems are combined. The hybrid system typically has improved performance compared to each of the component systems, which in turn may qualify for operational credit. The inclusion of more systems in the hybrid system normally enhances the performance of the system. The Manual of All-Weather Operations (Doc 9365) contains some examples of hybrid systems.

4. OPERATIONAL CREDITS

4.1 Aerodrome operating minima are expressed in terms of minimum visibility/RVR and MDA/H or DA/H. When aerodrome operating minima are established, the combined capability of the aeroplanes equipment and on-ground infrastructure should be taken into account. Better equipped aeroplanes may be able to operate into lower natural visibility conditions, lower DA/H and/or operate with less ground infrastructure. Operational credit means that the aerodrome operating minima may be reduced in case of suitably equipped aeroplanes. Another way to grant operational credit is to allow visibility requirements to be fulfilled, wholly or partly, by means

of the on-board systems. HUD, automatic landing or vision systems, which were not available at the time when the criteria for aerodrome operating minima were originally established.

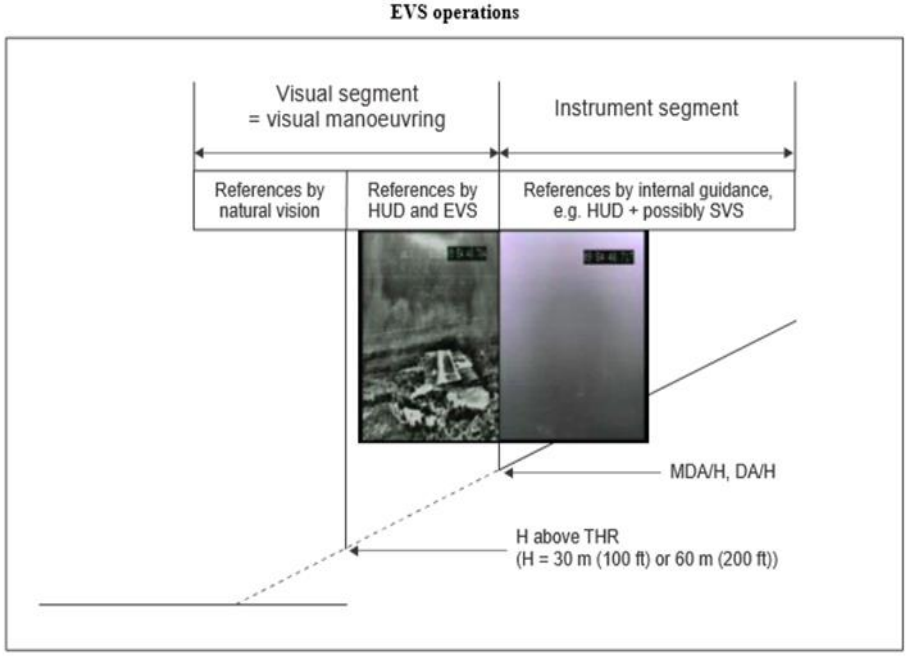


Figure 4-1. EVS operations — transition from instrument to visual references

4.2 The granting of operational credits does not affect the classification (i.e. Type or Category) of an instrument approach procedure since they are designed to support instrument approach operations conducted using aeroplanes with the minimum equipment prescribed.

4.3 The relation between the procedure design and the operation can be described as follows. The OCA/H is the end product of the procedure design which does not contain any RVR or visibility values. Based on the OCA/H and all the other elements such as available runway visual aids, the operator will establish MDA/H or DA/H and RVR/visibility, i.e. the aerodrome operating minima. The values derived should not be less than those prescribed by the State of the Aerodrome.

5. OPERATIONAL PROCEDURES

In accordance with Chapter 24.2 of this IS, the operator should develop suitable operational procedures associated with the use of an automatic landing system, a HUD or an equivalent display, vision systems and hybrid systems. These procedures should be included in the operations manual and cover at least the following:

a) limitations;
b) operational credits;
c) flight planning;
d) ground and airborne operations;
e) crew resource management;
f) standard operating procedures; and
g) ATS flight plans and communication.

6. APPROVALS

6.1 General

Note.— *When the application for a specific approval relates to operational credits for systems not including a vision system, the guidance on approvals in this attachment may be used to the extent applicable as determined by the State of the Operator.*

6.1.1 The operator that wishes to conduct operations with an automatic landing system, a HUD or an equivalent display, a vision system or a hybrid system will need to obtain certain approvals as prescribed in the relevant SARPs. The extent of the approvals will depend on the intended operation and the complexity of the equipment.

6.1.2 Systems that are not used for an operational credit or otherwise critical to the aerodrome operating minima, e.g. vision systems used to enhance situational awareness may be used without a specific approval. However, the standard operating procedures for these systems should be specified in the operations manual. An example of this type of operation may include an EVS or an SVS on a head-down display that is used only for situational awareness of the surrounding area of the aeroplane during ground operations where the display is not in the pilot's primary field of view. For enhanced situational awareness, the installation and operational procedures need to ensure that the operation of the vision system does not interfere with normal procedures or the operation or use of other aeroplane systems. In some cases, modifications to these normal procedures for other aeroplane systems or equipment may be necessary to ensure compatibility.

6.1.3 The Standard in Chapter 24.1 of this IS, requires that the use of an automatic landing system, a HUD or an equivalent display, EVS, SVS or CVS or any combination of those systems into a hybrid system, should be approved by the State of the Operator when those systems are used "for the safe operation of an aeroplane". When operational credits are granted by the State of the Operator as per the Standard in Chapter 2.8.1.1 of IS 013, the use of that system becomes essential for the safety of such operations and is subject to a specific approval. The use of these systems solely for enhanced situational awareness, reduced flight technical error and/or reduced workload is an important safety feature, but does not require a specific approval.

6.1.4 Any operational credit that has been granted should be reflected in the operation specifications for the type or individual aeroplane as applicable.

6.2 Specific approvals for operational credit

6.2.1 To obtain a specific approval for operational credit, the operator will need to specify the desired operational credit and submit a suitable application. The content of a suitable application should include:

a) Applicant details. The AOC holder's company name, AOC number and email.
b) Aircraft details. Aircraft make(s), model(s) and registration mark(s).
c) Operator's vision system compliance list. The contents of the compliance list are included in the Manual of All Weather Operations (SLCAP 4525). The compliance list should include the information that is relevant to the specific approval requested and the registration marks of the aircraft involved. If more than one type of aircraft/fleet is included in a single application, a completed compliance list should be included for each aircraft/fleet.

d) Documents to be included with the application. Copies of all documents to which the operator has made references should be included in the application. There should be no need to send complete manuals; only the relevant sections/pages should be required. Additional guidance material can be found in the Manual of All-Weather Operations (Doc 9365).
e) Name, title and signature.

6.2.2 The following items should be covered in a vision systems compliance list:

a) reference documents used in compiling the submission for approval;
b) flight manual;
c) feedback and reporting of significant problems;
d) requested operational credit and resulting aerodrome operating minima;
e) operations manual entries including MEL and standard operating procedures;
f) safety risk assessments;
g) training programmes; and
h) continuing airworthiness.

Expanded guidance on these items is contained in the Manual of All-Weather Operations (SLCAP 4510).