



CIVIL AVIATION DIRECTIVE – 6 PART 2



GENERAL⁺ AVIATION

AEROPLANE

CIVIL AVIATION AUTHORITY OF MALAYSIA

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Introduction

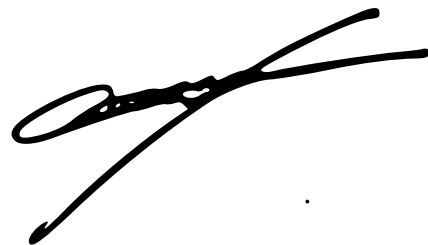
In exercise of the powers conferred by Section 24O of the Civil Aviation Act 1969 [Act 3], the Chief Executive Officer makes this Civil Aviation Directive 6 Part 2 – General Aviation – Aeroplane (“CAD 6 Part 2 – GA – Aeroplane), pursuant to Regulation(s) 31, 38, 39, 40, 41, 42, 43, 82, 85, 86, 87, 88, 90, 91, 93, 96, 99, 105, 106, 107, 108, 109, 120, 122, 125, 146, and 147 of the Malaysian Civil Aviation Regulations (MCAR) 2016.

This CAD contains the standards, requirements and procedures pertaining General Aviation operations. The standards and requirements in this CAD are based mainly on the Standards and Recommended Practices (SARPs) contained in the International Civil Aviation Organisation (ICAO) Annex 6 Part 2 to the Chicago Convention – Operation of Aircraft: General Aviation – Aeroplane, Amendment 37.

Civil Aviation Directive 6 Part 2 – General Aviation – Aeroplane (“CAD 6 Part 2 – GA – Aeroplane) is published by the Chief Executive Officer under Section 24O of the Civil Aviation Act 1969 [Act 3] and comes into operation on 1st April 2021.

Non-compliance with this CAD

Any person who contravenes any provision in this CAD commits an offence and shall on conviction be liable to the punishments under Section 24O (2) of the Civil Aviation Act 1969 [Act 3] and/or under Malaysia Civil Aviation Regulation 2016.



(Captain Chester Voo Chee Soon)
Chief Executive Officer
Civil Aviation Authority of Malaysia

Civil Aviation Directive components and Editorial practices

This Civil Aviation Directive is made up of the following components and are defined as follows:

Standards: Usually preceded by words such as “*shall*” or “*must*”, are any specification for physical characteristics, configuration, performance, personnel or procedure, where uniform application is necessary for the safety or regularity of air navigation and to which Operators must conform. In the event of impossibility of compliance, notification to the CAAM is compulsory.

Recommended Practices: Usually preceded by the words such as “*should*” or “*may*”, are any specification for physical characteristics, configuration, performance, personnel or procedure, where the uniform application is desirable in the interest of safety, regularity or efficiency of air navigation, and to which Operators will endeavour to conform.

Appendices: Material grouped separately for convenience but forms part of the Standards and Recommended Practices stipulated by the CAAM.

Definitions: Terms used in the Standards and Recommended Practices which are not self-explanatory in that they do not have accepted dictionary meanings. A definition does not have an independent status but is an essential part of each Standard and Recommended Practice in which the term is used, since a change in the meaning of the term would affect the specification.

Tables and Figures: These add to or illustrate a Standard or Recommended Practice and which are referred to therein, form part of the associated Standard or Recommended Practice and have the same status.

Notes: Included in the text, where appropriate, Notes give factual information or references bearing on the Standards or Recommended Practices in question but not constituting part of the Standards or Recommended Practices;

Attachments: Material supplementary to the Standards and Recommended Practices or included as a guide to their application.

It is to be noted that some Standards in this Civil Aviation Directive incorporates, by reference, other specifications having the status of Recommended Practices. In such cases, the text of the Recommended Practice becomes part of the Standard.

The units of measurement used in this document are in accordance with the International System of Units (SI) as specified in CAD 5. Where CAD 5 permits the use of non-SI alternative units, these are shown in parentheses following the basic units. Where two sets of units are quoted it must not be assumed that the pairs of values are equal and interchangeable. It may, however, be inferred that an equivalent level of safety is achieved when either set of units is used exclusively.

Any reference to a portion of this document, which is identified by a number and/or title, includes all subdivisions of that portion.

Throughout this Civil Aviation Directive, the use of the male gender should be understood to include male and female persons



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1 General

1.1 Citation

1.1.1 These Directives are the Civil Aviation Directives 6 Part 2 – General Aviation – Aeroplane (CAD 6 Part 2 – GA – Aeroplane), Issue 01/Revision 00, and comes into operation on 1st April 2021.

1.1.2 This CAD 6 Part 2 – GA – Aeroplane, Issue 01/Revision 00 will remain current until withdrawn or superseded.

1.2 Applicability

1.2.1 This CAD applies to all operators and crew conducting general aviation operations or activities that involve aeroplanes.

1.3 Revocation

1.3.1 This CAD revokes:

- a) Notice 6204 Electronic Flight Bag issue 1 dated 18th May 2020
- b) Notice 6301 Reduced Vertical Separation Minima (RVSM) issue 1 dated 15th July 2019
- c) Notice 6302 Performance-Based Navigation (PBN) – Airworthiness Review issue 1 dated 17th June 2020
- d) Notice 6304 Extended Diversion Time Operations (EDTO) issue 1 dated 15th July 2019
- e) Notice 6305 Performance-Based Communication and Surveillance (PBCS) – Airworthiness Review issue 1 dated 17th June 2020
- f) Notice 6306 Automatic Dependent Surveillance – Broadcast Out (ADS-B OUT) – Airworthiness Review issue 1 dated 17th June 2020
- g) Notice 6307 Low Visibility Operations (LVO) – Airworthiness Review issue 1 dated 13th October 2020
- h) Airworthiness Notice 79A Aeroplanes required to be equipped with Ground Proximity Warning Systems (GPWS) – Non-Commercial Airport Transport issue 1 dated 1st October 2002.

1.4 Definitions and Abbreviations

Abbreviations

AC	=	Alternating current
ACAS	=	Airborne collision avoidance system
ADREP	=	Accident / incident reporting



ADRS	=	Aircraft data recording system
ADS	=	Automatic dependent surveillance
AFCS	=	Automatic flight control system
AIR	=	Airborne image recorder
AIRS	=	Airborne image recording system
AOC	=	Air operator certificate
APCH	=	Approach
APU	=	Auxiliary power unit
AR	=	Authorisation required
ARINC	=	Aeronautical Radio, Incorporated
ASE	=	Altimetry system error
ATC	=	Air traffic control
ATM	=	Air traffic management
ATN	=	Aeronautical telecommunication network
ATS	=	Air traffic services
CAAM	=	Civil Aviation Authority Malaysia
CARS	=	Cockpit audio recording system
CAT I	=	Category I
CAT II	=	Category II
CAT III	=	Category III
CAT IIIA	=	Category IIIA
CAT IIIB	=	Category IIIB
CAT IIIC	=	Category IIIC
CFIT	=	Controlled flight into terrain
CG	=	Centre of gravity
cm	=	Centimetre
CPDLC	=	Controller-pilot data link communications
CVR	=	Cockpit voice recorder
CVS	=	Combined vision system
DA	=	Decision altitude
DA/H	=	Decision altitude/height
DC	=	Direct current
D-FIS	=	Data link-flight information services
DH	=	Decision height
DLR	=	Data link recorder
DLRS	=	Data link recording system
DME	=	Distance measuring equipment
DSTRK	=	Desired track
EFB	=	Electronic flight bag
EFIS	=	Electronic flight instrument system
EGT	=	Exhaust gas temperature
EICAS	=	Engine indication and crew alerting system
ELT	=	Emergency locator transmitter
ELT (AD)	=	Automatic deployable ELT
ELT (AF)	=	Automatic fixed ELT



ELT (AP)	=	Automatic portable ELT
ELT (S)	=	Survival ELT
EPR	=	Engine pressure ration
EUROCAE	=	European Organisation for Civil Aviation Equipment
EVS	=	Enhanced vision system
FANS	=	Future air navigation system
FDR	=	Flight data recorder
FL	=	Flight level
FM	=	Frequency modulation
ft	=	Foot
ft/min	=	Foot per minute
g	=	Normal acceleration
GBAS	=	Ground-based augmentation system
GCAS	=	Ground collision avoidance system
GLS	=	GBAS landing system
GNSS	=	Global navigation satellite system
GPS	=	Global positioning system
GPWS	=	Ground proximity warning system
hpa	=	Hectopascal
HUD	=	Head-up display
IAOPA	=	International Council of Aircraft Owner and Pilot Associations
IBAC	=	International Business Aviation Council
IFR	=	Instrument flight rules
ILS	=	Instrument landing system
IMC	=	Instrument meteorological conditions
inHG	=	Inch of mercury
INS	=	Inertial navigation system
ISA	=	International standard atmosphere
kg	=	Kilogram
km	=	Kilometre
km/h	=	Kilometres per hour
kt	=	Knot
lbf	=	Pound-force
LED	=	Light emitting diode
M	=	Metre
mb	=	Milibar
m/s	=	Metres per second
MDA	=	Minimum descent altitude
MDA/H	=	Minimum descent altitude/height
MDH	=	Minimum descent height
MEL	=	Minimum equipment list

MHz	=	Megahertz
MLS	=	Microwave landing system
MMEL	=	Master minimum equipment list
MNPS	=	Minimum navigation performance specification
MOPS	=	Minimum operational performance specification
NAV	=	Navigation
NM	=	Nautical mile
NVIS	=	Night vision imaging system
N ₁	=	Low pressure compressor speed (two-stage compressor); fan speed (three-stage compressor)
N ₂	=	High pressure compressor speed (two-stage compressor); intermediate pressure compressor (three-stage compressor)
N ₃	=	High pressure compressor speed (three-stage compressor)
OCA	=	Obstacle clearance altitude
OCA/H	=	Obstacle clearance altitude/height
OCH	=	Obstacle clearance height
PANS	=	Procedure for Air Navigation Services
PBC	=	Performance-based communication
PBN	=	Performance-based navigation
PBS	=	Performance-based surveillance
RCP	=	Required communication performance
RNAV	=	Area navigation
RNP	=	Required navigation performance
RNPSOR	=	Required navigation performance and special operational requirements
RSP	=	Required surveillance performance
RTCA	=	Radio Technical Commission for Aeronautics
RVR	=	Runway visual range
RVSM	=	Reduced vertical separation minima
SBAS	=	Satellite-based augmentation system
SI	=	International System of Units
SOP	=	Standard operating procedure
SVS	=	Synthetic vision system
TAWS	=	Terrain awareness system
TCAS	=	Traffic alert and collision avoidance system
TLA	=	Thrust lever angle
TLS	=	Target level of safety
TVE	=	Total vertical error
UTC	=	Coordinated universal time
V _D	=	Design diving speed



V _{so}	=	Stalling speed or the minimum steady flight speed in the landing configuration
VMC	=	Visual meteorological conditions
VOR	=	VHF omnidirectional radio range
VSM	=	Vertical separation minima
WXR	=	Weather radar

Symbols

°C	=	Degrees Celcius
%	=	Per cent

Definitions

Acts of unlawful interference means acts or attempted acts such as to jeopardise the safety of civil aviation and air transport i.e.:

- unlawful seizure of aeroplane in flight,
- unlawful seizure of aeroplane on the ground,
- hostage taking on board an aeroplane or on aerodromes,
- forcible intrusion on board an aeroplane, at an airport or on the premises of an aeronautical facility,
- introduction on board an aeroplane or at an airport of a weapon or hazardous device or material intended for criminal purposes,
- communication of false information as to jeopardise the safety of an aeroplane in flight or on the ground, of passengers, crew, ground personnel or the general public, at an airport or on the premises of a civil aviation facility.

Aerial work means an aircraft operation in which an aircraft is used for specialised services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue, aerial advertisement, and other similar activities.

Aerodrome means a defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome operating minima means the limits of usability of an aerodrome for:

- a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;
- b) landing in two dimensional (2D) instrument approach operations, expressed in terms of visibility and/or runway visual range minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions; and
- c) landing in three dimensional (3D) instrument approach operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the type and/or category of the operation.

Aeroplane means a power-driven heavier-than-air aircraft, deriving its lift in flight chiefly from aerodynamic reactions on surfaces which remain fixed under given conditions of flight.

Aircraft means any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the surface of the earth..

Air traffic service (ATS) means a generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Airworthy means the status of an aircraft, or its engine, propeller or part which conforms to the approved type design and is in a condition for safe operation.

Alternate aerodrome means an aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing where the necessary services and facilities are available, where aircraft performance requirements can be met and which is operational at the expected time of use. Alternate aerodromes include the following:

- *Take-off alternate* means an alternate aerodrome at which an aircraft would be able to land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.
- *En-route alternate* means an alternate aerodrome at which an aircraft would be able to land in the event that a diversion becomes necessary while en route.
- *Destination alternate* means an alternate aerodrome at which an aircraft would be able to land should it become either impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Altimetry system error (ASE) means the difference between the altitude indicated by the altimeter display, assuming a correct altimeter barometric setting, and the pressure altitude corresponding to the undisturbed ambient pressure.

Appropriate airworthiness requirements means the comprehensive and detailed airworthiness codes established, adopted or accepted by a Contracting State for the class of aircraft, engine or propeller under consideration.

Area navigation (RNAV) means a method of navigation which permits aircraft operation on any desired flight path within the coverage of ground- or spaced-based navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

Note.— Area navigation includes performance-based navigation as well as other operations that do not meet the definition of performance-based navigation.

Cabin crew member means a crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but does not include a flight crew member.

Combined vision system (CVS) means a system to display images from a combination of an enhanced vision system (EVS) and a synthetic vision system (SVS).

Commercial air transport operation means an aircraft operation involving the transport of passengers, cargo or mail for hire or reward.

Continuing airworthiness means the set of processes by which an aircraft, engine, propeller or part complies with the applicable airworthiness requirements and remains in a condition for safe operation throughout its operating life.

Continuing airworthiness records means records which are related to the continuing airworthiness status of an aircraft, engine, propeller or associated part.

Continuous descent final approach (CDFA) means a technique, consistent with stabilised approach procedures, for flying the final approach segment of a non-precision instrument approach procedure as a continuous descent, without level-off, from an altitude/height at or above the final approach fix altitude/height to a point approximately 15 m (50 ft) above the landing runway threshold or the point where the flare manoeuvre should begin for the type of aircraft flown.

Corporate aviation operation means the non-commercial operation or use of aircraft by a company for the carriage of passengers or goods as an aid to the conduct of company business, flown by a professional pilot(s) employed to fly the aircraft.

Dangerous goods means articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those Instructions.

Note.— Dangerous goods are classified in CAD 18, Chapter 3.

Decision altitude (DA) or decision height (DH) means a specified altitude or height in a three dimensional (3D) instrument approach operation or circling approach operation below which descent must not be made without the required visual reference.

Note 1.— Decision altitude (DA) is referenced to mean sea level and decision height (DH) is referenced to the threshold elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height the required visual reference is that specified for the particular procedure and operation.

Note 3.— For convenience where both expressions are used they may be written in the form “decision altitude/height” and abbreviated “DA/H”.

Electronic flight bag (EFB) means an electronic information system, comprised of equipment and applications for flight crew, which allows for the storing, updating, displaying and processing of EFB functions to support flight operations or duties.

Emergency locator transmitter (ELT) means a generic term describing equipment which broadcast distinctive signals on designated frequencies and, depending on application, may be automatically activated by impact or be manually activated. An ELT may be any of the following:

- *Automatic fixed ELT (ELT(AF))* means an automatically activated ELT which is permanently attached to an aircraft.
- *Automatic portable ELT (ELT(AP))* means an automatically activated ELT which is rigidly attached to an aircraft but readily removable from the aircraft.

- **Automatic deployable ELT (ELT(AD))** means an ELT which is rigidly attached to an aircraft and which is automatically deployed and activated by impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided.
- **Survival ELT (ELT(S))** means an ELT which is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by survivors.

Engine means a unit used or intended to be used for aircraft propulsion. It consists of at least those components and equipment necessary for functioning and control, but excludes the propeller/rotors (if applicable).

Enhanced vision system (EVS) means a system to display electronic real-time images of the external scene achieved through the use of image sensors.

Note.— EVS does not include night vision imaging systems (NVIS).

Extended flight over water means a flight operated over water at a distance of more than 93 km (50 NM), or 30 minutes at normal cruising speed, whichever is the lesser, away from land suitable for making an emergency landing.

Final approach segment (FAS) means that segment of an instrument approach procedure in which alignment and descent for landing are accomplished.

Flight crew member means a licenced crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Note.- As defined in MCAR 2016, flight crew member specifically means in relation to an aircraft, those members of the crew of the aircraft who respectively undertake to act as pilot, flight navigator, flight engineer and flight radiotelephony operator of the aircraft.

Flight manual means a manual, associated with the certificate of airworthiness, containing limitations within which the aircraft is to be considered airworthy, and instructions and information necessary to the flight crew members for the safe operation of the aircraft.

Flight plan means specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

Flight recorder means any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation.

Automatic deployable flight recorder (ADFR) means a combination flight recorder installed on the aircraft which is capable of automatically deploying from the aircraft.

Flight simulation training device means any one of the following three types of apparatus in which flight conditions are simulated on the ground:

A flight simulator, which provides an accurate representation of the flight deck of a particular aircraft type to the extent that the mechanical, electrical, electronic, etc. aircraft systems control functions, the normal environment of flight crew members, and the performance and flight characteristics of that type of aircraft are realistically simulated;

A flight procedures trainer, which provides a realistic flight deck environment, and which simulates instrument responses, simple control functions of mechanical, electrical, electronic,

etc. aircraft systems, and the performance and flight characteristics of aircraft of a particular class;

A basic instrument flight trainer, which is equipped with appropriate instruments, and which simulates the flight deck environment of an aircraft in flight in instrument flight conditions.

Flight time — aeroplanes means the total time from the moment an aeroplane first moves for the purpose of taking off until the moment it finally comes to rest at the end of the flight.

Note.— Flight time as here defined is synonymous with the term “block to block” time or “chock to chock” time in general usage which is measured from the time an aeroplane first moves for the purpose of taking off until it finally stops at the end of the flight.

General aviation operation means an aircraft operation other than a commercial air transport operation or an aerial work operation.

Head-up display (HUD) means a display system that presents flight information into the pilot's forward external field of view.

Industry codes of practice means guidance material developed by an industry body, for a particular sector of the aviation industry to comply with the requirements of the International Civil Aviation Organisation's Standards and Recommended Practices, other aviation safety requirements and the best practices deemed appropriate.

Instrument approach operations means an approach and landing using instruments for navigation guidance based on an instrument approach procedure. There are two methods for executing instrument approach operations:

- a) a two-dimensional (2D) instrument approach operation, using lateral navigation guidance only; and
- b) a three-dimensional (3D) instrument approach operation, using both lateral and vertical navigation guidance.

Note.— Lateral and vertical navigation guidance refers to the guidance provided either by:

- a) a ground-based radio navigation aid; or*
- b) computer-generated navigation data from ground-based, space-based, self-contained navigation aids or a combination of these.*

Instrument approach procedure (IAP) means a series of predetermined manoeuvres by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply. Instrument approach procedures are classified as follows:

Non-precision approach (NPA) procedure means an instrument approach procedure designed for 2D instrument approach operations Type A.

Note.— Non-precision approach procedures may be flown using a continuous descent final approach (CDFA) technique. CDFAs with advisory vertical navigation (VNAV) guidance calculated by on-board equipment are considered 3D instrument approach operations. CDFAs with manual calculation of the required rate of descent are considered 2D instrument approach operations. For more information on CDFAs, refer to PANS-OPS (ICAO Doc 8168), Volume I, Part II, Section 5.

Approach procedure with vertical guidance (APV) means a performance-based navigation (PBN) instrument approach procedure designed for 3D instrument approach operations Type A.

Precision approach (PA) procedure means an instrument approach procedure based on navigation systems (ILS, MLS, GLS and SBAS CAT I) designed for 3D instrument approach operations Type A or B.

Note.— Refer to Section 2, Chapter 2.2, 2.2.2.2.2, for instrument approach operation types.

Instrument flight rules means a set of rules determined by the Chief Executive Officer to govern flight under conditions in which flight by outside reference cannot be complied with.

Instrument meteorological conditions (IMC) means meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minima specified for visual meteorological conditions.

Note.— The specified minima for visual meteorological conditions are contained in Chapter 4 of CAD 2.

Isolated aerodrome means a destination aerodrome for which there is no destination alternate aerodrome suitable for a given aeroplane type.

Large aeroplane means an aeroplane of a maximum certificated take-off mass of over 5700 kg.

Low-visibility operations (LVO) means approach operations in RVRs less than 550 m and/or with a DH less than 60 m (200 ft) or take-off operations in RVRs less than 400 m.

Maintenance means in relation to an aircraft, the performance of tasks required to ensure the continuing airworthiness of the aircraft, including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

Maintenance programme means a document which describes the specific scheduled maintenance tasks and their frequency of completion and related procedures, such as a reliability programme, necessary for the safe operation of those aircraft to which it applies.

Maintenance release means a document which contains a certification confirming that the maintenance work to which it relates has been completed in a satisfactory manner in accordance with appropriate airworthiness requirements.

Meteorological information means meteorological report, analysis, forecast, and any other statement relating to existing or expected meteorological conditions.

Minimum descent altitude (MDA) or minimum descent height (MDH) means a specified altitude or height in a two dimensional (2D) instrument approach operation or circling approach operation below which descent must not be made without the required visual reference.

Note 1.— Minimum descent altitude (MDA) is referenced to mean sea level and minimum descent height (MDH) is referenced to the aerodrome elevation or to the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. A minimum descent height for a circling approach is referenced to the aerodrome elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In the case of a circling approach the required visual reference is the runway environment.

Note 3.— For convenience when both expressions are used they may be written in the form “minimum descent altitude/height” and abbreviated “MDA/H”.

Modification means a change to the type design of an aeronautical product which is not a repair.

Note.— A modification may also include the embodiment of the modification which is a maintenance task subject to a maintenance release. Further guidance on aircraft maintenance — modification and repair is contained in the Airworthiness Manual (ICAO Doc 9760).

Navigation specification means a set of aircraft and flight crew requirements needed to support performance-based navigation operations within a defined airspace. There are two kinds of navigation specifications:

Required navigation performance (RNP) specification means a navigation specification based on area navigation that includes the requirement for performance monitoring and alerting, designated by the prefix RNP, e.g. RNP 4, RNP APCH.

Area navigation (RNAV) specification means a navigation specification based on area navigation that does not include the requirement for performance monitoring and alerting, designated by the prefix RNAV, e.g. RNAV 5, RNAV 1.

Note 1.— The Performance-based Navigation (PBN) Manual (ICAO Doc 9613), Volume II, contains detailed guidance on navigation specifications

Note 2.— The term RNP, previously defined as “a statement of the navigation performance necessary for operation within a defined airspace”, has been removed from this CAD as the concept of RNP has been overtaken by the concept of PBN. The term RNP in this CAD is now solely used in the context of navigation specifications that require performance monitoring and alerting, e.g. RNP 4 refers to the aircraft and operating requirements, including a 4 NM lateral performance with on-board performance monitoring and alerting that are detailed in ICAO Doc 9613.

Night means the time twenty minutes after sunset and twenty minutes before sunrise, excluding both the times, determined at surface level.

Obstacle clearance altitude (OCA) or obstacle clearance height (OCH) means the lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Note 1.— Obstacle clearance altitude is referenced to mean sea level and obstacle clearance height is referenced to the threshold elevation or in the case of non-precision approach procedures to the aerodrome elevation or the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. An obstacle clearance height for a circling approach procedure is referenced to the aerodrome elevation.

Note 2.— For convenience when both expressions are used they may be written in the form “obstacle clearance altitude/height” and abbreviated “OCA/H”.

Operating base means the location from which operational control is exercised.

Note.— An operating base is normally the location where personnel involved in the operation of the aeroplane work and the records associated with the operation are located. An operating base has a degree of permanency beyond that of a regular point of call.

Operational control means the exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of the flight.

Operational flight plan means the operator’s plan for the safe conduct of the flight based on considerations of aeroplane performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes concerned.

Operations manual means a manual containing procedures, instructions and guidance for use by operational personnel in the execution of their duties.

Operator means the person, organisation or enterprise engaged in or offering to engage in an aircraft operation.

Note.— In the context of CAD 6, Part II, the operator is not engaged in the transport of passengers, cargo or mail for remuneration or hire.

Performance-based communication (PBC) means communication based on performance specifications applied to the provision of air traffic services.

Note.— An RCP specification includes communication performance requirements that are allocated to system components in terms of the communication to be provided and associated transaction time, continuity, availability, integrity, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

Performance-based navigation (PBN) means area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

Note.— Performance requirements are expressed in navigation specifications (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability

and functionality needed for the proposed operation in the context of a particular airspace concept.

Performance-based surveillance (PBS) means surveillance based on performance specifications applied to the provision of air traffic services.

Note.— An RSP specification includes surveillance performance requirements that are allocated to system components in terms of the surveillance to be provided and associated data delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality needed for the proposed operation in the context of a particular airspace concept.

Pilot-in-command means the pilot designated by the operator or the owner as being in command and charged with the safe conduct of a flight.

Point of no return means the last possible geographic point at which an aircraft can proceed to the destination aerodrome as well as to an available en-route alternate aerodrome for a given flight.

Psychoactive substances means alcohol, opioids, cannabinoids, sedatives and hypnotics, cocaine, other psychostimulants, hallucinogens, and volatile solvents, whereas coffee and tobacco are excluded.

Repair means the restoration of an aeronautical product to an airworthy condition as defined by the appropriate airworthiness requirements.

Required communication performance (RCP) specification means a set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based communication.

Required surveillance performance (RSP) specification means a set of requirements for air traffic service provision and associated ground equipment, aircraft capability, and operations needed to support performance-based surveillance.

Runway visual range (RVR) means the range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Specific approval means an approval which is documented in the operations specifications for commercial air transport operations or in the list of specific approvals for general aviation operations.

State of Design means the State having jurisdiction over the organisation responsible for the type design.

State of Registry means the State on whose register the aircraft is entered.

Note.— In the case of the registration of aircraft of an international operating agency on other than a national basis, the States constituting the agency are jointly and severally bound to assume the obligations which, under the Chicago Convention, attach to a State of Registry. See, in this regard, the Council Resolution of 14 December 1967 on Nationality and Registration of Aircraft Operated by International Operating Agencies which can be found in Policy and Guidance Material on the Economic Regulation of International Air Transport (ICAO Doc 9587).

State of the Aerodrome means the State in whose territory the aerodrome is located.

Synthetic vision system (SVS) means a system to display data-derived synthetic images of the external scene from the perspective of the flight deck.

State of the principal location of a general aviation operator means the State in which the operator of a general aviation aircraft has its principal place of business or, if there is no such place of business, its permanent residence.

Target level of safety (TLS) means a generic term representing the level of risk which is considered acceptable in particular circumstances.

Total vertical error (TVE) means the vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

Visual meteorological conditions (VMC) means meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, equal to or better than specified minima in accordance with visual flight rules.

Visual flight rules means a set of rules determined by the Chief Executive Officer to govern flight under conditions in which outside visual reference can be complied with.

. *Note.*— The specified minima are contained in Chapter 4 of CAD 2.

1.5 References

1.5.1 MCAR 2016

1.5.2 International Civil Aviation Organisation (ICAO).

Doc 4444, Doc 9868 (PAN-TRG)

Doc 9481 (ERP on DG)

Doc 9683 (Human Factors)

Doc 9640 (Manual De-icing)

Doc 9365 (AWO)

Doc 9379 (Licensing System)

Doc 9376 (Ops Manual)

Doc 9966 (Fatigue Management)

Doc 10002 (Cabin Crew Safety Training Manual)

1.5.3 CAD 8 – Airworthiness

1.5.4 Air Navigation (98-Special Operations) Regulation 2018

1.5.5 Other CADs and CAGM's

(i) CAGM 6008 - Special Approval (SPA)

(ii) CAD 6009 - Cabin Crew (CC)

2 General Aviation Operations

2.1 General

2.1.1 Compliance with laws, regulations and procedures

2.1.1.1 The pilot-in-command shall comply with the laws, regulations and procedures of those States where operations are conducted.

2.1.1.2 The pilot-in-command shall be familiar with the laws, regulations and procedures, pertinent to the performance of his duties, prescribed for the areas to be traversed, the aerodromes to be used and the related air navigation facilities.

2.1.1.3 The pilot-in-command shall have responsibility for operational control.

2.1.1.4 The pilot-in-command shall notify the appropriate local authority without delay if an emergency situation which endangers the safety or security of the aeroplane or persons necessitates the taking of action which involves a violation of local regulations or procedures.

2.1.1.5 All crew members shall be familiar with the laws, regulations and procedures pertinent to the performance of their duties.

2.1.1.6 The pilot-in-command shall ensure that flight crew members demonstrate the ability to speak and understand the language used for aeronautical radiotelephony communications.

2.1.2 Dangerous goods

Note 1.— Provisions for carriage of dangerous goods are contained in CAD 18.

Note 2.— Article 35 of the Convention refers to certain classes of cargo restrictions.

2.1.2.1 The pilot-in-command shall take all reasonable measures to prevent dangerous goods from being carried on board inadvertently.

2.1.2.2 The pilot-in-command shall, in accordance with the Technical Instructions, report without delay to the CAAM and the appropriate authority of the State of occurrence in the event of any dangerous goods accidents or incidents.

2.1.2.3 The pilot-in-command shall ensure that passengers are provided with information about dangerous goods in accordance with the Technical Instructions.

2.1.2.4 Reasonable quantities of articles and substances that would otherwise be classified as dangerous goods and that are used to facilitate flight safety, where carriage aboard the aircraft is advisable to ensure their timely availability for operational purposes, shall be considered authorised under paragraph

1;2.2.1(a) of the Technical Instructions. This is regardless of whether or not such articles and substances are required to be carried or intended to be used in connection with a particular flight.

2.1.2.5 The packing and loading on board of the above-mentioned articles and substances shall be performed, under the responsibility of the pilot-in-command, in such a way as to minimise the risks posed to crew members, passengers, cargo or the aircraft during aircraft operations.

2.1.3 **Use of psychoactive substances.**

Note. – For provisions concerning the use of psychoactive substances, refer to CAD 1, 1.2.7 and CAD 2, 2.5.

2.1.4 **Specific approvals**

2.1.4.1 The pilot-in-command shall not conduct operations for which a specific approval is required unless such approval has been issued by the CAAM. Specific approvals shall follow the layout and contain at least the information listed in Appendix 2.4.

2.1.4.2 Operations which require a specific approval are:

- a) Reduced Vertical Separation Minimum (RVSM).
- b) Performance Based Navigation (PBN).
- c) Low Visibility Operations (LVO).
- d) Electronic Flight Bags (EFBs).
- e) North Atlantic High Level Airspace (NAT HLA).
- f) Performance Based Communication and Surveillance (PBCS).
- g) Controller-Pilot Datalink Communications (CPDLC).

2.1.5 **Operational certification and supervision**

2.1.5.1 The pilot-in-command / operator shall not engage in general aviation operations unless in possession of a valid Certificate of Approval issued by the CAAM.

2.1.5.2 The Certificate of Approval authorises the pilot-in-command / operator to carry out non-commercial operations in accordance with the standard and special provisions contained therein.

2.1.5.3 The holder of the Certificate of Approval shall be responsible for the strict observance of the terms and provisions contained therein.

2.2 **Flight operations**

2.2.1 **Operating Facilities**

- 2.2.1.1 The pilot-in-command shall ensure that a flight will not be commenced unless it has been ascertained by every reasonable means available that the ground and/or water facilities including communication facilities and navigation aids available and directly required on such flight, for the safe operation of the aeroplane, are adequate for the type of operation under which the flight is to be conducted.
- 2.2.1.2 Before commencing a flight, the pilot-in-command shall be familiar with all available meteorological information appropriate to the intended flight. Preparation for a flight away from the vicinity of the place of departure, and for every flight under IFR, shall include:
- a) a study of available current weather reports and forecasts; and
 - b) the planning of an alternative course of action to provide for the eventuality that the flight cannot be completed as planned, because of weather conditions.
- 2.2.2 **Operational management**
- 2.2.2.1 Operating instructions- general
- 2.2.2.1.1 An aeroplane shall not be taxied on the movement area of an aerodrome unless the person at the controls is an appropriately qualified pilot or:
- a) has been duly authorised by the owner or a designated agent;
 - b) is fully competent to taxi the aeroplane;
 - c) is qualified to use the radio if radio communications are required; and
 - d) has received instruction from a competent person in respect of aerodrome layout, and where appropriate, information on routes, signs, marking, lights, ATC signals and instructions, phraseology and procedures, and is able to conform to the operational standards required for safe aeroplane movement at the aerodrome.
- 2.2.2.2 Aerodrome operating minima
- 2.2.2.2.1 The pilot-in-command shall establish aerodrome operating minima in accordance with criteria specified by the CAAM, for each aerodrome to be used in operations. Such minima shall not be lower than any that may be established for such aerodromes by the State of the Aerodrome, except when specifically approved by that State.
- 2.2.2.2.1.1 The CAAM may approve operational credit(s) for operations with aeroplanes equipped with automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS. Such approvals shall not affect the classification of the instrument approach procedure.

Note.— Operational credit includes:

- a) *for the purposes of an approach ban (2.2.4.1.2), a minima below the aerodrome operating minima;*
- b) *reducing or satisfying the visibility requirements; or*
- c) *requiring fewer ground facilities as compensated for by airborne capabilities.*

2.2.2.2.2 Instrument approach operations shall be classified based on the designed lowest operating minima below which an approach operation shall only be continued with the required visual reference as follows:

- a) Type A: a minimum descent height or decision height at or above 75 m (250 ft); and
- b) Type B: a decision height below 75 m (250 ft). Type B instrument approach operations are categorised as:
 - 1) Category I (CAT I): a decision height not lower than 60 m (200 ft) and with either a visibility not less than 800 m or a runway visual range not less than 550 m;
 - 2) Category II (CAT II): a decision height lower than 60 m (200 ft) but not lower than 30 m (100 ft) and a runway visual range not less than 300 m;
 - 3) Category III (CAT III): a decision height lower than 30 m (100 ft) or no decision height and a runway visual range less than 300 m or no runway visual range limitations.

Note 1.— Where decision height (DH) and runway visual range (RVR) fall into different categories of operation, the instrument approach operation would be conducted in accordance with the requirements of the most demanding category (e.g. an operation with a DH in the range of CAT II but with an RVR in the range of CAT I would be considered a CAT II operation).

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In the case of a circling approach operation, the required visual reference is the runway environment.

Note 3.— Guidance on approach classification as it relates to instrument approach operations, procedures, runways and navigation systems is contained in the Manual of All-Weather Operations (ICAO Doc 9365) and CAGM 6008 (III) – Low Visibility Operations.

2.2.2.2.3 The operating minima for 2D instrument approach operations using instrument approach procedures shall be determined by establishing a minimum descent altitude (MDA) or minimum descent height (MDH), minimum visibility and, if necessary, cloud conditions.

- 2.2.2.2.4 The operating minima for 3D instrument approach operations using instrument approach procedures shall be determined by establishing a decision altitude (DA) or decision height (DH) and the minimum visibility or RVR.
- 2.2.2.2.5 The pilot-in-command or the GA operator shall apply for a specific approval from the CAAM prior to conduct of instrument approach operations in low visibility which shall only be conducted when RVR information is provided.
- 2.2.2.2.6 Prior to conducting take-offs in low visibility, the pilot-in-command or the GA operator shall apply for a specific approval from the CAAM for the minimum take-off RVR.
- Note.— In general, visibility for take-off is defined in terms of RVR. An equivalent horizontal visibility may also be used.*
- 2.2.2.2.7 When establishing an aerodrome operating minima, the pilot-in-command shall take the following into account:
- a) the type, performance and handling characteristics of the aircraft;
 - b) his competence and experience;
 - c) the dimensions and characteristics of the runways that may be selected for use;
 - d) the adequacy and performance of the available visual and non-visual ground aids;
 - e) the equipment available in the aircraft for the purpose of navigation and/or control of the flight path, during the take-off, the approach, the flare, the landing, the rollout and the missed approach;
 - f) the obstacles in the approach, the missed approach and the climb-out areas necessary for the execution of contingency procedures;
 - g) the obstacle clearance altitude/height for the instrument approach procedures;
 - h) the means to determine and report meteorological conditions; and
 - i) the flight technique to be used during the final approach.
- 2.2.2.2.8 The minima for a specific type of approach and landing procedure shall only be used if all the following conditions are met:
- a) the ground equipment required for the intended procedure is operative;
 - b) the aircraft systems required for the type of approach are operative;
 - c) the required aircraft performance criteria are met; and
 - d) the pilot is qualified appropriately.

2.2.2.2.9 Aerodrome Operating minima – NPA, APV, CAT 1 operations

2.2.2.2.9.1 The decision height (DH) to be used for a non-precision approach (NPA) flown with the continuous descent final approach (CDFA) technique, approach procedure with vertical guidance (APV) or category I (CAT I) operation shall not be lower than the highest of:

- a) the minimum height to which the approach aid can be used without the required visual reference;
- b) the obstacle clearance height (OCH) for the category of aircraft;
- c) the published approach procedure DH where applicable;
- d) the system minimum specified in Table 1; or
- e) the minimum DH specified in the AFM or equivalent document, if stated.

2.2.2.2.9.2 The minimum descent height (MDH) for an NPA operation flown without the CDFA technique shall not be lower than the highest of:

- a) the OCH for the category of aircraft;
- b) the system minimum specified in Table 1; or
- c) the minimum MDH specified in the AFM, if stated.

Table 1

System minima

Facility	Lowest DH/MDH (ft)
Instrument landing system (ILS)	200
Global navigation satellite system (GNSS) / Satellite-based augmentation system (SBAS) (Lateral precision with vertical guidance approach (LPV))	200
GNSS (Lateral Navigation (LNAV))	250
GNSS / Baro-vertical navigation (VNAV) (LNAV/VNAV)	250
Localiser (LOC) with or without distance measuring equipment (DME)	250
Surveillance radar approach (SRA) (terminating at ½ NM)	250
SRA (terminating at 1NM)	300
SRA (terminating at 2NM or more)	350
VHF omnidirectional radio range (VOR)	300
VOR/DME	250
Non-directional beacon (NDB)	350
NDB/DME	300
VHF direction finder (VDF)	350

2.2.2.2.10 Aerodrome operating minima – circling operations with aeroplanes

2.2.2.2.10.1 The MDH for a circling operation with aeroplanes shall not be lower than the highest of:

- a) the published circling OCH for the aeroplane category;
- b) the minimum circling height derived from Table 1; or
- c) the DH/MDH of the preceding instrument approach procedure.

2.2.2.2.10.2 The minimum visibility for a circling operation with aeroplanes shall be the highest of:

- a) the circling visibility for the aeroplane category, if published;
- b) the minimum visibility derived from Table 1; or
- c) the runway visual range/converted meteorological visibility (RVR/CMV) of the preceding instrument approach procedure.

Table 1

MDH and minimum visibility for circling vs. aeroplane category

	Aeroplane category			
	A	B	C	D
MDH (ft)	400	500	600	700
Minimum meteorological visibility (m)	1500	1600	2400	3600

Note 1. – Where decision height (DH) and runway visual range (RVR) fall into different categories of operation, the instrument approach operation would be conducted in accordance with the requirements of the most demanding category (e.g. an operation with a DH in the range of CAT IIIA but with an RVR in the range of CAT IIIB would be considered a CAT IIIB operation or an operation with a DH in the range of CAT II but with an RVR in the range of CAT I would be considered a CAT II operation).

Note 2. – The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In the case of a circling approach operation, the required visual reference is the runway environment.

Note 3. – Guidance on approach classification as it relates to instrument approach operations, procedures, runways and navigation systems is contained in the Manual of All-Weather Operations (ICAO Doc 9365) and CAGM 6008 (III) – Low Visibility Operations.

2.2.2.3 Passengers

2.2.2.3.1 The pilot-in-command shall ensure that passengers are made familiar with the location and use of:

- a) seat belts;
- b) emergency exits;
- c) life jackets, if the carriage of life jackets is prescribed;

- d) oxygen dispensing equipment if the use of oxygen is anticipated; and
- e) other emergency equipment provided for individual use, including passenger emergency briefing cards.

2.2.2.3.2 The pilot-in-command shall ensure that all persons on board are aware of the location and general manner of use of the principal emergency equipment carried for collective use.

2.2.2.3.3 In an emergency during flight, the pilot-in-command shall ensure that passengers are instructed in such emergency action as may be appropriate to the circumstances.

2.2.2.3.4 The pilot-in-command shall ensure that, during take-off and landing and whenever considered necessary by reason of turbulence or any emergency occurring during flight, all passengers on board an aeroplane shall be secured in their seats by means of the seat belts or harnesses provided.

2.2.3 **Flight preparation**

2.2.3.1 A flight shall not be commenced until the pilot-in-command is satisfied that:

- a) the aeroplane is airworthy, duly registered and that appropriate certificates with respect thereto are aboard the aeroplane;
- b) the instruments and equipment installed in the aeroplane are appropriate, taking into account the expected flight conditions;
- c) any necessary maintenance has been performed in accordance with Chapter 2.6;
- d) the mass of the aeroplane and centre of gravity location are such that the flight can be conducted safely, taking into account the flight conditions expected;
- e) any load carried is properly distributed and safely secured; and
- f) the aeroplane operating limitations, contained in the flight manual, or its equivalent, will not be exceeded.

2.2.3.2 The pilot-in-command shall have sufficient information on climb performance with all engines operating to enable determination of the climb gradient that can be achieved during the departure phase for the existing take-off conditions and intended take-off technique.

2.2.3.3 Flight planning

2.2.3.3.1 The pilot-in-command shall be familiar with all available meteorological information appropriate to the intended flight. Preparation for a flight away from the vicinity of the place of departure, and for every flight under the instrument flight rules, shall include:

- a) a study of available current weather reports and forecasts; and
- b) the planning of an alternative course of action to provide for the eventuality that the flight cannot be completed as planned, because of weather conditions.

2.2.3.4 Meteorological conditions

2.2.3.4.1 A flight to be conducted in accordance with VFR shall not be commenced unless current meteorological reports or a combination of current reports and forecasts indicate that the meteorological conditions along the route or that part of the route to be flown under VFR will, at the appropriate time, be such as to enable compliance with these rules.

2.2.3.4.2 A flight to be conducted in accordance with the instrument flight rules shall not:

- a) take off from the departure aerodrome unless the meteorological conditions, at the time of use, are at or above the aerodrome operating minima for that operation; and
- b) take off or continue beyond the point of in-flight re-planning unless at the aerodrome of intended landing or at each alternate aerodrome to be selected in compliance with 2.2.3.5, current meteorological reports or a combination of current reports and forecasts indicate that the meteorological conditions will be, at the estimated time of use, at or above the aerodrome operating minima for that operation.

2.2.3.4.3 The estimated time of use of an aerodrome is defined as one hour before and one hour after the earliest and latest time of arrival.

2.2.3.4.4 Ice and other contaminants – ground and flight procedures

- a) The pilot-in-command shall only commence take-off if the aircraft is clear of any deposit that might adversely affect the performance or controllability of the aircraft, except as permitted in the AFM.
- b) A flight to be operated in known or expected icing conditions shall not be commenced unless the aeroplane is certificated and equipped to cope with such conditions.
- c) A flight to be planned or expected to operate in suspected or known ground icing conditions shall not take off unless the aeroplane has been inspected for icing and, if necessary, has been given appropriate de-icing/anti-icing treatment. Accumulation of ice or other naturally occurring contaminants shall be removed so that the aeroplane is kept in an airworthy condition prior to take-off.

2.2.3.5 Alternate aerodromes

- 2.2.3.5.1 For a flight to be conducted in accordance with the instrument flight rules, at least one destination alternate aerodrome shall be selected and specified in the flight plans, unless:
- a) the duration of the flight from the departure aerodrome, or from the point of in-flight re-planning, to the destination aerodrome is such that, taking into account all meteorological conditions and operational information relevant to the flight, at the estimated time of use, a reasonable certainty exists that:
 - 1) the approach and landing may be made under visual meteorological conditions; and
 - 2) separate runways are usable at the estimated time of use of the destination aerodrome with at least one runway having an operational instrument approach procedure; or
 - b) the aerodrome of intended landing is isolated and:
 - 1) a standard instrument approach procedure is prescribed for the aerodrome of intended landing;
 - 2) a point of no return has been determined; and
 - 3) a flight shall not be continued past the point of no return unless available current meteorological information indicates that the following meteorological conditions will exist at the estimated time of use:
 - i) a cloud base of at least 300 m (1 000 ft) above the minimum associated with the instrument approach procedure; and
 - ii) visibility of at least 5.5 km (3 NM) or of 4 km (2 NM) more than the minimum associated with the instrument approach procedure.

Note. — *Separate runways are two or more runways at the same aerodrome configured such that if one runway is closed, operations to the other runway(s) can be conducted.*

2.2.3.6 Fuel and oil requirements

- 2.2.3.6.1 A flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the aeroplane carries sufficient fuel and oil to ensure that it can safely complete the flight. The amount of fuel to be carried must permit:
- a) when the flight is conducted in accordance with the instrument flight rules and a destination alternate aerodrome is not required in accordance with 2.2.3.5, or when the flight is to an isolated aerodrome, flight to the aerodrome of intended landing, and after that, have a final reserve fuel for at least 45 minutes at normal cruising altitude; or

- b) when the flight is conducted in accordance with the instrument flight rules and a destination alternate aerodrome is required, flight to the aerodrome of intended landing, then to an alternate aerodrome, and after that, have a final reserve fuel for at least 45 minutes at normal cruising altitude; or
- c) when the flight is conducted in accordance with day VFR, flight to the aerodrome of intended landing, and after that, have a final reserve fuel for at least 30 minutes at normal cruising altitude; or
- d) by day, taking-off and landing at the same aerodrome/landing site and always remaining in sight of that aerodrome/landing site, to fly the intended route and thereafter for at least 10 minutes at normal cruising altitude; or
- e) when the flight is conducted in accordance with night VFR, flight to the aerodrome of intended landing and thereafter have a final reserve fuel for at least 45 minutes at normal cruising altitude.

2.2.3.6.2 The use of fuel after flight commencement for purposes other than originally intended during pre-flight planning shall require a re-analysis and, if applicable, adjustment of the planned operation.

2.2.3.7 Refuelling with passengers on board

2.2.3.7.1 An aeroplane shall not be refuelled when passengers are embarking, on board or disembarking unless it is attended by the pilot-in-command or other qualified personnel ready to initiate and direct an evacuation of the aeroplane by the most practical and expeditious means available.

2.2.3.7.2 When refuelling with passengers embarking, on board or disembarking, two-way communications shall be maintained by the aeroplane's intercommunication system or other suitable means between the ground crew supervising the refuelling and the pilot-in-command or other qualified personnel required by 2.2.3.7.1.

Note 1.— The provisions of 2.2.3.7.1 do not necessarily require the deployment of integral aeroplane stairs or the opening of emergency exits as a prerequisite to refuelling.

Note 2.— Additional precautions are required when refuelling with fuels other than aviation kerosene or when refuelling results in a mixture of aviation kerosene with other aviation turbine fuels, or when an open line is used.

2.2.3.8 Oxygen supply

2.2.3.8.1 The pilot-in-command shall ensure that breathing oxygen is available to crew members and passengers in sufficient quantities for all flights at such

altitudes where a lack of oxygen might result in impairment of the faculties of crew members or harmfully affect passengers

2.2.3.8.2 In any other case when the pilot-in-command cannot determine how the lack of oxygen might affect all occupants on board, he shall ensure that:

- a) all crew members engaged in performing duties essential to the safe operation of an aircraft in flight use supplemental oxygen for any period in excess of 30 minutes when the pressure altitude in the passenger compartment will be between 10 000 ft and 13 000 ft; and
- b) all occupants use supplemental oxygen for any period that the pressure altitude in the passenger compartment will be above 13 000 ft.

Note 1. — Guidance on the carriage and use of oxygen is given in Attachment 2.A.

Note 2. — Approximate altitudes in the Standard Atmosphere corresponding to the values of absolute pressure used in the text of Attachment 2.A are as follows:

<i>Absolute pressure</i>	<i>Metres</i>	<i>Feet</i>
<i>700 hPa</i>	<i>3 000</i>	<i>10 000</i>
<i>620 hPa</i>	<i>4 000</i>	<i>13 000</i>
<i>376 hPa</i>	<i>7 600</i>	<i>25 000</i>

2.2.4 In-flight procedures

2.2.4.1 Aerodrome operating minima

2.2.4.1.1 A flight shall not be continued towards the aerodrome of intended landing, unless the latest available information indicates that at the expected time of arrival, a landing can be effected at that aerodrome or at least one destination alternate aerodrome, in compliance with the operating minima established in accordance with 2222.

2.2.4.1.2 An instrument approach shall not be continued below 300 m (1000 ft) above the aerodrome elevation or into the final approach segment unless the reported visibility or controlling RVR is at or above the aerodrome operating minima.

2.2.4.1.3 If, after entering the final approach segment or after descending below 300 m (1000 ft) above the aerodrome elevation, the reported visibility or controlling RVR falls below the specified minimum, the approach may be continued to DA/H or MDA/H. In any case, an aeroplane shall not continue its approach-to-land beyond a point at which the limits of the aerodrome operating minima would be infringed.

Note. — Controlling RVR means the reported values of one or more RVR reporting locations (touchdown, midpoint and stop-end) used to determine whether operating minima are or are not met. Where RVR is used, the controlling RVR is the touchdown RVR, unless otherwise specified by State criteria.

2.2.4.2 Meteorological and operational observations by pilots

2.2.4.2.1 The pilot-in-command shall, as soon as possible, report to the appropriate air traffic services (ATS) unit any meteorological conditions encountered that are likely to affect the safety of other aircraft.

2.2.4.2.2 The pilot-in-command shall report runway braking action when the runway braking action encountered is not as good as reported.

2.2.4.3 Hazardous flight conditions

2.2.4.3.1 Hazardous flight conditions encountered, other than those associated with meteorological conditions, shall be reported to the appropriate aeronautical station as soon as possible. The reports so rendered should give such details as may be pertinent to the safety of other aircraft. Examples of hazardous flight conditions are:

- a) severe turbulence;
- b) severe icing;
- c) severe mountain wave;
- d) thunderstorms, with or without hail, that are obscured, embedded, widespread or in squall lines;
- e) heavy dust storm or heavy sandstorm;
- f) windshear;
- g) volcanic ash cloud; and
- h) unusual and/or increasing volcanic activity or a volcanic eruption.

2.2.4.4 Aeroplane operating procedures for landing performance

2.2.4.4.1 An approach to land should not be continued below 300 m (1 000 ft) above aerodrome elevation unless the pilot-in-command is satisfied that, with the runway surface condition information available, the aeroplane performance information indicates that a safe landing can be made.

2.2.4.5 Flight crew members at duty stations

2.2.4.5.1 *Take-off and landing.* All flight crew members required to be on flight deck duty shall be at their stations.

- 2.2.4.5.2 *En route.* All flight crew members required to be on flight deck duty shall remain at their stations except when their absence is necessary for the performance of duties in connection with the operation of the aeroplane or for physiological needs.
- 2.2.4.5.3 *Seat belts.* All flight crew members shall keep their seat belts fastened when at their stations.
- 2.2.4.5.4 *Safety harness.* When safety harnesses are provided, any flight crew member occupying a pilot's seat shall keep the safety harness fastened during the take-off and landing phases; all other flight crew members shall keep their safety harnesses fastened during the take-off and landing phases unless the shoulder straps interfere with the performance of their duties, in which case the shoulder straps may be unfastened but the seat belt must remain fastened.
- Note. — Safety harness includes shoulder strap(s) and a seat belt which may be used independently.*
- 2.2.4.6 Use of oxygen
- 2.2.4.6.1 All flight crew members, when engaged in performing duties essential to the safe operation of an aeroplane in flight, shall use breathing oxygen continuously whenever the circumstances prevail for which its supply has been prescribed in 2.2.3.8.
- 2.2.4.7 Safeguarding of cabin crew and passengers in pressurised aeroplanes in the event of loss of pressurisation
- 2.2.4.7.1 Cabin crew should be safeguarded so as to ensure reasonable probability of their retaining consciousness during any emergency descent which may be necessary in the event of loss of pressurisation and, in addition, they should have such means of protection as will enable them to administer first aid to passengers during stabilised flight following the emergency. Passengers should be safeguarded by such devices or operational procedures as will ensure reasonable probability of their surviving the effects of hypoxia in the event of loss of pressurisation.
- Note. — It is not envisaged that cabin crew will always be able to provide assistance to passengers during emergency descent procedures which may be required in the event of loss of pressurisation.*
- 2.2.4.8 In-flight fuel management
- 2.2.4.8.1 The pilot-in-command shall monitor at regular intervals the amount of usable fuel remaining on board to ensure it is not less than the fuel required to proceed to an aerodrome where a safe landing can be made with the planned final reserve fuel remaining.

2.2.4.8.2 The pilot-in-command shall advise ATC of a minimum fuel state by declaring MINIMUM FUEL when, having committed to land at a specific aerodrome, the pilot calculates that any change to the existing clearance to that aerodrome, or other air traffic delays, may result in landing with less than the planned final reserve fuel.

Note. — The declaration of MINIMUM FUEL informs ATC that all planned aerodrome options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance, or air traffic delays, may result in landing with less than the planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.

2.2.4.8.3 The pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL, when the calculated usable fuel estimated to be available upon landing at the nearest aerodrome where a safe landing can be made is less than the planned final reserve fuel.

Note 1. — The planned final reserve fuel refers to the value calculated in 2.2.3.6 and is the minimum amount of fuel required upon landing at any aerodrome.

2.2.4.9 Instrument approach procedures

2.2.4.9.1 One or more instrument approach procedures designed to support instrument approach operations shall be approved and promulgated by the State in which the aerodrome is located to serve each instrument runway or aerodrome utilised for instrument flight operations.

2.2.4.9.2 Aeroplanes operated in accordance with the instrument flight rules shall comply with the instrument approach procedures approved by the State in which the aerodrome is located.

2.2.5 Duties of pilot-in-command

2.2.5.1 The pilot-in-command shall be responsible for:

- a) the safety of the aircraft and of all crew members, passengers and cargo on board during aircraft operations;
- b) the initiation, continuation, termination or diversion of a flight in the interest of safety;
- c) ensuring that all instructions, operational procedures and checklists are complied with;
- d) only commencing a flight if he is satisfied that all operational limitations are complied with, as follows:
 - 1) the aircraft is airworthy;
 - 2) the aircraft is duly registered;

- 3) instruments and equipment required for the execution of that flight are installed in the aircraft and are operative, unless operation with inoperative equipment is permitted by the minimum equipment list (MEL) or equivalent document;
 - 4) the mass of the aircraft and centre of gravity location are such that the flight can be conducted within the limits prescribed in the airworthiness documentation;
 - 5) all equipment, baggage and cargo are properly loaded, secured and an emergency evacuation remains possible;
 - 6) the aircraft operating limitations as specified in the aircraft flight manual (AFM) will not be exceeded at any time during the flight; and
 - 7) any navigational database required for PBN is suitable and current;
- e) not commencing a flight if any flight crew member is incapacitated from performing duties by any cause such as injury, sickness, fatigue or the effects of any psychoactive substance;
 - f) not continuing a flight beyond the nearest weather-permissible aerodrome, when the capacity of any flight crew member to perform duties is significantly reduced from causes such as fatigue, sickness or lack of oxygen;
 - g) deciding on acceptance of the aircraft with unserviceabilities in accordance with the configuration deviation list (CDL) or minimum equipment list (MEL), as applicable;
 - h) recording utilisation data and all known or suspected defects in the aircraft at the termination of the flight, or series of flights, in the aircraft technical log or journey log for the aircraft; and

2.2.5.2 The pilot-in-command shall ensure that during critical phases of flight or whenever deemed necessary in the interest of safety, all crew members are seated at their assigned stations and do not perform any activities other than those required for the safe operation of the aircraft.

2.2.5.3 The pilot-in-command shall have the authority to refuse carriage of or disembark any person, baggage or cargo that may represent a potential hazard to the safety of the aircraft or its occupants.

2.2.5.4 The pilot-in-command shall, in an emergency situation that requires immediate decision and action, take any action he considers necessary under the circumstances. In such cases he may deviate from rules, operational procedures and methods in the interest of safety.

2.2.5.5 The pilot-in-command shall notify the nearest appropriate authority by the quickest available means of any accident involving the aircraft that results in

serious injury or death of any person or substantial damage to the aircraft or property.

2.2.6 Cabin baggage (take-off and landing)

2.2.6.1 The pilot-in-command shall ensure that all baggage carried onto an aeroplane and taken into the passenger cabin is securely stowed.

2.2.7 Additional requirements for Low Visibility Operations (LVO)

2.2.7.1 An operator/owner shall not conduct LVO unless:

- a) Each aircraft concerned is certificated by the regulatory authority of the State of the Manufacturer for operations with decision heights below 200 ft, or no decision height, and accepted by CAAM or CAAM has certified the aircraft for such operations as per Chapter 3 of CAGM 6008 (III) LVO),
- b) The aerodrome is approved for such operations by the State in which the aerodrome is located.
- c) It has verified that low visibility procedures (LVP) have been established, and will be enforced, at those aerodromes where low visibility operations are to be conducted.
- d) A suitable system for recording approach and/or automatic landing success and failure is established and maintained to monitor the overall safety of the operation;
- e) The operations are approved by CAAM.
- f) The flight crew consists of at least two pilots;
- g) Decision height is determined by means of a radio altimeter.
- h) Only RVR values are used for low visibility operations.

2.2.7.2 The maintenance programme shall ensure that the airborne equipment necessary for low visibility operations continues to operate to the required performance level and should cover following areas and any other requirement specified by the CAAM:

- a) Maintenance procedures.
- b) Maintenance and calibration of test equipment.
- c) Initial and recurrent training of maintenance staff.
- d) Recording and analysis of airborne equipment failures.

Note. – Details of continuing airworthiness and maintenance procedures of LVO are stated in CAGM 6008 (III) LVO.

2.2.7.3 Responsibilities of pilot-in-command

- 2.2.7.3.1 The pilot-in-command shall satisfy himself that:
- a) The status of the visual and non-visual facilities is sufficient prior to commencing a low visibility take-off, an approach utilising EVS or a Category II or III approach;
 - b) Appropriate LVPs are in force according to information received from Air Traffic Services, before commencing a low visibility take-off or a Category II or III approach; and
 - e) The flight crew members are properly qualified prior to commencing a low visibility take-off in an RVR of less than 150 m (200 m for Category D aircrafts), an approach utilising EVS or a Category II or III approach.
 - f) The operator/owner has appropriate authorisation from the state of registry and the state of aerodrome to carry out a low visibility take-off or a Category II or III approach to the aerodrome intended.
 - g) The aircraft is properly certified and all required equipment are serviceable for the intended low visibility take-off or a Category II or III approach (refer to paragraph 2.2.7.4).
- 2.2.7.4 Minimum equipment
- 2.2.7.4.1 The operator/owner shall include in the Operations Manual the minimum equipment that has to be serviceable at the commencement of a low visibility take-off, an approach utilising EVS, or a Category II or III approach in accordance with the AOM or another approved document.
- 2.2.7.4.2 The operator/owner shall have procedures to indicate to the flight crew / Flight operations officer the status of the aircraft when the aircraft is upgraded/degraded due to any un-serviceability as per paragraph 2.2.7.4.1 or any other reason.
- 2.2.7.4.3 The pilot-in-command shall satisfy himself the status of the aircraft and of the relevant airborne systems is appropriate for the specific operation to be conducted prior to departure.
- 2.2.7.5 Pilot qualifications
- 2.2.7.5.1 The operator/owner shall ensure that each flight crew member completes training and a check outlined in CAGM 6008 (III) LVO before being authorised to conduct Category II or III operations.
- 2.2.7.5.2 The flight crew qualifications as per above paragraph 2.2.7.5.1 are specific to the operator/owner and the type of aircraft in which the qualification obtained.
- 2.2.7.6 Crew training

- 2.2.7.6.1 An operator/owner shall ensure that, prior to conducting Category II and III operations or approaches utilising EVS:
- a) Each flight crew member completes the training and checking guidelines prescribed in CAGM 6008 (III) LVO including FSTD training in operating to the limiting values of RVR and Decision Height appropriate to the operator/owner's approval.
 - b) The training and checking is conducted in accordance with a detailed syllabus approved by the CAAM and included in the Operations Manual. This training is in addition to the training requirement for type qualifications.
- 2.2.7.6.2 An operator/owner shall ensure that flight crew member training programs for low visibility operations include structured courses of ground and FSTD training.
- 2.2.7.7 Crew training - low visibility take-off (LVTO)
- 2.2.7.7.1 Low Visibility Take-Off with RVR less than 400 m.
- a) All low visibility take-off less than 400 m requires CAAM approval.
 - b) An operator/owner must ensure that a flight crew member has completed a check before conducting Low Visibility Take-Offs in RVRs of less than 400 m.
- 2.2.7.8 Low Visibility Take-Off with RVR less than 150/200 m
- 2.2.7.8.1 An operator/owner must ensure that prior to authorisation to conduct take-offs in RVRs below 150 m (below 200 m for Category D aeroplanes) additional training as below is carried out:-
- a) Normal take-off in minimum authorised RVR conditions;
 - b) Take-off in minimum authorised RVR conditions with an engine failure between V1 and V2, or as soon as safety considerations permit; and
 - c) Take-off in minimum authorised RVR conditions with an engine failure before V1 resulting in a rejected take-off.
- 2.2.7.8.2 An operator/owner must ensure that the training required by subparagraphs 2.2.7.7.1 and 2.2.7.8.1 above is carried out in a flight simulator. This training must include the use of any special procedures and equipment.
- 2.2.7.8.3 An operator/owner must ensure that a flight crew member has completed a check before conducting Low Visibility Take-Offs in RVRs of less than 150 m (less than 200 m for Category D aeroplanes). The check may only be replaced by successful completion of the flight simulator and/or flight training prescribed in subparagraph 2.2.7.7.1 on conversion to an aeroplane type.



- 2.2.7.8.4 Operator/owner using HUD/EVS equipment wishing to conduct LVTO has to obtain further approval from CAAM.
- 2.2.7.9 Crew training - flight crew members conversion training
- 2.2.7.9.1 Conversion training requirements to conduct low visibility take-off, Category II / III operations by the operator/owner's crew members on another type / class or variant aircraft may be abbreviated program based on paragraph 4.4 of the CAGM 6008 (III) LVO.
- 2.2.7.10 Recurrent training - low visibility operations
- 2.2.7.10.1 An operator/owner shall ensure that all crew authorised for low visibility operations undergo an annual recurrent ground school training program which shall be an abbreviated training program covering requirements in paragraph 4.4.3 of the CAGM 6008 (III) LVO.
- 2.2.7.10.2 An operator/owner shall ensure that all crew authorised for low visibility operations undergo a recurrent simulator training program in the simulator prior to the certification requirement as per paragraph 2.2.7.11.
- 2.2.7.10.3 Training programs as required in paragraph 2.2.7.10.1 and 2.2.7.10.2 shall have the approval of the CAAM and included in the Operations manual.
- 2.2.7.11 Crew certification for Category II / Category III operations
- 2.2.7.11.1 An operator/owner shall ensure that, prior to conducting Category II and III operations or approaches utilising EVS and conducting low visibility take off, each flight crew member completes the checking requirements prescribed in this manual.
- 2.2.7.12 Flight crew training
- 2.2.7.12.1 Prior to conducting initial or recurrent Category II or Category III Checks, the Operator/owner shall ensure that the flight crew has completed the applicable approved Category II/III training program successfully.
- 2.2.7.13 Flight crew records
- 2.2.7.13.1 The operator/owner shall maintain records of all flight crew authorised to conduct low visibility operations.
- 2.2.7.13.2 The records as required as per paragraph 2.2.7.13.1 shall;
- a) Indicate initial and continued eligibility of the flight crew member to conduct LVTO, Category II / III operations
 - c) Minima authorised and Category of operation
 - d) Recency as required in paragraph 4.16 of the CAGM 6008 (III) LVO.

- 2.2.7.13.3 Each flight crew member is required to be in possession of the crew record as required in paragraph 2.2.7.13.1 when exercising the privileges authorised in this manual.
- 2.2.7.14 Flight dispatch procedure
- 2.2.7.14.1 An operator/owner shall ensure requirements for low visibility operations shall be included in the operator/owner flight dispatch procedures.
- 2.2.7.14.2 The Operator/owner shall have a system to inform the flight dispatch office regarding the status of the aircraft in respect low visibility operations.
- 2.2.7.14.3 Procedures as required in paragraph 2.2.7.14.1 shall be included in the operations manual.
- 2.2.7.15 Flight operations officers
- 2.2.7.15.1 If the system of flight dispatch of the operator/owner requires the employment of a Flight Operations Officer (FOO), the operator/owner shall ensure that the FOO receive initial and annual recurrent training in respect of flight dispatch in connection with low visibility operations.

2.3 Aeroplane performance operating limitations

2.3.1 General

- 2.3.1.1 An aeroplane shall be operated:
- a) in compliance with the terms of its airworthiness certificate or equivalent approved document;
 - b) within the operating limitations prescribed by the CAAM; and
 - c) if applicable, within the mass limitations imposed by compliance with the applicable noise certification standards unless otherwise authorised in exceptional circumstances for a certain aerodrome or a runway where there is no noise disturbance problem, by the competent authority of the State in which the aerodrome is situated.
- 2.3.1.2 Placards, listings, instrument markings, or combinations thereof, containing those operating limitations prescribed by the CAAM for visual presentation, shall be displayed in the aeroplane.
- 2.3.1.3 The pilot-in-command shall determine that aeroplane performance will permit the take-off and departure to be carried out safely.

2.3.2 Weighing

- 2.3.2.1 The CAMO shall ensure that the mass and the CG of the aircraft have been established by actual weighing prior to the initial entry into service of the aircraft.

The accumulated effects of modifications and repairs on the mass and balance shall be accounted for and properly documented. Such information shall be made available to the pilot-in-command. The aircraft shall be reweighed if the effect of modifications on the mass and balance is not accurately known.

- 2.3.2.2 The CAMO shall ensure that the weighing shall be accomplished by the manufacturer of the aircraft or by an approved maintenance organisation.

2.4 Aeroplane instruments, equipment and flight documents

2.4.1 General

- 2.4.1.1 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 acceptable to the CAAM.

2.4.2 Aeroplanes on all flights

- 2.4.2.1 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 manoeuvres and observe the operating limitations of the aeroplane in the expected operating conditions.

- 2.4.2.2 An aeroplane shall be equipped with or carry on board:

- a) An accessible first-aid kit which shall be readily accessible for use and kept up to date;
- b) Portable fire extinguishers of a type which, when discharged, will not cause dangerous contamination of the air within the aeroplane. At least one shall be located in:
 - 1) the pilot's compartment; and
 - 2) each passenger compartment that is separate from the pilot's compartment and that is not readily accessible to the flight crew;

Note. — Refer to 2.4.2.3 for fire extinguishing agents.

- 2.4.2.2.1 Seats, seat safety belts, restraint systems and child restraint devices:

- 2.4.2.2.1.1 Aeroplanes shall be equipped with:

- a) a seat or berth for each person on board who is aged 24 months or more;
- b) a seat belt on each seat and restraining belts for each berth;

- c) a child restraint device (CRD) for each person on board younger than 24 months; and
- d) a seat belt with upper torso restraint system on each flight crew seat, having a single point release for aeroplanes having a CofA first issued on or after 25 August 2016.

2.4.2.2.2 Documents, Manuals and information to be carried

- a) The following documents, manuals and information shall be carried on each flight as originals or copies unless otherwise specified:
 - 1) the AFM, or equivalent document(s);
 - 2) the original certificate of registration;
 - 3) the original certificate of airworthiness (CofA);
 - 4) the noise certificate, if applicable;
 - 5) the list of specific approvals, if applicable;
 - 6) the aircraft radio licence, if applicable;
 - 7) the third party liability insurance certificate(s);
 - 8) the journey log, or equivalent, for the aircraft;
 - 9) details of the filed ATS flight plan, if applicable;
 - 10) current and suitable aeronautical charts for the route area of the proposed flight and all routes along which it is reasonable to expect that the flight may be diverted;
 - 11) procedures and visual signals information for use by intercepting and intercepted aircraft;
 - 12) the MEL or CDL, if applicable; and
 - 13) any other documentation that may be pertinent to the flight or is required by the States concerned with the flight.
- b) Notwithstanding (a), on flights:
 - 1) intending to take off and land at the same aerodrome; or
 - 2) remaining within a distance or area determined by the CAAM, the documents and information in a)2) to a)8) may be retained at the aerodrome.
- c) The pilot-in-command shall make available within a reasonable time of being requested to do so by the CAAM, the documentation required to be carried on board.

2.4.2.3 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 2018 shall:

- a) meet the applicable minimum performance requirements of the CAAM; and
- b) not be of a type listed in the 1987 *Montreal Protocol on Substances that Deplete the Ozone Layer* as it appears in the Eighth Edition of the *Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer*, Annex A, Group II.

2.4.2.4 Aeroplanes on all flights shall be a seat belt with upper torso restraint system on each flight crew seat, having a single point release for aeroplanes having a CofA first issued on or after 25 August 2016.

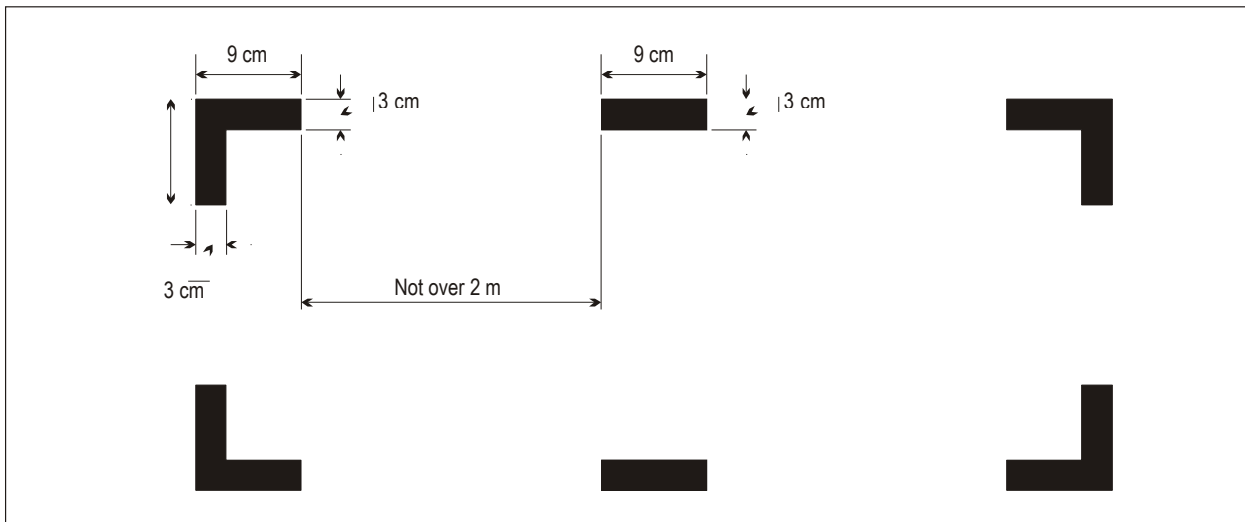
2.4.2.5 Marking of break-in points

2.4.2.5.1 If the CAAM requires an aeroplane to be marked with break-in points, the operator/owner shall ensure that, if areas of the fuselage suitable for break-in by rescue crews in emergency are marked on an aeroplane, such areas shall be marked as shown below (see figure following).

2.4.2.5.2 In addition to Regulation 96 (1) of the MCAR 2016, the colour of the markings shall be red or yellow, and if necessary, they shall be outlined in white to contrast with the background.

2.4.2.5.3 If the corner markings are more than 2 metres apart, intermediate lines 9 cm x 3 cm shall be inserted so that there is no more than 2 metres between adjacent marks.

Note. — This Standard does not require any aeroplane to have break-in areas.



MARKING OF BREAK-IN POINTS (see 2.4.2.5)

2.4.3 All aeroplanes operated as VFR flights

2.4.3.1 All aeroplanes when operated as VFR flights shall be:

- a) equipped with a means of measuring and displaying:
 - 1) magnetic heading;
 - 2) barometric altitude;
 - 3) indicated airspeed;
- b) equipped with, or shall carry, a means of measuring and displaying time in hours, minutes and seconds; and

2.4.3.2 VFR flights which are operated as controlled flights shall be equipped in accordance with 2.4.7.

2.4.4 Aeroplanes on flights over water**2.4.4.1 Seaplanes**

2.4.4.1.1 Seaplanes for all flights shall be equipped with:

- a) one life jacket, or equivalent individual floatation device, for each person on board, stowed in a position readily accessible from the seat or berth;
- b) equipment for making the sound signals prescribed in the International Regulations for Preventing Collisions at Sea, where applicable;
- c) one anchor; and
- d) one sea anchor (drogue), when necessary to assist in manoeuvring.

Note. — “Seaplanes” includes amphibians operated as seaplanes.

2.4.4.2 Landplanes

2.4.4.2.1 Single-engined Landplanes:

- a) when flying en route over water beyond gliding distance from the shore;
or
- b) when taking off or landing at an aerodrome where, in the opinion of the pilot-in-command, 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;

shall carry one life jacket or equivalent individual floatation 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.

Note.— “Landplanes” includes amphibians operated as landplanes

2.4.4.3 Aeroplanes on extended flights over water

2.4.4.3.1 All aeroplanes operated on extended flights over water shall be equipped with, at a minimum, one life jacket or equivalent individual floatation 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.

2.4.4.3.2 The pilot-in-command of an aeroplane operated on an extended flight over water shall determine the risks to survival of the occupants of the aeroplane in the event of a ditching. The pilot-in-command shall take into account the operating environment and conditions such as, but not limited to, sea state and sea and air temperatures, the distance from land suitable for making an emergency landing, and the availability of search and rescue facilities. Based upon the assessment of these risks, the pilot-in-command shall, in addition to the equipment required in 2.4.4.3.1, ensure that the aeroplane is equipped with:

- a) life-saving rafts 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; and
- b) equipment for making the distress signals described in CAD 2.

2.4.5 Aeroplanes on flights over designated land areas

2.4.5.1 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 signalling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area overflown.

2.4.6 Aeroplanes on high altitude flights

2.4.6.1 Aeroplanes intended to be operated at high altitudes shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 2.2.3.8.

2.4.6.2 Pressurised aeroplanes intended to be operated above 25 000 ft shall be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurisation.

2.4.6.3 For aeroplanes which the individual certificate of airworthiness was first issued before 1 January 1990, pressurised aeroplanes intended to be operated at flight altitudes at which the atmospheric pressure is less than 376 hPa should be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurisation.

2.4.7 All aeroplanes operated in accordance with the instrument flight rules

2.4.7.1 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 means of measuring and displaying:

- 1) magnetic heading (standby compass);
- 2) barometric altitude;
- 3) indicated airspeed, with a means of preventing malfunctioning due to either condensation or icing;
- 4) turn and slip;
- 5) aircraft attitude;
- 6) stabilised aircraft heading;

Note.— The requirements of 4), 5) and 6) 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.

- 7) whether the supply of power to the gyroscopic instruments is adequate;
- 8) the outside air temperature;
- 9) rate-of-climb and descent;

b) equipped with, or shall carry, a means of measuring and displaying time in hours, minutes and seconds; and

c) equipped with such additional instruments or equipment as may be prescribed by the appropriate authority.

2.4.8 Aeroplanes when operated at night

2.4.8.1 Aeroplanes, when operated at night, shall be equipped with:

- a) Anti-collision light system
- b) the equipment specified in 2.4.7; and
- c) the lights required by CAD 2 for aircraft in flight or operating on the movement area of an aerodrome;

Note.— Specifications for lights meeting the requirements of CAD 2 for navigation lights are contained in Appendix 2.1 – Lights To Be Displayed By Aeroplanes. The general characteristics of lights are specified in CAD 8.

d) a landing light;

- e) illumination for all flight instruments and equipment that are essential for the safe operation of the aeroplane that are used by the flight crew;
- f) lights in all passenger compartments; and
- g) an independent portable light for each crew member station;
- h) lights to conform with the International Regulations for Preventing Collisions at Sea if the aeroplane is operated as a seaplane.

2.4.9 **Aeroplanes complying with the noise certification Standards in CAD 16, Volume I**

2.4.9.1 An aeroplane shall carry a document attesting noise certification, including an English translation, where one has been provided by the State of Registry, is carried on each flight.

2.4.10 **Mach number indicator**

2.4.10.1 Aeroplanes with speed limitations expressed in terms of Mach number shall be equipped with a means of displaying Mach number.

2.4.11 **Aeroplanes required to be equipped with ground proximity warning systems (GPWS)**

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

2.4.11.2 All turbine-engined aeroplanes of a maximum certificated take-off mass of 5 700 kg or less and authorised to carry more than five but not more than nine passengers should be equipped with a ground proximity warning system which has a forward-looking terrain avoidance function.

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

2.4.11.4 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.

2.4.11.5 A ground proximity warning system shall provide, at a minimum, warnings of at least the following circumstances:

- a) excessive descent rate;
- b) excessive altitude loss after take-off or go-around; and

c) unsafe terrain clearance.

2.4.11.6 A ground proximity warning system should provide, as a minimum, warnings of at least 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;
 - 1) gear not locked down;
 - 2) flaps not in a landing position; and
- e) excessive descent below the instrument glide path.

2.4.11.7 A ground proximity warning system installed in turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorised to carry more than nine passengers for which the individual certificate of airworthiness was first issued after 1 January 2011 shall provide, as a minimum, warnings of at least 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;
 - 1) gear not locked down;
 - 2) flaps not in a landing position; and
- e) excessive descent below the instrument glide path.

2.4.12 Emergency locator transmitter (ELT)

2.4.12.1 All aeroplanes should carry an automatic ELT.

2.4.12.2 Except as provided for in 2.4.12.3, all aeroplanes shall be equipped with at least one ELT of any type.

2.4.12.3 All aeroplanes for which the individual certificate of airworthiness is first issued after 1 July 2008 shall be equipped with at least one automatic ELT.

2.4.12.4 ELT equipment carried to satisfy the requirements of 2.4.12.1, 2.4.12.2 and 2.4.12.3 shall operate in accordance with the relevant provisions of CAD 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.

2.4.13 Aeroplanes required to be equipped with a pressure-altitude reporting transponder

2.4.13.1 Aeroplanes shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of CAD 10, Volume IV.

2.4.13.2 Unless exempted by the CAAM aeroplanes operating as VFR flights shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provision of CAD 10, Volume IV.

2.4.13.3 Where required by the airspace being flown, aeroplanes shall be equipped with a secondary surveillance radar (SSR) transponder with all the required capabilities.

Note.— These provisions are intended to support the effectiveness of ACAS as well as to improve the effectiveness of air traffic services.

2.4.14 Use of headset and microphones

2.4.14.1 Each flight crew member required to be on duty in the flight crew compartment shall wear a headset with boom microphone or equivalent. The headset shall be used as the primary device for voice communications with ATS:

- a) when on ground:
 - 1) when receiving the ATC departure clearance via voice communication; and
 - 2) when engines are running;
 - b) when in flight:
 - 1) below transition altitude; or
 - 2) 10000ft, whichever is higher;
- and
- c) whenever deemed necessary by the pilot-in-command.

2.4.14.2 In the conditions of 2.4.14.1, the boom microphone or equivalent shall be in a position that permits its use for two-way radio communications.

2.4.14.3 When operating under the instrument flight rules, all flight crew members required to be on flight deck duty should communicate through boom or throat microphones below the transition level/altitude.

2.4.15 **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)**

2.4.15.1 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, criteria for the use of such systems for the safe operation of an aeroplane shall be established by the State of Registry.

Note.— Information regarding a HUD or equivalent displays, including references to RTCA and EUROCAE documents, is contained in the Manual of All-Weather Operations (ICAO Doc 9365).

2.4.15.2 In establishing operational criteria for the use of automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS, the State of Registry ensures that:

- a) the equipment meets the appropriate airworthiness certification requirements;
- b) the operator/owner has carried out a safety risk assessment associated with the operations supported by the automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS;
- c) the operator/owner 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) (ICAO Doc 9859). Note 2.— Guidance on establishing operational criteria is contained in Attachment 2.B.

2.4.16 **Flight recorders**

Note 1.— 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),
- a data link recorder (DLR).

Image and data link information may be recorded on either the CVR or the FDR.

Note 2.— 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),
- a data link recording system (DLRS).

Image and data link information may be recorded on either the CARS or the ADRS.

Note 3.— Detailed requirements on flight recorders are contained in Appendix 2.3.

Note 4.— For aeroplanes for which the application for type certification is submitted to a Contracting State before 1 January 2016, specifications applicable to crash-protected flight recorders may be found in EUROCAE ED-112, ED-56A, ED-55, Minimum Operational Performance Specifications (MOPS), or earlier equivalent documents.

Note 5.— For aeroplanes for which the application for type certification is submitted to a Contracting State on or after 1 January 2016, specifications applicable to crash-protected flight recorders may be found in EUROCAE ED-112A, Minimum Operational Performance Specification (MOPS), or equivalent documents.

Note 6.— Specifications applicable to lightweight flight recorders may be found in EUROCAE ED-155, Minimum Operational Performance Specification (MOPS), or equivalent documents.

2.4.16.1 Flight data recorders and aircraft data recording systems

Note.— Parameters to be recorded are listed in Tables A2.3-1 and A2.3-3 of Appendix 2.3.

2.4.16.1.1 Applicability

2.4.16.1.1.1 All turbine-engined aeroplanes with a seating configuration of more than five passenger seats and 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) an FDR which should record at least the first 16 parameters in Table A2.3-1 of Appendix 2.3 – Flight Recorders; or
- b) a Class C AIR or AIRS which should record at least the flight path and speed parameters displayed to the pilot(s), as defined in 2.2.2 of Appendix 2.3 – Flight Recorders; or
- c) an ADRS which should record at least the first 7 parameters listed in Table A2.3-3 of Appendix 2.3 – Flight Recorders.

Note 1.— AIR or AIRS classification is defined in 4.1 of Appendix 2.3.

Note 2.— “The application for type certification that is submitted to a Contracting State” 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 derivative models.

- 2.4.16.1.1.2 All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2023 shall be equipped with an FDR capable of recording at least the 82 parameters listed in Table A2.3-1 of Appendix 2.3.
- 2.4.16.1.1.3 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 2023 should be equipped with an FDR capable of recording at least the 82 parameters listed in Table A2.3-1 of Appendix 2.3.
- 2.4.16.1.2 Recording technology
FDRs, ADRS, AIRs or AIRS shall not use engraving metal foil, frequency modulation (FM), photographic film or magnetic tape.
- 2.4.16.1.3 Duration
- 2.4.16.1.3.1 All FDRs shall retain the information recorded during at least the last 25 hours of their operation.
- 2.4.16.2 Cockpit voice recorders and cockpit audio recording systems
- 2.4.16.2.1 Applicability
All turbine-engined aeroplanes with a seating configuration of more than five passenger seats and 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.
- 2.4.16.2.2 Recording technology
CVRs and CARS shall not use magnetic tape or wire.
- 2.4.16.2.3 Duration
- 2.4.16.2.3.1 All CVRs shall retain the information recorded during at least the last 2 hours of their operation.
- 2.4.16.2.3.2 All aeroplanes that are required to be equipped with CARS, and for which the individual certificate of airworthiness is first issued on or after 1 January 2025, shall be equipped with a CARS which shall retain the information recorded during at least the last two hours of their operation.
- 2.4.16.3 Data link recorders
- 2.4.16.3.1 Applicability

- 2.4.16.3.1.1 All aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2016, which utilise any of the data link communications applications listed in 5.1.2 of Appendix 2.3 and are required to carry a CVR, shall record on a crash-protected flight recorder all data link communications messages.
- 2.4.16.3.1.2 All aeroplanes which are modified on or after 1 January 2016 to install and utilise any of the data link communications applications listed in 5.1.2 of Appendix 2.3 and are required to carry a CVR shall record on a crash-protected flight recorder the data link communications messages.
- Note.— 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.*
- 2.4.16.3.2 Duration
- The minimum recording duration shall be equal to the duration of the CVR.*
- 2.4.16.3.3 Correlation
- Data link recording shall be able to be correlated to the recorded cockpit audio.*
- 2.4.16.4 Flight recorders — general
- 2.4.16.4.1 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.
- 2.4.16.4.2 Operation
- 2.4.16.4.2.1 Flight recorders shall not be switched off during flight time.
- 2.4.16.4.2.2 To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident. The flight recorders shall not be reactivated before their disposition as determined in accordance with CAD 13.
- Note 1.— 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.*
- Note 2.— The pilot-in-command's responsibilities regarding the retention of flight recorder records are contained in 2.4.16.4.3.*
- 2.4.16.4.3 Flight recorder records

The pilot-in-command, and/or the owner/operator, shall ensure, to the extent possible, in the event the aeroplane becomes involved in an accident or incident, the preservation of all related flight recorder records, and if necessary the associated flight recorders, and their retention in safe custody pending their disposition as determined in accordance with CAD 13.

2.4.16.4.4 Continued serviceability

Operational checks and evaluations of recordings from the flight recorder systems shall be conducted to ensure the continued serviceability of the recorders.

Note.— Procedures for the inspections of the flight recorder systems are given in Appendix 2.3.

2.4.16.4.5 Flight recorder electronic documentation

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

Note.— Industry specifications for documentation concerning flight recorder parameters may be found in ARINC 647A,

Flight Recorder Electronic Documentation, or equivalent document.

2.4.17 **Electronic flight bags (EFBs)**

Note.— Guidance on EFB equipment, functions and establishing criteria for their operational use is contained in the Manual on Electronic Flight Bags (EFBs) (ICAO Doc 10020) and CAGM 6008 (V) – EFB.

2.4.17.1 EFB equipment

2.4.17.1.1 Where portable EFBs are used on board an aeroplane, the pilot-in-command and/or the operator/owner shall ensure that they do not adversely affect the performance of the aeroplane systems, equipment or the ability to operate the aeroplane.

2.4.17.2 EFB functions

2.4.17.2.1 Where EFBs are used on board an aeroplane the pilot-in-command and/or the owner/operator shall:

- a) assess the safety risk(s) associated with each EFB function;
- b) establish 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) (ICAO Doc 9859).

- 2.4.17.2.2 Operators are required to seek a specific approval prior to operational use of EFB functions.
- 2.4.17.3 EFB specific approval
- To obtain CAAM approval for the use of EFBs, the pilot-in-command and/or the owner/operator shall:
- 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/owner has assessed the risks associated with the operations supported by the EFB function(s);
 - c) the operator/owner has established requirements for redundancy of the information (if appropriate) contained in and displayed by the EFB function(s);
 - d) the operator/owner has established and documented procedures for the management of the EFB function(s) including any databases it may use; and
 - e) the operator/owner has established and documented the procedures for the use of, and training requirements for, the EFB function(s).
- 2.4.17.4 Continuing Airworthiness and training for maintenance personnel
- 2.4.17.4.1 The operator shall establish a documented maintenance procedure to ensure the EFB is well maintained.
- 2.4.17.4.2 For the rechargeable lithium-type batteries, the operator shall ensure that the maintenance procedures meet the Original Equipment Manufacturer (OEM)'s recommendations.
- 2.4.17.4.3 The operator shall review and update the following documents to reflect the operation of EFB as applicable:
- a) Maintenance program
 - b) Minimum Equipment List (MEL); and
 - c) Aircraft Flight Manual Supplement (AFMS).
- 2.4.17.4.4 The operator shall develop a training program for all the maintenance personnel who are involved with the EFB operations. The training program shall consist of initial and recurrent training and include at least the overview of the EFB specificities, maintenance procedures and safety management. The operator shall regularly review the training program to ensure that the training program is relevant with the current technologies and effectively implemented.

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

2.5 Aeroplane Communication, Navigation And Surveillance Equipment

2.5.1 Communication equipment

2.5.1.1 An aeroplane to be operated in accordance with the instrument flight rules or at night shall be provided with radio communication equipment. Such equipment shall be capable of conducting two-way communication with those aeronautical stations and on those frequencies prescribed by the CAAM.

Note.— The requirements of 2.5.1.1 are considered fulfilled if the ability to conduct the communications specified therein is established during radio propagation conditions which are normal for the route.

2.5.1.2 When compliance with 2.5.1.1 requires that more than one communication equipment unit be provided, each shall be independent of the other or others to the extent that a failure in any one will not result in failure of any other.

2.5.1.3 An aeroplane to be operated in accordance with VFR, but as a controlled flight, shall be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the CAAM.

2.5.1.4 An aeroplane to be operated on a flight to which the provisions of 2.4.4.3.1 or 2.4.5 apply shall be provided with radio communication equipment capable of conducting two-way communication at any time during flight with such aeronautical stations and on such frequencies as may be prescribed by the CAAM.

2.5.1.5 The radio communication equipment required in accordance with 2.5.1.1 to 2.5.1.4 shall provide for communication on the aeronautical emergency frequency 121.5 MHz.

2.5.1.6 For operations where communication equipment is required to meet an RCP specification for *performance-based communication* (PBC), an aeroplane shall, in addition to the requirements specified in 2.5.1.1 to 2.5.1.5:

- a) be provided with communication equipment which will enable it to operate in accordance with the prescribed RCP specification(s);
- b) have information relevant to the aeroplane RCP specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design or State of Registry; and
- c) where the aeroplane is operated in accordance with a MEL, have information relevant to the aeroplane RCP specification capabilities included in the MEL.

Note.— Information on the performance-based communication and surveillance (PBCS) concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual (ICAO Doc 9869) and CAGM 6008 (VI)

- 2.5.1.7 The operator / owner shall, for operations where an RCP specification for PBC has been prescribed, ensure that they establish and document the following:
- a) normal and abnormal procedures, including contingency procedures;
 - b) flight crew qualification and proficiency requirements, in accordance with the appropriate RCP specifications;
 - c) a training programme for relevant personnel consistent with the intended operations; and
 - d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RCP specifications;
 - e) the equipment in accordance with the required communication performance;
 - f) identify the specific aircraft to be used for the operations for which approval is sought.
- 2.5.1.8 With respect to those aeroplanes mentioned in 2.5.1.6, the CAAM will, for Malaysian registered (9M) aeroplanes:
- a) receive reports of observed communication performance issued by monitoring programmes established in accordance with CAD 11, Chapter 3, 3.3.5.2; and
 - b) take immediate corrective action for individual aircraft, aircraft types or operators, identified in such reports as not complying with the RCP specification(s).
- 2.5.1.9 An operator / owner seeking a specific approval to use a data link system for communications, navigation or surveillance during its operations shall:
- a) identify the aircraft for which the specific approval is sought;
 - b) specify the equipment to be carried so identified such that the aircraft is in compliance with standards and the requirements specified by the CAAM;
 - c) provide details of:
 - 1) a training programme for every person to be involved in such operations as a flight crew member or a member of the operations personnel; and
 - 2) procedures for ensuring that these requirements and the conditions of this specific approval are met.

2.5.2 Navigation equipment

2.5.2.1 An aeroplane shall be provided with navigation equipment which will enable it to proceed:

- a) in accordance with its flight plan; and
- b) in accordance with the requirements of air traffic services;

except when, if not so precluded by the CAAM, navigation for flights under VFR is accomplished by visual reference to landmarks.

2.5.2.2 An operator / owner seeking a specific approval to conduct PBN operations shall:

- a) identify the particular aircraft to be used for the PBN operations;
- b) specify the equipment to be carried on board the identified aircraft such that the aircraft is equipped to perform in accordance with relevant PBN specifications;
- c) specify the composition and experience requirement of the flight crew for a flight involving the PBN operations;
- d) have information relevant to the aeroplane navigation specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of the Design or State of Registry;
- e) have information relevant to the aeroplane navigation specification capabilities included in the MEL; and
- f) provide details of:
 - 1) procedures for normal and contingency situations;
 - 2) incident reporting procedures;
 - 3) training programme for every person to be involved in the PBN operations as a flight crew member or a member of the operations personnel;
 - 4) to have a continuous monitoring programme to ensure the required level of navigation performance is maintained;
 - 5) appropriate maintenance procedures to ensure continued airworthiness, in accordance with the appropriate navigation specifications.
- g) For the purpose of granting an operational approval for an aircraft to be operated in the PBN airspace, airworthiness recommendation is required. Applicant shall submit an Engineering Report which contains:
 - 1) particulars of aircraft to be operated;

- 2) navigation equipment which will enable it to operate in accordance with the intended navigation specifications;
 - 3) information relevant to the aircraft eligibility and evidence of compliance with the navigation specifications for a particular PBN application provided there is clear statement in:
 - i) the Type Certificate (TC); or
 - ii) the Supplemental Type Certificate (STC); or
 - iii) the compliance statement from the manufacturer that has been approved by the State of Design and accepted by CAAM.
 - 4) the aircraft configuration list detailing the installation of the pertinent hardware and software components related to the PBN operation;
 - 5) the control of navigation database procedures which will define the data validation procedures for navigation databases and installation of new databases into aircraft so that they remain current with the Aeronautical Information Regulation and Control(AIRAC) cycle;
 - 6) the training programme for personnel involved in the PBN operations;
 - 7) continued airworthiness procedures for assessing and incorporating instructions for continued airworthiness and maintenance or inspection information concerning system modification, software revisions, etc;
 - 8) the aircraft's Aircraft Maintenance Programme (AMP), Reliability Programme and Minimum Equipment List (MEL) had been incorporated with the relevant PBN elements and systems;
 - 9) the aircraft current and updated Electrical Load Analysis; and
 - 10) the completed checklist for PBN Airworthiness Assessment Review - Performance Based Navigation (PBN).
-
- h) The applicant shall ensure that aircraft system is properly maintained to meet the appropriate navigation specifications.
 - i) No applicants shall conduct any modifications, or repairs on the aircraft which may impact the PBN related capability and systems.
 - j) In the case of modifications, or repairs that give impact to the PBN related capability and systems, the applicant shall inform CAAM on the changes made and provide information to ensure that the PBN related capability and systems is in compliance to this CAD.

2.5.2.3 An operator / owner with a specific approval to conduct a PBN operations must ensure that the aircraft used to conduct the PBN operation have flight crew members that:

- a) are of the composition and experience required for such operations; and

- b) have completed the training programme established in 2.5.2.2 f) 3) for every flight crew member involved in such operations.

2.5.2.4 An operator with a specific approval to conduct PBN operations must ensure that, when its aircraft is used to conduct a PBN operations, the flight crew comprises of at least 2 pilots.

Note 1. – Information on performance-based navigation, and guidance concerning the implementation and operational approval process, are contained in CAGM 6008 (II) Performance-based Navigation (PBN) Manual and ICAO Doc 9613.

Note 2.— Guidance on safety risks and mitigations for PBN operations, in accordance with CAD 19, are contained in the Performance-based Navigation (PBN) Operational Approval Manual (ICAO Doc 9997).

2.5.2.5 For flights in defined portions of the North Atlantic (NAT) airspace where, based on Regional Air Navigation Agreement, High Level Airspace Approval (HLA) is required (minimum navigation performance specifications (MNPS)), an aeroplane shall be provided with navigation equipment which:

- a) continuously provides indications to the flight crew of adherence to or departure from track to the required degree of accuracy at any point along that track; and
- b) has been authorised by the CAAM for the NAT HLA (MNPS) operations concerned.

Note.— The prescribed minimum navigation performance specifications and the procedures governing their application are published in the Regional Supplementary Procedures (ICAO Doc 7030) and CAGM 6008 (VI) NAT HLA, PBCS, CPDLC & ADS.

2.5.2.6 For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, a reduced vertical separation minimum (RVSM) of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, an aeroplane:

- a) shall be provided with equipment which is capable of:
 - 1) indicating to the flight crew the flight level being flown;
 - 2) automatically maintaining a selected flight level;
 - 3) providing an alert to the flight crew when a deviation occurs from the selected flight level. The threshold for the alert shall not exceed \pm 300 ft (90 m); and
 - 4) automatically reporting pressure-altitude;
- b) shall be authorised by the CAAM for operation in the airspace concerned; and

- c) shall demonstrate a vertical navigation performance in accordance with Appendix 2.2 – Altimetry System Performance Requirements For Operations In RVSM Airspace.

2.5.2.7 Prior to granting the RVSM approval required in accordance with 2.5.2.6 b), the CAAM shall be satisfied that:

- a) the vertical navigation performance capability of the aeroplane satisfies the requirements specified in Appendix 2.2.
- b) the owner/operator has instituted appropriate procedures in respect of continued airworthiness (maintenance and repair) practices and programmes; and
- c) the owner/operator has instituted appropriate flight crew procedures for operations in RVSM airspace.
- d) the operator shall establish a RVSM maintenance and inspection programme for the altimeter system and altitude reporting equipment in accordance with CAGM 6008 (I)
- e) no modifications, or repairs on the aircraft which may impact the altitude keeping ability and the RVSM system are made. In the case of modifications or repairs which give impact to the altitude keeping ability or the RVSM system, the operator shall meet the associated standards of this CAD.

Note.— An RVSM approval is valid globally on the understanding that any operating procedures specific to a given region will be stated in the operations manual or appropriate crew guidance.

2.5.2.8 With respect to those aeroplanes mentioned in 2.5.2.6, the CAAM will, for Malaysian registered (9M) aeroplanes:

- a) receive reports of height-keeping performance issued by the monitoring agencies established in accordance with CAD 11, 3.3.5.1; and
- b) take immediate corrective action for individual aircraft, or aircraft type groups, identified in such reports as not complying with the height-keeping requirements for operation in airspace where RVSM is applied;

2.5.2.9 The operator / owner that has been issued an RVSM approval shall establish a requirement which ensures that a minimum of two aeroplanes of each aircraft type grouping of the operator have their height-keeping performance monitored, at least once every two years or within intervals of 1 000 flight hours per aeroplane, whichever period is longer. If an operator aircraft type grouping consists of a single aeroplane, monitoring of that aeroplane shall be accomplished every two years or within intervals of 1 000 flight hours.

Note.— Monitoring data from any regional monitoring programme established in accordance with CAD 11, 3.3.5.2, may be used to satisfy the requirement.

2.5.2.10 Monitoring Agency for Asia Region (MAAR), established by Aeronautical Radio of Thailand, Ltd. (AEROTHAI) under the approval of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) to assume the duties and responsibilities of the Regional Monitoring Agency (RMA) for the Asia Region.

2.5.2.10.1 The principal role of the MAAR is to assist the International Civil Aviation Organisation (ICAO) in the continuation of the safety assessment programme for the implementation of Reduced Vertical Separation Minimum (RVSM) and other monitoring requirements as determined by the APANPIRG.

2.5.2.10.2 Malaysia registered aircraft with an RVSM approval are registered with MAAR. MAAR maintains a central registry of state RVSM approvals of operators and aircraft using the pacific region airspace where RVSM is applied. MAAR is responsible for determining whether an operator's fleet has demonstrated acceptable height keeping performance.

Note. – Guidance material relating to the approval for operation in RVSM airspace is contained in CAGM 6008 (I) and Manual on Implementation of 1 000 feet (300 m) Vertical Separation Minimum between FL 290 and FL 410 Inclusive ICAO Doc 9574.

2.5.2.11 The aeroplane shall be sufficiently provided with navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment will enable the aeroplane to navigate in accordance with 2.5.2.1 and where applicable 2.5.2.2, 2.5.2.5 and 2.5.2.6.

Note.— This requirement may be met by means other than the duplication of equipment.

2.5.2.12 On flights in which it is intended to land in instrument meteorological conditions, an aeroplane shall be provided with radio equipment capable of receiving signals providing guidance to a point from which a visual landing can be effected. This equipment shall be capable of providing such guidance for each aerodrome at which it is intended to land in instrument meteorological conditions and for any designated alternate aerodromes.

2.5.3 **Surveillance equipment**

2.5.3.1 An aeroplane shall be provided with surveillance equipment which will enable it to operate in accordance with the requirements of air traffic services.

2.5.3.2 For operations where surveillance equipment is required to meet an RSP specification for performance-based surveillance (PBS), an aeroplane shall, in addition to the requirements specified in 2.5.3.1:

- a) be provided with surveillance equipment which will enable it to operate in accordance with the prescribed RSP specification(s);

- b) have information relevant to the aeroplane RSP specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design or State of Registry; and
- c) where the aeroplane is operated in accordance with a MEL, have information relevant to the aeroplane RSP specification capabilities included in the MEL.

Note 1.— Information on surveillance equipment is contained in the Aeronautical Surveillance Manual (ICAO Doc 9924).

Note 2.— Information on RSP specifications for performance-based surveillance is contained in the Performance-based Communication and Surveillance (PBCS) Manual (ICAO Doc 9869) and CAGM 6008 (VI) NAT HLA, PBCS, CPDLC & ADS.

2.5.3.3 The operator / owner shall, for operations where an RSP specification for PBS has been prescribed, ensure that they establish and document the following:

- a) normal and abnormal procedures, including contingency procedures;
- b) flight crew qualification and proficiency requirements, in accordance with appropriate RSP specifications;
- c) a training programme for relevant personnel consistent with the intended operations; and
- d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RSP specifications;
- e) the equipment in accordance with the required surveillance performance;
- f) identify the specific aeroplane to be used for the operations for which approval is sought.

2.5.3.4 With respect to those aeroplanes mentioned in 2.5.3.2, the CAAM will, for Malaysian registered (9M) aeroplanes:

- a) receive reports of observed communication performance issued by monitoring programmes established in accordance with CAD 11, Chapter 3, 3.3.5.2; and
- b) take immediate corrective action for individual aircraft, aircraft types or operators, identified in such reports as not complying with the RSP specification(s).

2.5.4 Performance Based Communication and Surveillance (PBCS)

2.5.4.1 An operator seeking a specific approval to conduct any operations in an airspace or along a route where the appropriate air traffic service authority has specified a combination of the requirements of 2.5.1.6, 2.5.1.7, 2.5.1.9 and 2.5.3, for any aircraft operating in that airspace or along that route (called in this

CAD a PBCS operation), must comply with the requirements of 2.5.1.6, 2.5.1.7, 2.5.1.9 and 2.5.3.

2.6 Aeroplane Continuing Airworthiness

2.6.1 Owner's continuing airworthiness responsibilities

2.6.1.1 The owner of an aeroplane shall ensure that, in accordance with procedures acceptable to the CAAM:

- a) the aeroplane is maintained in an airworthy condition;
- b) the operational and emergency equipment necessary for an intended flight is serviceable; and
- c) the certificate of airworthiness of the aeroplane remains valid.

2.6.1.2 The owner shall not operate an aeroplane unless maintenance on the aeroplane, including any associated engine, propeller and part, is carried out by an organisation complying with CAD 8, Part II, Chapter 6 that is approved by the CAAM and there is a maintenance release in relation to the maintenance carried out.

2.6.1.3 *RESERVED*

2.6.1.4 The owner shall ensure that the maintenance of the aeroplane is performed in accordance with a maintenance programme acceptable to the CAAM.

Note 1. – Refer CAD 6801 Continuing Airworthiness of Aircraft (CAAM Part M)

Note 2. – Refer CAD 6802 Continuing Airworthiness Management Organisation (CAAM Part M Subpart G).

2.6.2 Continuing Airworthiness Records

2.6.2.1 The owner of an aeroplane shall ensure that the following records are kept for the periods mentioned in 2.6.2.2:

- a) the total time in service (hours, calendar time and cycles, as appropriate) of the aeroplane and all life-limited components;
- b) the current status of compliance with all applicable mandatory continuing airworthiness information;
- c) appropriate details of modifications and repairs;
- d) the time in service (hours, calendar time and cycles, as appropriate) since the last overhaul of the aeroplane or its components subject to a mandatory overhaul life;
- e) the current status of the aeroplane's compliance with the maintenance programme; and

- f) the detailed maintenance records to show that all requirements for the signing of a maintenance release have been met.

2.6.2.2 The records in 2.6.2.1 a) to f) shall be kept for a minimum period of 12 months after the unit to which they refer has been permanently withdrawn from service.

2.6.2.3 In the event of a temporary change of owner, the records shall be made available to the new owner. In the event of any permanent change of owner, the records shall be transferred to the new owner.

2.6.2.4 Records kept and transferred in accordance with 2.6.2 shall be maintained in a form and format that ensures readability, security and integrity of the records at all times.

2.6.3 **Modifications and repairs**

All modifications and repairs shall comply with airworthiness requirements acceptable to the State of Registry. Procedures shall be established to ensure that the substantiating data supporting compliance with the airworthiness requirements are retained.

2.6.4 **Maintenance release**

2.6.4.1 When maintenance is carried out by an approved maintenance organisation, the maintenance release shall be issued by the approved maintenance organisation in accordance with the provisions of CAD 8, Part II, 6.8.

2.6.4.2 *RESERVED*

2.6.4.3 *RESERVED*

2.7 **Aeroplane flight crew**

2.7.1 **Composition of the flight crew**

The number and composition of the flight crew shall not be less than that specified in the flight manual or other documents associated with the certificate of airworthiness.

2.7.2 **Qualifications**

2.7.2.1 The pilot-in-command shall:

- a) ensure that each flight crew member holds a valid licence issued by the CAAM, or if issued by another Contracting State, rendered valid by the CAAM, in accordance with CAD 1 – PEL;
- b) ensure that flight crew members are properly rated in accordance with CAD 1 – PEL; and
- c) be satisfied that flight crew members have maintained competency.

2.7.2.2 The pilot-in-command of an aeroplane equipped with an airborne collision avoidance system (ACAS II) shall ensure that each flight crew member has been appropriately trained to competency in the use of ACAS II equipment and the avoidance of collision.

Note 1.— Procedures for the use of ACAS II equipment are specified in the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, ICAO Doc 8168), Volume I — Flight Procedures. ACAS II Training Guidelines for Pilots are provided in PANS-OPS, Volume I, Attachment A to Part III, Section 3, Chapter 3.

Note 2.— Appropriate training, to the satisfaction of the State, to competency in the use of ACAS II equipment and the avoidance of collisions may be evidenced, for example, by:

- a) *possession of a type rating for an aeroplane equipped with ACAS II, where the operation and use of ACAS II are included in the training syllabus for the type rating; or*
- b) *possession of a document issued by a training organisation or person approved by the State to conduct training for pilots in the use of ACAS II, indicating that the holder has been trained in accordance with the guidelines referred to in Note 1; or*
- c) *a comprehensive pre-flight briefing by a pilot who has been trained in the use of ACAS II in accordance with the guidelines referred to in Note 1.*

2.8 Manual, log and records

Note.— The following documents are associated with this CAD but are not included in this chapter: Maintenance records — see 2.6.2.

2.8.1 Flight manual

Note.— The aeroplane flight manual contains the information specified in CAD 8.

The aeroplane flight manual shall be updated by implementing changes made mandatory by the CAAM.

2.8.2 Journey log book

2.8.2.1 A journey log book shall be maintained for every aeroplane engaged in air navigation in which shall be entered particulars of the aeroplane, its crew and each journey.

2.8.2.2 The aeroplane journey log shall contain the following items:

- a) aeroplane nationality and registration;
- b) date;
- c) flight crew member names and duty assignments;
- d) departure and arrival points and times;
- e) purpose of flight;

- f) observations regarding the flight; and
- g) signature of the pilot-in-command.

2.8.3 **Records of emergency and survival equipment carried**

The owner of the aeroplane shall at all times have available for immediate communication to rescue coordination centres, lists containing information on the emergency and survival equipment carried on board the aeroplane engaged in international air navigation. The information shall include, as applicable, the number, colour and type of life rafts and pyrotechnics, details of emergency medical supplies, water supplies and the type and frequencies of the emergency portable radio equipment.

2.9 **Security**

2.9.1 **Security of aircraft**

The pilot-in-command shall be responsible for the security of the aircraft during its operation.

2.9.2 **Reporting acts of unlawful interference**

Following an act of unlawful interference, the pilot-in-command shall submit a report without delay of such an act to the designated local authority and the CAAM.

Note.— In the context of this chapter, the word “security” is used in the sense of prevention of acts of unlawful interference against civil aviation.

Appendix 2.1 – Lights To Be Displayed By Aeroplanes

Note. – Chapter 2.4, 2.4.8, refers

1. TERMINOLOGY

When the following terms are used in this Appendix, they have the following meanings:

Angles of coverage.

- a) Angle of coverage A is formed by two intersecting vertical planes making angles of 70 degrees to the right and 70 degrees to the left respectively, looking aft along the longitudinal axis to a vertical plane passing through the longitudinal axis.
- b) Angle of coverage F is formed by two intersecting vertical planes making angles of 110 degrees to the right and 110 degrees to the left respectively, looking forward along the longitudinal axis to a vertical plane passing through the longitudinal axis.
- c) Angle of coverage L is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the aeroplane, and the other 110 degrees to the left of the first, when looking forward along the longitudinal axis.
- d) Angle of coverage R is formed by two intersecting vertical planes, one parallel to the longitudinal axis of the aeroplane, and the other 110 degrees to the right of the first, when looking forward along the longitudinal axis.

Horizontal plane. The plane containing the longitudinal axis and perpendicular to the plane of symmetry of the aeroplane.

Longitudinal axis of the aeroplane. A selected axis parallel to the direction of flight at a normal cruising speed, and passing through the centre of gravity of the aeroplane.

Making way. An aeroplane on the surface of the water is “making way” when it is under way and has a velocity relative to the water.

Under command. An aeroplane on the surface of the water is “under command” when it is able to execute manoeuvres as required by the International Regulations for Preventing Collisions at Sea for the purpose of avoiding other vessels.

Under way. An aeroplane on the surface of the water is “under way” when it is not aground or moored to the ground or to any fixed object on the land or in the water.

Vertical planes. Planes perpendicular to the horizontal plane.

Visible. Visible on a dark night with a clear atmosphere.

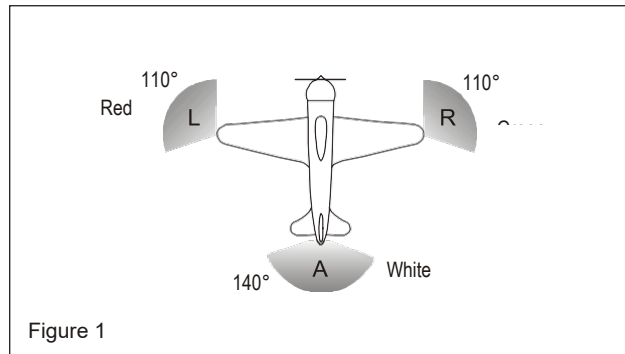
2. NAVIGATION LIGHTS TO BE DISPLAYED IN THE AIR

Note.— The lights specified herein are intended to meet the requirements of CAD 2 for navigation lights.

As illustrated in Figure 1, the following unobstructed navigation lights shall be displayed:

- a) a red light projected above and below the horizontal plane through angle of coverage L;

- b) a green light projected above and below the horizontal plane through angle of coverage R;
- c) a white light projected above and below the horizontal plane rearward through angle of coverage A.



3. LIGHTS TO BE DISPLAYED ON THE WATER

3.1 General

Note.— The lights specified herein are intended to meet the requirements of CAD 2 for lights to be displayed by aeroplanes on the water.

The International Regulations for Preventing Collisions at Sea require different lights to be displayed in each of the following circumstances:

- a) when under way;
- b) when towing another vessel or aeroplane
- c) when being towed;
- d) when not under command and not making way;
- e) when making way but not under command;
- f) when at anchor;
- g) when aground.

The lights required by aeroplanes in each case are described below.

As illustrated in Figure 2, the following appearing as steady, unobstructed lights:

- a) a red light projected above and below the horizontal through angle of coverage L;
- b) a green light projected above and below the horizontal through angle of coverage R;
- c) a white light projected above and below the horizontal through angle of coverage A; and

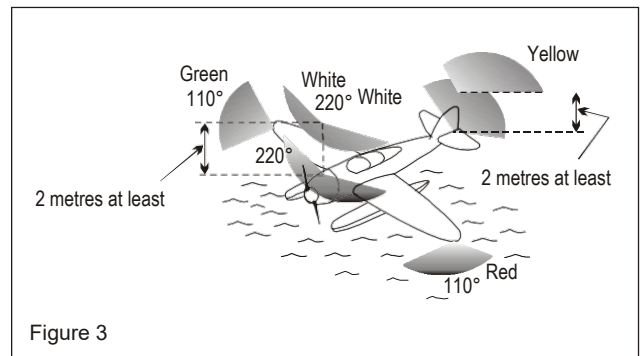
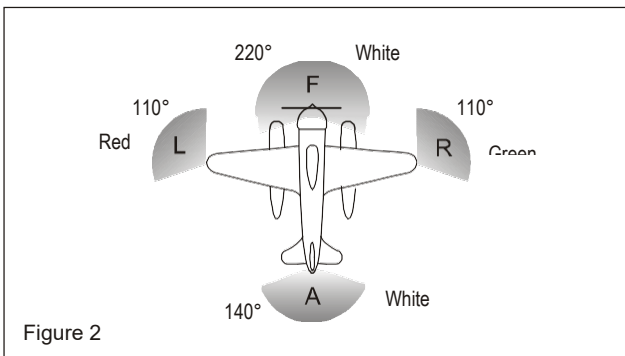
- d) a white light projected through angle of coverage F.

The lights described in a), b) and c) should be visible at a distance of at least 3.7 km (2 NM). The light described in d) should be visible at a distance of 9.3 km (5 NM) when fitted to an aeroplane of 20 m or more in length or visible at a distance of 5.6 km (3 NM) when fitted to an aeroplane of less than 20 m in length.

3.3 When towing another vessel or aeroplane

As illustrated in Figure 3, the following appearing as steady, unobstructed lights:

- a) the lights described in 3.2;
- b) a second light having the same characteristics as the light described in 3.2 d) and mounted in a vertical line at least 2 m above or below it; and
- c) a yellow light having otherwise the same characteristics as the light described in 3.2 c) and mounted in a vertical line at least 2 m above it.



3.4 When being towed

The lights described in 3.2 a), b) and c) appearing as steady, unobstructed lights.

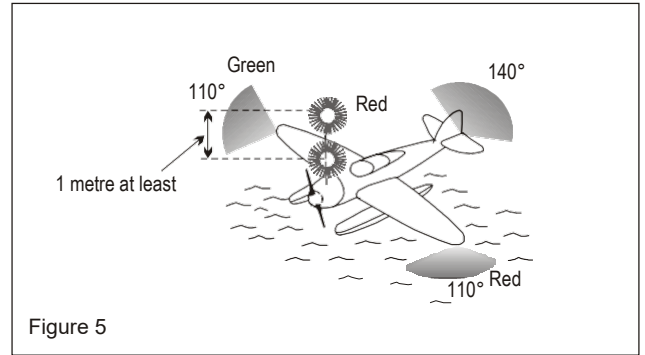
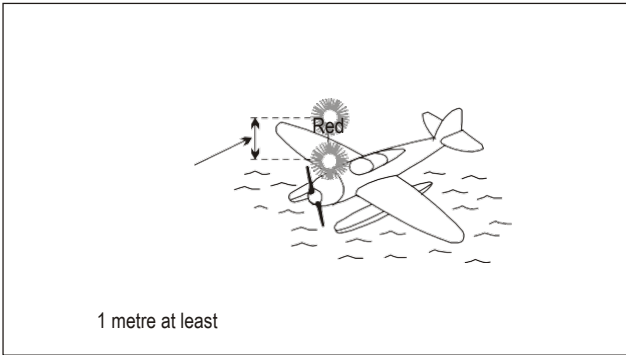
3.5 When not under command and not making way

As illustrated in Figure 4, two steady red lights placed where they can best be seen, one vertically over the other and not less than 1 m apart, and of such a character as to be visible all around the horizon at a distance of at least 3.7 km (2 NM).

3.6 When making way but not under command

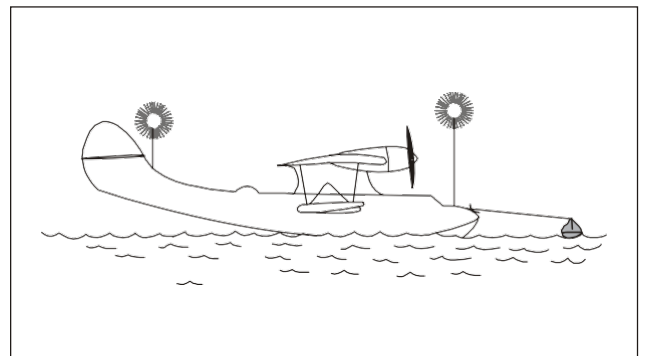
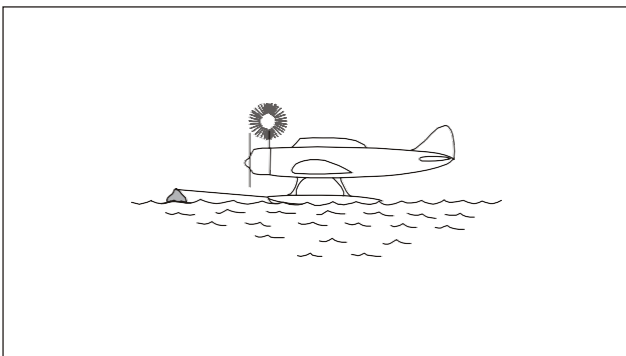
As illustrated in Figure 5, the lights described in 3.5 plus the lights described in 3.2 a), b) and c).

Note.— The display of lights prescribed in 3.5 and 3.6 is to be taken by other aircraft as signals that the aeroplane showing them is not under command and cannot therefore get out of the way. They are not signals of aeroplanes in distress and requiring assistance.



3.7 When at anchor

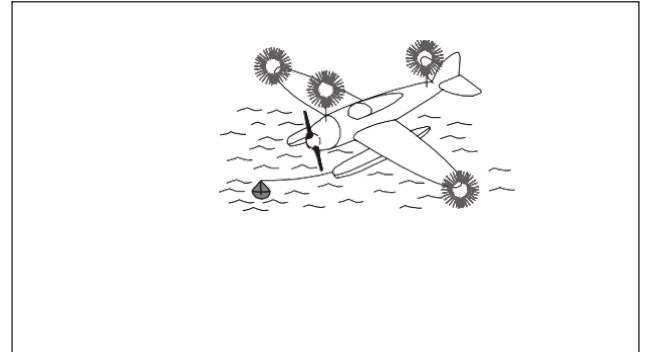
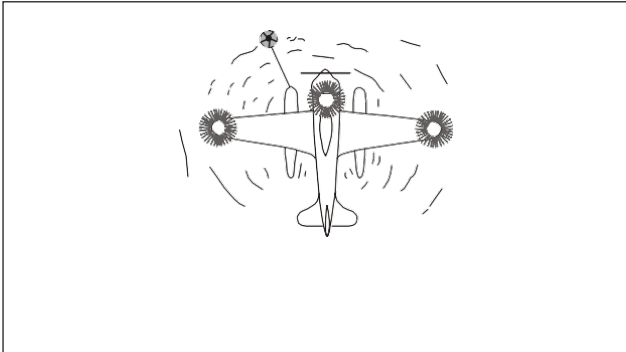
- a) If less than 50 m in length, where it can best be seen, a steady white light (Figure 6), visible all around the horizon at a distance of at least 3.7 km (2 NM).
- b) If 50 m or more in length, where they can best be seen, a steady white forward light and a steady white rear light (Figure 7) both visible all around the horizon at a distance of at least 5.6 km (3 NM).



- c) If 50 m or more in span a steady white light on each side (Figures 8 and 9) to indicate the maximum span and visible, so far as practicable, all around the horizon at a distance of at least 1.9 km (1 NM).

3.8 When aground

The lights prescribed in 3.7 and in addition two steady red lights in vertical line, at least 1 m apart so placed as to be visible all around the horizon.





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Appendix 2.2 – Altimetry System Performance Requirements For Operations In RVSM Airspace

Note. – Chapter 2.5, 2.5.2.8, refers

1. In respect of groups of aeroplanes that are nominally of identical design and build with respect to all details that could influence the accuracy of height-keeping performance, the height-keeping performance capability shall be such that the total vertical error (TVE) for the group of aeroplanes shall have a mean no greater than 25 m (80 ft) in magnitude and shall have a standard deviation no greater than $28 - 0.013z^2$ for $0 \leq z \leq 25$ when z is the magnitude of the mean TVE in metres, or $92 - 0.004z^2$ for $0 \leq z \leq 80$ where z is in feet. In addition, the components of TVE shall have the following characteristics:
 - a) the mean altimetry system error (ASE) of the group shall not exceed 25 m (80 ft) in magnitude;
 - b) the sum of the absolute value of the mean ASE and of three standard deviations of ASE shall not exceed 75 m (245 ft); and
 - c) the differences between cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.

2. In respect of aeroplanes for which the characteristics of the airframe and altimetry system fit are unique and so cannot be classified as belonging to a group of aeroplanes encompassed by paragraph 1, the height-keeping performance capability shall be such that the components of the TVE of the aeroplane have the following characteristics:
 - a) the ASE of the aeroplane shall not exceed 60 m (200 ft) in magnitude under all flight conditions; and
 - b) the differences between the cleared flight level and the indicated pressure altitude actually flown shall be symmetric about a mean of 0 m, with a standard deviation no greater than 13.3 m (43.7 ft), and in addition, the decrease in the frequency of differences with increasing difference magnitude shall be at least exponential.



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Appendix 2.3 – Flight Recorders

Note. – Chapter 2.4, 2.4.16, refers

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),
- 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),
- a data link recording system (DLRS).

1. General Requirements

- 1.1 Non-deployable flight recorder containers shall be painted a distinctive orange colour.
- 1.2 Non-deployable crash-protected flight recorder containers shall:
 - a) carry reflective material to facilitate their location; and
 - b) have securely attached an automatically activated underwater locating device operating at a frequency of
 - c) 37.5 kilohertz (kHz). At the earliest practical date, but not later than 1 January 2018, this device shall operate for a minimum of 90 days.
- 1.3 *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.
- 1.4 The flight recorder systems shall be installed so that:
 - a) the probability of damage to the recordings is minimised;
 - b) there is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and
 - c) if the flight recorder systems have an erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact; and

- d) aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2023, a flight crew-operated erase function shall be provided on the flight deck which, when activated, modifies the recording of a CVR and AIR so that it cannot be retrieved using normal replay or copying techniques. The installation shall be designed to prevent activation during flight. In addition, the probability of an inadvertent activation of an erase function during an accident shall also be minimised.

Note.— The erase function is intended to prevent access to CVR and AIR recordings by normal replay or copying means, but would not prevent accident investigation authorities access to such recordings by specialised replay or copying techniques.

- 1.5 The flight recorder systems shall be installed so that they receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardising service to essential or emergency loads.
- 1.6 The flight recorder systems, when tested by methods approved by the CAAM, shall be demonstrated to be suitable for the environmental extremes over which they are designed to operate.
- 1.7 Means shall be provided for an accurate time correlation between the recorder systems recordings.
- 1.8 The manufacturer shall provide the CAAM with the following information in respect of the flight recorder 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) And Aircraft Data Recording System (ADRS)

2.1 Start and stop logic

The FDR or ADRS 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 The parameters that satisfy the requirements for FDRs are listed in Table A2.3-1. 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 If further FDR 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 centralised 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 autoflight 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;
 - 3) warnings and alerts; and
 - 4) the identity of displayed pages for emergency procedures and checklists;
- b) retardation information including brake application for use in the investigation of landing overruns and rejected take-offs.

2.2.2.3 The parameters that satisfy the recommendations 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 (*) are to 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*

2.2.4 The parameters that satisfy the requirements for ADRS are listed in Table A2.3-3.

2.3 Additional information

2.3.1 The measurement range, recording interval and accuracy of parameters on installed equipment shall be verified by methods approved by CAAM.

2.3.2 Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator/owner. The documentation shall 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 Start and stop logic

The CVR or 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 or 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.

3.2 Signals to be recorded

3.2.1 The CVR shall record simultaneously 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) digital communications with ATS, unless recorded by the FDR.

3.2.2 The preferred CVR audio allocation should be as follows:

- a) pilot-in-command audio panel;
- b) co-pilot audio panel;
- c) additional flight crew positions and time reference; and
- d) cockpit area microphone.

3.2.3 The CARS shall record simultaneously 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.

3.2.4 The preferred CARS audio allocation should be as follows:

- a) voice communication; and
- b) aural environment on the flight deck.

4 Airborne Image Recorder (AIR) And Airborne Image Recording System (AIRS)

4.1 Start and stop logic

The AIR or AIRS 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 AIR or AIRS 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.

4.2 Classes

- 4.2.1 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.

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

- 4.2.3 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.

5 Data Link Recorder (DLR)

5.1 Applications to be recorded

- 5.1.1 Where the aircraft flight path is authorised 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 in Table A2.3-2 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.

6 Inspections Of Flight Recorder Systems

- 6.1 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.

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

- 6.3 Recording 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 recording 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) the FDR or ADRS recording from a complete flight 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.
- 6.4 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.
- 6.5 A report of the recording inspection shall be made available on request to the CAAM for monitoring purposes.
- 6.6 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.



Appendix 2.4 – General Aviation Specific Approvals

Note. – Chapter 2.1, 2.1.4, refers

1. PURPOSE AND SCOPE

- 1.1 Specific approvals are included in the Certificate of Approval and contains the all the specific approvals issued to the holder.

Note.— *When the operations to be conducted require a specific approval, a copy of the document(s) needs to be carried on board (see 2.4.2.2).*



2. SPECIFIC APPROVAL TEMPLATE

SPECIFIC APPROVAL				
ISSUING AUTHORITY and CONTACT DETAILS¹				
Issuing Authority ¹ _____				
Address _____				
Signature: _____		Date ² : _____		
Telephone: _____		Fax: _____		Email: _____
OWNER/OPERATOR				
Name ³ : _____		Address: _____		
Telephone: _____		Fax: _____		Email: _____
Aircraft model ⁴ and registration marks:				
SPECIFIC APPROVAL	YES	NO	DESCRIPTION ⁵	REMARKS
Low visibility operations				
Approach and landing	<input type="checkbox"/>	<input type="checkbox"/>	CAT ⁶ : _____ RVR: _____m DH: _____ft	
Take-off	<input type="checkbox"/>	<input type="checkbox"/>	RVR ⁷ : _____m	
Operational credit(s)	<input type="checkbox"/>	<input type="checkbox"/>	⁸	
RVSM	<input type="checkbox"/>	<input type="checkbox"/>		
AR navigation specifications for PBN operations	<input type="checkbox"/>	<input type="checkbox"/>	⁹	
Other ¹⁰	<input type="checkbox"/>	<input type="checkbox"/>		

Notes.—

1. Civil Aviation Authority name and contact details, including the telephone country code and email if available.
2. Issuance date of the specific approval (dd-mm-yyyy) and signature of the authority representative.
3. Owner or operator's name and address.
4. Insert the aeroplane make, model and series, or master series, if a series has been designated. The CAST/ICAO taxonomy is available at: <http://www.intlaviationstandards.org/>.
5. List in this column the most permissive criteria for each approval or the approval type (with appropriate criteria).
6. Insert the applicable precision approach category (CAT II, IIIA, IIIB or IIIC). Insert the minimum RVR in metres and decision height in feet. One line is used per listed approach category.
7. Insert the approved minimum take-off RVR in metres. One line per approval may be used if different approvals are granted.
8. List the airborne capabilities (i.e. automatic landing, HUD, EVS, SVS, CVS) and associated operational credit(s) granted.
9. Performance-based navigation (PBN): one line is used for each PBN AR navigation specification approval (e.g. RNP AR APCH), with appropriate limitations listed in the "Description" column.
10. Other specific approvals or data can be entered here, using one line (or one multi-line block) per approval (e.g. specific approach operations approval, MNPS).

Attachment 2.A – Carriage And Use Of Oxygen

Note. – Supplementary to 2.2.3.8

INTRODUCTION

The performance of crew members and the well-being of passengers during flights at such altitudes where a lack of oxygen might result in impairment of faculties are of major concern. Research conducted in altitude chambers or by exposure to mountain elevations indicates that human tolerance could be related to the altitude concerned and the exposure time. The subject is dealt with in detail in the Manual of Civil Aviation Medicine (ICAO Doc 8984). In light of the above and to further assist the pilot-in-command in providing the oxygen supply intended by 2.2.3.8 of this CAD, the following guidelines, which take into account the requirements already established in CAD 6, Part I, are considered relevant.

1 OXYGEN SUPPLY

- 1.1 A flight to be operated at altitudes at which the cabin pressure altitude in personnel compartments will be more than 10 000 ft should not be commenced unless sufficient stored breathing oxygen is carried to supply:
- a) all crew members and at least 10 per cent of the passengers for any period in excess of 30 minutes that the cabin pressure altitude in compartments occupied by them will be between 10 000 ft and 13 000 ft and
 - b) all crew members and passengers for any period that the cabin pressure altitude in compartments occupied by them will be more than 13 000 ft.
- 1.2 A flight to be operated with a pressurised aeroplane should not be commenced unless a sufficient quantity of stored breathing oxygen is carried to supply all crew members and passengers, as is appropriate to the circumstances of the flight being undertaken, in the event of loss of pressurisation, for any period that the cabin pressure altitude in any compartment occupied by them would be more than 10 000 ft. In addition, when an aeroplane is operated at flight altitudes at which the pressure altitude is more than 25 000 ft, or which, if operated at flight altitudes at which the pressure altitude is less than 25 000 ft and cannot descend safely within four minutes to a flight altitude at which the pressure altitude is equal to 13 000 ft, there shall be no less than a 10-minute supply for the occupants of the passenger compartment.

2 USE OF OXYGEN

- 2.1 All flight crew members, when engaged in performing duties essential to the safe operation of an aeroplane in flight, should use breathing oxygen continuously whenever the circumstances prevail for which its supply has been indicated to be necessary in 1.1 or 1.2.
- 2.2 All flight crew members of pressurised aeroplanes operating above an altitude where the pressure altitude is more than 25 000 ft should have available at the flight duty station a quick donning type of mask which will readily supply oxygen upon demand.

Note.— Approximate altitudes in the Standard Atmosphere corresponding to the values of absolute pressure used in the text are as follows:

Absolute pressure	Metres	Feet
700 hPa	3 000	10 000



<i>620 hPa</i>	<i>4 000</i>	<i>13 000</i>
<i>376 hPa</i>	<i>7 600</i>	<i>25 000</i>

Attachment 2.B – Automatic Landing Systems, Head-Up Display (HUD) Or Equivalent Displays And Vision Systems

Note. – Supplementary to 2.2.2.2 and 2.4.15

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 aircraft 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 to 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 State of Registry.

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 a HUD.

Note 4.— More detailed information and guidance on automatic landing systems, HUD or equivalent displays and vision systems are contained in the Manual of All-Weather Operations (ICAO 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 primary flight displays if certified for this purpose.

1.2.3 An approval 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 Registry. 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 (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 (ICAO 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 Registry 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 the 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.

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 the specific approval by the State of Registry. 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.

EVS OPERATIONS

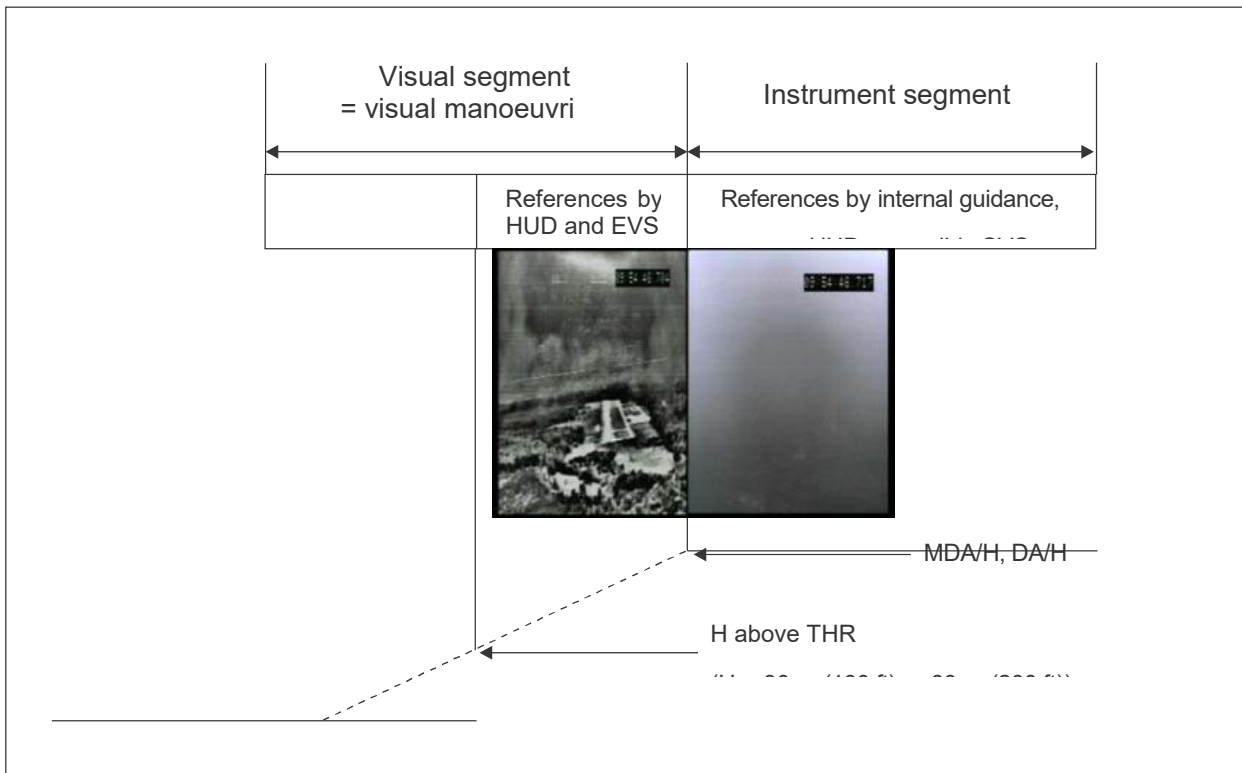


Figure 2.B-1. EVS operations — transition from instrument to visual references

2.4 Vision systems training

Training and recent experience requirements should be established by the State of Registry. Training should address all flight operations for which the vision system is used.

2.5.1 Visual references

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 the vision system until a certain height during the approach as described in 2.3.2.

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* (ICAO 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 systems in the hybrid system normally enhances the performance of the system. The *Manual of All-Weather Operations* (ICAO 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 aircraft equipment and on-ground infrastructure should be taken into account. Better equipped aircraft 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 aircraft. 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 the criteria for aerodrome operating minima were originally established.

- 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 with aircraft 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 that may be prescribed by the State of the Aerodrome.

5 Operational Procedures

In accordance with Chapter 2.4, 2.4.15.2, 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 Registry.

- 6.1.1 The operator that wishes to conduct operations with an automatic landing system, a HUD or equivalent display, vision system or hybrid system will need to meet certain criteria and, in some instances, obtain specific approvals (see Chapter 2.2, 2.2.2.2 and Chapter 2.4, 2.4.15). The extent of the approvals will depend on the intended operation and the complexity of the equipment.
- 6.1.2 Systems may be used to improve situational awareness without a specific approval. However, the standard operating procedures for these systems should be specified in the operations manual or equivalent document. 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 aircraft 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 aircraft systems. In some cases, modifications to these normal procedures for other aircraft systems or equipment may be necessary to ensure compatibility.

- 6.1.3 Chapter 2.2, 2.2.2.2.1.1 states that operational credits based on 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 specifically approved.
- 6.1.4 The Standard in Chapter 2.4, 2.4.15 requires the State of Registry to establish criteria for 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 “for the safe operation of an aeroplane” and specifies such criteria. When operational credits are granted by the State of Registry as per the Standard in Chapter 2.2, 2.2.2.2.1.1, the use of that system becomes essential for the safety of those operations and approval of the use of such systems is part of the operational credit 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.
- 6.1.5 Any operational credit that has been granted should be reflected in the specific approval template and be carried on board the particular aeroplane.

6.2 Specific approvals for operational credit

6.2.1 To obtain operational credit the operator will need to specify the desired operational credit and submit an application in accordance with Chapter 2.1, 2.1.4. The content of a suitable application should include:

- a) Applicant details. The official name and any business or trading name(s), address, mailing address, email address and contact telephone/fax numbers of the applicant.
- 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 (ICAO Doc 9365). The compliance list should include the information that is relevant to the 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 (ICAO 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 (or an equivalent document) entries including MEL (where applicable) and standard operating procedures;



- f) safety risk assessment;
- g) training programmes; and
- h) continuing airworthiness.

Expanded guidance on these items is contained in the Manual of All-Weather Operations (ICAO Doc 9365).

Attachment 2.C – Guide To Current Flight Recorder Provisions

Note. – Supplementary to Chapter 2, 2.4.16

INTRODUCTION

Since 1973, and the inclusion in CAD 6 of SARPs for the carriage of flight recorders, new and revised requirements were introduced concerning flight recorders. These amendments include an update of the provisions pertaining to flight recorders, recording of digital communications, FDR requirements for new aircraft, revised parameter listings, and two-hour duration CVRs. Through the years, the applicability date and the carriage of flight recorders to be installed, as defined by the SARPs, were complex.

The tables below summarise the current flight recorders carriage requirements.

Table A2.C-1. SARPs for the recording of flight parameters

	Maximum certificated take-off mass (MCTOM)
Date	5 700 kg and below
	All turbine-engined aeroplanes with more than five passengers – first certificate of airworthiness
2016 ⇒	2.4.16.1.1.1

Table A2.C-2 CVR/CARS installation SARPs

	Maximum certificated take-off mass (MCTOM)
Date	5 700 kg and below
	All turbine-engined aeroplanes with more than five passengers required to be operated by more than one pilot – first certificate of airworthiness
2016 ⇒	2.4.16.2.1



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3 Large and Turbojet Aeroplanes

3.1 Applicability

3.1.1 The following operations shall be subject to the Standards of Chapter 2 and Chapter 3 this CAD:

- a) aeroplanes with a maximum certificated take-off mass exceeding 5 700 kg; or
- b) aeroplanes equipped with one or more turbojet engines.

3.1.2 An operation involving an aeroplane with a seating configuration of more than 9 passenger seats shall be conducted in accordance with Chapter 3.

Note.— The applicability of 3.1 does not preclude a general aviation operator from satisfying the requirements of Chapter 3 where it may be to the operator's advantage.

3.2 Corporate aviation operations

3.2.1 A corporate aviation operation involving three or more aircraft that are operated by pilots employed for the purpose of flying the aircraft shall be conducted in accordance with Chapter 3.

Note.— The term “aircraft” is used to indicate that a corporate aviation operation using a mix of aeroplanes and helicopters is subject to this Standard as long as at least one aeroplane is involved.

3.3 General

3.3.1 Compliance with laws, regulations and procedures

3.3.1.1 The operator shall ensure that all employees know that they must comply with the laws, regulations and procedures of those States in which operations are conducted.

Note.— Information for pilots on flight procedure parameters and operational procedures is contained in PANS-OPS (ICAO Doc 8168), Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS (ICAO Doc 8168), Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons.

3.3.1.2 The operator shall ensure that all pilots are familiar with the laws, regulations and procedures, pertinent to the performance of their duties, prescribed for the areas to be traversed, the aerodromes to be used and the air navigation facilities relating thereto. The operator shall ensure that other members of the flight crew are familiar with such of these laws, regulations and procedures as are pertinent to the performance of their respective duties in the operation of the aeroplane.

- 3.3.1.3 The pilot-in-command is responsible for operational control. The operator shall describe the operational control system in the operations manual and identify the roles and responsibilities of those involved with the system.

Note.— The rights and obligations of a State in respect to the operation of aeroplanes registered in that State are not affected by this provision.

- 3.3.1.4 The operator shall ensure that the pilot-in-command has available on board the aeroplane all the essential information concerning the search and rescue services in the area over which the aeroplane will be flown. This information may be made available to the pilot by means of the operations manual or such other means as is considered appropriate.

- 3.3.1.5 The operator shall ensure that flight crew members demonstrate the ability to speak and understand the language used for aeronautical radiotelephony communications as specified in CAD 1.

3.3.2 **Safety management**

- 3.3.2.1 CAAM does not allow the use of recordings or transcripts of CVR, CARS, Class A AIR and Class A AIRS for purposes other than the investigation of an accident or incident as per CAD 13, except where the recordings or transcripts are:

- a) related to a safety-related event identified in the context of a safety management system; are restricted to the relevant portions of a de-identified transcript of the recording; and are subject to protection of safety data;
- b) sought for use in criminal proceedings not related to an event involving an accident or incident investigation and are subject to the protection of safety data; or
- c) used for inspections of flight recorder systems as provided in Section 7 of Appendix 2.3.

Note.— When an investigation under CAD 13 is instituted, investigation records are subject to the protections accorded by CAD 13.

- 3.3.2.2 CAAM does not allow the use of recordings or transcripts of FDR, ADRS, Class B and C AIR, and Class B and C AIRS for purposes other than the investigation of an accident or incident as per CAD 13, except where the recordings or transcripts are subject to the protections accorded by CAD 19 and are:

- a) used by the operator for airworthiness or maintenance purposes;
- b) sought for use in proceedings not related to an event involving an accident or incident investigation;
- c) de-identified; or
- d) disclosed under secure procedures.

3.4 Flight Operations

3.4.1 Operating facilities

3.4.1.1 The operator shall ensure that a flight will not be commenced unless it has been ascertained by every reasonable means available that the ground and/or water facilities including communication facilities and navigation aids available and directly required on such flight, for the safe operation of the aeroplane, are adequate for the type of operation under which the flight is to be conducted.

Note.— “Reasonable means” in this Standard is intended to denote the use, at the point of departure, of information available to the operator either through official information published by the aeronautical information services or readily obtainable from other sources.

3.4.2 Operational management

3.4.2.1 Operator notification

3.4.2.1.1 If the operator has an operating base in a State other than Malaysia, the operator shall notify the CAAM in which the operating base is located.

3.4.2.1.2 Upon notification in accordance with 3.4.2.1.1, safety and security oversight shall be coordinated between the State in which the operating base is located and the CAAM.

3.4.2.2 Operations manual

3.4.2.2.1 The operator shall provide, for the use and guidance of personnel concerned, an operations manual containing all the instructions and information necessary for operations personnel to perform their duties. The operations manual shall be amended or revised as is necessary to ensure that the information contained therein is kept up to date. All such amendments or revisions shall be issued to all personnel that are required to use this manual.

Note 1. – The basis for the development of an operations manual may reference the Standards published in Appendix 2 of the CAD 6 Part 1, as applicable.

Note 2.— Attachment 3.A contains guidance on the organisation and content of an operations manual.

3.4.2.3 Operating instructions — general

3.4.2.3.1 The operator shall ensure that all operations personnel are properly instructed in their particular duties and responsibilities and the relationship of such duties to the operation as a whole.

3.4.2.3.2 The operator shall issue operating instructions and provide information on aeroplane climb performance with all engines operating to enable the pilot-

in-command to determine the climb gradient that can be achieved during the departure phase for the existing take-off conditions and intended take-off technique. This information shall be included in the operations manual.

3.4.2.4 In-flight simulation of emergency situations

3.4.2.4.1 The operator shall ensure that when passengers are being carried, no emergency or abnormal situations shall be simulated.

3.4.2.5 Checklists

3.4.2.5.1 Checklists shall be used by flight crews prior to, during and after all phases of operations, and in emergencies, to ensure compliance with the operating procedures contained in the aircraft operating manual and the aeroplane flight manual or other documents associated with the certificate of airworthiness and otherwise in the operations manual. The design and utilisation of checklists shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683).

3.4.2.6 Minimum flight altitudes

3.4.2.6.1 The operator shall specify, for flights which are to be conducted in accordance with the instrument flight rules, the method of establishing terrain clearance altitudes.

3.4.2.7 Aerodrome operating minima

3.4.2.7.1 The operator shall establish aerodrome operating minima, in accordance with criteria specified by the CAAM, for each aerodrome to be used in operations. Such minima shall not be lower than any that may be established for such aerodromes by the State of the Aerodrome, except when specifically approved by that State.

Note.— This Standard does not require the State of the Aerodrome to establish aerodrome operating minima

3.4.2.7.2 When establishing an aerodrome operating minima, the operator shall take the following into account:

- a) the type, performance and handling characteristics of the aircraft;
- b) the composition, competence and experience of the flight crew;
- c) the dimensions and characteristics of the runways that may be selected for use;
- d) the adequacy and performance of the available visual and non-visual ground aids;

- e) the equipment available in the aircraft for the purpose of navigation and/or control of the flight path, during the take-off, the approach, the flare, the landing, the rollout and the missed approach;
- f) the obstacles in the approach, the missed approach and the climb-out areas necessary for the execution of contingency procedures;
- g) the obstacle clearance altitude/height for the instrument approach procedures;
- h) the means to determine and report meteorological conditions; and
- i) the flight technique to be used during the final approach.

3.4.2.7.3 The minima for a specific type of approach and landing procedure shall only be used if all the following conditions are met:

- a) the ground equipment required for the intended procedure is operative;
- b) the aircraft systems required for the type of approach are operative;
- c) the required aircraft performance criteria are met; and
- d) the crew is qualified appropriately.

3.4.2.7.4 Aerodrome Operating minima – NPA, APV, CAT 1 operations

- e) The decision height (DH) to be used for a non-precision approach (NPA) flown with the continuous descent final approach (CDFA) technique, approach procedure with vertical guidance (APV) or category I (CAT I) operation shall not be lower than the highest of:
 - 1) the minimum height to which the approach aid can be used without the required visual reference;
 - 2) the obstacle clearance height (OCH) for the category of aircraft;
 - 3) the published approach procedure DH where applicable;
 - 4) the system minimum specified in Table 1; or
 - 5) the minimum DH specified in the AFM or equivalent document, if stated.
- f) The minimum descent height (MDH) for an NPA operation flown without the CDFA technique shall not be lower than the highest of:
 - 1) the OCH for the category of the aircraft;
 - 2) the system minimum specified in Table 1; or
 - 3) the minimum MDH specified in the AFM, if stated.

Table 1

System minima

Facility	Lowest DH/MDH (ft)
Instrument landing system (ILS)	200
Global navigation satellite system (GNSS) / Satellite-based augmentation system (SBAS) (Lateral precision with vertical guidance approach (LPV))	200
GNSS (Lateral Navigation (LNAV))	250
GNSS / Baro-vertical navigation (VNAV) (LNAV/VNAV)	250
Localiser (LOC) with or without distance measuring equipment (DME)	250
Surveillance radar approach (SRA) (terminating at ½ NM)	250
SRA (terminating at 1NM)	300
SRA (terminating at 2NM or more)	350
VHF omnidirectional radio range (VOR)	300
VOR/DME	250
Non-directional beacon (NDB)	350
NDB/DME	300
VHF direction finder (VDF)	350

3.4.2.7.5 Aerodrome operating minima – circling operations with aeroplanes

- g) The MDH for a circling operation with aeroplanes shall not be lower than the highest of:
 - 1) the published circling OCH for the aeroplane category;
 - 2) the minimum circling height derived from Table 1; or
 - 3) the DH/MDH of the preceding instrument approach procedure.
- h) The minimum visibility for a circling operation with aeroplanes shall be the highest of:
 - 1) the circling visibility for the aeroplane category, if published;
 - 2) the minimum visibility derived from Table 1; or
 - 3) the runway visual range/converted meteorological visibility (RVR/CMV) of the preceding instrument approach procedure.

Table 1

MDH and minimum visibility for circling vs. aeroplane category

	Aeroplane category			
	A	B	C	D
MDH (ft)	400	500	600	700
Minimum meteorological visibility (m)	1500	1600	2400	3600

3.4.2.8 Fatigue management programme

- 3.4.2.8.1 The operator shall establish and implement a fatigue management programme that ensures that all operator personnel involved in the operation and maintenance of aircraft do not carry out their duties when fatigued. The programme shall address flight and duty times and be included in the operations manual.

Note.— Guidance on fatigue management programmes can be found in the Fatigue Management Manual for General Aviation (ICAO Doc 10033) and CAD 1901 – FTL.

3.4.2.9 Passengers

- 3.4.2.9.1 The operator shall ensure that passengers are made familiar with the location and use of:

- a) seat belts;
- b) emergency exits;
- c) life jackets, if the carriage of life jackets is prescribed;
- d) oxygen dispensing equipment, if the provision of oxygen for the use of passengers is prescribed; and
- e) life rafts (if applicable);
- f) other emergency equipment provided for individual use, including passenger emergency briefing cards.

- 3.4.2.9.2 The operator shall ensure that all persons on board are aware of the location and general manner of use of the principal emergency equipment carried for collective use.

- 3.4.2.9.3 The operator shall ensure that in an emergency during flight, passengers are instructed in such emergency action as may be appropriate to the circumstances.

- 3.4.2.9.4 The operator shall ensure that during take-off and landing and whenever considered necessary, by reason of turbulence or any emergency occurring during flight, all passengers on board an aeroplane are secured in their seats by means of the seat belts or harnesses provided.

- 3.4.2.9.5 For single-pilot operations without cabin crew, the should provide safety briefings to passengers except during critical phases of flight and taxiing.

3.4.3 **Flight preparation**

- 3.4.3.1 The operator shall develop procedures to ensure that a flight is not commenced unless:

- a) the aeroplane is airworthy, duly registered and that appropriate certificates with respect thereto are aboard the aeroplane;

- b) the instruments and equipment installed in the aeroplane are appropriate, taking into account the expected flight conditions;
- c) any necessary maintenance has been performed in accordance with Chapter 3.8;
- d) the mass of the aeroplane and centre of gravity location are such that the flight can be conducted safely, taking into account the flight conditions expected;
- e) any load carried is properly distributed and safely secured; and
- f) the aeroplane operating limitations, contained in the flight manual, or its equivalent, will not be exceeded.

3.4.3.2 The operator shall make available sufficient information on climb performance with all engines operating to enable determination of the climb gradient that can be achieved during the departure phase for the existing take-off conditions and intended take-off technique.

3.4.3.3 Operational flight planning

3.4.3.3.1 The operator shall specify flight planning procedures to provide for the safe conduct of the flight based on considerations of aeroplane performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes concerned. These procedures shall be included in the operations manual.

Note 1.— It is the practice in some States to declare, for flight planning purposes, higher minima for an aerodrome nominated as an alternate, than for the same aerodrome planned as that of intended landing.

Note 2.— The requirements for flight plans are contained in CAD 2 — Rules of the Air and Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, ICAO Doc 4444).

3.4.3.4 Alternate aerodromes

3.4.3.4.1 Take-off alternate aerodrome

3.4.3.4.1.1 A take-off alternate aerodrome shall be selected and specified in the flight plan if either the meteorological conditions at the aerodrome of departure are below the applicable aerodrome landing minima for that operation or if it would not be possible to return to the aerodrome of departure for other reasons.

3.4.3.4.1.2 The take-off alternate aerodrome shall be located within the following flight time from the aerodrome of departure:

- a) for aeroplanes with two engines, one hour of flight time at a one-engine-inoperative cruising speed, determined from the aircraft operating

manual, calculated in ISA and still-air conditions using the actual take-off mass; or

- b) for aeroplanes with three or more engines two hours of flight time at an one-engine-inoperative operating cruising speed, determined from the aircraft operating manual, calculated in ISA and still-air conditions using the actual take-off mass.

3.4.3.4.1.3 For an aerodrome to be selected as a take-off alternate the available information shall indicate that, at the estimated time of use, the conditions will be at or above the applicable aerodrome operating minima for that operation.

3.4.3.5 Fuel requirements

3.4.3.5.1 An aeroplane shall carry a sufficient amount of usable fuel to complete the planned flight safely and to allow for deviations from the planned operation.

3.4.3.5.2 The amount of usable fuel to be carried shall, as a minimum, be based on:

- a) fuel consumption data:
 - 1) provided by the aeroplane manufacturer; or
 - 2) if available, current aeroplane-specific data derived from a fuel consumption monitoring system; and
- b) the operating conditions for the planned flight including:
 - 1) anticipated aeroplane mass;
 - 2) Notices to Airmen;
 - 3) current meteorological reports or a combination of current reports and forecasts;
 - 4) air traffic services procedures, restrictions and anticipated delays; and
 - 5) the effects of deferred maintenance items and/or configuration deviations.

Note.— Where no specific fuel consumption data exist for the precise conditions of the flight, the aircraft may be operated in accordance with estimated fuel consumption data.

3.4.3.5.3 The pre-flight calculation of usable fuel required shall include:

- a) *taxi fuel*, which shall be the amount of fuel expected to be consumed before take-off taking into account local conditions at the departure aerodrome and auxiliary power unit (APU) fuel consumption;

- b) *trip fuel*, which shall be the amount of fuel required to enable the aeroplane to fly from take-off until landing at the destination aerodrome taking into account the operating conditions of 3.4.3.5.2 b)
- c) *contingency fuel*, which shall be the amount of fuel required to compensate for unforeseen factors. It shall be not less than five per cent of the planned trip fuel;

Note.— Unforeseen factors are those which could have an influence on the fuel consumption to the destination aerodrome, such as deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions, extended delays and deviations from planned routings and/or cruising levels.

- d) destination alternate fuel, which shall be:
 - 1) where a destination alternate aerodrome is required, the amount of fuel required to enable the aeroplane to:
 - i) perform a missed approach at the destination aerodrome;
 - ii) climb to the expected cruising altitude;
 - iii) fly the expected routing;
 - iv) descend to the point where the expected approach is initiated; and
 - v) conduct the approach and landing at the destination alternate aerodrome; or
 - 2) where a flight is operated without a destination alternate aerodrome, the amount of fuel required to enable the aeroplane to fly for 15 minutes at holding speed at 450 m (1 500 ft) above destination aerodrome elevation in standard conditions; or
 - 3) where the aerodrome of intended landing is an isolated aerodrome:
 - i) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes plus 15 per cent of the flight time planned to be spent at cruising level, including final reserve fuel, or two hours, whichever is less; or
 - ii) for a turbine-engined aeroplane, the amount of fuel required to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel;
- e) *final reserve fuel*, which shall be the amount of fuel on arrival at the destination alternate aerodrome, or the destination aerodrome when no destination alternate aerodrome is required:
 - 1) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes; or

- 2) for a turbine-engined aeroplane, the amount of fuel required to fly for 30 minutes at holding speed at 450 m(1 500 ft) above aerodrome elevation in standard conditions;
- f) *additional fuel*, which shall be the supplementary amount of fuel required to enable the aircraft to descend as necessary and proceed to land at an alternate aerodrome in the event of engine failure or loss of pressurisation based on the assumption that such a failure occurs at the most critical point along the route;
- g) *discretionary fuel*, which shall be the extra amount of fuel to be carried at the discretion of the pilot-in-command.
- 3.4.3.5.4 The use of fuel after flight commencement for purposes other than originally intended during pre-flight planning shall require a re-analysis and, if applicable, adjustment of the planned operation.
- Note.— Nothing in 3.4.3.5 precludes the in-flight amendment of a flight plan to re-plan that flight to another aerodrome, provided that the requirements of 3.4.3.5 can be complied with from the point where the flight is re-planned.*
- 3.4.3.6 In-flight fuel management
- 3.4.3.6.1 The operator shall establish policies and procedures to ensure that in-flight fuel checks and fuel management are performed.
- 3.4.3.6.2 The pilot-in-command shall continually ensure at regular intervals that the amount of usable fuel remaining in flight is not less than the fuel required to proceed to a an aerodrome where a safe landing can be made with the planned final reserve fuel remaining upon landing.
- Note.— The protection of final reserve fuel is intended to ensure a safe landing at any aerodrome when unforeseen occurrences may not permit safe completion of an operation as originally planned. Guidance on flight planning including the circumstances that may require re-analysis, adjustment and/or re-planning of the planned operation before take-off or en- route, is contained in the Flight Planning and Fuel Management (FPFM) Manual (ICAO Doc 9976).*
- 3.4.3.6.3 The pilot-in-command shall request delay information from ATC when unanticipated circumstances may result in landing at the destination aerodrome with less than the final reserve fuel plus any fuel required to proceed to an alternate aerodrome or the fuel required to operate to an isolated aerodrome.
- 3.4.3.6.4 The pilot-in-command shall advise ATC of a minimum fuel state by declaring MINIMUM FUEL when, having committed to land at a specific aerodrome, the pilot calculates that any change to the existing clearance to that aerodrome may result in landing with less than the planned final reserve fuel.

Note.— The declaration of MINIMUM FUEL informs ATC that all planned aerodrome options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance may result in landing with less than the planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.

3.4.3.6.5 The pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL when the calculated usable fuel estimated to be available upon landing at the nearest aerodrome where a safe landing can be made is less than the planned final reserve fuel.

Note 1.— The planned final reserve fuel refers to the value calculated in 3.4.3.5.3 e) and is the minimum amount of fuel required upon landing at any aerodrome.

Note 2.— The words “MAYDAY FUEL” describe the nature of the distress conditions as required in CAD 10, Volume II, 5.3.2.1.1, b) 3).

3.4.3.7 Additional requirements for operations beyond 60 minutes to an en-route alternate aerodrome

3.4.3.7.1 When conducting operations beyond 60 minutes from a point on a route to an en-route alternate aerodrome operators shall ensure that:

- a) en-route alternate aerodromes are identified; and
- b) the pilot-in-command has access to current information on the identified en-route alternate aerodromes, including operational status and meteorological conditions.

3.4.3.8 Refuelling with passengers on board

3.4.3.8.1 An aeroplane shall not be refuelled when passengers are embarking, on board or disembarking unless it is properly attended by qualified personnel ready to initiate and direct and evacuation of the aeroplane by the most practical and expeditious means available.

3.4.3.8.2 When refuelling with passengers embarking, on board or disembarking, two-way communication shall be maintained by the aeroplane’s intercommunication system or other suitable means between the ground crew supervising the refuelling and the qualified personnel on board the aeroplane.

3.4.3.8.3 An aeroplane shall not be refuelled with aviation gasoline(AVGAS) or wide-cut type fuel or a mixture of these types of fuel, when passengers are embarking, on board or disembarking.

Note 1.— The provisions of 3.4.3.8.1 do not necessarily require the deployment of integral aeroplane stairs or the opening of emergency exits as a prerequisite to refuelling.

Note 2.— Provisions concerning aircraft refuelling are contained in CAD 14, Volume I, and guidance on safe refuelling practices is contained in the Airport Services Manual (ICAO Doc 9137), Parts 1 and 8.

Note 3.— Additional precautions are required when refuelling with fuels other than aviation kerosene or when refuelling results in a mixture of aviation kerosene with other aviation turbine fuels, or when an open line is used.

3.4.3.9 Oxygen supply

3.4.3.9.1 The pilot-in-command shall ensure he and flight crew members engaged in performing duties essential to the safe operation of an aircraft in flight use supplemental oxygen continuously whenever the cabin altitude exceeds 10000 ft for a period of more than 30 minutes and whenever the cabin altitude exceeds 13 000 ft.

3.4.3.9.2 Supplemental Oxygen - Pressurised Aeroplanes

3.4.3.9.2.1 Pressurised aeroplanes operated at flight altitudes for which the oxygen supply is required in accordance with 3.4.3.9.2.2 shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the required oxygen supplies.

3.4.3.9.2.2 Pressurised aeroplanes operated above flight altitudes at which the pressure altitude in the passenger compartments is above 10000 ft shall carry enough breathing oxygen to supply:

- a) all crew members and:
 - 1) 100 % of the passengers for any period when the cabin pressure altitude exceeds 15000 ft but in no case less than 10 minutes supply;
 - 2) at least 30% of the passengers, for any period when, in the event of loss of pressurisation and taking into account the circumstances of the flight, the pressure altitude in the passenger compartment will be between 14000 ft and 15000 ft; and
 - 3) at least 10% of the passengers for any period in excess of 30 minutes when the pressure altitude in the passenger compartment will be between 10 000 ft and 14 000 ft;
- b) all the occupants of the passenger compartment for no less than 10 minutes, in the case of aeroplanes operated at pressure altitudes above 25000 ft, or operated below that altitude, but under conditions that will not allow them to descend safely to a pressure altitude of 13000 ft within 4 minutes.

3.4.3.9.3 Supplemental Oxygen – Non Pressurised Aeroplanes

- 3.4.3.9.3.1 Non-pressurised aeroplanes operated at flight altitudes for which the oxygen supply is required in accordance with 3.4.3.9.3.2 shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the required oxygen supplies.
- 3.4.3.9.3.2 Non-pressurised aeroplanes operated above flight altitudes at which the pressure altitude in the passenger compartments is above 10 000 ft shall carry enough breathing oxygen to supply:
- a) all crew members at least 10% of the passengers for any period in excess of 30 minutes when the pressure altitude in the passenger compartment will be between 10 000 ft and 13 000 ft; and
 - b) all crew members and passengers for any period that the pressure altitude in the passenger compartments will be above 13 000 ft.
- 3.4.4 **In-flight procedures**
- 3.4.4.1 Instrument approaches
- 3.4.4.1.1 In the aircraft operating manual, the operator shall include operating procedures for conducting instrument approaches.
- 3.4.4.1.2 The pilot-in-command shall ensure that sufficient means are available to navigate and land at the destination aerodrome or at any destination alternate aerodrome in the case of loss of capability for the intended approach and landing operation.
- 3.4.4.2 Use of oxygen
- 3.4.4.2.1 All flight crew members, when engaged in performing duties essential to the safe operation of an aeroplane in flight, shall use breathing oxygen continuously whenever the circumstances prevail for which its supply has been required in 3.4.3.9.1, 3.4.3.9.2 or 3.4.3.9.3.
- 3.4.4.2.2 Pressurised aeroplanes operated at flight altitudes above 25 000 ft shall, in addition, be equipped with:
- a) a device to provide a warning indication to the flight crew of any loss of pressurisation; and
 - b) quick donning masks for flight crew members which will readily supply oxygen upon demand.
- 3.4.4.3 Aeroplane operating procedures for noise abatement
- 3.4.4.3.1 The operator shall develop operating procedures taking into account the need to minimise the effect of aircraft noise while ensuring that safety has priority over noise abatement

- 3.4.4.3.2 Aeroplane operating procedures for noise abatement shall comply with the provisions of PANS-OPS (ICAO Doc 8168), Volume I.
- 3.4.4.3.3 Noise abatement procedures specified by the operator for any one aeroplane type should be the same for all aerodromes.
- Note.— A single procedure may not satisfy the requirements at some aerodromes.*
- 3.4.4.4 Aeroplane operating procedures for rates of climb and descent
- 3.4.4.4.1 Unless otherwise specified in an air traffic control instruction, to avoid unnecessary airborne collision avoidance system (ACAS II) resolution advisories in aircraft at or approaching adjacent altitudes or flight levels, pilots shall use appropriate procedures to ensure that a rate of climb or descent of less than 8 m/s or 1 500 ft/min (depending on the instrumentation available) is achieved throughout the last 300 m (1 000 ft) of climb or descent to the assigned altitude or flight level, when made aware of another aircraft at or approaching an adjacent altitude or flight level.
- Note.— Material concerning the development of these procedures is contained in PANS-OPS (ICAO Doc 8168), Volume I, Part III, Section 3, Chapter 3.*
- 3.4.4.5 Aeroplane operating procedures for landing performance
- 3.4.4.5.1 An approach to land shall not be continued below 300 m (1 000 ft) above aerodrome elevation unless the pilot-in-command is satisfied that, with the runway surface condition information available, the aeroplane performance information indicates that a safe landing can be made.
- Note 1.— The procedures for using runway surface condition information on board aircraft are contained in the PANS- Aerodromes (ICAO Doc 9981) and in the performance section of the aeroplane flight manual; for aeroplanes certificated in accordance with CAD 8, Part IIIB, in the Aeroplane Performance Manual (ICAO Doc 10064).*
- Note 2.— Guidance on development of aeroplane performance information for aeroplanes certificated in accordance with CAD 8, Part IIIB is contained in the Aeroplane Performance Manual (ICAO Doc 10064).*
- 3.4.4.5.2 The pilot-in-command shall ensure that at any aerodrome, after clearing all obstacles in the approach path by a safe margin, the aeroplane shall be able to land and stop within the landing distance available. Allowance shall be made for expected variations in the approach and landing techniques, if such allowance has not been made in the scheduling of performance data.
- 3.4.5 **Duties of pilot-in-command**
- 3.4.5.1 The pilot-in-command shall ensure that the checklists specified in 3.4.2.5 are complied with in detail.

- 3.4.5.2 The pilot-in-command shall be responsible for
- a) notifying the nearest appropriate authority by the quickest available means of any accident involving the aeroplane, resulting in serious injury or death of any person or substantial damage to the aeroplane or property. In the event that the pilot-in-command is incapacitated the operator shall take the forgoing action.
- Note.— A definition of the term “serious injury” is contained in CAD 13.*
- b) reporting all known or suspected defects in the aeroplane, to the operator, at the termination of the flight.
 - c) the journey log book or the general declaration containing the information listed in 2.8.2.
 - d) ensuring that:
 - 1) flight recorders are not disabled or switched off during flight;
 - 2) in the event of an occurrence other than an accident or a serious incident that shall be reported, flight recorders recordings are not intentionally erased; and
 - 3) in the event of an accident or a serious incident, or if preservation of recordings of flight recorders is directed by the investigating authority:
 - i) flight recorders recordings are not intentionally erased;
 - ii) flight recorders are deactivated immediately after the flight is completed; and
 - iii) precautionary measures to preserve the recordings of flight recorders are taken before leaving the flight crew compartment.
- 3.4.5.3 The pilot-in-command shall, as soon as possible, report to the appropriate air traffic services (ATS) unit any hazardous weather or flight conditions encountered that are likely to affect the safety of other aircraft
- 3.4.5.4 Notwithstanding the provision of 2.2.5.1 2.2.5.1, in a multi-crew operation the pilot-in-command may continue a flight beyond the nearest weather permissible aerodrome when adequate mitigating procedures are in place.
- 3.4.6 **Cabin baggage (take-off and landing)**
- 3.4.6.1 The operator shall specify procedures to ensure that all baggage carried onto an aeroplane and taken into the passenger cabin is adequately and securely stowed.
- 3.4.6.2 The operator shall establish procedures to ensure that all baggage and cargo on board that might cause injury or damage, or obstruct aisles and exits if displaced, is stowed so as to prevent movement.

3.5 Aeroplane Performance Operating Limitations

3.5.1 General

3.5.1.1 For aeroplanes for which Parts IIIA and IIIB of CAD 8 are not applicable because of the exemption provided for in Article 41 of the Convention, the level of performance specified in 3.5.2 shall be met as far as practicable.

3.5.1.2 During any phase of operation, the loading, the mass and the centre of gravity (CG) position of the aircraft shall comply with any limitation specified in the AFM, or the operations manual, if more restrictive

3.5.1.3 Placards, listings, instrument marking, or combinations thereof, containing those operating limitations prescribed by the AFM for visual presentation, shall be displayed in the aircraft.

3.5.2 Applicable to aeroplanes certificated in accordance with Parts IIIA and IIIB of CAD 8

3.5.2.1 The Standards contained in 3.5.2.2 to 3.5.2.9 inclusive are applicable to the aeroplanes to which Parts IIIA and IIIB of CAD 8 are applicable.

Note.— The Standards of CAD 8 — Airworthiness of Aircraft, Parts IIIA and IIIB, apply to all aeroplanes of over 5 700 kg maximum certificated take-off mass intended for the carriage of passengers or cargo or mail in international air navigation.

3.5.2.2 An aeroplane shall be operated in compliance with the terms of its certificate of airworthiness and within the approved operating limitations contained in its flight manual.

3.5.2.3 The general level of safety contemplated by these provisions shall be maintained under all expected operating conditions, including those not covered specifically by the provisions of this chapter.

3.5.2.4 A flight shall not be commenced unless the performance information provided in the flight manual indicates that the Standards of 3.5.2.5 to 3.5.2.9 can be complied with for the flight to be undertaken.

3.5.2.5 In applying the Standards of this chapter, account shall be taken of all factors that significantly affect the performance of the aeroplane (such as: mass, operating procedures, the pressure altitude appropriate to the elevation of the aerodrome, runway slope, the ambient temperature, wind, and surface conditions of the runway at the expected time of use, i.e. presence of slush, water and/or ice). Such factors shall be taken into account directly as operational parameters or indirectly by means of allowances or margins, which may be provided in the scheduling of performance data or in the comprehensive and detailed code of performance in accordance with which the aeroplane is being operated.

3.5.2.6 Mass limitations

- a) The mass of the aeroplane at the start of take-off shall not exceed the mass at which 3.5.2.7 is complied with, or the mass at which 3.5.2.8 and 3.5.2.9 are complied with, allowing for expected reductions in mass as the flight proceeds, and for such fuel jettisoning as is envisaged in applying 3.5.2.8 and 3.5.2.9 and, in respect of alternate aerodromes, 3.5.2.6 c) and 3.5.2.9.
- b) In no case shall the mass at the start of take-off exceed the maximum take-off mass specified in the flight manual for the pressure altitude appropriate to the elevation of the aerodrome, and if used as a parameter to determine the maximum take-off mass, any other local atmospheric condition.
- c) In no case shall the estimated mass for the expected time of landing at the aerodrome of intended landing and at any destination alternate aerodrome, exceed the maximum landing mass specified in the flight manual for the pressure altitude appropriate to the elevation of those aerodromes, and if used as a parameter to determine the maximum landing mass, any other local atmospheric condition.
- d) In no case shall the mass at the start of take-off, or at the expected time of landing at the aerodrome of intended landing and at any destination alternate aerodrome, exceed the relevant maximum masses at which compliance has been demonstrated with the applicable noise certification Standards in CAD 16, Volume I, unless otherwise authorised in exceptional circumstances for a certain aerodrome or a runway where there is no noise disturbance problem, by the competent authority of the State in which the aerodrome is situated.

3.5.2.7 *Take-off.* The aeroplane shall be able, in the event of a critical engine failing at any point in the take-off, either to discontinue the take-off and stop within either the accelerate-stop distance available or the runway available, or to continue the take-off and clear all obstacles along the flight path by an adequate margin until the aeroplane is in a position to comply with 3.5.2.8.

Note. – “An adequate margin” referred to this provision is illustrated by the appropriate examples included in the *Aeroplane Performance Manual (ICAO Doc 10064)*

3.5.2.7.1 In determining the length of the runway available, account shall be taken of the loss, if any, of runway length due to alignment of the aeroplane prior to take-off.

3.5.2.8 *En route — one engine inoperative.* The aeroplane shall be able, in the event of the critical engine becoming inoperative at any point along the route or planned diversions therefrom, to continue the flight to an aerodrome at which the Standard of 3.5.2.9 can be met, without flying below the minimum obstacle clearance altitude at any point.

3.5.2.9 *Landing.* The aeroplane shall, at the aerodrome of intended landing and at any alternate aerodrome, after clearing all obstacles in the approach path by a safe

margin, be able to land, with assurance that it can come to a stop or, for a seaplane, to a satisfactorily low speed, within the landing distance available. Allowance shall be made for expected variations in the approach and landing techniques, if such allowance has not been made in the scheduling of performance data.

Note.— Guidance on appropriate margins for the “at time of landing assessment” are contained in the Aeroplane Performance Manual (ICAO Doc 10064).

3.6 Aeroplane Instruments, Equipment And Flight Documents

3.6.1 General

3.6.1.1 Where a master minimum equipment list (MMEL) is established for the aircraft type, the operator shall include in the operations manual a minimum equipment list (MEL) approved by the CAAM 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.

Note.— Attachment 3.B contains guidance on the minimum equipment list.

3.6.1.2 The operator shall provide operations staff and flight crew with an aircraft operating manual, for each aircraft type operated, containing the normal, abnormal and emergency procedures relating to the operation of the aircraft. The manual should be consistent with the aircraft flight manual and checklists to be used. The design of the manual should observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683).

3.6.2 Aeroplanes on all flights

3.6.2.1 In addition to the requirements contained in 2.4.2.2, an aeroplane shall be equipped with:

- a) accessible and adequate medical supplies appropriate to the number of passengers the aeroplane is authorised to carry;

Note.— Guidance on the types, number, location and contents of the medical supplies is given in Attachment A to CAD 6, Part 1.

- b) a safety harness for each flight crew seat. The safety harness for each pilot seat shall incorporate a device which will automatically restrain the occupant’s torso in the event of rapid deceleration;

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

- c) means of ensuring that the following information and instructions are conveyed to passengers:
 - 1) when seat belts are to be fastened;
 - 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 flotation devices where their carriage is required;
 - 5) location of emergency equipment; and
 - 6) location and method of opening emergency exits.

3.6.2.2 An aeroplane shall carry:

- a) the operations manual prescribed in 3.4.2.2, 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 Chapter 3.5 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) the checklists to which 3.4.2.5 refers.

3.6.3 **Flight recorders**

3.6.3.1 Flight data recorders

3.6.3.1.1 Applicability

3.6.3.1.1.1 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 2005 shall be equipped with an FDR which shall record at least 78 parameters listed in Table A2.3-1 of Appendix 2.3.

3.6.3.1.1.2 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 an FDR which shall record at least the first 32 parameters listed in Table A2.3-1 of Appendix 2.3.

3.6.3.1.1.3 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, should be equipped with an FDR which should record at least the first 16 parameters listed in Table A2.3-1 of Appendix 2.3.

3.6.3.2 Cockpit voice recorders

3.6.3.2.1 Applicability

3.6.3.2.1.1 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2016 and required to be operated by more than one pilot shall be equipped with a CVR.

3.6.3.2.1.2 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 1987 shall be equipped with a CVR.

3.6.3.2.1.3 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 1987, should be equipped with a CVR.

3.6.3.2.2 Duration

3.6.3.2.2.1 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 2022 shall be equipped with a CVR capable of retaining the information recorded during at least the last 25 hours of its operation.

3.6.3.3 Combination recorders

All aeroplanes of a maximum certificated take-off mass over 5 700 kg, required to be equipped with an FDR and a CVR, may alternatively be equipped with two combination recorders (FDR/CVR).

3.6.3.4 Aeroplanes on long-range over-water flights

3.6.3.4.1 The operator of an aeroplane operated on an extended flight over water shall determine the risks to survival of the occupants of the aeroplane in the event of a ditching. The operator shall take into account the operating environment and conditions such as, but not limited to, sea state and sea and air temperatures, the distance from land suitable for making an emergency landing, and the availability of search and rescue facilities. Based upon the assessment of these risks, the operator shall, in addition to the equipment required in 2.4.4.3, ensure that the aeroplane is appropriately equipped with:

- a) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such lifesaving equipment, including means of sustaining life, as is appropriate to the flight to be undertaken; and
- b) equipment for making the distress signals described in CAD 2.

- 3.6.3.4.2 Each life jacket and equivalent individual flotation device, when carried in accordance with 2.4.4.3, shall be equipped with a means of electric illumination for the purpose of facilitating the location of persons, except where the requirement of 2.4.4.3.1 is met by the provision of individual flotation devices other than life jackets.
- 3.6.3.5 Aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1990
- 3.6.3.5.1 Pressurised aeroplanes intended to be operated above 25 000 ft shall be equipped with a device to provide positive warning to the flight crew of any dangerous loss of pressurisation.
- 3.6.3.5.2 An aeroplane intended to be operated at cabin altitudes above 10 000 ft shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 3.4.3.9.1.
- 3.6.3.5.3 An aeroplane intended to be operated above 10 000 ft but which is provided with means of maintaining cabin altitudes lower than 10 000 ft shall be provided with oxygen storage and dispensing apparatus capable of storing and dispensing the oxygen supplies required in 3.4.3.9.1.
- 3.6.4 **Aeroplanes in icing conditions**
- 3.6.4.1 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.
- 3.6.5 **Aeroplanes operated in accordance with the Instrument Flight Rules**
- 3.6.5.1 In addition to the requirements contained in 2.4.7, 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 two independent altitude measuring and display systems.
- 3.6.5.2 Aeroplanes over 5 700 kg — Emergency power supply for electrically operated attitude indicating instruments
- 3.6.5.2.1 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.

3.6.5.2.2 Aircraft with advanced cockpit automation systems (glass cockpits) shall have system redundancy that provides the flight crew with attitude, heading, airspeed and altitude indications in case of failure of the primary system or display.

3.6.5.2.3 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.

3.6.6 Airborne weather detecting equipment

3.6.6.1 The following shall be equipped with airborne weather detecting equipment when operated at night or in IMC in areas where thunderstorms or other potentially hazardous weather conditions, regarded as detectable with airborne weather detecting equipment, may be expected to exist along the route:

- a) pressurised aeroplanes;
- b) non-pressurised aeroplanes with a maximum certificated take-off mass of more than 5700 kg; and
- c) non-pressurised aeroplanes with a maximum approved passenger seating configuration of more than nine.

3.6.7 Aeroplanes operated above 15 000 m (49 000 ft) — radiation indicator

3.6.7.1 Aeroplanes intended to be primarily operated above 15 000 m (49 000 ft) should 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 crew member.

Note.— The equipment is calibrated on the basis of assumptions acceptable to the CAAM.

3.6.8 Aeroplanes carrying passengers — cabin crew seats

3.6.8.1 Aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 1981 shall be equipped with a forward or rearward facing seat (within 15° of the longitudinal axis of the aeroplane), fitted with a safety harness for the use of each cabin crew member required to satisfy the intent of 3.12.1 in respect of emergency evacuation.

3.6.8.2 Aeroplanes for which the individual certificate of airworthiness was first issued before 1 January 1981 should be equipped with a forward or rearward facing seat (within 15° of the longitudinal axis of the aeroplane), fitted with a safety harness for the use of each cabin crew member required to satisfy the intent of 3.12.1 in respect of emergency evacuation.

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

- 3.6.8.2.1 Cabin crew seats provided in accordance with 3.6.8.1 or 3.6.8.2 shall be located near floor level and other emergency exits as required by the State of Registry for emergency evacuation.

3.6.9 Aeroplanes required to be equipped with an Airborne Collision Avoidance System (ACAS)

- 3.6.9.1 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg, or authorised to carry more than 30 passengers, for which the individual airworthiness certificate is first issued after 24 November 2005, should be equipped with an airborne collision avoidance system (ACAS II).

- 3.6.9.2 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 15 000 kg, or authorised to carry more than 30 passengers, for which the individual airworthiness certificate is first issued after 1 January 2007, shall be equipped with an airborne collision avoidance system (ACAS II).

- 3.6.9.3 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 15 000 kg, or authorised to carry more than 19 passengers, for which the individual airworthiness certificate is first issued after 1 January 2008, should be equipped with an airborne collision avoidance system (ACAS II).

3.6.10 Aeroplanes required to be equipped with a pressure-altitude reporting transponder

- 3.6.10.1 Aeroplanes shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of CAD 10, Volume IV.

Note.— This provision is intended to improve the effectiveness of air traffic services as well as airborne collision avoidance systems.

3.6.11 Microphones

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

3.7 Aeroplane Communication, Navigation And Surveillance Equipment

3.7.1 Communication equipment

- 3.7.1.1 In addition to the requirements of 2.5.1.1 to 2.5.1.5, an aeroplane shall be provided with radio communication equipment capable of:

- a) conducting two-way communication for aerodrome control purposes;

- b) receiving meteorological information at any time during flight; and
- c) conducting two-way communication at any time during flight with at least one aeronautical station and with such other aeronautical stations and on such frequencies as may be prescribed by the appropriate authority.

Note.— The requirements of 3.7.1 are considered fulfilled if the ability to conduct the communications specified therein is established during radio propagation conditions which are normal for the route.

3.7.2 **Installation**

- 3.7.2.1 The equipment installation shall be such that the failure of any single unit required for communications, navigation or surveillance purposes or any combination thereof will not result in the failure of another unit required for communications, navigation or surveillance purposes.

3.7.3 **Electronic navigation data management**

- 3.7.3.1 The operator of an aeroplane shall not employ electronic navigation data products that have been processed for application in the air and on the ground unless the CAAM has approved the operator's procedures for ensuring that the process applied and the products delivered have met acceptable standards of integrity and that the products are compatible with the intended function of the existing equipment. The operator shall continue to monitor both the process and products.

Note.— Guidance relating to the processes that data suppliers may follow is contained in RTCA DO-200A/EUROCAE ED-76 and RTCA DO-201A/EUROCAE ED-77.

- 3.7.3.2 The operator shall implement procedures that ensure the timely distribution and insertion of current and unaltered electronic navigation data to all necessary aeroplanes.

3.8 **Aeroplane Continuing Airworthiness**

3.8.1 **Operator's Continuing Airworthiness responsibilities**

- 3.8.1.1 The operator shall comply with the requirements of 2.6.1.
- 3.8.1.2 The operator shall ensure that all maintenance personnel receive initial and continuation training acceptable to the CAAM and appropriate to their assigned tasks and responsibilities. This should include Human Factors and coordination with other maintenance personnel and flight crew.

Note.— Refer CAD 6801 – Continuing Airworthiness of Aircraft (CAAM Part M)

3.8.2 **Continuing Airworthiness Management Exposition**

The operator shall provide a Continuing Airworthiness Management Exposition, as specified in 3.11.1, for the use and guidance of maintenance and operations personnel. The design of the manual should observe Human Factors principles.

Note 1.— Refer to CAD 6802 – Continuing Airworthiness Management Organisation (CAAM Part M Subpart G)

3.8.3 **Maintenance programme**

3.8.3.1 The operator shall provide, for the use and guidance of maintenance and operational personnel concerned, a maintenance programme, acceptable to the CAAM, containing the information required by 3.11.2. The design and application of the operator's maintenance programme shall observe Human Factors principles.

Note.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683).

3.8.3.2 Copies of all amendments to the maintenance programme shall be furnished promptly to all organisations or persons to whom the maintenance programme has been issued.

3.8.4 **Continuing airworthiness information**

The operator of an aeroplane of a maximum certificated take-off mass in excess of 5 700 kg shall, as prescribed by the CAAM, ensure that the information resulting from maintenance and operational experience with respect to continuing airworthiness, is transmitted as required by CAD 1900.

3.8.5 **Maintenance release**

3.8.5.1 When maintenance is carried out by an approved maintenance organisation, the maintenance release shall be issued by the approved maintenance organisation in accordance with the provisions of CAD 8, Part II, 6.8.

3.8.5.2 *RESERVED*

3.9 **Aeroplane Flight Crew**

3.9.1 **Composition of the flight crew**

3.9.1.1 For each flight the operator shall designate a pilot to act as pilot-in-command.

3.9.1.2 When a separate flight engineer's station is incorporated in the design of an aeroplane, the flight crew shall include at least one flight engineer especially assigned to that station, unless the duties associated with that station can be satisfactorily performed by another flight crew member, holding a flight engineer licence, without interference with regular duties.

3.9.2 **Flight crew member emergency duties**

3.9.2.1 The operator shall, for each type of aeroplane, assign to all flight crew members the necessary functions they are to perform in an emergency or in a situation requiring emergency evacuation. Recurrent training in accomplishing these functions shall be contained in the operator's training programme and shall include instruction in the use of all emergency and life-saving equipment required to be carried, and drills in the emergency evacuation of the aeroplane.

3.9.3 **Flight crew member training programmes**

3.9.3.1 The operator shall establish and maintain a training programme that is designed to ensure that a person who receives training acquires and maintains the competency to perform assigned duties, including skills related to human performance.

3.9.3.2 Ground and flight training programmes shall be established, either through internal programmes or through a training services provider, and shall include or make reference to a syllabus for those training programmes in the company operations manual.

3.9.3.3 The training programme shall include training to competency for all equipment installed.

3.9.3.4 Flight simulators shall be used to the maximum extent practicable for initial and annual recurrent training.

3.9.4 **Qualifications**

3.9.4.1 Flight crew member licensing

3.9.4.1.1 The operator shall:

- a) ensure that each flight crew member assigned to duty holds a valid licence issued by the CAAM, or if issued by another Contracting State, rendered valid by the CAAM;
- b) ensure that flight crew members are properly rated; and
- c) be satisfied that flight crew members are competent to carry out assigned duties.

3.9.4.1.2 The operator of an aeroplane equipped with an airborne collision avoidance system (ACAS II) shall ensure that each flight crew member has been appropriately trained to competency in the use of ACAS II equipment and the avoidance of collisions.

Note 1.— Procedures for the use of ACAS II equipment are specified in the Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS, ICAO

Doc 8168), Volume I — Flight Procedures. ACAS II Training Guidelines for Pilots are provided in PANS-OPS, Volume I, Attachment A to Part III, Section 3, Chapter 3.

Note 2.— Appropriate training, to the satisfaction of the CAAM, to competency in the use of ACAS II equipment and the avoidance of collisions may be evidenced, for example, by:

- a) possession of a type rating for an aeroplane equipped with ACAS II, where the operation and use of ACAS II are included in the training syllabus for the type rating; or*
- b) possession of a document issued by a training organisation or person approved by the CAAM to conduct training for pilots in the use of ACAS II, indicating that the holder has been trained in accordance with the guidelines referred to in Note 1; or*
- c) a comprehensive pre-flight briefing by a pilot who has been trained in the use of ACAS II in accordance with the guidelines referred to in Note 1.*

3.9.4.2 Recent experience — pilot-in-command

3.9.4.2.1 The operator shall not assign a pilot to act as pilot-in-command of an aeroplane unless that pilot has made at least three (3) take-offs and landings within the preceding 90 days on the same type of aeroplane or in a flight simulator approved for the purpose.

3.9.4.3 Recent experience — co-pilot

3.9.4.3.1 The operator shall not assign a co-pilot to operate at the flight controls of an aeroplane during take-off and landing unless that pilot has made at least three (3) take-offs and landings within the preceding 90 days on the same type of aeroplane or in a flight simulator approved for the purpose.

3.9.4.4 Pilot proficiency checks

3.9.4.4.1 The operator shall ensure that piloting technique and the ability to execute emergency procedures is checked periodically in such a way as to demonstrate the pilot's competence. Where the operation may be conducted under the instrument flight rules, the operator shall ensure that the pilot's competence to comply with such rules is demonstrated to either a check pilot of the operator or a representative of the State issuing the pilot licence.

Note 1.— The periodicity of the checks referred to in 3.9.4.4 is dependent upon the complexity of both the aeroplane and the operation.

Note 2. – Refer to renewal of class and type ratings – aeroplanes under 2.1.5 of CAD 1 – PEL.e

3.10 Flight Operations Officer/Flight Dispatcher

- 3.10.1 The operator shall ensure that any person assigned as a flight operations officer/flight dispatcher is trained and maintains familiarisation with all features of the operation which are pertinent to their duties, including knowledge and skills related to Human Factors.

3.11 Manuals, Logs And Records

Note.— The following document is associated with this CAD but is not included in this chapter: Operational flight plan — see 3.4.3.3.

3.11.1 Continuing Airworthiness Management Exposition

- 3.11.1.1 The continuing airworthiness management exposition provided in accordance with 3.8.2, which may be issued in separate parts, shall contain:

- a) the means for complying with the procedures required by 3.8.1.1;
- b) the means of recording the names and duties of the person or persons required by 3.8.1.1;
- c) the maintenance programme required by 3.8.3.1;
- d) the methods used for the completion and retention of the operator's continuing airworthiness records required by 3.8.5;
- e) the procedures for complying with the service information reporting requirements of CAD 1900;
- f) the procedures for implementing action resulting from mandatory continuing airworthiness information;
- g) a system of analysis and continued monitoring of the performance and efficiency of the maintenance programme, in order to correct any deficiency in that programme;
- h) the aircraft types and models to which the manual applies;
- i) the procedures for ensuring that unserviceabilities affecting airworthiness are recorded and rectified; and
- j) procedures for advising the CAAM of significant in-service occurrences.

3.11.2 Maintenance programme

- 3.11.2.1 A maintenance programme for each aeroplane as required by 3.8.3 shall contain the following information:

- a) maintenance tasks and the intervals at which these are to be performed, taking into account the anticipated utilisation of the aeroplane;
- b) when applicable, a continuing structural integrity programme;
- c) procedures for changing or deviating from a) and b) above as approved by the CAAM; and

- d) when applicable and approved by the CAAM, condition monitoring and reliability programme descriptions for aircraft systems, components and engines.

3.11.2.2 Maintenance tasks and intervals that have been specified as mandatory in approval of the type design, or approved changes to the maintenance programme, shall be identified as such.

3.11.2.3 The maintenance programme should be based on maintenance programme information made available by the State of Design or by the organisation responsible for the type design, and any additional applicable experience.

3.11.3 **Flight recorder records**

The owner of the aeroplane shall ensure, to the extent possible, in the event the aeroplane becomes involved in an accident or incident, the preservation of all related flight recorder records and, if necessary, the associated flight recorders, and their retention in safe custody pending their disposition.

3.12 **Cabin Crew**

In addition to the following paragraphs, an operator shall comply with CAD 6009 – Cabin Crew for all matters related to the duties and responsibilities of a cabin crew member.

3.12.1 **Assignment of emergency duties**

3.12.1.1 The requirement for cabin crew number and composition for each type of aeroplane shall be based on the requirements laid on in CAD 6009 – Cabin Crew (CC), in order to effect a safe and expeditious evacuation of the aeroplane, and the necessary functions to be performed in an emergency or a situation requiring emergency evacuation. The operator shall assign these functions for each type of aeroplane.

3.12.2 **Cabin crew at emergency evacuation stations**

3.12.2.1 When cabin crew are required by a the CAAM, each cabin crew member assigned to emergency evacuation duties shall occupy a seat provided in accordance with 3.6.8 during take-off and landing and whenever the pilot-in-command so directs.

3.12.3 **Protection of cabin crew during flight**

3.12.3.1 Each cabin crew member shall be seated with seat belt or, when provided, safety harness fastened during take-off and landing and whenever the pilot-in-command so directs.

3.12.4 **Training**

- 3.12.4.1 The operator shall ensure that a training programme is completed by all persons before being assigned as a cabin crew member.
- 3.12.4.2 The operator should establish and maintain a cabin crew training programme that is designed to ensure that persons who receive training acquire the competency to perform their assigned duties and includes or makes reference to a syllabus for the training programme in the company operations manual. The training programme should include Human Factors training.

Note.— Guidance material on the application of Human Factors principles can be found in the Cabin Crew Safety Training Manual (ICAO Doc 10002).

3.13 Security

3.13.1 Security programme

- 3.13.1.1 Each entity conducting general aviation operations, including corporate operator aviation operations, using aircraft with a maximum take-off mass greater than 5 700 kg, shall establish, implement and maintain a written operator security programme.

Provisions on general aviation operation may be referred to Item 15 of CAD 17 – NCASP.



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ATTACHMENT 3.A COMPANY OPERATIONS MANUAL

Supplementary to 3.4.2.2

The following is the suggested content of a company operations manual. It may be issued in separate parts corresponding to specific aspects of an operation. It should include the instructions and information necessary to enable the personnel concerned to perform their duties safely and shall contain at least the following information:

- a) table of contents;
- b) amendment control page and list of effective pages, unless the entire document is reissued with each amendment and the document has an effective date on it;
- c) duties, responsibilities and succession of management and operating personnel;
- d) operator safety management system;
- e) operational control system;
- f) MEL procedures (where applicable);
- g) normal flight operations;
- h) standard operating procedures (SOPs);
- i) weather limitations;
- j) flight and duty time limitations;
- k) emergency operations;
- l) accident/incident considerations;
- m) personnel qualifications and training;
- n) record keeping;
- o) a description of the maintenance control system;
- p) security procedures (where applicable);
- q) performance operating limitations;
- r) use/protection of FDR/CVR records (where applicable);
- s) handling of dangerous goods; and
- t) use of head-up displays (HUD)/enhanced vision systems (EVS).



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ATTACHMENT 3.B MINIMUM EQUIPMENT LIST (MEL)

Supplementary to 3.6.1.1

- 1) If deviations from the requirements of the CAAM in the certification of aircraft were not permitted, an aircraft could not be flown unless all systems and equipment were operable. Experience has proved that some unserviceability can be accepted in the short term when the remaining operative systems and equipment provide for continued safe operations.
- 2) The minimum equipment list indicates systems and items of equipment that may be inoperative for certain flight conditions with the intent that no flight can be conducted with inoperative systems and equipment other than those specified.
- 3) The minimum equipment list, approved by the CAAM, is therefore necessary for each aircraft, based on the master minimum equipment list established for the aircraft type by the organisation responsible for the type design in conjunction with the State of Design.
- 4) The CAAM requires the operator to prepare a minimum equipment list designed to allow the operation of an aircraft with certain systems or equipment inoperative provided an acceptable level of safety is maintained.
- 5) The minimum equipment list is not intended to provide for operation of the aircraft for an indefinite period with inoperative systems or equipment. The basic purpose of the minimum equipment list is to permit the safe operation of an aircraft with inoperative systems or equipment within the framework of a controlled and sound programme of repairs and parts replacement.
- 6) Operators are to ensure that no flight is commenced with multiple minimum equipment list items inoperative without determining that any interrelationship between inoperative systems or components will not result in an unacceptable degradation in the level of safety and/or undue increase in the flight crew workload.
- 7) The exposure to additional failures during continued operation with inoperative systems or equipment should also be considered in determining that an acceptable level of safety is being maintained. The minimum equipment list may not deviate from requirements of the flight manual limitations section, emergency procedures or other airworthiness requirements of the CAAM unless the appropriate airworthiness authority or the flight manual provides otherwise.
- 8) Systems or equipment accepted as inoperative for a flight should be placarded where appropriate and all such items should be noted in the aircraft technical log to inform the flight crew and maintenance personnel of the inoperative system or equipment.



- 9) For a particular system or item of equipment to be accepted as inoperative, it may be necessary to establish a maintenance procedure, for completion prior to flight, to deactivate or isolate the system or equipment. It may similarly be necessary to prepare an appropriate flight crew operating procedure.
- 10) The responsibilities of the pilot-in-command in accepting an aeroplane for operation with deficiencies in accordance with a minimum equipment list are specified in 2.2.3.1.

ATTACHMENT 3.C – Guide to current Flight Recorder provisions

Supplementary to Chapter 3, 3.6.3

INTRODUCTION

Since 1973, and the inclusion in Annex 6 of SARPs for the carriage of flight recorders, new and revised requirements were introduced concerning flight recorders. These amendments include an update of the provisions pertaining to flight recorders, recording of digital communications, FDR requirements for new aircraft, revised parameter listings, and two-hour duration CVRs. Through the years, the applicability date and the carriage of flight recorders to be installed, as defined by the SARPs, were complex.

The tables below summarise the current flight recorders carriage requirements.

Table 3.C-1. SARPs for the recording of flight parameters

Date	Maximum certificated take-off mass (MCTOM)			
	Over 27 000 kg		Over 5 700 kg	
	All aeroplanes new type certificate	All aeroplanes first certificate of airworthiness	All aeroplanes new type certificate	All aeroplanes first certificate of airworthiness
1989 ⇒		3.6.3.1.1.2		3.6.3.1.1.3
2005 ⇒		3.6.3.1.1.1		3.6.3.1.1.1
2016 ⇒		Table A2.3-1 (Some parameters are sampled at an increased frequency)		
2023 ⇒	2.4.16.1.1.2	2.4.16.1.1.3	2.4.16.1.1.2	2.4.16.1.1.3

Table 3.C-2. CVR/CARS installation SARPs

Date	Maximum certificated take-off mass (MCTOM)		
	Over 27 000 kg		Over 5 700 kg
	All aeroplanes first certificate of airworthiness	All aeroplanes first certificate of airworthiness	All turbine-engined aeroplanes operated by more than one pilot new type certificate
1987 ⇒	3.6.3.2.1.2	3.6.3.2.1.3	
2016 ⇒			3.6.3.2.1.1
2021 ⇒	3.6.3.2.2.1		

Table 3.C-3. Combination recorder installation SARPs

Maximum certificated take-off mass (MCTOM)
Over 5 700 kg
All aeroplanes requiring an FDR and a CVR
3.6.3.3