CIVIL AVIATION AUTHORITY OF FIJI

STANDARDS DOCUMENT

Airworthiness of Aircraft – Part 2 (ICAO Requirements)

SD-AOA-PART 2

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Civil Aviation Authority of Fiji
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2	01/06/20	01/06/20	AEI-WS
3	15/02/25	15/02/25	CAAF
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SUMMARY OF AMENDMENTS

Date of Amendment	***Amendment #***	***Summary***
15/02/2025 *15/02/2025*	*Second Edition* *3*	*This edition introduces the new CAAF logo and the newly improved CAAF Standards Document template.* *This amendment includes changes brought about by Amendment 110 to Annex 8, which introduces an update to Standards related to remotely piloted aircraft systems (RPAS) consequential to provisions in the newly adopted Annex 6, Part IV.*

PREFACE

General

Fiji's National Aviation Law consists of a three tier or triple system regulatory system, comprising Acts, Regulations and Standards Documents; the purpose of which is to ensure, where deemed appropriate, compliance and conformance with ICAO Standards and Recommended Practices (SARPS).

The 'three tier' or 'triple system' regulatory system represents Fiji's Primary Legislation System and Specific Operating Regulations to meet Critical Elements CE1 and CE2 of ICAO's Eight Critical Element of a safety oversight system

Standards Documents (SD) are issued by the Civil Aviation Authority of Fiji under the provision of Section 14 (3) (b) of the Civil Aviation Authority Act 1979 (CAP 174A)

Where appropriate, the SD also contains technical guidance (Critical Element CE5) on standards, practices, and procedures that are acceptable to the Authority.

Notwithstanding the above, and where specifically indicated in this Standards Document that such a provision is available, consideration may be given to other methods of compliance that may be presented to the Authority provided they have compensating factors that can demonstrate a level of safety equivalent to or better than those prescribed herein. Accordingly, the Authority will consider each case based on its own merits holistically in the context of and relevancy of the alternative methods to the individual applicant.

When new standards, practices, or procedures are determined to be acceptable, they will be added to this document.

Purpose

This SD is issued by the Civil Aviation Authority of Fiji pursuant to *Section 14 (3) (b)* of the *Civil Aviation Authority Act 1979* (CAP 174A). It complements and expands of Part II of the Air Navigation Regulations 1981 (as amended) as well as CAAF SD – Airworthiness of Aircraft and ICAO Annex 8. The Document is intended for use by the Civil Aviation Authority of Fiji, as well as applicants for, and holders of, Air Operator Certificates and for their staff.

Change Notice

This SD has been developed regarding the Authority's obligation to provide oversight on certified organisations and individuals as well as operator's obligation to comply with standards notified by the Authority and is the means by which such notification is given.

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THERESA LEVESTAM
CHIEF EXECUTIVE

TABLE OF CONTENTS

INTERNATIONAL STANDARDS

PART I – DEFINITIONS

When the following terms are used in the Standards for Airworthiness of Aircraft, they have the following meanings:

Aeroplane. 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. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Note.††— When the word aircraft is used, it includes the remotely piloted aircraft.

Airworthy.† The status of an aircraft, engine, propeller or part when it conforms to its approved design and is in a condition for safe operation.

Airworthy.†† The status of an aircraft, remote pilot station, engine, propeller or part when it conforms to its approved design and is in a condition for safe operation.

Anticipated operating conditions.† Those conditions which are known from experience or which can be reasonably envisaged to occur during the operational life of the aircraft taking into account the operations for which the aircraft is made eligible, the conditions so considered being relative to the meteorological state of the atmosphere, to the configuration of terrain, to the functioning of the aircraft, to the efficiency of personnel and to all the factors affecting safety in flight. Anticipated operating conditions do not include:

a) Those extremes which can be effectively avoided by means of operating procedures; and

b) Those extremes which occur so infrequently that to require the Standards to be met in such extremes would give a higher level of airworthiness than experience has shown to be necessary and practical.

Anticipated operating conditions.†† Those conditions which are known from experience or which can be reasonably envisaged to occur during the operational life of the aircraft and remote pilot station taking into account the operations for which the aircraft or remote pilot station is made eligible, the conditions so considered being relative to the meteorological state of the atmosphere, to the configuration of terrain, to the functioning of the aircraft and remote pilot station, to the efficiency of personnel and to all the factors affecting safety in flight. Anticipated operating conditions do not include:

a) those extremes which can be effectively avoided by means of operating procedures; and

b) those extremes which occur so infrequently that to require the Standards to be met in such extremes would give a higher level of airworthiness than experience has shown to be necessary and practical.

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† Applicable until 25 November 2026.
†† Applicable as of 26 November 2026.

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

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

Approved. Accepted by a Contracting State as suitable for a particular purpose.

C2 Link.†† The data link between the remotely piloted aircraft and the remote pilot station for the purposes of managing the flight.

C2 Link interruption.†† Any temporary situation where the C2 Link is unavailable, discontinuous, introduces too much delay, or has inadequate integrity; but where the lost C2 Link decision time has not been exceeded.

C2 Link specification.†† The minimum performance to be achieved by the C2 Link equipment in conformity with the applicable airworthiness system design requirements.

Category A. With respect to helicopters, means a multi-engine helicopter designed with engine and system isolation features specified in Part IVB and capable of operations using take-off and landing data scheduled under a critical engine failure concept which assures adequate designated surface area and adequate performance capability for continued safe flight or safe rejected take-off.

Category B. With respect to helicopters, means a single-engine or multi-engine helicopter which does not meet Category A standards. Category B helicopters have no guaranteed capability to continue safe flight in the event of an engine failure, and a forced landing is assumed.

Configuration (as applied to the aeroplane). A particular combination of the positions of the moveable elements, such as wing flaps and landing gear, etc., that affects the aerodynamic characteristics of the aeroplane.

Continuing airworthiness.† 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.†† The set of processes by which an aircraft, remote pilot station, engine, propeller or part complies with the applicable airworthiness requirements and remains in a condition for safe operation throughout its operating life.***Critical engine(s).*** Any engine whose failure gives the most adverse effect on the aircraft characteristics relative to the case under consideration.

> *Note: On some aircraft there may be more than one equally critical engine. In this case, the expression "the critical engine" means one of those critical engines.*

Design landing mass. The maximum mass of the aircraft at which, for structural design purposes, it is assumed that it will be planned to land.

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† Applicable until 25 November 2026.
†† Applicable as of 26 November 2026.

Design take-off mass. The maximum mass at which the aircraft, for structural design purposes, is assumed to be planned to be at the start of the take-off run.***Design taxiing mass.*** The maximum mass of the aircraft at which structural provision is made for load liable to occur during use of the aircraft on the ground prior to the start of take-off.

Detect and avoid.†† The capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action.

Discrete source damage. Structural damage of the aeroplane that is likely to result from: impact with a bird, uncontained fan blade failure, uncontained engine failure, uncontained high-energy rotating machinery failure or similar causes.

Engine. 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).

Factor of safety. A design factor used to provide for the possibility of loads greater than those assumed, and for uncertainties in design and fabrication.

Final approach and take-off area (FATO). A defined area over which the final phase of the approach manoeuvre to hover or landing is completed and from which the take-off manoeuvre is commenced. Where the FATO is to be used by performance Class 1 helicopters, the defined area includes the rejected take-off area available.

Fireproof. The capability to withstand the application of heat by a flame for a period of 15 minutes.

Note: *The characteristics of an acceptable flame can be found in ISO 2685.*

Fire resistant. The capability to withstand the application of heat by a flame for a period of 5 minutes.

Note: *The characteristics of an acceptable flame can be found in ISO 2685.*

Handover.†† The act of passing piloting control from one remote pilot station to another.

Helicopter. A heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

Note.— *Some States use the term "rotorcraft" as an alternative to "helicopter".*

Human Factors principles. Principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Human performance. Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Landing surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft landing in a particular direction.

Limit loads. The maximum loads assumed to occur in the anticipated operating conditions.

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† Applicable until 25 November 2026.
†† Applicable as of 26 November 2026.

Load factor. The ratio of a specified load to the weight of the aircraft, the former being expressed in terms of aerodynamic forces, inertia forces, or ground reactions.

Lost C2 Link decision time.†† The maximum length of time permitted before declaring a lost C2 Link state during which the C2 Link performance is not sufficient to allow the remote pilot to actively manage the flight in a safe and timely manner appropriate to the airspace and operational conditions.

Lost C2 Link state. †† The state of the RPAS in which the C2 Link performance has degraded, as a result of a C2 Link interruption that is longer than the lost C2 Link decision time, to a point where it is not sufficient to allow the remote pilot to actively manage the flight in a safe and timely manner.

Maintenance.† The performance of tasks on an aircraft, engine, propeller or associated part required to ensure the continuing airworthiness of an aircraft, engine, propeller or associated part including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

Maintenance.†† The performance of tasks on an aircraft, remote pilot station, engine, propeller or associated part required to ensure the continuing airworthiness of an aircraft, remote pilot station, engine, propeller or associated part including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

Maintenance organization's procedures manual. A document endorsed by the head of the maintenance organization which details the maintenance organization's structure and management responsibilities, scope of work, description of facilities, maintenance procedures and quality assurance or inspection systems.

Maintenance records. Records that set out the details of the maintenance carried out on an aircraft, engine, propeller or associated part.

Maintenance release. 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.

Modification. A change to the type design of an aircraft, engine or propeller.

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 (Doc 9760).

Nominal C2 Link state.†† The state of the RPAS when the C2 Link performance is sufficient to allow the remote pilot to actively manage the flight of the RPA in a safe and timely manner appropriate to the airspace and operational conditions.

Organisation responsible for the type design.† The organization that holds the type certificate, or equivalent document, for an aircraft, engine or propeller type, issued by a Contracting State.

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† Applicable until 25 November 2026.
†† Applicable as of 26 November 2026.

Organisation responsible for the type design.†† The organization that holds the type certificate, or equivalent document, for an aircraft, remote pilot station, engine or propeller type, issued by a Contracting State.

Orphan aircraft type. An aircraft which has its Type Certificate revoked by the State of Design, and no longer has a designated State of Design in accordance with Annex 8. These aircraft do not meet the Standards of Annex 8.

Performance Class 1 helicopter. A helicopter with performance such that, in case of engine failure, it is able to land on the rejected take-off area or safely continue the flight to an appropriate landing area.

Performance Class 2 helicopter. A helicopter with performance such that, in case of engine failure, it is able to safely continue the flight, except when the failure occurs prior to a defined point after take-off or after a defined point before landing, in which cases a forced landing may be required.

Performance Class 3 helicopter. A helicopter with performance such that, in case of engine failure at any point in the flight profile, a forced landing must be performed.

Powerplant. The system consisting of all the engines, drive system components (if applicable), and propellers (if installed), their accessories, ancillary parts, and fuel and oil systems installed on an aircraft but excluding the rotors for a helicopter.

Pressure-altitude. An atmospheric pressure expressed in terms of altitude which corresponds to that pressure in the Standard Atmosphere.

Quality of service delivered (QoSD).†† A statement of the QoS achieved or delivered to the RPAS operator by the C2CSP.

Quality of service required (QoSR).†† A statement of the QoS requirements of the RPAS operator to the C2CSP.

Note.— The QoSR may be expressed in descriptive terms (criteria) listed in the order of priority, with preferred performance value for each criterion. The C2CSP then translates these into parameters and metrics pertinent to the service.

Remote pilot station (RPS).†† The component of the remotely piloted aircraft system containing the equipment used to pilot the remotely piloted aircraft.

Remotely piloted aircraft (RPA).†† An unmanned aircraft which is piloted from a remote pilot station.

Remotely piloted aircraft system (RPAS).†† A remotely piloted aircraft, its associated remote pilot station(s), the required C2 Link(s) and any other components as specified in the type design.

Rendering (a Certificate of Airworthiness) valid. The action taken by a Contracting State, as an alternative to issuing its own Certificate of Airworthiness, in accepting a Certificate of Airworthiness issued by any other Contracting State as the equivalent of its own Certificate of Airworthiness.

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

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† Applicable until 25 November 2026.
†† Applicable as of 26 November 2026.

Satisfactory evidence. A set of documents or activities that a Contracting State accepts as sufficient to show compliance with an airworthiness requirement.

Standard atmosphere. An atmosphere defined as follows:

a) the air is a perfect dry gas;

b) the physical constants are:

— Sea level mean molar mass:
$M_0 = 28.964\ 420 \times 10^{-3}$ kg mol^{-1}

— Sea level atmospheric pressure:
$P_0 = 1\ 013.250$ hPa

— Sea level temperature:
$t_0 = 15°C$
$T_0 = 288.15$ K
Density: $\rho_0 = 1.225\ 0$ kg m^{-3}

— Temperature of the ice point: $T_i = 273.15$ K

— Universal gas constant: $R^* = 8.314\ 32$ JK^{-1}mol^{-1}

c) The temperature gradients are:

Geopotential altitude (km)		*Temperature gradient (Kelvin per standard geopotential kilometre)*
From	*To*	
–5.0	11.0	–6.5
11.0	20.0	0.0
20.0	32.0	+1.0
32.0	47.0	+2.8
47.0	51.0	0.0
51.0	71.0	–2.8
71.0	80.0	–2.0

Note 1.— The standard geopotential metre has the value 9.806 65 m2 s–2.
Note 2.— See Doc 7488 for the relationship between the variables and for tables giving the corresponding values of temperature, pressure, density and geopotential.
Note 3.— Doc 7488 also gives the specific weight, dynamic viscosity, kinematic viscosity and speed of sound at various altitudes.

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† Applicable until 25 November 2026.
†† Applicable as of 26 November 2026.

State of Design. The State having jurisdiction over the organization responsible for the type design.

State of Design of Modification. The State having jurisdiction over the individual or organization responsible for the design of the modification or repair of an aircraft, engine or propeller.

State of Manufacture.† The State having jurisdiction over the organization responsible for the final assembly of the aircraft, engine or propeller.

State of Manufacture.†† The State having jurisdiction over the organization responsible for the final assembly of the aircraft, remote pilot station, engine or propeller.

State of Registry. 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 (Doc 9587).

Switchover.†† The act of transferring the active datalink path between the RPS and the RPA from one of the links or networks that constitutes the C2 Link to another link or network that constitutes the C2 Link.

Take-off surface. That part of the surface of an aerodrome which the aerodrome authority has declared available for the normal ground or water run of aircraft taking off in a particular direction.

Type Certificate.[†] A document issued by a Contracting State to define the design of an aircraft, engine or propeller type and to certify that this design meets the appropriate airworthiness requirements of that State.
Note.— In some Contracting States a document equivalent to a Type Certificate may be issued for an engine or propeller type.

Type Certificate.[††] A document issued by a Contracting State to define the design of an aircraft, remote pilot station, engine or propeller type and to certify that this design meets the appropriate airworthiness requirements of that State.
Note 1.[†††]*— In some Contracting States a document equivalent to a Type Certificate may be issued for an engine or propeller type.*
Note 2.[††]*— A document equivalent to a Type Certificate may be issued for a remote pilot station type.*

Type design.[†] The set of data and information necessary to define an aircraft, engine or propeller type for the purpose of airworthiness determination.
Type design.[††] The set of data and information necessary to define an aircraft, remote pilot station, engine or propeller type for the purpose of airworthiness determination.
Ultimate load. The limit load multiplied by the appropriate factor of safety.

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[†] Applicable until 25 November 2026.
[††] Applicable as of 26 November 2026.
[†††] As of 26 November 2026, this Note becomes Note 1.

PART II - PROCEDURES FOR CERTIFICATION AND CONTINUING AIRWORTHINESS

Note: *Although the Convention on International Civil Aviation allocates to the State of Registry certain functions which that State is entitled to discharge, or obligated to discharge, as the case may be, the Assembly recognised, in Resolution A23-13, that the State of Registry may be unable to fulfil its responsibilities adequately in instances where aircraft are leased, chartered or interchanged — in particular without crew — by an operator of another State and that the Convention may not adequately specify the rights and obligations of the State of an Operator in such instances until such time as Article 83 bis of the Convention enters into force. Accordingly, the Council urged that if, in the above-mentioned instances, the State of Registry finds itself unable to discharge adequately the functions allocated to it by the Convention, it delegates to the State of the Operator, subject to acceptance by the latter State, those functions of the State of Registry that can more adequately be discharged by the State of the Operator. It was understood that pending entry into force of the ICAO Article 83 bis of the Convention, the foregoing action would only be a matter of practical convenience and would not affect either the provisions of the Chicago Convention prescribing the duties of the State of Registry or any third State. However, as ICAO Article 83 bis entered into force on 20 June 1997, such transfer agreements will have effect in respect of those Contracting States which have ratified the related Protocol (ICAO Doc 9318) upon fulfilment of the conditions established in Article 83 bis.*

CHAPTER 1 – TYPE CERTIFICATION

Note 1: *Fiji does not have an aircraft design and manufacturing industry and as such is not a state of design nor state of manufacture.*

Note 2: *Applicants for the certification of aircraft in Fiji should be aware that, in accordance with the requirements of the Air Navigation Regulations and CAAF Standards Document - Airworthiness of Aircraft, all aircraft, irrespective of their size, will normally be subject to review by CAAF as deemed to be necessary, in order to establish, taking into account their design, construction, modification standard and original approval basis, that an acceptable level of airworthiness has been met. However, in order to achieve this, the principles of granting Fiji Type Approval by accepting (validating) the certification approval granted by the Authority of the state of manufacture, will be used as far as possible. The degree by which the approval of the Authority of the state of manufacture can be taken into account, and the amount of additional CAAF review required, will depend on various criteria. CAAF will also require knowledge of the arrangements for post-approval design support in order to be satisfied that this airworthiness standard may be expected to be sustained after approval*

1.1 APPLICABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this chapter shall be applicable to all aircraft, and to engines and propellers if type certificated separately, for which the application for certification was submitted to a Contracting State on or after 13 June 1960, except that:

a) the provisions of 1.4 of this part shall only be applicable to an aircraft type for which an application for a Type Certificate was submitted to the State of Design on or after 2 March 2004;

b) the provisions of 1.4 of this part shall only be applicable to an engine or propeller type for which an application for a Type Certificate was submitted to the State of Design on or after 10 November 2016;

c) the provisions of 1.2.6 of this part shall only be applicable to an aircraft type for which an application for a Type Certificate was submitted to the State of Design on or after 31 December 2014;

d) the provisions of 1.2.7 of this part shall only be applicable to an aircraft type for which an application for a Type Certificate is submitted to the State of Design on or after 28 November 2024; and

e) the provisions of 1.4 of this part shall only be applicable to a remotely piloted aircraft and to a remote pilot station if type certificated separately, for which an application for a Type Certificate is submitted to the State of Design on or after 26 November 2026.

Note 1.— Until 25 November 2026, normally, a request for a Type Certificate is submitted by the manufacturer when the aircraft, engine or propeller is intended for serial production.

Note 1.— As of 26 November 2026, normally, a request for a Type Certificate is submitted by the manufacturer when the aircraft, remote pilot station, engine or propeller is intended for serial production.

Note 2.— For Part VB aeroplanes, guidance material concerning the appropriate airworthiness safety levels commensurate with acceptable risk levels is contained in the Airworthiness Manual *(Doc 9760).*

Note.3 — As of 26 November 2026, the provisions of this part support remotely piloted aircraft systems operation SARPs in Annex 6, Part IV.

1.2 DESIGN ASPECTS OF THE APPROPRIATE AIRWORTHINESS REQUIREMENTS

1.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design aspects of the appropriate airworthiness requirements, used by a Contracting State for type certification in respect of a class of aircraft or for any change to such type certification, shall be such that compliance with them will ensure compliance with the Standards of Part II of ICAO Annex 8 and, where applicable, with the Standards of Parts III, IV, V, VI or VII of this SD.

1.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design shall not have any features or characteristics that render it unsafe under the anticipated operating conditions.

1.2.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the design features of a particular aircraft render any of the design aspects of the appropriate airworthiness requirements or the Standards in Parts III, IV, V, VI or VII inappropriate, the Contracting State shall apply appropriate requirements that will give at least an equivalent level of safety shall be applied, and shall be that assigned by Fiji through CAAF.

1.2.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the design features of a particular aircraft render any of the design aspects of the appropriate airworthiness requirements or the Standards in Parts III, IV, V, VI or VII inadequate, additional requirements that are considered by the Contracting State to give at least an equivalent level of safety shall be applied, and shall be that assigned by Fiji through CAAF.

Note: An Airworthiness Manual (ICAO Doc 9760) containing guidance material has been published by ICAO.

1.2.5 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the approved design of an aircraft under Parts IIIB, IVB and V of this SD shall use extinguishing agents that are not listed in the ICAO 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, in the aircraft fire suppression or extinguishing systems in the lavatories, engines and auxiliary power unit.

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

1.3 PROOF OF COMPLIANCE WITH THE APPROPRIATE AIRWORTHINESS REQUIREMENTS

1.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, there shall be an approved design consisting of such drawings, specifications, reports and documentary evidence as are necessary to define the design of the aircraft and to show compliance with the design aspects of the appropriate airworthiness requirements.

Note: The approval of the design is facilitated, in some States, by approving the design organisation.

1.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aircraft shall be subjected to such inspections and ground and flight tests as are deemed necessary by the State to show compliance with the design aspects of the appropriate airworthiness requirements and shall be that approved by Fiji through CAAF.

1.3.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in addition to determining compliance with the design aspects of the appropriate airworthiness requirements for an aircraft, Contracting States CAAF shall take whatever other steps they deem necessary to ensure that the design approval is withheld if the aircraft is known or suspected to have dangerous features not specifically guarded against by those requirements.

1.3.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, CAAF A Contracting State issuing issues an approval for the design of a modification, of a repair or of a replacement part shall do so on the basis of satisfactory evidence that the aircraft is in compliance with the airworthiness requirements used for the issuance of the Type Certificate, its amendments or later requirements when determined by the State.

Note 1: While a repair may be completed and shown to be in compliance with the set of requirements that had been selected for the original type certification of the aircraft, some repairs may need to be shown to comply with the latest applicable certification requirements. In such cases, States may issue a repair design approval against the latest set of requirements for that aircraft type.

Note 2: The approval of the design of a modification to an aircraft is signified, in some States, by the issuance of a supplemental Type Certificate or amended Type Certificate.

Note 2: Due to the limited resources available to the CAAF it is normal practice to only accept Major modifications which are supported by a Supplementary Type Certificate or Design Data approved by the Authority of the State of Design.

Note 3: Modifications approved by the Authority of the State of Design and promulgated in the form of manufactures' Service Bulletins are considered by the CAAF to be approved.

Note 4: The CAAF will signify approval of a Major modification by forwarding a copy of the Airworthiness Approval Note to the applicant.

1.4 ISSUANCE OF TYPE CERTIFICATE

1.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the State of Design, upon receipt of satisfactory evidence that the aircraft type is in compliance with the design aspects of the appropriate airworthiness requirements, shall issue a Type Certificate to define the design and to signify approval of the design of the aircraft type.

Note: Some Contracting States also issue Type Certificates for engines and propellers.

1.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when a Contracting State, other than the State of Design, issues a Type Certificate for an aircraft type, it shall do so on the basis of satisfactory evidence that the aircraft type is in compliance with the design aspects of the appropriate airworthiness requirements.

1.5 SUSPENSION OF TYPE CERTIFICATE

1.5.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the State of Design, upon receipt of satisfactory evidence that the aircraft type is in compliance with the design aspects of the appropriate airworthiness requirements, shall issue a Type Certificate to define the design and to signify approval of the design of the aircraft type.

Note: Some Contracting States also issue Type Certificates for engines and propellers.

1.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when a Contracting State, other than the State of Design, issues a Type Certificate for an aircraft type, it shall do so on the basis of satisfactory evidence that the aircraft type is in compliance

1.6 REVOCATION OF TYPE CERTIFICATE

1.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the State of Design, upon receipt of satisfactory evidence that the aircraft type is in compliance with the design aspects of the appropriate airworthiness requirements, shall issue a Type Certificate to define the design and to signify approval of the design of the aircraft type.

Note: Some Contracting States also issue Type Certificates for engines and propellers.

1.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when a Contracting State, other than the State of Design, issues a Type Certificate for an aircraft type, it shall do so on the basis of satisfactory evidence that the aircraft type is in compliance

1.7 TRANSFER OF TYPE CERTIFICATE

1.7.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the State of Design, upon receipt of satisfactory evidence that the aircraft type is in compliance with the design aspects of the appropriate airworthiness requirements, shall issue a Type Certificate to define the design and to signify approval of the design of the aircraft type.

Note: Some Contracting States also issue Type Certificates for engines and propellers.

1.7.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when a Contracting State, other than the State of Design, issues a Type Certificate for an aircraft type, it shall do so on the basis of satisfactory evidence that the aircraft type is in compliance

CHAPTER 2 – PRODUCTION

Note 1: *Fiji does not have an aircraft design and manufacturing industry and as such is not a state of design nor state of manufacture.*

Note 2: *Applicants for the certification of aircraft in Fiji should be aware that, in accordance with the requirements of the Air Navigation Regulations and CAAF Standards Document - Airworthiness of Aircraft, all aircraft, irrespective of their size, will normally be subject to review by CAAF as deemed to be necessary, in order to establish, taking into account their design, construction, modification standard and original approval basis, that an acceptable level of airworthiness has been met. However, in order to achieve this, the principles of granting Fiji Type Approval by accepting (validating) the certification approval granted by the Authority of the state of manufacture, will be used as far as possible. The degree by which the approval of the Authority of the state of manufacture can be taken into account, and the amount of additional CAAF review required, will depend on various criteria. CAAF will also require knowledge of the arrangements for post-approval design support in order to be satisfied that this airworthiness standard may be expected to be sustained after approval*

2.1 APPLICABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this chapter are applicable to the production of all aircraft and aircraft parts.

2.2 AIRCRAFT PRODUCTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the State of Manufacture shall ensure that each aircraft, including aircraft parts manufactured by sub-contractors and/or suppliers, is airworthy.

2.3 AIRCRAFT PARTS PRODUCTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Contracting State taking responsibility for the production of aircraft parts manufactured under the design approval referred to in 1.3.4 of Part II shall ensure that the aircraft parts are airworthy.

2.4 PRODUCTION APPROVAL

2.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when approving production of aircraft or aircraft parts, the Contracting State shall:

a) Examine the supporting data and inspect the production facilities and processes so as to determine that the manufacturing organisation is in compliance with the appropriate production requirements; and

b) Ensure that the manufacturing organisation has established and can maintain a quality system or a production inspection system such as to guarantee that each aircraft or aircraft part produced by the organisation or by sub-contractors and/or suppliers is airworthy.

Note 1: *Normally, the oversight of production is facilitated by approving the manufacturing organisation.*

Note 2: *Where the State of Manufacture is a State other than the Contracting State where the aircraft parts are produced, there may be an agreement or arrangement acceptable to both States to support the oversight responsibilities of the State of Manufacture over the organisations manufacturing the aircraft parts.*

2.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the manufacturing organisation shall hold, for each aircraft or aircraft part concerned, a design approval as referred to in 1.3 of Part II or the right of access under an agreement or arrangement to the approved design data relevant for production purposes.

2.4.3 Further to the provisions of Section 12, 13,14 and 123 of the Air Navigation Regulations, records shall be maintained such that the origin of the aircraft and of the aircraft parts, and their identification with the approved design and productions can be established.

Note: The origin of aircraft and of the aircraft parts refers to the manufacturer, the date of manufacture, the serial number or other information that can be tracked to its production record.

2.4.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the State of Manufacture is other than the State of Design, there shall be an agreement or arrangement acceptable to both States to:

a) Ensure that the manufacturing organisation has the right of access to the approved design data relevant for production purposes; and address the responsibilities of each State with regard to design, manufacture and continued airworthiness of the aircraft.

CHAPTER 3 – CERTIFICATE OF AIRWORTHINESS

Note: The Certificate of Airworthiness as used in these Standards is the Certificate of Airworthiness referred to in Article 31 of the Convention.

3.1 APPLICABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this chapter are applicable in respect of all aircraft, except 3.3 and 3.4 which are not applicable in respect of all aircraft that are of a type of which the prototype was submitted to appropriate national authorities for certification before 13 June 1960.

3.2 ELIGIBILITY, ISSUANCE AND CONTINUED VALIDITY OF A CERTIFICATE OF AIRWORTHINESS

3.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a Certificate of Airworthiness shall be issued by CAAF on the basis of satisfactory evidence that the aircraft complies with the design aspects of the appropriate airworthiness requirements.

3.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, CAAF shall not issue or render valid a Certificate of Airworthiness for which it intends to claim recognition pursuant to Article 33 of the Convention on International Civil Aviation unless it has satisfactory evidence that the aircraft complies with the applicable Standards of this SD through compliance with appropriate airworthiness requirements.

3.2.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a Certificate of Airworthiness shall be renewed or shall remain valid, subject to the laws of Fiji, provided that CAAF shall require that the continuing airworthiness of the aircraft shall be determined by a periodical inspection at appropriate intervals having regard to lapse of time and type of service or, alternatively, by means of a system of inspection, approved by the CAAF, that will produce at least an equivalent result.

3.2.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when an aircraft possessing a valid Certificate of Airworthiness issued by a Contracting State is entered on the Fiji Aircraft register, CAAF, when issuing its Certificate of Airworthiness may consider the previous Certificate of Airworthiness as satisfactory evidence, in whole or in part, that the aircraft complies with the applicable Standards of this SD through compliance with the appropriate airworthiness requirements.

Note: Some Contracting States facilitate the transfer of aircraft onto the register of another State by the issue of an "Export Certificate of Airworthiness" or similarly titled document. While not valid for the purpose of flight, such a document provides confirmation by the exporting State of a recent satisfactory review of the airworthiness status of the aircraft. Guidance on the issue of an "Export Certificate of Airworthiness" is contained in the Airworthiness Manual (ICAO Doc 9760).

3.2.5 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when a State of Registry renders valid a Certificate of Airworthiness issued by another Contracting State, as an alternative to issuance of its own Certificate of Airworthiness, it shall establish validity by suitable authorization to be carried with the former Certificate of Airworthiness accepting it as the equivalent of the latter. The validity of the authorization shall not extend beyond the period of validity of the Certificate of Airworthiness being rendered valid. The State of Registry shall ensure that the continuing airworthiness of the aircraft is determined in accordance with 3.2.3.

3.3 STANDARD FORM OF CERTIFICATE OF AIRWORTHINESS

3.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Certificate of Airworthiness shall contain the information shown in Figure 1 and shall be generally similar to it.

3.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, Certificates of Airworthiness issued by CAAF are issued in English however any Certificates of Airworthiness, being

submitted to CAAF, and issued by an ICAO Contracting State in a language other than English, they shall include an English translation.

Note: *Article 29 of the Convention on International Civil Aviation requires that the Certificate of Airworthiness be carried on board every aircraft engaged in international air navigation.*

3.4 AIRCRAFT LIMITATIONS AND INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, each aircraft shall be provided with a flight manual, placards or other documents stating the approved limitations within which the aircraft is considered airworthy as defined by the appropriate airworthiness requirements and additional instructions and information necessary for the safe operation of the aircraft.

3.5 TEMPORARY LOSS OF AIRWORTHINESS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, failure to maintain an aircraft in an airworthy condition as defined by the appropriate airworthiness requirements shall render the aircraft ineligible for operation until the aircraft is restored to an airworthy condition.

3.6 DAMAGE TO AIRCRAFT

3.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when an aircraft has sustained damage, CAAF shall judge whether the damage is of a nature such that the aircraft is no longer airworthy as defined by the appropriate airworthiness requirements.

3.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, if the damage is sustained or ascertained when the aircraft is in the territory of another Contracting State, the authorities of the other Contracting State shall be entitled to prevent the aircraft from resuming its flight on the condition that they shall advise CAAF immediately, communicating to it all details necessary to formulate the judgement referred to in 3.6.1.

3.6.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when CAAF considers that the damage sustained is of a nature such that the aircraft is no longer airworthy, it shall prohibit the aircraft from resuming flight until it is restored to an airworthy condition. CAAF may, however, in exceptional circumstances, prescribe particular limiting conditions to permit the aircraft to fly a non-commercial air transport operation to an aerodrome at which it will be restored to an airworthy condition. In prescribing particular limiting conditions, CAAF shall consider all limitations proposed by the Contracting State that had originally, in accordance with 3.6.2, prevented the aircraft from resuming its flight. That Contracting State shall permit such flight or flights within the prescribed limitations.

3.6.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when CAAF considers that the damage sustained is of a nature such that the aircraft is still airworthy, the aircraft shall be allowed to resume its flight.

ISO 9001: 2015 CERTIFIED

Civil Aviation Authority of Fiji

Certificate of Airworthiness

No:

Nationality and Registration Marks	Manufacturer and Manufacturer's Designation of Aircraft	Aircraft Serial No. (Manufacturer's No.)

Category		Airworthiness Code	

This Certificate of Airworthiness is issued pursuant to the Convention on International Civil Aviation dated 7th December 1944, the Airworthiness Code above and to the Civil Aviation Authority of Fiji Act 1979, Civil Aviation Reform Act 1999 - as amended in respect of the abovementioned aircraft which is considered to be airworthy when maintained and operated in accordance with the foregoing and pertinent operating limitations. The Flight Manual reference…… is the flight manual approved for this aircraft, and forms part of this certificate. In accordance with the Air Navigation Regulation Section 42 and the Standards Document – Aircraft Weight and Performance, the aircraft is designated as Performance group / Category ……

Date of Issue	…… For the **Civil Aviation Authority of Fiji**

This certificate is valid for the period(s) shown below				Official Stamp and Date
From		To		
From		To		
From		To		
From		To		

Form AW103A 010620

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CHAPTER 4 – CONTINUING AIRWORTHINESS OF AIRCRAFT

4.1 APPLICABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this chapter are applicable to all aircraft.

4.2 RESPONSIBILITIES OF CONTRACTING STATES IN RESPECT OF CONTINUING AIRWORTHINESS

Note: Guidance on continuing airworthiness requirements is contained in the Airworthiness Manual (ICAO Doc 9760).

4.2.1 STATE OF DESIGN

4.2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the State of Design of an aircraft shall:

a) Transmit to CAAF which has in accordance with 4.2.3 a) advised the State of Design that it has entered the aircraft on its register, and to any other Contracting State upon request, any generally applicable information which it has found necessary for the continuing airworthiness of the aircraft, including its engines and propellers when applicable, and for the safe operation of the aircraft, (hereinafter called mandatory continuing airworthiness information) and notification of the suspension or revocation of a Type Certificate;

Note 1: The term "mandatory continuing airworthiness information" is intended to include mandatory requirements for modification, replacement of parts or inspection of aircraft and amendment of operating limitations and procedures. Among such information is that issued by Contracting States in the form of airworthiness directives.

Note 2: The Continuing Airworthiness of Aircraft in Service (ICAO Cir 95) provides the necessary information to assist Contracting States CAAF in establishing contact with competent authorities of other Contracting States for the purpose of maintaining continuing airworthiness of aircraft in service.

b) Ensure that, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg maximum certificated take-off mass, there exists a system for:

i) Receiving information submitted in accordance with 4.2.3 f);

ii) Deciding if and when airworthiness action is needed;

iii) Developing the necessary airworthiness actions; and

iv) Promulgating the information on those actions including that required in 4.2.1.1 a);

c) ensure that, in respect of aeroplanes over 5 700 kg maximum certificated take-off mass, there exists a continuing structural integrity programme to ensure the airworthiness of the aeroplane. The programme shall include specific information concerning corrosion prevention and control; and

d) ensure that, where the State of Manufacture of an aircraft is other than the State of Design, there is an agreement acceptable to both States to ensure that the manufacturing organisation cooperates with the organisation responsible for the type design in assessing information received on experience with operating the aircraft.

4.2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the State of Design of an engine or a propeller, where it is different from the State of Design of the aircraft, shall

transmit any continuing airworthiness information to the State of Design of the aircraft and to any other Contracting State upon request.

4.2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the State of Design of a modification is different from the State of Design of the product being modified, the State of Design of the modification shall transmit the mandatory continuing airworthiness information to all States that have the modified aircraft on their registries.

4.2.2 STATE OF MANUFACTURE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the State of Manufacture of an aircraft shall ensure that where it is not the State of Design there is an agreement acceptable to both States to ensure that the manufacturing organisation cooperates with the organisation responsible for the type design in assessing information received on experience with operating the aircraft.

4.2.3 STATE OF REGISTRY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the State of Registry CAAF shall:

a) Ensure that, when it first enters on its register an aircraft of a particular type for which it is not the State of Design and issues or validates a Certificate of Airworthiness in accordance with 3.2 of this part, it shall advise the State of Design that it has entered such an aircraft on its register;

b) Determine the continuing airworthiness of an aircraft in relation to the appropriate airworthiness requirements in force for that aircraft;

c) Develop or adopt requirements to ensure the continuing airworthiness of the aircraft during its service life, including requirements to ensure that the aircraft:

   i) Continues to comply with the appropriate airworthiness requirements after a modification, a repair or the installation of a replacement part; and

   ii) Is maintained in an airworthy condition and in compliance with the maintenance requirements of ICAO Annex 6, and where applicable, Parts III, IV and V of this SD;

d) Upon receipt of mandatory continuing airworthiness information from the State of Design, adopt the mandatory information directly or assess the information received and take appropriate action;

e) Ensure the transmission to the State of Design of all mandatory continuing airworthiness information in respect of a product or a modification which it, as the State of Registry, originated in respect of that aircraft; and

f) Ensure that, in respect of aeroplanes over 5700 kg and helicopters over 3175 kg maximum certificated take-off mass, there exists a system whereby information on faults, malfunctions, defects and other occurrences that cause or might cause adverse effects on the continuing airworthiness of the aircraft is transmitted to the organisation responsible for the type design of that aircraft. Where a continuing airworthiness safety issue is associated with a modification, CAAF shall ensure that there exists a system whereby the above information is transmitted to the organisation responsible for the design of the modification.

Note: *Guidance on interpretation of "the organisation responsible for the type design" is contained in the Airworthiness Manual (ICAO Doc 9760).*

4.2.4 ALL CONTRACTING STATES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, Fiji has established, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg maximum certificated take-off mass, the type of service information that is to be reported to its airworthiness authority by operators, organisations responsible for type design and maintenance organisations. Procedures for reporting this information shall also be established.

CHAPTER 5 – SAFETY MANAGEMENT

Note 1.— Safety management provisions for organizations responsible for the type design or manufacture of aircraft and for approved maintenance organizations are included in Annex 19. Further guidance is contained in the Safety Management Manual (SMM) (Doc 9859).

Note 2.— As of 26 November 2026, safety management provisions for organizations responsible for the type design or manufacture of aircraft, remote pilot stations and for approved maintenance organizations are included in Annex 19. Further guidance is contained in the Safety Management Manual (SMM) (Doc 9859) and in the Manual on Remotely Piloted Aircraft Systems (RPAS) (Doc 10019).

CHAPTER 6 – MAINTENANCE ORGANISATION APPROVAL

6.1 APPLICABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this chapter are applicable to the approval of organizations involved in the maintenance of aircraft, engines, propellers and associated parts. Approval certificates issued before 5 November 2020 shall be amended before 5 November 2022 to ensure compliance with the requirements in 6.2.3.

6.2 MAINTENANCE ORGANISATION APPROVAL

Note. — The provisions in this Part do not prevent the maintenance organization from performing maintenance on an aircraft which is not under the responsibility of the Contracting State issuing this approval, including aircraft not registered in any Contracting State. Additional information is provided in the Airworthiness Manual (Doc 9760).

6.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, Fiji has promulgated appropriate requirements for the approval of a maintenance organisation in accordance with the standards of this chapter.

Note. — Guidance material on the approval of an approved maintenance organization is contained in the Airworthiness Manual (Doc 9760).

6.2.2 The issuance of a maintenance organization approval by a Fiji shall be dependent upon the applicant demonstrating compliance with the applicable Standards of this chapter through compliance with appropriate requirements defined in accordance with 6.2.1 and relevant provisions contained in Annex 19 for such organizations.

6.2.3 The approval certificate shall contain at least the following information:
a) the issuing authority and the name, title and signature of the person issuing the certificate;
b) the maintenance organization's name and registered address;
c) the maintenance organization approval reference number;
d) the date of current issue;
e) in the case of certificates of limited duration, the expiration date;
f) the scope of approval, in relation to aircraft, component and/or specialized maintenance, and to the type of aircraft and components covered by the approval; and
g) the locations of the maintenance facilities, unless the information is included in a separate document referred to in the approval certificate.

Note. — Guidance material on the content of the approval certificate is contained in Doc 9760.

6.2.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended that the approval certificate should follow the template in the Appendix and contain the date of original issue if different from the date of current issue.

6.2.4 The continued validity of the approval shall depend upon the organization remaining in compliance with the appropriate requirements of 6.2.1 and 6.2.2.

6.2.5 The maintenance organization shall notify the Contracting State which issued the maintenance organization approval of any changes to the organization's scope of work, location or personnel nominated in accordance with this chapter.

6.2.6 Where a Contracting State accepts, in whole or in part, a maintenance organization approval issued by another Contracting State, it shall establish a process for the recognition of such approval and

successive changes. In such a case, the recognizing Contracting State shall build an adequate liaison with the Contracting State that initially issued the maintenance organization approval.

6.3 MAINTENANCE ORGANISATION'S PROCEDURES MANUAL

6.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall provide for the use and guidance of maintenance personnel concerned a procedures manual which may be issued in separate parts containing the following information:

a) a general description of the scope of work authorized under the organization's terms of approval;

b) a description of the organization's procedures and quality or inspection system in accordance with 6.4;

c) a general description of the organization's facilities;

d) names and duties of the person or persons required by 6.6.1 and 6.6.2;

e) a description of the procedures used to establish the competence of the maintenance personnel required by 6.6.4;

f) a description of the method used for the completion and retention of the maintenance records required by 6.7;

g) a description of the procedures for preparing the maintenance release and the circumstances under which the release is to be signed;

h) the personnel authorized to sign the maintenance release and the scope of their authorization;

i) a description, when applicable, of contracted activities;

j) a description, when applicable, of the additional procedures for complying with an operator's maintenance procedures and requirements;

k) a description of the procedures for complying with the information reporting requirements of 4.2.4.1 f) and 4.2.5 of this part;

l) a description of the procedure for receiving, assessing, amending and distributing within the maintenance organization all necessary airworthiness data from the organization responsible for the type design; and

m) a description of the procedures for implementing changes affecting the approval of the maintenance organization.

6.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall ensure that the procedures manual is amended as necessary to keep the information contained therein up to date.

6.3.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall furnish copies of all amendments to the procedures manual promptly to all organizations or persons to whom the manual has been issued.

Note. — *Guidance material on the content of a maintenance organization's procedures manual is contained in Doc 9760.*

6.4 MAINTENANCE PROCEDURES AND QUALITY ASSURANCE SYSTEM

6.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall establish procedures acceptable to the Contracting State granting the approval which ensure good maintenance practices and compliance with all relevant Standards prescribed in 6.2.1 and 6.2.2.

6.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall ensure compliance with 6.4.1 by either establishing an independent quality assurance system to monitor compliance with, and adequacy of, the procedures, or by providing a system of inspection to ensure that all maintenance is properly performed.

6.5 FACILITIES

6.5.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall provide the appropriate facilities and working environments for the tasks to be performed.

Note. — Guidance material on requirements for approved maintenance organization facilities is contained in Doc 9760.

6.5.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall have the necessary technical data, equipment, tools and material to perform the work for which it is approved.

6.5.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall ensure that storage conditions provide adequate security and prevent deterioration of, and damage to, stored items such as parts, equipment, tools and material.

6.6 PERSONNEL

6.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall nominate an accountable executive who, irrespective of other functions, is accountable on behalf of the organization.

Note. — Guidance material on the responsibilities of an accountable executive is contained in Doc 9760 and the Safety Management Manual (SMM) (*Doc 9859).*

6.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization's accountable executive shall nominate a person or group of persons whose responsibilities include ensuring that the maintenance organization is in compliance with the requirements of 6.2.1 and 6.2.2.

6.6.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall employ the necessary personnel to plan, perform, supervise, inspect and release the maintenance work to be performed.

6.6.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall establish the competence of maintenance personnel in accordance with procedures and to a level acceptable to the Contracting State granting the approval. If the person signing the maintenance release is a non-licensed person, the person shall meet the qualification requirements specified in Annex 1 — *Personnel Licensing* to sign a maintenance release.

6.6.5 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall ensure that all maintenance personnel receive initial and continuation training appropriate to their assigned tasks and responsibilities. The training programme established by the

maintenance organization shall include training in knowledge and skills related to human performance, including coordination with other maintenance personnel and flight crew.

Note. — *Guidance material to design training programmes to develop knowledge and skills in human performance can be found in the* Human Factors Training Manual *(Doc 9683)*.

6.7 RECORDS

6.7.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the maintenance organization shall retain detailed maintenance records to show that all requirements for the signing of a maintenance release have been met.

6.7.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the records required by 6.7.1 shall be kept for a minimum period of one year after the signing of the maintenance release.

6.7.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, records kept in accordance with 6.7 shall be maintained in a form and format that ensures readability, security and integrity of the records at all times.

Note 1. — *The form and format of the records may include, for example, paper records, film records, electronic records or any combination thereof.*

Note 2.— *Guidance material regarding electronic aircraft maintenance records is contained in Doc 9760.*

6.8 MAINTENANCE RELEASE

6.8.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a maintenance release shall be completed and signed to certify that the maintenance work performed has been completed satisfactorily and in accordance with approved data and the procedure described in the maintenance organization's procedures manual.

6.8.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a maintenance release shall be signed and include the following:

a) basic details of the maintenance carried out including detailed reference to the data used;
b) the date such maintenance was completed;
c) the identity of the approved maintenance organization; and
d) the identity of the person or persons signing the release.

PART III – LARGE AEROPLANES
PART IIIA – AEROPLANES OVER 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 13 JUNE 1960 BUT BEFORE 2 MARCH 2004

Note: *The provisions of Part IIIA are the same as those contained in Part III of ICAO Annex 8, Ninth Edition (including Amendment 99), except for modified applicability clauses and cross-references*

CHAPTER 1 - GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part, except for those specified in 8.4, are applicable in respect of all aeroplanes designated in 1.1.3 that are of types of which the prototype was submitted to the appropriate national authorities CAAF for certification on or after 13 June 1960, but before 2 March 2004.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards specified in 8.4 of this part are applicable in respect of all aeroplanes designated in 1.1.3 that are of types of which the prototype was submitted to the appropriate national authorities CAAF for certification on or after 22 March 1985, but before 2 March 2004.

1.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of this part shall apply to 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.

Note: *The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.*

1.1.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the aeroplanes designated in 1.1.3 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.5 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, the Standards apply to the complete aeroplane including powerplant, systems and equipment.

1.2 NUMBER OF ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall have not less than two engines.

1.3 OPERATING LIMITATIONS

1.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting conditions shall be established for the aeroplane, its powerplant and its equipment (see 9.2).

Compliance with the Standards of this part shall be established assuming that the aeroplane is operated within the limitations specified. The limitations shall be sufficiently removed from any condition(s) prejudicial to the safety of the aeroplane to render the likelihood of accidents arising therefrom extremely remote.

Note: *Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual (ICAO Doc 9760).*

1.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting ranges of any parameter whose variation may compromise the safe operation of the aeroplane, e.g. mass, centre of gravity location, load distribution, speeds, and altitude or pressure-altitude, shall be established within which compliance with all the pertinent Standards in this part is shown, except that combinations of conditions which are fundamentally impossible to achieve need not be considered.

Note 1: *The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.*

Note 2: *The following items, for instance, may be considered as basic aeroplane limitations:*

- *Maximum certificated take-off mass;*
- *Maximum certificated taxiing mass;*
- *Maximum certificated landing mass;*
- *Maximum certificated zero fuel mass; and*
- *Most forward and rearward centre of gravity positions in various configurations (take-off, en route, landing).*

Note 3: *Maximum operating mass may be limited by the application of Noise Certification Standards (see ICAO Annex 16, Volume I, and ICAO Annex 6, Parts I and II).*

1.4 UNSAFE FEATURES AND CHARACTERISTICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, under all anticipated operating conditions, the aeroplane shall not possess any feature or characteristic that renders it unsafe.

1.5 PROOF OF COMPLIANCE

1.5.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the appropriate airworthiness requirements shall be based on evidence either from tests, calculations, or calculations based on tests, provided that in each case the accuracy achieved will ensure a level of airworthiness equal to that which would be achieved were direct tests conducted.

1.5.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the tests of 1.5.1 shall be such as to provide reasonable assurance that the aeroplane, its components and equipment are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2 – FLIGHT

2.1 GENERAL

2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the Standards prescribed in Chapter 2 shall be established by flight or other tests conducted upon an aeroplane or aeroplanes of the type for which a Certificate of Airworthiness is sought, or by calculations based on such tests, provided that the results obtained by calculations are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with each Standard shall be established for all applicable combinations of aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where necessary, appropriate aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the aeroplane's flying qualities.

2.2 PERFORMANCE

2.2.1 GENERAL

2.2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient data on the performance of the aeroplane shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the aeroplane on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, achieving the performance scheduled for the aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note: Guidance material on human performance can be found in the Human Factors Training Manual (ICAO Doc 9683).

2.2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the scheduled performance of the aeroplane shall be consistent with compliance with 1.3.1 and with the operation in logical combinations of those of the aeroplane's systems and equipment, the operation of which may affect performance.

2.2.2 MINIMUM PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, at the maximum mass scheduled (see 2.2.3) for take-off and for landing as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for seaplanes, in specified conditions of smooth water, the aeroplane shall be capable of accomplishing the minimum performances specified in 2.2.2.1 and 2.2.2.2, respectively, not considering obstacles, or runway or water run length.

Note: This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the aeroplane flight manual against, for example:

- *Aerodrome elevation, or*
- *Pressure-altitude at aerodrome level, or*

— *Pressure-altitude and atmospheric temperature at aerodrome level,*

So as to be readily usable when applying the national code on aeroplane performance operating limitations.

2.2.2.1 TAKE-OFF

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be capable of taking off assuming the critical engine to fail (see 2.2.3), the remaining engines being operated within their take-off power limitations.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, after the end of the period during which the take-off power may be used, the aeroplane shall be capable of continuing to climb, with the critical engine inoperative and the remaining engines operated within their maximum continuous power limitations, up to a height that it can maintain and at which it can carry out a circuit of the aerodrome.

c) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealised conditions for which data are scheduled (see 2.2.3), the departure from the scheduled values is not disproportionate.

2.2.2.2 LANDING

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, starting from the approach configuration and with the critical engine inoperative, the aeroplane shall be capable, in the event of a missed approach, of continuing the flight to a point from which a fresh approach can be made.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, starting from the landing configuration, the aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all engines operating.

2.2.3 SCHEDULING OF PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, performance data shall be determined and scheduled in the flight manual so that their application by means of the operating rules to which the aeroplane is to be operated in accordance with 5.2 of ICAO Annex 6, Part I, will provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing

surface for landplanes; water surface conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the aeroplane is to be certificated.

2.2.3.1 ***Take-off.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off performance data shall include the accelerate-stop distance and the take-off path.

2.2.3.1.1 ***Accelerate-stop distance.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the accelerate-stop distance shall be the distance required to accelerate and stop, or, for a seaplane to accelerate and come to a satisfactorily low speed, assuming the critical engine to fail suddenly at a point not nearer to the start of the take-off than that assumed when determining the take-off path (see 2.2.3.1.2).

2.2.3.1.2 ***Take-off path.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off path shall comprise the ground or water run, initial climb and climb-out, assuming the critical engine to fail suddenly during the take-off (see 2.2.3.1.1). The take-off path shall be scheduled up to a height that the aeroplane can maintain and at which it can carry out a circuit of the aerodrome. The climb-out shall be made at a speed not less than the take-off safety speed as determined in accordance with 2.3.1.3.

2.2.3.2 ***En route.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the en-route climb performance shall be the climb (or descent) performance with the aeroplane in the en-route configuration with:

a) The critical engine inoperative; and

b) The two critical engines inoperative in the case of aeroplanes having three or more engines.

The operating engines shall not exceed maximum continuous power.

2.2.3.3 ***Landing.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path at a selected height above the landing surface to the point on the landing surface at which the aeroplane comes to a complete stop, or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations therefrom.

Note: *If the landing distance includes the distance margin specified in this Standard, it is not necessary to allow for the expected variations in the approach and landing techniques in applying 5.2.11 of ICAO Annex 6, Part I.*

2.3 FLYING QUALITIES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the aeroplane is approved.

2.3.1 CONTROLLABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine

power, changes of aeroplane configurations) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any engine. A technique for safely controlling the aeroplane shall be established for all stages of flight and aeroplane configurations for which performance is scheduled.

Note: *This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.*

2.3.1.1 ***Controllability on the ground (or water).*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.1.2 ***Controllability during take-off.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable in the event of sudden failure of the

critical engine at any point in the take-off, when the aeroplane is handled in the manner associated with the scheduling of take-off paths and accelerate-stop distances.

2.3.1.3 ***Take-off safety speed.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations the take-off safety speeds assumed when the performance of the aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the aeroplane remains controllable after sudden failure of the critical engine.

2.3.2 TRIM

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall have such trim and other characteristics as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more engines for which performance characteristics are established.

2.3.3 STABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. aeroplane configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the aeroplane shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the aeroplane is prejudiced by lack of manoeuvrability in emergency conditions.

2.3.4 STALLING

2.3.4.1 ***Stall warning.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when the aeroplane approaches a stall both in straight and turning flight with all engines operating and with one engine inoperative, a clear and distinctive stall warning shall be apparent to the pilot with the aeroplane in all permissible configurations and powers, except those which are not considered to be essential for safe flying. The stall warning and other characteristics of the aeroplane shall be such as to enable the pilot to arrest the development of the stall after the warning begins and, without altering the engine power, to maintain full control of the aeroplane.

2.3.4.2 ***Behaviour following a stall.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in any configuration and power in which it is considered that the ability to recover from a stall is essential, the behaviour of the aeroplane following a stall shall not be so extreme as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the aeroplane. It shall be acceptable to throttle back the operating engines during recovery from the stall.

2.3.4.3 ***Stalling speeds.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of flight (e.g. take-off, en route, landing) shall be established. One of the values of the power used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

2.3.5 FLUTTER AND VIBRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be demonstrated by suitable tests that all parts of the aeroplane are free from flutter and excessive vibration in all aeroplane configurations under all speed conditions within the operating limitations of the aeroplane (see 1.3.2). There shall be no buffeting severe enough to interfere with control of the aeroplane, to cause structural damage or to cause excessive fatigue to the flight crew.

Note: *Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.*

CHAPTER 3 – STRUCTURES

3.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Chapter 3 apply to the aeroplane structure consisting of all portions of the aeroplane, the failure of which would seriously endanger the aeroplane.

3.1.1 MASS AND MASS DISTRIBUTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.1.2 LIMIT LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.3, 3.4 and 3.5 shall be considered as limit loads.

3.1.3 STRENGTH AND DEFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in the various loading conditions prescribed in 3.3, 3.4 and 3.5, no part of the aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the aeroplane structure shall be capable of supporting the ultimate load.

3.2 AIRSPEEDS

3.2.1 DESIGN AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design airspeeds shall be established for which the aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads in accordance with 3.3. In establishing the design airspeeds, consideration shall be given to the following speeds:

a) VA, the design manoeuvring speed;

b) VB, the speed at which the maximum vertical gust velocity assumed in accordance with 3.3.2 can be withstood;

c) VC, a speed not expected to be exceeded in normal cruising flight taking into account possible effects of upsets when flying in turbulent conditions;

d) V_D, maximum dive speed, sufficiently greater than the speed in c), to make it unlikely that such a design speed would be exceeded as a result of inadvertent speed increases in the anticipated operating conditions, taking into account the flying qualities and other characteristics of the aeroplane;

e) V_{E1} to V_{En}, maximum speeds at which flaps and landing gears may be extended or other configuration changes be made.

The speeds V_A, V_B, V_C, and V_E in a), b), c) and e) shall be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air.

3.2.2 LIMITING AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in

accordance with 1.3.1, shall be included in the aeroplane flight manual as part of the operating limitations (see 9.2.2).

3.3 FLIGHT LOAD

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the flight loading conditions of 3.3.1, 3.3.2 and 3.5 shall be considered for the range of mass and mass distributions prescribed in 3.1.1 and at airspeeds established in accordance with 3.2.1. Asymmetrical as well as symmetrical loading shall be taken into account. The air, inertia and other loads resulting from the specified loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.3.1 MANOEUVRING LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, manoeuvring loads shall be computed on the basis of manoeuvring load factors appropriate to the manoeuvres permitted by the operating limitations. They shall not be less than values that experience indicates will be adequate for the anticipated operating conditions.

3.3.2 GUST LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, gust loads shall be computed for vertical and horizontal gust velocities and gradients that statistics or other evidence indicate will be adequate for the anticipated operating conditions.

3.4 GROUND AND WATER LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be able to withstand all the loads due to the reactions of the ground and water surface that are likely to arise during taxiing, take-off and landing.

3.4.1 LANDING CONDITIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing conditions at the design take-off mass and at the design landing mass shall include such symmetrical and asymmetrical attitudes of the aeroplane at ground or water contact, such velocities of descent, and such other factors affecting the loads imposed upon the structure as might be present in the anticipated operating conditions.

3.5 MISCELLANEOUS LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in addition to or in conjunction with the manoeuvring and gust loads and with the ground and water loads, consideration shall be given to all other loads (flight control loads, cabin pressures, effects of engine operation, loads due to changes of configuration, etc.) that are likely to occur in the anticipated operating conditions.

3.6 FLUTTER, DIVERGENCE AND VIBRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane structure shall be designed to be free from flutter, structural divergence (i.e. unstable structural distortion due to aerodynamic loading), and loss of control due to structural deformation, at speeds within and sufficiently beyond the operating limitations to comply with 1.3.1. Adequate strength shall be provided to withstand the vibration and buffeting that might occur in the anticipated operating conditions.

3.7 FATIGUE STRENGTH

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the strength and fabrication of the aeroplane shall be such as to ensure that the probability of disastrous fatigue failure of the aeroplane's structure under repeated loads and vibratory loads in the anticipated operating conditions is extremely remote.

Note: *Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual (ICAO Doc 9760).*

CHAPTER 4 – DESIGN AND CONSTRUCTION

4.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, details of design and construction shall be such as to give reasonable assurance that all aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

Note: *Guidance material on Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683)*

4.1.1 SUBSTANTIATING TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the functioning of all moving parts essential to the safe operation of the aeroplane shall be demonstrated by suitable tests in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.2 MATERIALS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all materials used in parts of the aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.3 MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.4 PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the aeroplane will receive.

4.1.5 INSPECTION PROVISIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the aeroplane that require such attention, either periodically or after unusually severe operations.

4.1.6 SYSTEMS DESIGN FEATURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) ***Controls and control systems.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the controls and control systems shall be such as to minimise the

b) possibility of jamming, inadvertent operations, and unintentional engagement of control surface locking devices.

c) ***System survivability.***

1) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification

was submitted on or after 12 March 2000, aeroplane systems shall be designed, arranged and physically separated to maximise the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.

2) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, It is recommended for aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg and for which the application for certification was submitted on or after 12 March 2000, aeroplane systems should be designed, arranged and physically separated to maximise the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.

d) ***Crew environment.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the flight crew compartment shall be such as to minimise the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

e) ***Pilot vision.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the arrangement of the pilot compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the aeroplane, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the pilot windshield shall permit, under precipitation conditions, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

f) ***Provision for emergencies.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the aeroplane. Reasonable provisions shall be made for continuation of essential services following engine or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this SD and in ICAO Annex 6, Parts I and II.

g) ***Fire precautions.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the aeroplane and the materials used in its manufacture, including cabin interior furnishing materials replaced during major refurbishing, shall be such as to minimise the possibility of in-flight and ground fires and also to minimise the production of smoke and toxic gases in the event of a fire. Means shall be provided to contain or to detect and extinguish such fires as might occur in such a way that no additional danger to the aeroplane is caused.

h) ***Fire suppression*****.** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which the application for certification was submitted on or after 12 March 2000, cargo compartment fire suppression systems, including their extinguishing agents, shall be designed

i) so as to take into account a sudden and extensive fire such as could be caused by an explosive or incendiary device or dangerous goods.

j) ***Incapacitation of occupants.***

1) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, design precautions shall be taken to protect against possible instances of cabin depressurisation and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.

2) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, It is recommended for aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg and for which the application for certification was submitted on or after 12 March 2000, design precautions should be taken to protect against possible instances of cabin depressurisation and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.

i) ***Protection of the flight crew compartment from smoke and fumes.***

1) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, means shall be provided to minimise entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.

2) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended for aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg and for which the application for certification was submitted on or after 12 March 2000, means should be provided to minimise entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.

4.1.7 EMERGENCY LANDING PROVISIONS

4.1.7.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

4.1.7.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane.

4.1.7.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the interior layout of the cabin and the position and number of emergency exits, including the means of locating and

illuminating the escape paths and exits, shall be such as to facilitate rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing.

4.1.7.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, on aeroplanes certificated for ditching conditions, provisions shall be made in the design to give maximum practicable assurance that safe evacuation from the aeroplane of passengers and crew can be executed in case of ditching.

4.1.8 GROUND HANDLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provisions shall be made in the design to minimise the risk that ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the aeroplane essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5 – ENGINES

5.1 SCOPE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Chapter 5 shall apply to engines of all types that are used on the aeroplane as primary propulsion units.

5.2 DESIGN, CONSTRUCTION AND FUNCTIONING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the engine complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly installed in the aeroplane in accordance with Chapter 7 and, if applicable, fitted with a suitable propeller.

5.3 DECLARED RATINGS, CONDITIONS AND LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the power ratings and the conditions of the atmosphere upon which they are based and all operating conditions and limitations which are intended to govern the operation of the engine shall be declared.

5.4 TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, an engine of the type shall complete satisfactorily such tests as are necessary to verify the validity of the declared ratings, conditions and limitations and to ensure that it will operate satisfactorily and reliably. The tests shall include at least the following:

a) ***Power calibration.*** Tests shall be conducted to establish the power or thrust characteristics of the engine when new and also after the tests in b) and c). There shall be no excessive decrease in power at the conclusion of all the tests specified.

b) ***Operation.*** Tests shall be conducted to ensure that starting, idling, acceleration, vibration, over speeding and other characteristics are satisfactory and to demonstrate adequate margins of freedom from detonation, surge or other detrimental conditions as may be appropriate to the particular type engine.

c) ***Endurance.*** Tests of sufficient duration shall be conducted at such powers, thrust, speeds and other operating conditions as are necessary to demonstrate reliability and durability of the engine. They shall also include operation under conditions in excess of the declared limits to the extent that such limitations might be exceeded in actual service.

CHAPTER 6 – PROPELLERS

6.1 SCOPE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Chapter 6 shall apply to propellers of all types.

6.2 DESIGN, CONSTRUCTION AND FUNCTIONING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the propeller assembly complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly fitted to the engine and installed in the aeroplane in accordance with Chapter 7.

6.3 DECLARED RATINGS, CONDITIONS AND LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the power ratings and all operating conditions and limitations which are intended to govern the operation of the propeller shall be declared.

6.4 TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a propeller of the type shall complete satisfactorily such tests as are necessary to ensure that it will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) ***Operation.*** Tests shall be conducted to ensure that strength vibration and over speeding characteristics are satisfactory and to demonstrate proper and reliable functioning of pitch changing and control mechanisms.

b) ***Endurance.*** Tests of sufficient duration shall be conducted at such powers, speeds and other operating conditions as are necessary to demonstrate reliability and durability of the propeller.

CHAPTER 7 – POWERPLANT INSTALLATION

7.1 GENERAL

7.1.1 APPLICABLE STANDARDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation shall comply with the Standards of Chapter 4 and with the Standards of this chapter.

7.1.2 COMPLIANCE WITH ENGINE AND PROPELLER LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of being used in the anticipated operating conditions. In conditions established in the aeroplane flight manual, the aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with Chapters 5, 6 and 7.

7.1.3 CONTROL OF ENGINE ROTATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the engine in flight or to reduce it to a safe level.

7.1.4 ENGINE RESTARTING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

7.2 ARRANGEMENT AND FUNCTIONING

7.2.1 INDEPENDENCE OF ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant shall be arranged and installed so that each engine together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical engine.

7.2.2 PROPELLER VIBRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the aeroplane.

7.2.3 COOLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cooling system shall be capable of maintaining powerplant temperatures within the established limits (see 7.1.2) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the aeroplane. The maximum and, if necessary, minimum ambient air temperature for which the powerplant has been established as being suitable shall be scheduled in the aeroplane flight manual.

7.2.4 ASSOCIATED SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the fuel, oil, air induction, and other systems associated with the power plant shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning

of the systems (e.g. engine power, aeroplane attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

7.2.5 FIRE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.1.6 e).:

a) Isolation. Such regions shall be isolated by fire-resisting material from other regions of the aeroplane where the presence of fire would jeopardise continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) Flammable fluids. Flammable fluid system components located in such regions shall be capable of containing the fluid when exposed to fire conditions. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs.

c) Fire detection. A sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions.

d) Fire extinguishment. Such regions shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the region would not jeopardise the safety of the aeroplane.

CHAPTER 8 – INSTRUMENTS AND EQUIPMENT

8.1 REQUIRED INSTRUMENTS AND EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be provided with approved instruments and equipment necessary for the safe operation of the aeroplane in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the aeroplane within its operating limitations.

Note 1: *Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in ICAO Annex 6, Parts I and II, for particular circumstances or on particular kinds of routes.*

Note 2: *Instruments and equipment design shall observe Human Factors principles.*

Note 3: *Guidance material on Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683) and in the Human Factors Guidelines for Air Traffic Management (ATM) Systems (ICAO Doc 9758).*

8.2 INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, instrument and equipment installations shall comply with the Standards of Chapter 4.

8.3 SAFETY AND SURVIVAL EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

*8.4 NAVIGATION LIGHTS AND ANTI-COLLISION LIGHTS

8.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the lights required by ICAO Annex 2 — Rules of the Air to be displayed by aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note 1: *It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).*

Note 2: *See the Airworthiness Manual (ICAO Doc 9760) for detailed technical specifications for exterior lights for aeroplanes.*

* Please refer to 1.1.2 of this part.

8.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, lights shall be installed in aeroplanes so as to minimise the possibility that they will:

a) Adversely affect the satisfactory performance of the flight crews' duties; or

b) Subject an outside observer to harmful dazzle.

Note: *In order to avoid the effects mentioned in 8.4.2, it will be necessary in some cases to provide means whereby the pilot can switch off or reduce the intensity of the flashing lights.*

CHAPTER 9 – OPERATING LIMITATIONS AND INFORMATION

9.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the operating limitations within which compliance with the Standards of this SD is determined, together with any other information necessary to the safe operation of the aeroplane, shall be made available by means of an aeroplane flight manual, markings and placards, and such other means as may effectively accomplish the purpose. The limitations and information shall include at least those prescribed in 9.2, 9.3 and 9.4.

9.2 OPERATING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations which there is a risk of exceeding in flight and which are defined quantitatively shall be expressed in suitable units and corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

9.2.1 LOADING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see 1.3.2).

9.2.2 AIRSPEED LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the airspeed limitations shall include all speeds (see 3.2) that are limiting from the standpoint of structural integrity or flying qualities of the aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate aeroplane configurations and other pertinent factors.

9.2.3 POWERPLANT LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant limitations shall include all those established for the various powerplant components as installed in the aeroplane (see 7.1.2 and 7.2.3).

9.2.4 LIMITATIONS ON EQUIPMENT AND SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the aeroplane.

9.2.5 MISCELLANEOUS LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the aeroplane (see 1.3.1).

9.2.6 FLIGHT CREW LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the aeroplane, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note: *See ICAO Annex 6 — Operation of Aircraft, Parts I and II, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this SD.*

9.2.7 FLYING TIME LIMITATION AFTER SYSTEM OR ENGINE FAILURE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the systems limitations shall include the maximum flying time for which system reliability has been established in relation to the approval of operations by aeroplanes with two turbine engines beyond the threshold time established in accordance with 4.7 of ICAO Annex 6, Part I.

Note: *The maximum time established in accordance with 4.7 of ICAO Annex 6, Part I, for a particular route may be less than that determined in accordance with 9.2.7 because of the operational considerations involved.*

9.3 OPERATING INFORMATION AND PROCEDURES

9.3.1 TYPES OF ELIGIBLE OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, there shall be listed the particular types of operations, as may be defined in ICAO Annex 6, Parts I and II, or be generally recognised, for which the aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements.

9.3.2 LOADING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading information shall include the empty mass of the aeroplane, together with a definition of the condition of the aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note: *Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.*

9.3.3 OPERATING PROCEDURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a description shall be given of normal and emergency operating procedures which are peculiar to the particular aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more engines.

9.3.4 HANDLING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any significant or unusual features of the aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by 2.3.4.3 shall be scheduled.

9.3.5 LEAST-RISK BOMB LOCATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, a least-risk location on the aeroplane shall be identified where a bomb or other explosive device may be placed to minimize the effects on the aeroplane in the case of detonation.

9.4 PERFORMANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance of the aeroplane shall be scheduled in accordance with 2.2. There shall be included information regarding the various aeroplane configurations and powers involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

9.5 AEROPLANE FLIGHT MANUAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a flight manual shall be made available. It shall identify clearly the specific aeroplane or series of aeroplanes to which it is related. The flight manual shall include at least the limitations, information and procedures specified in this chapter.

9.6 MARKINGS AND PLACARDS

9.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

9.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (e.g. towing, refuelling) that could pass unnoticed and that could jeopardise the safety of the aeroplane in subsequent flights.

CHAPTER 10 – CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

10.1 GENERAL

Further to the provisions of Section 12, 13, 14 and 15 of the Air Navigation Regulations, information for use in developing procedures for maintaining the aeroplane in an airworthy condition shall be made available. The information shall include that described in 10.2, 10.3 and 10.4.

10.2 MAINTENANCE INFORMATION

Further to the provisions of Section 12, 13,14 and 15 of the Air Navigation Regulations, maintenance information shall include a description of the aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

10.3 MAINTENANCE PROGRAMME INFORMATION

Further to the provisions of Section 12, 13,14 and 15 of the Air Navigation Regulations, maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

10.4 MAINTENANCE INFORMATION RESULTING FROM THE TYPE DESIGN APPROVAL

Further to the provisions of Section 12, 13,14 and 15 of the Air Navigation Regulations, maintenance tasks and frequencies that have been specified as mandatory by the State of Design in approval of the type design shall be identified as such.

CHAPTER 11 – SECURITY

11.1 AEROPLANES USED FOR DOMESTIC COMMERCIAL OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended that International Standards and Recommended Practices set forth in this chapter should be applied by all Contracting States for aeroplanes engaged in domestic commercial operations (air services).

11.2 LEAST-RISK BOMB LOCATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, consideration shall be given during the design of the aeroplane to the provision of a least-risk bomb location so as to minimize the effects of a bomb on the aeroplane and its occupants.

11.3 PROTECTION OF THE FLIGHT CREW COMPARTMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended that in all aeroplanes, which are required by ICAO Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for amending the Type Certificate to include a derivative type design is submitted to the appropriate national authority CAAF, consideration should be given to reinforcing the flight crew compartment bulkheads, floors and ceilings so as to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.

Note: *Standards and Recommended Practices concerning the requirements for the flight crew compartment door in all commercial passenger-carrying aeroplanes are contained in ICAO Annex 6, Part I, Chapter 13.*

11.4 INTERIOR DESIGN

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60 and for which the application for certification was submitted on or after 12 March 2000, consideration shall be given to design features that will deter the easy concealment of weapons, explosives or other dangerous objects on board aircraft and that will facilitate search procedures for such objects.

PART IIIB – AEROPLANES OVER 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 2 MARCH 2004

CHAPTER 1 – GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part are applicable in respect of all aeroplanes designated in 1.1.2 for which an application for the issue of a Type Certificate is submitted to the appropriate national authorities on or after 2 March 2004.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of this part shall apply to all aeroplanes with a maximum certificated take-off mass greater than 5 700 kg and intended for the carriage of passengers or cargo or mail in international air navigation.

Note 1: The aeroplanes described in 1.1.2 are known in some States as transport category aeroplanes.

Note 2: The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

1.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the aeroplanes designated in 1.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulation, unless otherwise stated, the Standards apply to the complete aeroplane including its powerplant, systems and equipment.

1.2 NUMBER OF ENGINES

1.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall have not less than two engines.

1.3 OPERATING LIMITATIONS

1.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting conditions shall be established for the aeroplane, its powerplant, systems and equipment (see 7.2). Compliance with the Standards of this part shall be established assuming that the aeroplane is operated within the limitations specified. The limitations shall include a margin of safety to render the likelihood of accidents arising therefrom extremely remote.

1.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting ranges of any parameter whose variation may compromise the safe operation of the aeroplane, e.g. mass, centre of gravity location, load distribution, speeds, ambient air temperature and altitude, shall be established within which compliance with all the pertinent Standards in this part is shown.

Note 1: The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

Note 2: *Maximum operating mass may be limited by the application of noise certification Standards (see Annex 16* — Environmental Protection, *Volume I* — Aircraft Noise, *and Annex 6* — Operation of

Aircraft, *Part I* — International Commercial Air Transport — Aeroplanes *and Part II* — International General Aviation — Aeroplanes*).*

1.4 UNSAFE FEATURES AND CHARACTERISTICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, under all anticipated operating conditions, the aeroplane shall not possess any feature or characteristic that renders it unsafe.

1.5 PROOF OF COMPLIANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the means by which compliance with the appropriate airworthiness requirements is demonstrated shall ensure that in each case the accuracy achieved will be such as to provide reasonable assurance that the aeroplane, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2 – FLIGHT

2.1 GENERAL

2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the Standards prescribed in this chapter shall be established by flight or other tests conducted upon an aeroplane or aeroplanes of the type for which a Type Certificate is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with each Standard shall be established for all applicable combinations of aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where necessary, appropriate aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the aeroplane's flying qualities.

2.2 PERFORMANCE

2.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient data on the performance of the aeroplane shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the aeroplane on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, achieving the performance scheduled for the aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note: Guidance material on human performance can be found in the Human Factors Training Manual (ICAO Doc 9683).

2.2.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the scheduled performance of the aeroplane shall be consistent with compliance with 1.2.1 and with the operation in logical combinations of those of the aeroplane's systems and equipment, the operation of which may affect performance.

2.2.4 MINIMUM PERFORMANCE

2.2.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, at the maximum masses scheduled (see 2.2.7) for take-off and for landing as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for seaplanes, in specified conditions of smooth water, the aeroplane shall be capable of accomplishing the minimum performances specified in 2.2.5 and 2.2.6, respectively, not considering obstacles, or runway or water run length.

Note: This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the flight manual against, for example:

- *Aerodrome elevation,*
- *Pressure-altitude at aerodrome level, or*
- *Pressure-altitude and atmospheric temperature at aerodrome level,*

So as to be readily usable when applying the national code on aeroplane performance operating limitations.

2.2.4.2 For aeroplanes for which application for certification was submitted on or after 2 March 2019, at the maximum masses scheduled for take-off and for landing permitted by the performance data in the flight manual (see *2.2.7.3*) as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for seaplanes, in specified conditions of smooth water, the aeroplane shall be capable of accomplishing the minimum performances specified in 2.2.5 and 2.2.6, respectively, not considering obstacles, or runway or water run length.

2.2.5 TAKE-OFF

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be capable of taking off assuming the critical engine to fail (see 2.2.7), the remaining engine(s) being operated within their take-off power or thrust limitations.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, after the end of the period during which the take-off power or thrust may be used, the aeroplane shall be capable of continuing to climb, with the critical engine inoperative and the remaining engine(s) operated within their maximum continuous power or thrust limitations, up to a height that it can maintain and at which it can continue safe flight and landing.

c) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealised conditions for which data are scheduled (see 2.2.7), the departure from the scheduled values is not disproportionate.

2.2.6 LANDING

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, starting from the approach configuration and with the critical engine inoperative, the aeroplane shall be capable, in the event of a missed approach, of continuing the flight to a point from which another approach can be made.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, starting from the landing configuration, the aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all engine(s) operating.

2.2.7 PERFORMANCE DATA

2.2.7.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the following stages are considered, as applicable:

a) Take-off. The take-off performance data shall include the accelerate-stop distance and the take-off path.

b) *Accelerate-stop distance*. The accelerate-stop distance shall be the distance required to accelerate and stop, or, for a seaplane to accelerate and come to a satisfactorily low speed, assuming the critical engine to fail suddenly at a point
not nearer to the start of the take-off than that assumed when determining the take-off path (see *2.2.7.1 c)*). Additionally, for landplanes, the distance shall be based on operations with all the wheel brake assemblies at the fully worn limit of their allowable wear range.

c) *Take-off path*. The take-off path shall comprise the ground or water run, initial climb and climb-out, assuming the critical engine to fail suddenly during the take-off (*see 2.2.7.1 b)*). The take-off path shall be scheduled up to a height from which the aeroplane can continue safe flight and landing. The climb-out shall be made at a speed not less than the take-off safety speed as determined in accordance with 2.3.2.4.

d) *En-route*. The en-route climb performance shall be the climb (or descent) performance with the aeroplane in the en-route configuration with:

1) the critical engine inoperative; and

2) the two critical engines inoperative in the case of aeroplanes having three or more engines.

The operating engine(s) shall not exceed maximum continuous power or thrust.

e) *Landing. Landing performance data at the time of take-off*. The landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path at a selected height above the landing surface to the point on the landing surface at which the aeroplane comes to a complete stop, or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations therefrom. For landplanes, this distance shall be based on operations with all the wheel brake assemblies at the fully worn limit of their allowable wear range.

Note. — If at time of take-off landing performance data includes the distance margin specified in this Standard, it is not necessary to allow for the expected variations in the approach and landing techniques in applying 5.2.11 of Annex 6, Part I.

f) *Landing*. *At time of landing performance data*. The landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path to the point on the landing surface at which the aeroplane comes to a complete stop, or, for a seaplane, comes to a satisfactorily low speed. The approach speed, use of deceleration devices, and airborne portion of the landing distance shall be in accordance with and reflect directly actual normal operating practices. This distance may be supplemented by such distance margin as may be necessary. For landplanes, this distance shall be
based on operations with all the wheel brake assemblies at the fully worn limit of their allowable wear range.

2.2.7.2 For aeroplanes for which application for certification was submitted before 2 March 2019, performance data shall be determined and furnished in the flight manual so that its application by means of the operating rules to which the aeroplane is to be operated in accordance with 5.2 of Annex 6, Part I, will provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and furnished for the stages in 2.2.7.1 a) to e) for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing surface for landplanes; water surface conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the aeroplane is to be certificated.

2.2.7.3 For aeroplanes for which application for certification was submitted on or after 2 March 2019, performance data shall be determined and furnished in the flight manual. Such performance data shall be so that its application by means of the operating rules to which the aeroplane is to be operated in accordance with 5.2 of Annex 6, Part I, will provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and furnished for the stages in *2.2.7.1 a) to f)* for the ranges of mass, pressure-altitude, ambient temperature, wind velocity, and for any other operational variables for which the aeroplane is to be certificated. Additionally, the take-off performance data and the at time of landing performance data shall include the effect of the gradient and conditions (dry, wet or contaminated) of the take-off or landing surface as appropriate for landplanes, and water surface conditions, density of water and strength of current for seaplanes. The at time of take-off landing performance data need only to be determined with standard day

temperature and level, dry landing surfaces for landplanes, but shall include the effect of water surface conditions, density of water, and strength of current for seaplanes.

2.3 FLYING QUALITIES

2.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the aeroplane is approved.

2.3.2 CONTROLLABILITY

2.3.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power or thrust, changes of aeroplane configurations) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any engine. A technique for safely controlling the aeroplane shall be established for all stages of flight and aeroplane configurations for which performance is scheduled.

Note: *This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.*

2.3.2.2 Controllability on the ground (or water). Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.2.3 Controllability during take-off. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable in the event of sudden failure of the critical engine at any point in the take-off, when the aeroplane is handled in the manner associated with the scheduling of take-off paths and accelerate-stop distances.

2.3.2.4 Take-off safety speed. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off safety speeds assumed when the performance of the aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the aeroplane remains controllable after sudden failure of the critical engine.

2.3.3 TRIM

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations the aeroplane shall have such trim characteristics as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more engines for which performance characteristics are established.

2.4 STABILITY AND CONTROL

2.4.1 STABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. aeroplane configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the aeroplane shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the aeroplane is prejudiced by lack of manoeuvrability in emergency conditions. It shall be shown that any combination of failures or conditions that would result in the need for

exceptional piloting skills is extremely improbable. The stability may be achieved by natural or artificial means, or a combination of both. If compliance with the flight characteristics requirements is dependent upon a stability augmentation system or upon any other automatic or power-operated system, compliance shall be shown with 4.2 of this part.

2.4.2 STALLING

2.4.2.1 Stall warning. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when the aeroplane approaches a stall both in straight and turning flight with all engines operating, a clear and distinctive stall warning shall be apparent to the pilot with the aeroplane in all permissible configurations and powers or thrusts, except those which are not considered to be essential for safe flying. The stall warning and other characteristics of the aeroplane shall be such as to enable the pilot to arrest the development of the stall after the warning begins and, without altering the engine power or thrust, to maintain full control of the aeroplane.

2.4.2.2 Behaviour following a stall. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in any configuration and at any level of power or thrust in which it is considered that the ability

to recover from a stall is essential, the behaviour of the aeroplane following a stall shall not be so extreme as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the aeroplane.

2.4.2.3 Stalling speeds. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of flight (e.g. take-off, en route, landing) shall be established. One of the values of the power or thrust used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

2.4.3 FLUTTER AND VIBRATION

2.4.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulation, it shall be demonstrated by suitable tests, analyses or any acceptable combination of tests and analyses that all parts of the aeroplane are free from flutter and excessive vibration in all aeroplane configurations under all speed conditions within the operating limitations of the aeroplane (see 1.2.2). There shall be no vibration or buffeting severe enough to cause structural damage.

2.4.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, there shall be no vibration or buffeting severe enough to interfere with control of the aeroplane or to cause excessive fatigue to the flight crew.

Note: *Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.*

CHAPTER 3 – STRUCTURE

3.1 GENERAL

3.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted before 24 February 2013, the aeroplane structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding catastrophic failure throughout its operational life.

3.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, the aeroplane structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding hazardous and catastrophic failure throughout its operational life.

3.2 MASS AND MASS DISTRIBUTION.

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.3 LIMIT LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.6 shall be considered as limit loads.

3.4 STRENGTH AND DEFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in the various loading conditions prescribed in 3.6, no part of the aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the aeroplane structure shall be capable of supporting the ultimate load.

3.5 AIRSPEEDS

3.5.1 DESIGN AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design airspeeds shall be established for which the aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads. To avoid inadvertent exceedances due to upsets or atmospheric variations, the design airspeeds shall provide sufficient margin for the establishment of practical operational limiting airspeeds. In addition, the design air-speeds shall be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air. Consideration shall be given to a design manoeuvring speed, a design cruising speed, a design dive speed, and any other design airspeeds necessary for configurations with high lift or other special devices.

3.5.2 LIMITING AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.2.1, shall be included in the flight manual as part of the operating limitations (see 7.2).

3.6 STRENGTH

3.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all structural elements shall be designed to withstand the maximum loads expected in service under all anticipated

operating conditions without failure, permanent distortion or loss of functionality. In determining these loads, account shall be taken of:

a) The expected operational life of the aeroplane;

b) The vertical and horizontal gust environment, taking into consideration the expected variations in mission profile and loading configurations;

c) The manoeuvre spectrum, taking into account variations in mission profiles, and loading configurations;

d) Asymmetrical as well as symmetrical loading;

e) The ground and water loads, including taxi, landing and take-off loads, and ground/water handling loads;

f) The speed range of the aeroplane, taking into account the aeroplane characteristics and operation limitations;

g) Vibration and buffeting loads;

h) Corrosion or other degradation, given the maintenance specified, and various operating environments; and

i) Any other loads, such as flight control loads, cabin pressurisation loads, engine loads, or dynamic loads due to changes to the steady state configuration.

3.6.2 The air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.7 SURVIVABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be designed so as to provide the occupants with the maximum practicable protection in the event of structural failure, or in the event of damage due to ground, water, or object impact. Consideration shall be given to at least the following:

a) Likely impact with birds;

b) Energy absorption by the airframe, occupant seats and restraints;

c) The probable behaviour of the aeroplane in ditching; and

d) Allowing egress in the shortest practicable time.

3.8 STRUCTURAL DURABILITY

3.8.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted before 24 February 2013, the design and construction of the aeroplane shall, wherever practicable, conform to damage tolerance principles and shall be such

as to ensure that the probability of catastrophic failure during the operational life is extremely remote, taking into account:

a) The expected environment;

b) The expected repeated loads applied in service;

c) Expected vibrations from aerodynamic interaction or internal sources;

d) Thermal cycles;

e) Accidental and discrete source damage;

f) Likely corrosion or other degradation;

g) Specified maintenance; and

h) Likely structural repairs.

3.8.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, the design and construction of the aeroplane shall, wherever practicable, conform to damage tolerance and failsafe principles and shall be such as to avoid catastrophic failure during the operational life, taking into account:

a) The expected environment;

b) The expected repeated loads applied in service;

c) Expected vibrations from aerodynamic interaction or internal sources;

d) Thermal cycles;

e) Accidental and discrete source damage;

f) Likely corrosion or other degradation;

g) Widespread fatigue damage;

h) Specified maintenance; and

i) Likely structural repairs.

Note: *The expression "wherever practicable" is introduced to ensure that when an effective damage-tolerant structure cannot be achieved within the limitations of geometry, inspectability or good design practice, the structure can be designed to the fatigue evaluation (safe-life) principles. Typical examples of structures that might not be amenable to damage-tolerant design are landing gear, engine mounts and their attachments.*

3.9 SPECIAL FACTORS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, the design features (e.g. castings, bearings or fittings), the strength of which is subject to variability in manufacturing processes, deterioration in service, or any other cause, shall be accounted for by a suitable factor.

CHAPTER 4 – DESIGN AND CONSTRUCTION

4.1 GENERAL

4.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, details of design and construction shall be such as to give reasonable assurance that all aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

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

4.1.2 SUBSTANTIATION OF MOVING PARTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the functioning of all moving parts essential to the safe operation of the aeroplane shall be demonstrated by suitable tests in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.3 MATERIALS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all materials used in parts of the aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design. The effect of the materials on the occupants of the aeroplane and other persons on the ground, and the environment in general, in normal and emergency situations, shall be taken into account.

4.1.4 MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.5 PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the aeroplane will receive.

4.1.6 INSPECTION PROVISIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the aeroplane that require such attention, either periodically or after unusually severe operations.

4.2 SYSTEMS DESIGN FEATURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) ***Controls and control systems.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the controls and control systems shall be such that:

1) Each control and control system shall operate with the ease, smoothness and precision appropriate to its function;

2) Continued safe flight and landing of the aeroplane shall not be prevented by:

   i) Any single failure not shown to be extremely improbable in the control system; or

   ii) Any event that results in a jam of a flight control in any normally encountered position of the flight controls;

3) The possibility of jamming, inadvertent operations and unintentional engagement of control surface locking devices is minimised; and

4) Each element of each flight control system is designed, or distinctively and permanently marked, to minimise the probability of any incorrect assembly that could result in the malfunction of the system.

b) **System survivability.**

1) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, aeroplane systems shall be designed, arranged and physically separated to maximise the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.

2) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended for aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg, aeroplane systems should be designed, arranged and physically separated to maximise the potential for continued safe flight and landing after any event resulting in damage to the aeroplane structure or systems.

c) ***Crew environment.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the flight crew compartment shall be such as to minimise the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

d) ***Pilot vision.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the arrangement of the flight crew compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the aeroplane, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the windshield shall permit, under precipitation conditions, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

e) ***Provision for emergencies.*** Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided which shall either automatically prevent, or enable the flight
crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the aeroplane. Reasonable provisions shall be made for continuation of essential services following engine or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this SD and in ICAO Annex 6, Parts I and II.

f) ***Fire precautions.***

1) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the aeroplane and the materials used in its manufacture shall be such so as to minimise the risk of in-flight and ground fires, to minimise the production of smoke and toxic gases in the event of a fire and to delay the occurrence of flashover resulting from heat release in the cabin. Means shall be provided to contain or to detect and extinguish such fires as might occur in such a way that no additional danger to the aeroplane is caused. Lavatories installed in aeroplanes shall be equipped with a smoke detection system and a built-in fire extinguisher system for each receptacle intended for the disposal of towels, paper or waste.

2) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, design precautions shall be taken to minimise the risk of an uncontained fire initiating in areas of the aeroplane that contain high concentrations of wiring or equipment that are not normally accessible in flight.

Note: *Design precautions may include the selection of appropriate materials and types of equipment installed in these areas, as well as the reduction of possible ignition sources, typically by preventing the ingress of fuel or fuel vapour, upgrading the flammability requirements of aircraft wiring or*

improving the detection of overheating or smoke and the indication of its presence to the flight crew, etc.

g) ***Cargo compartment protection***. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations,

1) Each cargo compartment shall be equipped with a built-in fire detection system, and a means to suppress a fire, except when the presence of a fire would be easily discovered by a crew member while at their station and the crew member has a means to extinguish it rapidly.

2) The means to suppress a fire for each cargo compartment not accessible to a crew member shall include a built-in fire suppression system.

3) For aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, cargo compartment fire suppression systems, including their extinguishing agents, shall be designed so as to take into account a sudden and extensive fire such as could be caused by an explosive or incendiary device.

4) For those aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2025, the elements of the aeroplane design associated with cargo compartment fire protection, and a summary of the demonstrated standards that were considered in the process of

aeroplane certification shall be included in the required aeroplane documentation and made available to the operator.

Note. -- Guidance material on the elements of cargo compartment fire protection and associated demonstrated standards is contained in the Guidance for Safe Operations Involving Aeroplane Cargo Compartments (Doc 10102).

h) ***Incapacitation of occupants***.

1) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, design precautions shall be taken to protect against possible instances of cabin depressurisation and against the presence of smoke or other toxic gases that could incapacitate the occupants of the aeroplane.

2) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in addition, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, design precautions shall be taken to protect against possible instances of cabin depressurisation and against the presence of smoke or other toxic gases caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.

3) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended for aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg, design precautions should be taken to protect against possible instances of cabin depressurisation and against the presence of smoke or other toxic gases, including those caused by explosive or incendiary devices or dangerous goods, which could incapacitate the occupants of the aeroplane.

i) **Protection of the flight crew compartment from smoke and fumes.**

1) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a

passenger seating capacity greater than 60, means shall be provided to minimise entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.

2) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended for aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg but not exceeding 45 500 kg, means should be provided to minimise entry into the flight crew compartment of smoke, fumes and noxious vapours generated by an explosion or fire on the aeroplane.

4.3 AEROELASTICITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be free from flutter, structural divergence, and loss of control due to structural deformation and aeroelastic effects, at all speeds within and sufficiently beyond the design envelope to comply with 1.2.1. Account shall be taken of the characteristics of the aeroplane and variations in pilot skill and workload. Allowable limits

for aerodynamic control surfaces and how those limits are to be monitored shall be specified so as to ensure that the aeroplane remains free from aeroelastic problems during its operational life.

4.4 OCCUPANTS ACCOMMODATION FEATURES

4.4.1 SEATING AND RESTRAINTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate seating and restraints shall be provided for the occupants, taking account of the likely flight and emergency landing loads to be encountered. Attention shall be paid to minimizing injury to occupants due to contact with surrounding structure during the operation of the aeroplane.

4.4.2 CABIN ENVIRONMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, ventilation, heating and, where applicable, pressurisation systems shall be designed to provide the cabin with an adequate environment during the anticipated flight and ground or water operating conditions. The systems design shall also consider likely emergency conditions.

4.5 ELECTRICAL BONDING AND PROTECTION AGAINST LIGHTNING AND STATIC ELECTRICITY

4.5.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, electrical bonding and protection against lightning and static electricity shall be such as to:

a) Protect the aeroplane, its systems, its occupants and those who come in contact with the aeroplane on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) Prevent dangerous accumulation of electrostatic charge.

4.5.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall also be protected against catastrophic effects of lightning. Due account shall be taken of the material used in the construction of the aeroplane.

4.6 EMERGENCY LANDING PROVISIONS

4.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

4.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an

emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane and shall be shown to be suitable for their intended purpose.

4.6.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the interior layout of the cabin and the position and number of emergency exits, including the means of locating and

illuminating the escape paths and exits, shall be such as to facilitate rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing.

4.6.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, on aeroplanes certificated for ditching conditions, provisions shall be made in the design to give maximum practicable assurance that safe evacuation from the aeroplane of passengers and crew can be executed in case of ditching.

4.7 GROUND HANDLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provisions shall be made to minimize the risk that normal ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the aeroplane essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5 – POWERPLANT

5.1 ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part VI of this SD shall apply to each engine that is used on the aeroplane as a primary propulsion unit.

5.2 PROPELLERS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part VII of this SD shall apply to each propeller that is used on the aeroplane.

5.3 POWERPLANT INSTALLATION

5.3.1 COMPLIANCE WITH ENGINE AND PROPELLER LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of functioning reliably in the anticipated operating conditions. In conditions established in the flight manual, the aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with this chapter and with Parts VI and VII.

5.3.2 CONTROL OF ENGINE ROTATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the failed engine in flight or to reduce it to a safe level.

5.3.3 TURBINE ENGINE INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for a turbine engine installation:

a) The design shall minimise the hazards to the aeroplane in the event of failure of engine rotating parts, or an engine fire which burns through the engine case; and

b) The powerplant installation shall be designed to give reasonable assurance that those engine operating limitations that adversely affect the structural integrity of rotating parts shall not be exceeded in service.

5.3.4 ENGINE RESTARTING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

5.3.5 ARRANGEMENT AND FUNCTIONING

5.3.5.1 INDEPENDENCE OF ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted before 24 February 2013, the powerplant shall be arranged and installed so that each engine together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely

remote, cannot result in a loss of more power than that resulting from complete failure of the critical engine.

5.3.5.2 INDEPENDENCE OF ENGINES AND ASSOCIATED SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, the engines together with their associated systems shall be arranged and isolated from each other to allow operation, in at least one configuration, so that the failure or malfunction of any engine, or of any system that can affect the engine, will not:

a) Prevent the continued safe operation of the remaining engine(s); or

b) Require immediate action by any crew member for continued safe operation of the remaining engine(s).

5.3.5.3 PROPELLER VIBRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the aeroplane.

5.3.5.4 COOLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cooling system shall be capable of maintaining the temperature of powerplant components and fluids within the established limits (see 5.3.1) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the aeroplane. The maximum and, if necessary, minimum ambient air temperature for which the powerplant has been established as being suitable shall be scheduled in the flight manual.

5.3.5.5 ASSOCIATED SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the fuel, oil, air induction, and other systems associated with the powerplant shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power or thrust, aeroplane attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

5.3.5.6 FIRE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.2 f).

a) Isolation. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, such regions shall be isolated by fireproof material from other regions of the aeroplane where the presence of fire would jeopardise continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) Flammable fluids. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, flammable fluid system components located in such regions shall be fire resistant. Drainage of each region shall be provided to minimise hazards resulting from the failure of any component containing

flammable fluids. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs. Where sources of flammable fluid exist in such regions, the whole of the related system within the region, including supporting structure, shall be fireproof or shielded from the effects of the fire.

c) Fire detection. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions.

d) Fire extinguishment. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, such regions shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the region would not jeopardise the safety of the aeroplane.

CHAPTER 6 – SYSTEMS AND EQUIPMENT

6.1 GENERAL

6.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be provided with approved instruments, equipment and systems, including guidance and flight management systems necessary for the safe operation of the aeroplane in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the aeroplane within its operating limitations. Instruments and equipment design shall observe Human Factors principles.

Note 1: Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in ICAO Annex 6, Parts I and II, for particular circumstances or on particular kinds of routes.

Note 2: Guidance material on Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683) and in the Human Factors Guidelines for Air Traffic Management (ATM) Systems (ICAO Doc 9758).

6.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the instruments, equipment and systems required by 6.1.1 and their installation shall be such that:

a) An inverse relationship exists between the probability of a failure condition and the severity of its effect on the aircraft and its occupants, as determined by a system safety assessment process;

b) They perform their intended function under all anticipated operating conditions; and

c) Electromagnetic interference between them is minimised.

6.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to warn the crew of unsafe system operating conditions and to enable them to take corrective action.

6.1.4 Electrical power supply

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations of the aeroplane and essential power loads after failures that affect the electrical generating system and under expected environmental conditions.

6.1.5 Development assurance of complex electronic hardware and system software.
Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, complex electronic hardware and system software shall be developed, verified and validated such as to ensure that the systems in which they are used perform their intended functions at a level of safety that complies with the requirements of this part, notably those of 6.1.2 a) and 6.1.2 b).

Note: Some States accept the use of national or international industry standards for the development assurance (development, verification and validation) of complex electronic hardware and systems software.

6.2 INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, instrument and equipment installations shall comply with the Standards of Chapter 4.

6.3 SAFETY AND SURVIVAL EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

6.4 NAVIGATION LIGHTS AND ANTI-COLLISION LIGHTS

6.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the lights required by ICAO Annex 2 — Rules of the Air to be displayed by aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note: It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

6.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, lights shall be installed in aeroplanes so as to minimise the possibility that they will adversely affect the satisfactory performance of the flight crews' duties.

Note: In order to avoid the effects mentioned in 6.4.2, it will be necessary in some cases to provide means whereby the pilot can adjust the intensity of the flashing lights.

6.5 ELECTROMAGNETIC INTERFERENCE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, aeroplane electronic systems, particularly flight-critical and flight-essential systems, shall be protected against electromagnetic interference from both internal and external sources.

6.6 ICE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, if certification for flight in icing conditions is requested, the aeroplane shall be shown to be able to operate safely in icing conditions likely to be encountered in all anticipated operating environments.

CHAPTER 7 – OPERATING LIMITATIONS AND INFORMATION

7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the operating limitations within which compliance with the Standards of this SD is determined, together with any other information necessary to the safe operation of the aeroplane, shall be made available by means of a flight manual, markings and placards, and such other means as may effectively accomplish the purpose.

7.2 OPERATING LIMITATIONS

7.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations which might be exceeded in flight and which are defined quantitatively shall be expressed in suitable units. These limitations shall be corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

7.2.2 LOADING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see 1.2.2).

7.2.3 AIRSPEED LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the airspeed limitations shall include all speeds (see 3.5) that are limiting from the standpoint of structural integrity or flying qualities of the aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate aeroplane configurations and other pertinent factors.

7.2.4 POWERPLANT LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant limitations shall include all those established for the various powerplant components as installed in the aeroplane (see 5.3.1 and 5.3.5.4).

7.2.5 LIMITATIONS ON EQUIPMENT AND SYSTEMS3

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the aeroplane.

7.2.6 MISCELLANEOUS LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the aeroplane (see 1.3.1).

7.2.7 FLIGHT CREW LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the aeroplane, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note: *See ICAO Annex 6 — Operation of Aircraft, Parts I and II, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this SD.*

7.2.8 FLYING TIME LIMITATION AFTER SYSTEM OR ENGINE FAILURE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the systems limitations shall include the maximum flying time for which system reliability has been established in relation to the approval of operations by aeroplanes with two turbine engines beyond the threshold time established in accordance with 4.7 of ICAO Annex 6, Part I.

Note: *The maximum time established in accordance with 4.7 of ICAO Annex 6, Part I, for a particular route may be less than that determined in accordance with 7.2.8 because of the operational considerations involved.*

7.3 OPERATING INFORMATION AND PROCEDURES

7.3.1 TYPES OF ELIGIBLE OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the particular types of operations for which the aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

7.3.2 LOADING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading information shall include the empty mass of the aeroplane, together with a definition of the condition of the aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note: *Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.*

7.3.3 OPERATING PROCEDURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a description shall be given of normal and emergency operating procedures which are peculiar to the particular aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more engines.

7.3.4 HANDLING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any significant or unusual features of the aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by 2.4.2.3 shall be scheduled.

7.3.5 LEAST-RISK BOMB LOCATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, a least-risk location on the aeroplane shall be identified where a bomb or other explosive device may be placed to minimise the effects on the aeroplane in the case of detonation.

7.4 PERFORMANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance of the aeroplane shall be scheduled in accordance with 2.2. There shall be included information regarding the various aeroplane configurations and powers or thrusts involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

7.5 FLIGHT MANUAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a flight manual shall be made available. It shall identify clearly the specific aeroplane or series of aeroplanes to which it is related. The flight manual shall include at least the limitations, information and procedures specified in 7.2, 7.3, 7.4 and 7.6.1.

7.6 MARKINGS AND PLACARDS

7.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

7.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (e.g. towing, refuelling) that could pass unnoticed and that could jeopardise the safety of the aeroplane in subsequent flights.

7.7 CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

7.7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, information for use in developing procedures for maintaining the aeroplane in an airworthy condition shall be made available. The information shall include that described in 7.7.2, 7.7.3 and 7.7.4.

7.7.2 MAINTENANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance information shall include a description of the aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

7.7.3 MAINTENANCE PROGRAMME INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance programme information shall include the maintenance tasks and recommended intervals at which these tasks are to be performed.

Note: The development of initial maintenance programme information at the time of aeroplane type certification is sometimes referred to as the Maintenance Review Board (MRB) process.

7.7.4 MANDATORY MAINTENANCE REQUIREMENTS RESULTING FROM THE TYPE DESIGN APPROVAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of 7.7.3.

Note: Mandatory requirements identified as part of the type design approval are often referred to as Certification Maintenance Requirements (CMR) and/or airworthiness limitations.

CHAPTER 8 – CRASHWORTHINESS AND CABIN SAFETY

8.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, crashworthiness shall be taken into account in the design of aeroplanes to improve the probability of occupant survival.

8.2 DESIGN EMERGENCY LANDING LOADS

8.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted before 24 February 2013, emergency landing (crash) loads shall be determined for all categories of aeroplanes so that the interiors, furnishings, support structure and safety equipment can be designed to maximise survivability for the occupants. Items to be considered shall include:

a) Dynamic effects;

b) Restraint criteria for items that could cause a hazard;

c) Distortion of the fuselage in the areas of emergency exits;

d) Fuel cell integrity and position; and

e) Integrity of electrical systems to avoid sources of ignition.

8.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, emergency landing (crash) loads shall be determined so that the interiors, furnishings, support structure and safety equipment can be designed to protect the occupants under emergency landing conditions. Items to be considered shall include:

a) Dynamic effects;

b) Restraint criteria for items that could cause a hazard;

c) Deformation of the fuselage in the areas of emergency exits;

d) Fuel cell integrity and position; and

e) Integrity of electrical systems to avoid sources of ignition.

8.3 CABIN FIRE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cabin shall be so designed as to provide fire protection to the occupants in the event of airborne systems failures or a crash situation. Items to be considered shall include:

a) Flammability of cabin interior materials;

b) Fire resistance and the generation of smoke and toxic fumes;

c) Provision of safety features to allow for safe evacuation; and

d) Fire detection and suppression equipment.

8.4 EVACUATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be equipped with sufficient emergency exits to allow maximum opportunity for cabin evacuation within an appropriate time period. Items to be considered shall include:

a) Number of seats and seating configuration;

b) Number, location and size of exits;

c) Marking of exits and provision of instructions for use;

d) Likely blockages of exits;

e) Operation of exits; and

f) Positioning and weight of evacuation equipment at exits, e.g. slides and rafts.

8.5 LIGHTING AND MARKING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, emergency lighting shall be provided and shall have the following characteristics:

a) Independence from main electrical supply;

b) Automatic activation upon loss of normal power/impact;

c) Visual indication of the path to emergency exits in smoke-filled cabin conditions;

d) Illumination both inside and outside the aeroplane during evacuation; and

e) No additional hazard in the event of fuel spillage.

8.6 SURVIVAL EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be so equipped as to provide the crew and occupants with the maximum opportunity to survive in the expected external environment for a reasonable time-span. Items to be considered shall include:

a) Number of life rafts/life jackets;

b) Survival equipment suited to the likely environment;

c) Emergency radios and pyrotechnical distress signalling equipment; and

d) Automatic emergency radio beacons.

CHAPTER 9 – OPERATING ENVIRONMENT AND HUMAN FACTORS

9.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be designed to allow safe operation within the performance limitations of its passengers and those who operate, maintain and service it.

Note: *The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the aeroplane is capable of being controlled at all phases of the flight (including any degradation due to failures) and that neither the crew nor passengers are harmed by the environment in which they have been placed for the duration of the flight.*

9.2 FLIGHT CREW

9.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be designed in such a way as to allow safe and efficient control by the flight crew. The design shall allow for variations in flight crew skill and physiology commensurate with flight crew licensing limits. Account shall be taken of the different expected operating conditions of the aeroplane in its environment, including operations degraded by failures.

9.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the workload imposed on the flight crew by the design of the aeroplane shall be reasonable at all stages of flight. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the aeroplane, such as a contained engine failure or windshear encounter.

Note: *Workload can be affected by both cognitive and physiological factors.*

9.3 ERGONOMICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, during design of the aeroplane, account shall be taken of ergonomic factors including:

a) Ease of use and prevention of inadvertent misuse;

b) Accessibility;

c) Flight crew working environment;

d) Cockpit standardization; and

e) Maintainability.

9.4 OPERATING ENVIRONMENTAL FACTORS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the aeroplane shall take into consideration the flight crew operating environment including:

a) effect of aeromedical factors such as level of oxygen, temperature, humidity, noise and vibration;

b) Effect of physical forces during normal flight;

c) Effect of prolonged operation at high altitude; and

d) Physical comfort.

CHAPTER 10 – SECURITY

10.1 AEROPLANES USED FOR DOMESTIC COMMERCIAL OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended that the International Standards and Recommended Practices set forth in this chapter should be applied by all Contracting States including Fiji for aeroplanes engaged in domestic commercial operations (air services).

10.2 LEAST-RISK BOMB LOCATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, consideration shall be given during the design of the aeroplane to the provision of a least-risk bomb location so as to minimise the effects of a bomb on the aeroplane and its occupants.

10.3 PROTECTION OF THE FLIGHT CREW COMPARTMENT

10.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in all aeroplanes, which are required by ICAO Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for the issue of a Type Certificate is first submitted to the appropriate national authority on or after 20 May 2006, the flight crew compartment bulkheads, floors and ceilings shall be designed to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.

10.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended in all aeroplanes, which are required by ICAO Annex 6, Part I, Chapter 13 to have an approved flight crew compartment door, and for which an application for amending the Type Certificate to include a derivative type design is submitted to the appropriate national authority on or after 20 May 2006, consideration should be given to reinforcing the flight crew compartment bulkheads, floors and ceilings so as to resist penetration by small arms fire and grenade shrapnel and to resist forcible intrusions, if these areas are accessible in flight to passengers and cabin crew.

Note: *Standards and Recommended Practices concerning the requirements for the flight crew compartment door in all commercial passenger-carrying aeroplanes are contained in ICAO Annex 6, Part I, Chapter 13.*

10.4 INTERIOR DESIGN

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater than 60, consideration shall be given to design features that will deter the easy concealment of weapons, explosives or other dangerous objects on board aircraft and that will facilitate search procedures for such objects.

PART IV – HELICOPTERS
PART IVA – HELICOPTERS FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 22 MARCH 1991 BUT BEFORE 13 DECEMBER 2007

Note: *The provisions of PART IVA are the same as those contained in PART IV of Annex 8, Ninth Edition except for modified applicability clauses and cross references.*

CHAPTER 1 – GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part are applicable in respect of all helicopters designated in 1.1.2 that are of types of which the prototype was submitted to the appropriate national authorities for certification on or after 22 March 1991 but before 13 December 2007.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part shall apply to helicopters intended for the carriage of passengers or cargo or mail in international air navigation.

Note: *The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.*

1.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the helicopters designated in 1.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, the Standards apply to the complete helicopter including powerplant, systems and equipment.

1.2 LIMITATIONS

1.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting conditions shall be established for the helicopter, its powerplant and its equipment (see 9.2). Compliance with the Standards of this Part shall be established assuming that the helicopter is operated within the limitations specified. The limitations shall be sufficiently removed from any conditions prejudicial to the safety of the helicopter to render the likelihood of accidents arising therefrom extremely remote.

1.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting ranges of mass, centre of gravity location, load distribution, speeds and ambient conditions shall be established within which compliance with all the pertinent Standards in this Part is shown, except that combinations of conditions which are fundamentally impossible to achieve need not be considered.

Note 1: *The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.*

Note 2: *The following items, for instance, may be considered as basic helicopter limitations:*
— Maximum certificated take-off (including lift-off) mass;

— Maximum certificated ground-taxiing mass;

— Maximum certificated landing mass;

— Most forward, rearward, and lateral centre of gravity positions in various configurations; and

— Maximum certificated cargo sling mass.

Note 3: *Maximum operating mass may be limited by the application of Noise Certification Standards (see Annex 16* — Environmental Protection*, Volume I* — Aircraft Noise*, and Annex 6* — Operation of Aircraft*, Part III* — International Operations — Helicopters*).*

1.3 UNSAFE FEATURES AND CHARACTERISTICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, under all anticipated operating conditions, the helicopter shall not possess any feature or characteristic that renders it unsafe.

1.4 PROOF OF COMPLIANCE

1.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the appropriate airworthiness requirements shall be based on evidence either from tests, calculations, calculations based on tests, or other methods, provided that in each case the accuracy achieved will ensure a level of airworthiness equal to that which would be achieved were direct tests conducted.

1.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the tests of 1.4.1 shall be such as to provide reasonable assurance that the helicopter, its components and equipment are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2 – FLIGHT

2.1 GENERAL

2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the Standards prescribed in Chapter 2 shall be established by flight or other tests conducted upon a helicopter or helicopters of the type for which a Certificate of Airworthiness is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with each Standard shall be established for all applicable combinations of helicopter mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where necessary, appropriate helicopter configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the helicopter's flying qualities.

2.2 PERFORMANCE

2.2.1 GENERAL

2.2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient data on the performance of the helicopter shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the helicopter on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, achieving the performance scheduled for the helicopter shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the pilot.

Note: Guidance material on human performance can be found in the Human Factors Training Manual (ICAO Doc 9683).

2.2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the scheduled performance of the helicopter shall be consistent with compliance with 1.2.1 and with the operation in logical combinations of those of the helicopter's systems and equipment, the operation of which may affect performance.

2.2.2 MINIMUM PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, at the maximum mass scheduled (see 2.2.3) for take-off and for landing as functions of the take-off or landing site elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions, and, for water operations, in specified conditions of smooth water, the helicopter shall be capable of accomplishing the minimum performances specified in 2.2.2.1 and 2.2.2.2, respectively, not considering obstacles, or final approach and take-off area length.

Note: This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the helicopter flight manual against, for example at the take-off or landing site:

— Elevation, or

— Pressure-altitude, or

— Pressure-altitude and atmospheric temperature,

so as to be readily usable when applying the national code on helicopter performance operating limitations.

2.2.2.1 Take-off

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in the event of critical engine failure, at or after the take-off decision point (for performance Class 1) or the defined point after take-off (for performance Class 2), performance Classes 1 and 2 helicopters shall be capable of continuing safe flight, the remaining engine(s) being operated within the approved limitations.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealised conditions for which data are scheduled (see 2.2.3), the departure from the scheduled values is not disproportionate.

2.2.2.2 Landing

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, starting from the approach configuration, in the event of critical engine failure at or before the landing decision point (performance Class 1) or the defined point before landing (performance Class 2), the helicopter shall be capable of continuing safe flight, the remaining engine(s) being operated within the approved limitations.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, starting from the landing configuration, the helicopter shall be capable, in the event of a balked landing, of making a climb-out, with all engines operating.

2.2.3 SCHEDULING OF PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, performance data shall be determined and scheduled in the flight manual so that their application by means of the operating rules to which the helicopter is to be operated in accordance with 5.1.2 of ICAO Annex 6, Part III, will provide a safe relationship between the performance of the helicopter and the aerodromes, heliports and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, and other ambient conditions and any other operational variables for which the helicopter is to be certificated, and additionally for amphibians, water surface conditions and strength of current.

2.2.3.1 *Take-off.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off performance data shall include the take-off distance required and the take-off path. For performance Class 1 helicopters, it shall also include the rejected take-off distance required.

2.2.3.1.1 *Take-off decision point.* (For performance Class 1 helicopters only.) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off decision point shall be the point in the take-off phase used in determining take-off performance and from which either a rejected take-off may be made or a take-off safely continued, with the critical engine inoperative.

2.2.3.1.2 *Take-off distance required.* (For performance Class 1 helicopters only.) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off distance required shall be the horizontal distance required from the start of the take-off to the point at which the take-off safety speed (VTOSS), a selected height above the take-off surface, and a positive climb gradient are

achieved, following failure of the critical engine at the take-off decision point, the remaining engine(s) operating within approved operating limits.

2.2.3.1.3 *Rejected take-off distance required.* (For performance Class 1 helicopters only.) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the rejected take-off distance required shall be the horizontal distance required from the start of the take-off to the point where the helicopter comes to a complete stop following an engine failure and rejection of the take-off at the take-off decision point.

2.2.3.1.4 *Take-off distance required.* (For performance Classes 2 and 3 helicopters only.) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off distance required shall be the horizontal distance required from the start of take-off to the point where the best rate of climb speed (Vy) or the best angle of climb speed (Vx) or a selected intermediate speed (provided this speed does not involve flight within the avoid areas of the height-velocity diagrams) and a selected height above the take-off surface are achieved, all engines operating at approved take-off power.

2.2.3.2 *En route.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the en-route performance shall be the climb, cruise or descent performance with:

a) The critical engine inoperative;

b) The two critical engines inoperative in the case of helicopters having three or more engines; and

c) The operating engine(s) not exceeding the power for which they are certificated.

2.2.3.3 *Landing*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing performance data shall include the landing distance required and, for performance Class 1 helicopters, the landing decision point.

2.2.3.3.1 *Landing decision point*. (For performance Class 1 helicopters only.) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing decision point shall be the latest point in the approach phase from which either a landing may be made or a rejected landing (go-around) safely initiated, with the critical engine inoperative.

2.2.3.3.2 *Landing distance required*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing distance required shall be the horizontal distance required to land and come to a complete stop from a point on the approach flight path at a selected height above the landing surface.

2.3 FLYING QUALITIES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the helicopter is approved.

2.3.1 CONTROLLABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power, changes of helicopter configurations) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any engine. A technique for safely controlling the helicopter shall be established for all stages of flight and helicopter configurations for which performance is scheduled.

Note: *This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.*

2.3.1.1 *Controllability on the ground (or water).* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.1.2 *Controllability during take-off.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be controllable in the event of sudden failure of the critical engine at any point in the take-off, when the helicopter is handled in the manner associated with the scheduling of the take-off data.

2.3.2 TRIM

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall have such trim and handling capabilities as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. In the event of a malfunction of the systems associated with the flight controls, there must not be any significant deterioration of the handling characteristics.

2.3.3 STABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. helicopter configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the helicopter shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the helicopter is prejudiced by lack of manoeuvrability in emergency conditions.

2.3.4 AUTOROTATION

2.3.4.1 *Rotor speed control.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the autorotation characteristics of the helicopter shall be such as to enable the pilot to control the rotor speed to within prescribed limits and to maintain full control of the helicopter.

2.3.4.2 *Behaviour following a power loss.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the behaviour of the helicopter following a power loss shall not be so extreme as to make difficult a prompt recovery of rotor speed without exceeding the airspeed or strength limitations of the helicopter.

2.3.4.3 *Autorotation airspeeds.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the autorotation airspeeds recommended for maximum range and minimum rate of descent shall be established.

2.3.5 FLUTTER AND VIBRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be demonstrated by suitable tests that all parts of the helicopter are free from flutter and excessive vibration in all helicopter configurations under all speed conditions within the operating limitations of the helicopter (see 1.2.2). There shall be no vibration severe enough to interfere with control of the helicopter, to cause structural damage or to cause excessive fatigue to the flight crew.

CHAPTER 3 – STRUCTURES

3.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Chapter 3 apply to the helicopter structure consisting of all portions of the helicopter, the failure of which would seriously endanger the helicopter.

3.1.1 MASS AND MASS DISTRIBUTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.1.2 LIMIT LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.4, 3.5 and 3.6 shall be considered as limit loads.

3.1.3 STRENGTH AND DEFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in the various loading conditions prescribed in 3.4, 3.5 and 3.6, no part of the helicopter structure shall sustain detrimental deformation at any load up to and including the limit load and the helicopter structure shall be capable of supporting the ultimate load.

3.2 AIRSPEEDS

3.2.1 DESIGN AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design airspeeds shall be established for which the helicopter structure is designed to withstand the corresponding manoeuvring and gust loads in accordance with 3.4.

3.2.2 LIMITING AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.2.1, shall be included in the helicopter flight manual as part of the operating limitations (see 9.2.2). When airspeed limitations are a function of mass, mass distribution, altitude, rotor speed, power or other factors, airspeed limitations based on the critical combination of these factors shall be established

3.3 MAIN ROTOR(S) ROTATIONAL SPEED LIMITS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a range of main rotor(s) speeds shall be established that:

a) With power on, provides adequate margin to accommodate the variations in rotor speed occurring in any appropriate manoeuvre and is consistent with the kind of governor or synchroniser used; and

b) With power off, allows each appropriate autorotative manoeuvre to be performed throughout the ranges of airspeed and mass for which certification is requested.

3.4 FLIGHT LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the flight loading conditions of 3.4.1, 3.4.2 and 3.6 shall be considered for the range of mass and mass distributions prescribed in 3.1.1 and at airspeeds established in accordance with 3.2.1. Asymmetrical as well as symmetrical loading shall be taken into account. The air, inertia and other loads resulting from the

specified loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.4.1 MANOEUVRING LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, manoeuvring loads shall be computed on the basis of manoeuvring load factors appropriate to the manoeuvres permitted by the operating limitations. They shall not be less than values that experience indicates will be adequate for the anticipated operating conditions.

3.4.2 GUST LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, gust loads shall be computed for vertical and horizontal gust velocities that statistics or other evidence indicate will be adequate for the anticipated operating conditions.

3.5 GROUND AND WATER LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be able to withstand all the loads due to the reactions of the ground or water surface, as applicable, that are likely to arise during start-up, ground and water taxiing, lift-off, touchdown and rotor braking.

3.5.1 LANDING CONDITIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing conditions at the design take-off mass and at the design landing mass shall include such symmetrical and asymmetrical attitudes of the helicopter at ground or water contact, such velocities of descent, and such other factors affecting the loads imposed upon the structure as might be present in the anticipated operating conditions.

3.6 MISCELLANEOUS LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in addition to or in conjunction with the manoeuvring and gust loads and with the ground and water loads, consideration shall be given to all other loads (flight control loads, cabin pressures, effects of engine operation, loads due to changes of configuration, loads due to external mass, etc.) that are likely to occur in the anticipated operating conditions.

3.7 FLUTTER, DIVERGENCE AND VIBRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, each part of the helicopter structure shall be free from excessive vibration or oscillation (ground resonance, flutter, etc.) under each appropriate speed and power condition.

3.8 FATIGUE STRENGTH

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the strength and fabrication of the helicopter shall be such as to ensure that the probability of disastrous fatigue failure of

the helicopter's structure under repeated loads and vibratory loads in the anticipated operating conditions is extremely remote.

Note 1: *This Standard can be complied with by the establishment of "safe lives" or "fail safe" characteristics of the structure, having regard to the reasonable expected load magnitudes and frequencies under the anticipated operating conditions and inspection procedures. For some parts of the structure, it might be necessary to establish "fail safe" characteristics as well as "safe lives".*

Note 2: *Guidance material concerning the expression "extremely remote" is contained in the Airworthiness Manual (ICAO Doc 9760).*

CHAPTER 4 – DESIGN AND CONSTRUCTION

4.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, details of design and construction shall be such as to give reasonable assurance that all helicopter parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

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

4.1.1 SUBSTANTIATING TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the functioning of all moving parts essential to the safe operation of the helicopter shall be demonstrated by suitable tests in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.2 MATERIALS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all materials used in parts of the helicopter essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.3 MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.4 PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the helicopter will receive.

4.1.5 INSPECTION PROVISIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the helicopter that require such attention, either periodically or after unusually severe operations.

4.1.6 SYSTEMS DESIGN FEATURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) Controls and control systems. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the controls and control systems shall be such as to minimise the possibility of jamming, inadvertent operations, and unintentional engagement of control surface locking devices.

   i) Each control and control system shall operate with the ease, smoothness and effectiveness appropriate to its function.

   ii) Each element of each flight control system shall be designed to minimise the probability of any incorrect assembly that could result in the malfunction of the system.

b) Crew environment. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the flight crew compartment shall be such as to minimise the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

c) Pilot vision. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the arrangement of the pilot compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the helicopter, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the pilot windshield shall permit, under precipitation conditions, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

d) Provision for emergencies. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the helicopter. Reasonable provisions shall be made for continuation of essential services following engine or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this SD and in ICAO Annex 6, Part III.

e) Fire precautions. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the helicopter and the materials used in its manufacture, including cabin interior furnishing materials replaced during major refurbishing, shall be such as to minimise the possibility of in-flight and ground fires and also to minimise the production of smoke and toxic gases in the event of a fire. Means shall be provided to contain or to detect and extinguish, wherever possible, all accessible fires as might occur in such a way that no additional danger to the helicopter is caused.

f) Incapacitation of occupants. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design precautions shall be taken to protect against possible instances of cabin depressurisation and against the presence of smoke or other toxic gases that could incapacitate the occupants of the helicopter.

4.1.7 EMERGENCY LANDING PROVISIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, provisions shall be made in the design of the helicopter to protect the occupants from fire and effects of deceleration in the event of an emergency landing. Facilities shall be provided for the rapid evacuation of the helicopter in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the helicopter. On helicopters certificated for ditching conditions, provisions shall also be made in the design to give maximum practicable assurance that safe evacuation from the helicopter of passengers and crew can be executed in case of ditching.

4.1.8 GROUND HANDLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provisions shall be made in the design to minimise the risk that ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the helicopter essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5 – ENGINES

5.1 SCOPE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Chapter 5 shall apply to engines of all types that are used on the helicopter as primary propulsion units.

5.2 DESIGN, CONSTRUCTION AND FUNCTIONING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the engine complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly installed in the helicopter in accordance with Chapter 6 and with the suitable rotor and power transmission installed.

5.3 DECLARED RATINGS, CONDITIONS AND LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the power ratings and the conditions of the atmosphere upon which they are based and all operating conditions and limitations which are intended to govern the operation of the engine shall be declared.

5.4 TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, an engine of the type shall complete satisfactorily such tests as are necessary to verify the validity of the declared ratings, conditions and limitations and to ensure that it will operate satisfactorily and reliably. The tests shall include at least the following:

a) *Power calibration.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests shall be conducted to establish the power characteristics of the engine when new and also after the tests in b) and c). There shall be no excessive decrease in power at the conclusion of all the tests specified.

b) *Operation.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests shall be conducted to ensure that starting, idling, acceleration, vibration, overspeeding and other characteristics are satisfactory and to demonstrate adequate margins of freedom from detonation, surge or other detrimental conditions as may be appropriate to the particular type engine.

c) *Endurance.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests of sufficient duration shall be conducted at such powers, engine and rotor speeds and other operating conditions as are necessary to demonstrate reliability and durability of the engine. They shall also include operation under conditions in excess of the declared limits to the extent that such limitations might be exceeded in actual service.

CHAPTER 6 – ROTOR AND POWER TRANSMISSION SYSTEMS AND POWERPLANT INSTALLATION

6.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation, including rotor and power transmission system, shall comply with the Standards of Chapter 4 and with the Standards of this chapter.

6.2 DESIGN, CONSTRUCTION AND FUNCTIONING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the rotor and power transmission systems assembly complete with accessories shall be designed and constructed so as to function reliably within its operating limitations under the anticipated operating conditions when properly fitted to the engine and installed in the helicopter in accordance with this chapter.

6.3 DECLARED RATINGS, CONDITIONS AND LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the power ratings and all operating conditions and limitations which are intended to govern the operation of the rotor and power transmission systems shall be declared.

6.3.1 MAXIMUM AND MINIMUM ROTOR ROTATIONAL SPEED LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maximum and minimum speeds for the rotors in both power-on and power-off conditions shall be established. Any operating conditions (e.g. airspeed) that affect such maxima or minima shall be declared.

6.3.2 ROTOR UNDERSPEED AND OVERSPEED WARNINGS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when the helicopter is made to approach a rotor rotational speed limit, with or without engines inoperative, clear and distinctive warnings shall be apparent to the pilot. The warnings and initial characteristics of the condition shall be such as to enable the pilot to arrest the development of the condition after the warning begins and to recover the rotor rotational speed to within prescribed normal limits and to maintain full control of the helicopter.

6.4 TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, rotor and power transmission systems shall complete satisfactorily such tests as are necessary to ensure that they will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) *Operation.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests shall be conducted to ensure that strength, vibration and overspeeding characteristics are satisfactory and to demonstrate proper and reliable functioning of pitch changing and control mechanisms and free wheel mechanisms.

b) *Endurance*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests of sufficient duration shall be conducted at such powers, engine and rotor speeds and other operating conditions as are necessary to demonstrate reliability and durability of the rotor and power transmission systems.

6.5 COMPLIANCE WITH ENGINE AND ROTOR AND POWER TRANSMISSION SYSTEMS LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation shall be so designed that the engines and rotor and power transmission systems are capable of being used in the anticipated operating conditions. In conditions established in the

helicopter flight manual, the helicopter shall be capable of being operated without exceeding the limitations established for the engines and rotor and power transmission systems in accordance with Chapters 5 and 6.

6.6 CONTROL OF ENGINE ROTATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the engine in flight or to reduce it to a safe level.

6.7 ENGINE RESTARTING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

6.8 ARRANGEMENT AND FUNCTIONING

6.8.1 INDEPENDENCE OF ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for performance Classes 1 and 2 helicopters, the powerplant shall be arranged and installed so that each engine together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical engine.

6.8.2 ROTOR AND POWER TRANSMISSION SYSTEMS VIBRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the vibration stresses for the rotor and power transmission systems shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the helicopter.

6.8.3 COOLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cooling system shall be capable of maintaining powerplant and power transmission systems temperatures within the established limits (see 6.5) at ambient air temperatures approved for operation of the helicopter. The maximum and minimum air temperatures for which the powerplant and power transmission systems have been established as being suitable shall be scheduled in the helicopter flight manual.

6.8.4 ASSOCIATED SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the fuel, oil, air induction, and other systems associated with each engine, each power transmission unit and each rotor shall be capable of supplying the appropriate unit in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power setting, helicopter attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

6.8.5 FIRE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for designated fire zones where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.1.6 e):

a) Isolation. Such zones shall be isolated by fire-resisting material from other zones of the helicopter where the presence of fire would jeopardise continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) Flammable fluids. Flammable fluid system components located in such zones shall be capable of containing the fluid when exposed to fire conditions. Means shall be provided for the crew to shut off the flow of hazardous quantities of flammable fluids into such zones if a fire occurs.

c) Fire detection. There shall be provided a sufficient number of fire detectors so located as to ensure rapid detection of any fire that might occur in such zones.

d) Fire extinguishment. Such zones shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the zone would not jeopardise the safety of the helicopter.

CHAPTER 7 – INSTRUMENTS AND EQUIPMENT

7.1 REQUIRED INSTRUMENTS AND EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be provided with approved instruments and equipment necessary for the safe operation of the helicopter in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the helicopter within its operating limitations. Instruments and equipment design shall observe Human Factors principles.

Note 1: *Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in ICAO Annex 6, Part III, for particular circumstances or on particular kinds of routes.*

Note 2: *Guidance material on Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683).*

7.2 INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, instrument and equipment installations shall comply with the Standards of Chapter 4.

7.3 SAFETY AND SURVIVAL EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

7.4 NAVIGATION LIGHTS AND ANTI-COLLISION LIGHTS

7.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the lights required by ICAO Annex 2 — Rules of the Air to be displayed by helicopters in flight or operating on the movement area of an aerodrome or a heliport shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note 1: *It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).*

Note 2: *See the Airworthiness Manual (Doc 9760) for detailed technical specifications for exterior lights for helicopters.*

7.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, lights shall be installed in helicopters so as to minimise the possibility that they will:

a) Adversely affect the satisfactory performance of the flight crews' duties; or

b) Subject an outside observer to harmful dazzle.

Note: *In order to avoid the effects mentioned in 7.4.2, it will be necessary in some cases to provide means whereby the pilot can switch off or reduce the intensity of the flashing lights.*

CHAPTER 8 – ELECTRICAL SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the electrical system shall be so designed and installed as to ensure that it will perform its intended function under any foreseeable operating conditions.

CHAPTER 9 – OPERATING LIMITATIONS AND INFORMATION

9.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the operating limitations within which compliance with the Standards of this SD is determined, together with any other information necessary to the safe operation of the helicopter, shall be made available by means of a helicopter flight manual, markings and placards, and such other means as may effectively accomplish the purpose. The limitations and information shall include at least those prescribed in 9.2, 9.3 and 9.4.

9.2 OPERATING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations which there is a risk of exceeding in flight and which are defined quantitatively shall be expressed in suitable units and corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

9.2.1 LOADING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see 1.2.2).

9.2.2 AIRSPEED LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the airspeed limitations shall include all speeds (see 3.2) that are limiting from the standpoint of structural integrity or flying qualities of the helicopter, or from other considerations. These speeds shall be identified with respect to the appropriate helicopter configurations and other pertinent factors.

9.2.3 POWERPLANT AND POWER TRANSMISSION LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant limitations shall include all those established for the various powerplant and transmission components as installed in the helicopter (see 6.5 and 6.6).

9.2.4 ROTOR LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations on rotor speeds shall include maximum and minimum rotor speeds for power-off (autorotation) and power-on conditions.

9.2.5 LIMITATIONS ON EQUIPMENT AND SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the helicopter.

9.2.6 MISCELLANEOUS LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the helicopter (see 1.2.1).

9.2.7 FLIGHT CREW LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the

helicopter, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note: *See ICAO Annex 6 — Operation of Aircraft, Part III, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this SD.*

9.3 OPERATING INFORMATION AND PROCEDURES

9.3.1 TYPES OF ELIGIBLE OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, there shall be listed the particular types of operations, as may be defined in ICAO Annex 6, Part III, or be generally recognised, for which the helicopter has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements.

9.3.2 LOADING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading information shall include the empty mass of the helicopter, together with a definition of the condition of the helicopter at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note: *Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.*

9.3.3 OPERATING PROCEDURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a description shall be given of normal and emergency operating procedures which are peculiar to the particular helicopter and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more engine(s).

9.3.4 HANDLING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any significant or unusual features of the helicopter characteristics.

9.4 PERFORMANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance of the helicopter shall be scheduled in accordance with 2.2. There shall be included information regarding the various helicopter configurations and powers involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

9.5 HELICOPTER FLIGHT MANUAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a flight manual shall be made available. It shall identify clearly the specific helicopter or series of helicopters to which it is related. The flight manual shall include at least the limitations, information and procedures specified in this chapter.

9.6 MARKINGS AND PLACARDS

9.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

9.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (e.g. towing, refuelling) that could pass unnoticed and that could jeopardise the safety of the helicopter in subsequent flights.

PART IVB – HELICOPTERS FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 13 DECEMBER 2007

CHAPTER 1 – GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part are applicable in respect of all helicopters designated in 1.1.2 for which an application for the issue of a Type Certificate is submitted to the appropriate national authorities on or after 13 December 2007.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of this part shall apply to helicopters greater than 750 kg maximum certificated take-off mass intended for the carriage of passengers or cargo or mail in international air navigation.

Note: The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

1.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the helicopters designated in 1.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, the Standards apply to the complete helicopter including its powerplant, rotors, systems and equipment.

1.2 OPERATING LIMITATIONS

1.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting conditions shall be established for the helicopter, its powerplant, rotors, systems and equipment (see 7.2). Compliance with the Standards of this part shall be established assuming that the helicopter is operated within the limitations specified. The safety implications of exceeding these operating limits shall be considered.

1.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting ranges of any parameter whose variation may compromise the safe operation of the helicopter, e.g. mass, centre of gravity location, load distribution, speeds, ambient air temperature and altitude, shall be established within which compliance with all the pertinent Standards of this part is shown.

Note 1: The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each practicably separate operating condition, e.g. take-off, en route, landing.

Note 2: *Maximum operating mass may be limited by the application of noise certification Standards (see Annex 16* — Environmental Protection, *Volume I* — Aircraft Noise, *and Annex 6* — Operation of Aircraft, *Part III* — International Operations — Helicopters*).*

1.3 UNSAFE FEATURES AND CHARACTERISTICS

Under all anticipated operating conditions, the helicopter shall not possess any feature or characteristic that renders it unsafe.

1.4 PROOF OF COMPLIANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the means by which compliance with the appropriate airworthiness requirements is demonstrated shall ensure that in each case the accuracy achieved will be such as to provide reasonable assurance that the helicopter, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2 – FLIGHT

2.1 GENERAL

2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the Standards prescribed in this chapter shall be established by flight or other tests conducted upon a helicopter or helicopters of the type for which a Type Certificate is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with each Standard shall be established for all applicable combinations of helicopter mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where necessary, appropriate helicopter configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the helicopter's flying qualities.

2.2 PERFORMANCE

2.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient data on the performance of the helicopter shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the helicopter on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, achieving the performance scheduled for the helicopter shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note: *Guidance material on human performance can be found in the Human Factors Training Manual (ICAO Doc 9683).*

2.2.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the scheduled performance of the helicopter shall be consistent with compliance with 1.2.1 and with the operation in logical combinations of those of the helicopter's systems and equipment, the operation of which may affect performance.

2.2.4 MINIMUM PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, at the maximum masses scheduled (see 2.2.7) for take-off and for landing as functions of the take-off and landing site pressure-altitude and temperature in still air conditions, and, for water operations, in specified conditions of smooth water, the helicopter shall be capable of accomplishing the minimum performances specified in 2.2.5 and 2.2.6, respectively, not considering obstacles or final approach and take-off area length.

2.2.5 TAKE-OFF

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealised conditions for which data are scheduled (see 2.2.7), the departure from the scheduled values is not disproportionate.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for Category A helicopters, in the event of critical engine failure at or after the take-off decision point, the helicopter shall be capable of continuing safe flight, the remaining engine(s) being operated within the approved limitations.

2.2.6 LANDING

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be possible to make a safe landing on a prepared landing surface after complete power failure occurring during normal cruise.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for Category A helicopters, starting from the landing configuration in the event of critical engine failure at or before the landing decision point, the helicopter shall be capable of continuing safe flight, the remaining engine(s) being operated within the approved limitations.

2.2.7 SCHEDULING OF PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, performance data shall be determined and scheduled in the flight manual as follows for the ranges of mass, altitude, temperature and other operational variables for which the helicopter is to be certificated, and additionally for amphibians, water surface conditions and strength of current shall be included.

a) Hover performance. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the hover performance shall be determined for both in-ground effect and out-of-ground effect with all engines operating.

b) Climb. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the steady rate of climb with the engine(s) operating at or within approved limits shall be established.

c) Height-velocity envelope. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, if there are any combinations of height and forward velocity (including hover) under which a safe landing cannot be made after failure of the critical engine and with the remaining engine(s) (if applicable) operating within approved limits, a height-velocity envelope shall be established.

d) Take-off distance – all engines operating. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where required by the operating rules, the take-off distance — all engines operating shall be the horizontal distance required from the start of the take-off to the point where a selected speed up to the best rate of climb speed (Vy) and selected height above the take-off surface are achieved, all engines operating at approved take-off power required.
In addition, for Category A helicopters:

e) Minimum performance. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the minimum climb performance shall be established for both take-off and landing.

f) Take-off decision point. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off decision point shall be the point in the take-off phase used in determining take-off performance and from which either a rejected take-off may be made or a take-off safely continued, with the critical engine inoperative.

g) Take-off distance required. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off distance required shall be the horizontal distance required from the start of the take-off to the point at which the take-off safety speed (VTOSS), a selected height above the take-off surface, and a positive climb gradient are achieved, following failure of the critical engine at take-off decision point, the remaining engine(s) operating within approved operating limits. If procedures involve rearward flight, the back-up distance shall be included.

h) Rejected take-off distance required. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the rejected take-off distance required shall be the horizontal distance required from the start of the take-off to the point where the helicopter comes to a complete stop following engine failure and rejection of the take-off at the take-off decision point.

i) Take-off path – climb gradients. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off path – climb gradient shall be the steady gradient(s) of climb for the appropriate configuration(s) with the critical engine inoperative from the end of the take-off distance required to a defined point above the take-off surface.

j) Engine inoperative climb. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the engine inoperative climb shall be the steady rate of climb/descent with the critical engine inoperative and the operating engine(s) not exceeding the power for which they are certificated.

k) Landing decision point. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing decision point shall be the latest point in the approach phase from which either a landing may be made or a rejected landing (go-around) safely initiated, with the critical engine inoperative.

l) Landing distance required. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing distance required shall be the horizontal distance required to land and come to a complete stop from a point on the approach flight path at a selected height above the landing surface with the critical engine inoperative.

2.3 FLYING QUALITIES

2.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall comply with the Standards of this paragraph at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the helicopter is approved.

2.3.2 CONTROLLABILITY

2.3.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be controllable and manoeuvrable under all anticipated operating conditions and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power, changes of helicopter configuration) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any engine. A technique for safely controlling the helicopter shall be established for all stages of flight and helicopter configurations for which performance is scheduled.

Note: *This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.*

2.3.2.2 Controllability on the ground (or water). Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.2.3 Controllability during take-off. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be controllable in the event of sudden failure of the critical engine at any point in the take-off, when the helicopter is handled in the manner associated with the scheduling of the take-off data.

2.3.3 TRIM

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall have such trim and handling capabilities as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. In the event of a malfunction of the systems associated with the flight controls, there shall not be any significant deterioration of the handling characteristics.

2.4 STABILITY AND CONTROL

2.4.1 STABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. helicopter configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the helicopter shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the helicopter is prejudiced by lack of manoeuvrability in emergency conditions.

2.4.2 AUTOROTATION

2.4.2.1 Rotor speed control. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the autorotation characteristics of the helicopter shall be such as to enable the pilot to control the rotor speed to within prescribed limits and to maintain full control of the helicopter.

2.4.2.2 Behaviour following a power loss. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the behaviour of the helicopter following a power loss shall not be so extreme as to make
difficult a prompt recovery of rotor speed without exceeding the airspeed or strength limitations of the helicopter.

2.4.2.3 Autorotation airspeeds. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for Category A helicopters, airspeeds for autorotative landings shall be established. For other helicopters,

the autorotation airspeeds recommended for maximum range and minimum rate of descent shall be established.

2.4.3 VIBRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, there shall be no vibration or buffeting severe enough to interfere with the control of the helicopter.

2.4.4 GROUND RESONANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall have no dangerous tendency to oscillate on the ground with the rotor turning.

CHAPTER 3 – STRUCTURE

3.1 GENERAL

3.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for helicopters for which application for certification was submitted before 24 February 2013, the helicopter structure shall be designed, manufactured and provided with instructions for its maintenance with the objective of avoiding catastrophic failure throughout its operational life.

3.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for helicopters for which application for certification was submitted on or after 24 February 2013, the helicopter structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding hazardous and catastrophic failure throughout its operational life.

Note: *Structure includes the airframe, undercarriage, control system, blades and rotorhead, rotor pylon and auxiliary lifting surfaces.*

3.2 MASS AND MASS DISTRIBUTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.3 LIMIT LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.7, 3.8 and 3.9 shall be considered as limit loads.

3.4 STRENGTH AND DEFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in the various loading conditions prescribed in 3.7, 3.8 and 3.9, no part of the helicopter structure shall sustain detrimental deformation at any load up to and including the limit load and the helicopter structure shall be capable of supporting the ultimate load.

3.5 AIRSPEEDS

3.5.1 DESIGN AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design airspeeds shall be established for which the helicopter structure is designed to withstand the corresponding manoeuvring and gust loads in accordance with 3.7.

3.5.2 LIMITING AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.2.1, shall be included in the flight manual as part of the operating limitations (see 7.2.3). When airspeed limitations are a function of mass, mass distribution, altitude, rotor speed, power or other factors, airspeed limitations based on the critical combination of these factors shall be established.

3.6 MAIN ROTOR(S) ROTATIONAL SPEED LIMITS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a range of main rotor(s) speeds shall be established that:

a) With power on, provides adequate margin to accommodate the variations in rotor speed occurring in any appropriate manoeuvre, and is consistent with the kind of governor or synchroniser used; and

b) With power off, allows each appropriate autorotative manoeuvre to be performed throughout the ranges of airspeed and mass for which certification is requested.

3.7 LOADS

3.7.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading conditions of 3.7, 3.8 and 3.9 shall consider the range of mass and mass distributions prescribed in 3.2, the main rotor rpm ranges established in 3.6, and airspeeds established in accordance with 3.5.1. Asymmetrical as well as symmetrical loading shall be taken into account. The air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively in consideration of all anticipated operating conditions.

3.7.2 MANOEUVRING LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, manoeuvring loads shall be computed on the basis of manoeuvring load factors appropriate to the manoeuvres permitted by the operating limitations. They shall not be less than values that experience indicates will be adequate for the anticipated operating conditions.

3.7.3 GUST LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, gust loads shall be computed for vertical and horizontal gust velocities that statistics or other evidence indicate will be adequate for the anticipated operating conditions.

3.8 GROUND AND WATER LOADS

3.8.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be able to withstand all the loads due to the reactions of the ground or water surface, as applicable, that arise during start-up, ground and water taxiing, lift-off, touchdown and rotor braking.

3.8.2 LANDING CONDITIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing conditions at the maximum certificated take-off mass and at the maximum certificated landing mass shall include such symmetrical and asymmetrical attitudes of the helicopter at ground or water contact, such velocities of descent, and such other factors affecting the loads imposed upon the structure as might be present in the anticipated operating conditions.

3.9 MISCELLANEOUS LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in addition to or in conjunction with, the manoeuvring and gust loads and with the ground and water loads, consideration shall be given to all other loads (flight control loads, pilot forces, engine torque, loads due to changes of configuration, external loads, etc.) that are likely to occur in the anticipated operating conditions.

3.10 FATIGUE STRENGTH

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the strength and fabrication technique of the helicopter structure shall be such as to avoid catastrophic fatigue failure under repeated loads and vibratory loads in the anticipated operating conditions. Environmental degradation, accidental damage and other likely failures shall be considered.

3.11 SPECIAL FACTORS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design features (e.g. castings, bearings or fittings), the strength of which are subject to variability in manufacturing processes, deterioration in service or any other cause, shall be accounted for by a suitable factor.

CHAPTER 4 – DESIGN AND CONSTRUCTION

4.1 GENERAL

4.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, details of design and construction shall be such as to give reasonable assurance that all helicopter parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

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

4.1.2 SUBSTANTIATION OF MOVING PARTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the functioning of all moving parts essential to the safe operation of the helicopter shall be demonstrated in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.3 MATERIALS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all materials used in parts of the helicopter essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.4 MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the methods of manufacturing and assembly shall be such as to produce consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.5 PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the helicopter will receive.

4.1.6 INSPECTION PROVISIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the helicopter that require such attention, either periodically or after unusually severe operations.

4.1.7 CRITICAL PARTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all critical parts used in the helicopter shall be identified and procedures shall be established to ensure that the required level of integrity for critical parts is controlled during design, manufacture and throughout the service life of those parts.

4.2 SYSTEMS DESIGN FEATURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) Controls and control systems. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the controls and control systems shall be such as to minimise the possibility of jamming, inadvertent operations and unintentional engagement of control locking devices.

1) Each control and control system shall operate with the ease, smoothness and precision appropriate to its function.

2) Each element of each flight control system shall be designed, or distinctively and permanently marked, to minimise the probability of any incorrect assembly that could result in the malfunction of the system.

b) Crew environment. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the flight crew compartment shall allow operation of the controls by the crew without unreasonable concentration or fatigue.

c) Crew vision. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the arrangement of the flight crew compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the helicopter under all foreseeable operating conditions for which certification is requested.

d) Provision for emergencies. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems which would endanger the helicopter.

e) Fire precautions. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall have adequate fire protection.

f) Incapacitation of crew. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design precautions shall be taken to protect against the presence of toxic gases which under normal operating conditions could incapacitate the flight crew.

g) *Cargo compartment protection.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended that as of 7 March 2025, the elements of the helicopter design associated with cargo compartment fire protection, if applicable, and a summary of the demonstrated standards that were considered in the process of helicopter certification should be included in the required helicopter documentation and made available to the operator

4.3 FLUTTER

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, each aerodynamic surface of the helicopter shall be free from flutter under each appropriate speed and power condition.

4.4 OCCUPANT ACCOMMODATION FEATURES

4.4.1 SEATING AND RESTRAINTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate seating and restraints shall be provided for the occupants, taking account of the likely flight and emergency landing loads to be encountered. Attention shall be paid to minimising injury to occupants due to contact with surrounding structure during the operation of the helicopter.

4.4.2 CABIN ENVIRONMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, ventilation systems shall be designed to provide the cabin with an adequate environment during the anticipated flight and ground operating conditions.

4.5 ELECTRICAL BONDING AND PROTECTION AGAINST LIGHTNING AND STATIC ELECTRICITY

4.5.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, electrical bonding and protection against lightning and static electricity shall be such as to:

a) protect the helicopter, its systems, its occupants and those who come in contact with the helicopter on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) Prevent dangerous accumulation of electrostatic charge.

4.5.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall also be protected against catastrophic effects of lightning. Due account shall be taken of the material used in the construction of the helicopter.

4.6 EMERGENCY LANDING PROVISIONS

4.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, provisions shall be made in the design of the helicopter to protect the occupants from fire and effects of deceleration in the event of an emergency landing.

4.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for helicopters for which application for certification was submitted before 24 February 2013, facilities shall be provided for rapid evacuation of the helicopter in conditions likely to occur following an emergency landing, and such facilities shall be related to the passenger and crew capacity of the helicopter. On helicopters certificated for ditching conditions, provisions shall also be made in the design to give reasonable assurance that safe evacuation from the helicopter of passengers and crew can be executed in case of ditching.

4.6.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for helicopters for which application for certification was submitted on or after 24 February 2013, facilities shall be provided for rapid evacuation of the helicopter in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the helicopter and shall be shown to be suitable for their intended purpose. On helicopters certificated for ditching conditions, provisions shall also be made in the design to give reasonable assurance that safe evacuation from the helicopter of passengers and crew can be executed in case of ditching.

4.7 GROUND HANDLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provisions shall be made in the design to minimise the risk that normal ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the helicopter essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5 - ROTORS AND POWERPLANT

5.1 ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part VI of this SD shall apply to each engine that is used on the helicopter as a primary propulsion unit(s).

5.2 ROTORS AND POWERPLANT INSTALLATION

5.2.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation and rotors shall comply with the Standards of Chapter 4 and with the Standards of 5.2.

5.2.2 DESIGN, CONSTRUCTION AND FUNCTIONING

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the rotors and rotor drive systems assembly complete with accessories shall be designed and constructed so as to function reliably within their operating limitations under the anticipated operating

conditions when properly fitted to the engine and installed in the helicopter in accordance with this chapter.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for helicopters of maximum certificated take-off mass greater than 3 175 kg or helicopters which are certificated to Category A Standard, an assessment shall be conducted for the rotors and rotor drive systems to ensure that they function safely throughout the full range of operating conditions. Where this assessment identifies a failure which could prevent continued safe flight or landing of the helicopter, means shall be prescribed to minimise the likelihood of that failure.

5.2.3 DECLARED RATINGS, CONDITIONS AND LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the power ratings and all operating conditions and limitations which are intended to govern the operation of the rotors and rotor drive systems shall be declared.

a) Maximum and minimum rotor rotational speed limitations. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maximum and minimum speeds for the rotors in both power-on and power-off conditions shall be established. Any operating conditions (e.g. airspeed) that affect such maxima or minima shall be declared.

b) Rotor under speed warnings for single engine helicopters, and for multi-engine helicopters not having an approved device for automatically increasing power when an engine fails. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when the helicopter approaches a rotor rotational speed limit, with or without engines inoperative, clear and distinctive warnings shall be apparent to the pilot. The warnings or initial characteristics of the condition shall be such as to enable the pilot to arrest the development of the condition after the warning begins and to recover the rotor rotational speed to within prescribed normal limits and to maintain full control of the helicopter.

5.2.4 TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, rotors and rotor drive systems shall complete satisfactorily such tests as are necessary to ensure that they will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) Operation. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests shall be conducted to ensure that strength and vibration characteristics are satisfactory and to demonstrate proper and reliable functioning of pitch changing and control mechanisms and free wheel mechanisms. Overspeed characteristics shall be demonstrated to be satisfactory for helicopters of maximum certificated take-off mass greater than 3 175 kg; and

b) Endurance. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests of sufficient duration shall be conducted at such powers, engine and rotor speeds, and other operating conditions as are necessary to demonstrate reliability and durability of the rotors and rotor drive systems.

5.2.5 COMPLIANCE WITH ENGINE, ROTOR AND ROTOR DRIVE SYSTEM LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation shall be so designed that the engines, rotors and rotor drive systems are capable of functioning reliably in the anticipated operating conditions. In conditions established in the flight manual, the helicopter shall be capable of being operated without exceeding the limitations established for the engines, rotors and rotor drive systems in accordance with this chapter and Section VI.

5.2.6 CONTROL OF ENGINE ROTATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for helicopters of a maximum certificated take-off mass greater than 3 175 kg and for helicopters which are certificated to Category A Standard, where continued rotation of a failed engine would increase the

hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the failed engine in flight or to reduce it to a safe level.

5.2.7 ENGINE RESTARTING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for helicopters of a maximum certificated take-off mass greater than 3 175 kg and for helicopters which are certificated to Category A Standard, a means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

5.2.8 ARRANGEMENT AND FUNCTIONING

5.2.8.1 Independence of engines. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for Category A helicopters for which application for certification was submitted before 24 February 2013, the powerplant shall be arranged and installed so that each engine together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical engine.

5.2.8.2 Independence of engines and associated systems. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for Category A helicopters for which application for certification was submitted on or after 24 February 2013, the engines together with their associated systems shall be arranged and isolated from each other to allow operation, in at least one configuration, so that the failure or malfunction of any engine, or the failure of any system that can affect any engine, will not:

a) Prevent the continued safe operation of the remaining engine(s); or

b) Require immediate action, other than normal pilot action with primary flight controls, by any crew member to maintain safe operation.

5.2.8.3 Rotors and rotor drive systems vibration. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the vibration stresses for the rotors and rotor drive systems shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the helicopter.

5.2.8.4 Cooling. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cooling system shall be capable of maintaining the temperature of powerplant components and fluids within the established limits (see 5.2.5) at all ambient temperatures approved for operation of the helicopter. The maximum and minimum ambient air temperatures for which the powerplant has been established as being suitable shall be scheduled in the flight manual.

5.2.8.5 Associated systems. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the fuel, oil, air induction, and other systems associated with the powerplant and the rotor(s), shall be capable of supplying the appropriate unit in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power setting, helicopter attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

5.2.8.6 Fire protection. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.2 e).

a) Isolation. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, such regions shall be isolated by fire resistant material from other regions of the helicopter where the presence of fire would jeopardise continued flight and landing (helicopters of a maximum certificated take-off mass greater than 3 175 kg or Category A) or would jeopardise safe landing (other helicopters), taking into account the probable points of origin and paths of propagation of fire.

b) Flammable fluids. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, flammable fluid system components located in such regions shall be fire resistant. Drainage of each region shall be provided to minimise hazards resulting from the failure of any component containing flammable fluids. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs. Where sources of flammable fluid exist in such regions, the whole of the related system within the region, including supporting structure, shall be fireproof or shielded from the effects of fires.

c) Fire detection. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for turbine engine installations, a sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions, unless the fire can be readily observed in flight by the pilot in the cockpit.

d) Fire extinguishment. For turbine engine helicopters of a maximum certificated take-off mass greater than 3 175 kg, such regions shall be provided with a fire extinguisher system capable of extinguishing any fire likely to occur therein, unless the degree of isolation, quantity of combustibles, fire resistance of the structure, and other factors are such that any fire likely to occur in the region would not jeopardise the safety of the helicopter.

CHAPTER 6 – SYSTEMS AND EQUIPMENT

6.1 GENERAL

6.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be provided with approved instruments, equipment and systems necessary for the safe operation of the helicopter in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the helicopter within its operating limitations. Instruments and equipment design shall consider Human Factors principles.

Note 1: Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in ICAO Annex 6, Part III, for particular circumstances or on particular kinds of routes.

Note 2: Guidance material on Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683) and in the Human Factors Guidelines for Air Traffic Management (ATM) Systems (ICAO Doc 9758).

6.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, The design of the instruments, equipment and systems required by 6.1.1 and their installation shall be such that:

a) For a Category A helicopter, an inverse relationship exists between the probability of a failure condition and the severity of its effect on the helicopter and its occupants, as determined by a system safety assessment process;

b) They perform their intended function under all anticipated operating conditions; and

c) Electromagnetic interference between them is minimised.

6.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to warn the crew of unsafe system operating conditions and to enable them to take corrective action.

6.1.4 ELECTRICAL POWER SUPPLY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations and shall also be such that no single failure or malfunction could impair the ability of the system to supply essential loads for safe operation.

6.1.5 DEVELOPMENT ASSURANCE OF COMPLEX ELECTRONIC HARDWARE AND SYSTEM SOFTWARE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for helicopters for which application for certification was submitted on or after 24 February 2013, complex electronic hardware and system software shall be developed, verified and validated such as to ensure that the systems in which they are used perform their intended functions at a level of safety that complies with the requirements of this part, notably those of 6.1.2 a) and 6.1.2 b).

Note: *Some States accept the use of national or international industry standards for the development assurance (development, verification and validation) of complex electronic hardware and systems software.*

6.2 INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, instrument and equipment installations shall comply with the Standards of Chapter 4.

6.3 SAFETY AND SURVIVAL EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

6.4 NAVIGATION LIGHTS AND ANTI-COLLISION LIGHTS

6.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the lights required by ICAO Annex 2 — Rules of the Air to be displayed by helicopters in flight or operating on the movement area of an aerodrome or a heliport shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note *It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).*

6.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, lights shall be installed in helicopters so as to minimise the possibility that they will adversely affect the satisfactory performance of the flight crews' duties.

Note: *In order to avoid the effects mentioned in 6.4.2, it will be necessary in some cases to provide means whereby the pilot can adjust the intensity of the flashing lights.*

6.5 ELECTROMAGNETIC INTERFERENCE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, aircraft electronic systems, particularly flight-critical and flight-essential systems, shall be protected as appropriate against electromagnetic interference from both internal and external sources.

6.6 ICE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, if certification for flight in icing conditions is required, the helicopter shall be shown to be able to operate safely in all icing conditions likely to be encountered in all anticipated operating environments.

CHAPTER 7 – OPERATING LIMITATIONS AND INFORMATION

7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the operating limitations within which compliance with the Standards of this SD is determined, together with any other information necessary to the safe operation of the helicopter, shall be made available by means of a flight manual, markings and placards, and such other means as may effectively accomplish the purpose.

7.2 OPERATING LIMITATIONS

7.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations which might be exceeded in flight and which are defined quantitatively shall be expressed in suitable units. These limitations shall be corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

7.2.2 LOADING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see 1.2.2).

7.2.3 AIRSPEED LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the airspeed limitations shall include all speeds (see 3.5.2) that are limiting from the standpoint of structural integrity or flying qualities of the helicopter, or from other considerations. These speeds shall be identified with respect to the appropriate helicopter configurations and other pertinent factors.

7.2.4 POWERPLANT LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant limitations shall include all those established for the various powerplant components as installed in the helicopter (see 5.2.5 and 5.2.8.4).

7.2.5 ROTOR LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations on rotor speeds shall include maximum and minimum rotor speeds for power-off (autorotation) and power-on conditions.

7.2.6 LIMITATIONS ON EQUIPMENT AND SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the helicopter.

7.2.7 MISCELLANEOUS LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the helicopter (see 1.2.1).

7.2.8 FLIGHT CREW LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the helicopter, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note: *See ICAO Annex 6 — Operation of Aircraft, Part III, for the circumstances in which the flight crew includes members in addition to the minimum flight crew defined in this SD.*

7.3 OPERATING INFORMATION AND PROCEDURES

7.3.1 TYPES OF ELIGIBLE OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the particular types of operations for which the helicopter has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

7.3.2 LOADING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading information shall include the empty mass of the helicopter, together with a definition of the condition of the helicopter at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note: *Usually the empty mass excludes the mass of the crew and payload, and the usable fuel supply; it includes the mass of all fixed ballast, unusable fuel supply and total quantity of oil, engine coolant and hydraulic fluid.*

7.3.3 OPERATING PROCEDURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a description shall be given of normal and emergency operating procedures which are peculiar to the particular helicopter and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more engines.

7.3.4 HANDLING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any significant or unusual features of the helicopter characteristics

7.4 PERFORMANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance of the helicopter shall be scheduled in accordance with 2.2. There shall be included information regarding the various helicopter configurations and powers involved and the relevant speeds, together with information which will assist the flight crew in attaining the performance as scheduled.

7.5 FLIGHT MANUAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a flight manual shall be made available. It shall identify clearly the specific helicopter or series of helicopters to which it is related. The flight manual shall include at least the limitations, information and procedures specified in 7.2, 7.3, 7.4 and 7.6.1.

7.6 MARKINGS AND PLACARDS

7.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

7.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (towing, refuelling, etc.) that could pass unnoticed and that could jeopardise the safety of the helicopter in subsequent flights.

7.7 CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

7.7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, information for use in developing procedures for maintaining the helicopter in an airworthy condition shall be made available. The information shall include that described in 7.7.2, 7.7.3 and 7.7.4.

7.7.2 MAINTENANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance information shall include a description of the helicopter and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

7.7.3 MAINTENANCE PROGRAMME INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

Note: *The development of initial maintenance programme information at the time of helicopter type certification is sometimes referred to as the Maintenance Review Board (MRB) process or the process of developing instructions for continued airworthiness.*

7.7.4 MANDATORY MAINTENANCE REQUIREMENTS RESULTING FROM THE TYPE DESIGN APPROVAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of 7.7.3.

Note: *Mandatory requirements identified as part of the type design approval are often referred to as Certification Maintenance Requirements (CMR) and/or airworthiness limitations.*

CHAPTER 8 – CRASHWORTHINESS AND CABIN SAFETY

8.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, crashworthiness shall be taken into account in the design of helicopters to improve the probability of occupant survival.

8.2 DESIGN EMERGENCY LANDING LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, emergency landing (crash) loads shall be determined so that the interiors, furnishings, support structure and safety equipment can be designed to reasonably protect occupants under emergency landing conditions. Items to be considered shall include:

a) Dynamic effects;

b) Restraint criteria for items that could cause a hazard;

c) Deformation of the fuselage in the areas of emergency exits;

d) Fuel cell integrity and position; and

e) Integrity of electrical systems to avoid sources of ignition in the area of fuel components.

8.3 CABIN FIRE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cabin shall be so designed as to provide fire protection to the occupants in the event of airborne systems failures or a crash situation. Items to be considered shall include:

a) Flammability of cabin interior materials;

b) Fire resistance and, for helicopters of a maximum certificated take-off mass greater than 3 175 kg, the generation of smoke;

c) Provision of safety features to allow for safe evacuation; and

d) Fire suppression equipment.

8.4 EVACUATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be equipped with sufficient emergency exits to allow for cabin evacuation within an appropriate time period. Items to be considered, appropriate to the size and category of the helicopter, shall include:

a) Number of seats and seating configuration;

b) Number, location and size of exits;

c) Marking of exits and provision of instructions for use;

d) likely blockages of exits;

e) Operation of exits; and

f) Positioning and weight of evacuation equipment at exits, e.g. slides and rafts.

8.5 LIGHTING AND MARKING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for helicopters with 10 or more passenger seats, emergency lighting shall be provided and shall have the following characteristics:

a) Independence from main electrical supply;

b) For helicopters for which application for certification was submitted on or after 24 February 2013, automatic activation upon loss of normal power/impact;

c) Visual indication of emergency exits; and

d) Illumination both inside and outside the helicopter during evacuation.

CHAPTER 9 – OPERATING ENVIRONMENT AND HUMAN FACTORS

9.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be designed to allow safe operation within the performance limitations of its passengers and those who operate, maintain and service it.

Note: *The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the helicopter is capable of being controlled at all phases of the flight (including any degradation due to failures) and that neither the crew nor passengers are harmed by the environment in which they have been placed for the duration of the flight.*

9.2 FLIGHT CREW

9.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the helicopter shall be designed in such a way as to allow safe and efficient control by the flight crew. The design shall allow for variations in flight crew skill and physiology commensurate with flight crew licensing limits. Account shall be taken of the different expected operating conditions of the helicopter in its environment, including operations degraded by failures.

9.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the workload imposed on the flight crew by the design of the helicopter shall be reasonable at all stages of flight. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the helicopter, such as engine failure.

Note: *Workload* can be affected by both cognitive and physiological factors.

9.3 ERGONOMICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, during design of the helicopter, account shall be taken of ergonomics factors including:

a) Ease of use and prevention of inadvertent misuse;

b) Accessibility;

c) Flight crew working environment;

d) Cockpit standardization; and

e) Maintainability.

9.4 OPERATING ENVIRONMENTAL FACTORS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the helicopter shall take into consideration the flight crew operating environment including:

a) Effect of aeromedical factors such as noise and vibration; and

b) Effect of physical forces during normal flight.

PART V – SMALL AEROPLANES
PART VA – AEROPLANES OVER 750 KG BUT NOT EXCEEDING 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION WAS SUBMITTED ON OR AFTER 13 DECEMBER 2007 BUT BEFORE 7 MARCH 2021

CHAPTER 1 – GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part of this part are applicable in respect of all aeroplanes designated in 1.1.2 for which an application for the issue of a Type Certificate was submitted to the appropriate national authorities on or after 13 December 2007 but before 7 March 2021.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of this part shall apply to all aeroplanes having a maximum certificated take-off mass greater than 750 kg but not exceeding 5 700 kg intended for the carriage of passengers or cargo or mail in international air navigation.

Note 1: The aeroplanes described in 1.1.2 are known in some States as normal, utility and aerobatic category aeroplanes.

Note 2: The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

1.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the aeroplanes designated in 1.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, the Standards apply to the complete aeroplane including its powerplants, systems and equipment.

1.2 OPERATING LIMITATIONS

1.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting conditions shall be established for the aeroplane, its powerplant, systems and equipment (see 7.2). Compliance with the Standards of this part shall be established assuming that the aeroplane is operated within the limitations specified. The limitations shall include a margin of safety to render the likelihood of accidents arising therefrom extremely remote.

1.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting ranges of any parameter whose variation may compromise the safe operation of the aeroplane, e.g. mass, centre of gravity location, load distribution, speeds, ambient air temperature and altitude, shall be established within which compliance with all the pertinent Standards in this part is shown.

Note 1: The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

Note 2: Maximum operating mass may be limited by the application of Noise Certification Standards (see ICAO Annex 16, Volume 1 and ICAO Annex 6, Parts I and II).

1.3 UNSAFE FEATURES AND CHARACTERISTICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, under all anticipated operating conditions, the aeroplane shall not possess any feature or characteristic that renders it unsafe.

1.4 PROOF OF COMPLIANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the means by which compliance with the appropriate airworthiness requirements is demonstrated shall ensure that in each case the accuracy achieved will be such as to provide reasonable assurance that the aeroplane, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2 – FLIGHT

2.1 GENERAL

2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the Standards prescribed in this chapter shall be established by flight or other tests conducted upon an aeroplane or aeroplanes of the type for which a Type Certificate is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with each Standard shall be established for all applicable combinations of aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where necessary, appropriate aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the aeroplane's flying qualities.

2.2 PERFORMANCE

2.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient data on the performance of the aeroplane shall be determined and scheduled in the flight manual to provide operators with the necessary information for the purpose of determining the total mass of the aeroplane on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, achieving the performance scheduled for the aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note: *Guidance material on human performance can be found in the Human Factors Training Manual (ICAO Doc 9683).*

2.2.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the scheduled performance of the aeroplane shall be consistent with compliance with 1.2.1 and with the operation in logical combinations of those of the aeroplane's systems and equipment, the operation of which may affect performance.

2.2.4 MINIMUM PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, minimum performance shall be scheduled for aeroplanes with more than one engine that are turbine-powered or have a maximum certificated take-off mass of over 2 721 kg as follows:

a) At the maximum masses scheduled (see 2.2.7) for take-off and for landing, as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions; and

b) For seaplanes in specified conditions in smooth water,

the aeroplane shall be capable of accomplishing the minimum performances specified in 2.2.5 a) and 2.2.6

a) respectively, not considering obstacles, or runway or water run length.

Note: *This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the flight manual against, for example:*
— Aerodrome elevation, or

— Pressure-altitude at aerodrome level, or

— Pressure-altitude and atmospheric temperature at aerodrome level,

so as to be readily usable when applying the national code on aeroplane performance operating limitations.

2.2.5 TAKE-OFF

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes with more than one engine that are turbine-powered or have a maximum certificated take-off mass of over 2 721 kg, after the end of the period during which the take-off power or thrust may be used, the aeroplane shall be capable of continuing to climb, with the critical engine inoperative and the remaining engine(s) operated within their maximum continuous power or thrust limitations, up to a height that it can maintain and at which it can continue safe flight and landing.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealised conditions for which data are scheduled (see 2.2.7), the departure from the scheduled values is not disproportionate.

2.2.6 LANDING

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, aeroplanes with one engine, or a single propeller, or aeroplanes with more than one engine that cannot maintain a positive climb gradient following an engine or propeller failure, the design shall, in the case of engine or propeller failure, enable the aeroplane to be operated to a safe forced landing in favourable conditions.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes with more than one engine that are turbine-powered or have a maximum certificated take-off mass of over 2 721 kg, starting from the approach configuration and with the critical engine inoperative, the aeroplane shall be capable, in the event of a missed approach, of continuing the flight to a point from which another approach can be made.

c) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, starting from the landing configuration, the aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all engines operating.

2.2.7 SCHEDULING OF PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, performance data shall be determined and scheduled in the flight manual in order to provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated.

Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing surface for landplanes; water surface conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the aeroplane is to be certificated.

a) Take-off. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off performance data shall include the distance required to take-off and climb to a selected height above the take-off surface. It must be determined for each mass, altitude and temperature within the operational limits established for take-off with:

— Take-off power on each engine;

— Wing flaps in the take-off position(s); and,

— Landing gear extended.

b) En route. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes with more than one engine, the en-route climb performance shall be the climb (or descent) performance with the aeroplane in the en-route configuration with the critical engine inoperative. The operating engine(s) shall not exceed maximum continuous power or thrust.

c) Landing. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path at a selected height above the landing surface to the point on the landing surface at which the aeroplane comes to a complete stop, or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations therefrom.

2.3 FLYING QUALITIES

2.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the aeroplane is approved.

2.3.2 CONTROLLABILITY

2.3.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to

make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power or thrust, changes of aeroplane configurations) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any engine. A technique for safely controlling

the aeroplane shall be established for all stages of flight and aeroplane configurations for which performance is scheduled.

Note: *This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.*

2.3.2.2 Controllability on the ground (or water). Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.2.3 Controllability during take-off. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable in the event of sudden failure of the critical engine at any point in the take-off.

2.3.2.4 Take-off safety speed. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off safety speeds assumed when the performance of the aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the aeroplane remains controllable after sudden failure of the critical engine.

2.3.3 TRIM

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall have such trim characteristics as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more engines for which performance characteristics are established.

2.4 STABILITY AND CONTROL

2.4.1 STABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. aeroplane configurations and speed ranges) as to ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the aeroplane shall not, however, be such that excessive demands are made on the pilot's strength or that the safety of the aeroplane is prejudiced by lack of manoeuvrability in emergency conditions. The stability may be achieved by natural or artificial means, or a combination of both. In those cases where artificial stability is necessary to show compliance with the Standards of this part, it shall be shown that any failure or condition that would result in the need for exceptional pilot skill or strength for recovery of aeroplane stability is extremely improbable.

2.4.2 STALLING

2.4.2.1 Stall warning. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when the aeroplane approaches a stall both in straight and turning flight, a clear and distinctive stall warning shall be apparent to the pilot with the aeroplane in all permissible configurations, except those which are not considered to be essential for safe flying. The stall warning and other characteristics of the aeroplane shall be such as to enable the pilot to arrest the development of the stall after the warning begins and, without altering the engine power or thrust, to maintain full control of the aeroplane.

2.4.2.2 Behaviour following a stall. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in any configuration and at any level of power or thrust in which it is considered that the ability to recover from a stall is essential, the behaviour of the aeroplane following a stall shall not be so extreme as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the aeroplane.

2.4.2.3 Stalling speeds. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of

flight (e.g. take-off, en route, landing) shall be established. One of the values of the power or thrust used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

2.4.3 FLUTTER AND VIBRATION

2.4.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be demonstrated by suitable tests, analyses or any acceptable combination of tests and analyses that all parts of the aeroplane are free from flutter and excessive vibration in all aeroplane configurations under all speed conditions within the operating limitations of the aeroplane (see 1.2.2). There shall be no vibration or buffeting severe enough to cause structural damage.

2.4.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, there shall be no vibration or buffeting severe enough to interfere with control of the aeroplane or to cause excessive fatigue to the flight crew.

Note: *Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.*

2.4.4 SPINNING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be demonstrated that the aeroplane during normal operation does not exhibit any tendency to inadvertently enter into a spin. If the design is such that spinning is allowed or for aeroplanes with one engine inadvertently possible, it shall be demonstrated that with normal use of the controls and without the use of exceptional piloting skill the aeroplane can be recovered from a spin within appropriate recovery limits.

CHAPTER 3 – STRUCTURE

3.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding catastrophic failure throughout its operational life.

3.2 MASS AND MASS DISTRIBUTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.3 LIMIT LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.6 shall be considered as limit loads.

3.4 STRENGTH AND DEFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in the various loading conditions prescribed in 3.6, no part of the aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the aeroplane structure shall be capable of supporting the ultimate load.

3.5 AIRSPEEDS

3.5.1 DESIGN AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design airspeeds shall be established for which the aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads. To avoid inadvertent exceedances due to upsets or atmospheric

variations, the design airspeeds shall provide sufficient margin for the establishment of practical operational limiting airspeeds. In addition, the design airspeeds shall be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air. Consideration shall be given to a design manoeuvring

speed, a design cruising speed, a design dive speed, and any other design airspeeds necessary for configurations with high lift or other special devices.

3.5.2 LIMITING AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.2.1, shall be included in the flight manual as part of the operating limitations (see 7.2).

3.6 STRENGTH

3.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all structural elements shall be designed to withstand the maximum loads expected in service under all anticipated operating conditions without failure, permanent distortion or loss of functionality. In determining these loads, account shall be taken of:

a) The expected operational life of the aeroplane;

b) The vertical and horizontal gust environment, taking into consideration the expected variations in mission profile and loading configurations;

c) The manoeuvre spectrum, taking into account variations in mission profiles, and loading configurations;

d) Asymmetrical as well as symmetrical loading;

e) The ground and water loads, including taxi, landing and take-off loads, and ground/water handling loads;

f) The speed range of the aeroplane, taking into account the aeroplane characteristics and operation limitations;

g) Vibration and buffeting loads;

h) Corrosion or other degradation, given the maintenance specified, and various operating environments; and

i) Any other loads, such as flight control loads, cabin pressurisation loads, engine loads, or dynamic loads due to changes to the steady state configuration.

3.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.7 SURVIVABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be designed so as to provide the occupants with the maximum practicable protection in the event of structural failure, or in the event of damage due to ground, water or object impact. Consideration shall be given to at least the following:

a) Energy absorption by the airframe, occupant seats and restraints; and

b) Allowing egress in the shortest practicable time.

3.8 STRUCTURAL DURABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure of the aeroplane shall conform to damage tolerance, safe-life or failsafe principles and shall be such as to avoid catastrophic failure during the operational life, taking into account, where appropriate:

a) The expected environment;

b) The expected repeated loads applied in service;

c) Expected vibrations from aerodynamic interaction or internal sources;

c) Thermal cycles;

d) Accidental and discrete source damage;

f) Likely corrosion or other degradation;

g) Specified maintenance; and

h) Likely structural repairs.

3.9 SPECIAL FACTORS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, design features (e.g. castings, bearings or fittings), the strength of which is subject to variability in manufacturing processes, deterioration in service, or any other cause, shall be accounted for by a suitable factor.

CHAPTER 4 – DESIGN AND CONSTRUCTION

4.1 GENERAL

4.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, details of design and construction shall be such as to give reasonable assurance that all aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider Human Factors principles.

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

4.1.2 SUBSTANTIATION OF MOVING PARTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the functioning of all moving parts essential to the safe operation of the aeroplane shall be demonstrated in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.3 MATERIALS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all materials used in parts of the aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.4 MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.5 PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the aeroplane will receive.

4.1.6 INSPECTION PROVISIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the aeroplane that require such attention, either periodically or after unusually severe operations

4.2 SYSTEMS DESIGN FEATURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) Controls and control systems. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the controls and control systems shall be such as to minimise the possibility of jamming, inadvertent operation including prevention of mis-assembly, and unintentional engagement of control surface locking devices.

1) Each control and control system shall operate with the ease, smoothness and precision appropriate to its functions.

2) Each element of each flight control system shall be designed, or distinctively and permanently marked, to minimise the probability of any incorrect assembly that could result in the malfunction of the system.

b) System survivability. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, aeroplane systems shall be designed and arranged to maximise the potential for continued safe flight and landing after events resulting in damage to the aeroplane structure or systems.

c) Crew environment. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the flight crew compartment shall be such as to minimise the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

d) Pilot vision. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the arrangement of the flight crew compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the aeroplane, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the windshield shall permit, under precipitation conditions of moderate rain, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

e) Provision for emergencies. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the aeroplane. Reasonable provisions shall be made for continuation of essential services following engine or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this SD and in ICAO Annex 6, Parts I and II.

f) Fire precautions. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the aeroplane and the materials used in its manufacture shall be such so as to minimise the risk of in-flight and ground fires, and to minimise the production of smoke and toxic gases in the event of a fire.

g) Cargo compartment protection. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations:

1) Sources of heat within the compartment which are capable of igniting the cargo or baggage shall be shielded or insulated to prevent such ignition; and

2) Each cargo and baggage compartment shall be constructed of materials which are at least flame resistant.

h) Incapacitation of occupants. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design precautions shall be taken to protect against possible instances of cabin depressurisation and against the presence of smoke or other toxic gases that could incapacitate the occupants of the aeroplane.

4.3 AEROELASTICITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be free from flutter, structural divergence, control reversal, loss of control due to structural deformation and aeroelastic effects, at all speeds within and sufficiently beyond the design envelope to comply with 1.2.1. Account shall be taken of the characteristics of the aeroplane.

4.4 OCCUPANT ACCOMMODATION FEATURES

4.4.1 SEATING AND RESTRAINTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate seating and restraints shall be provided for the occupants, taking account of the likely flight and

emergency landing loads to be encountered. Attention shall be paid to minimising injury to occupants due to contact with surrounding structure during the operation of the aeroplane.

4.4.2 CABIN ENVIRONMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, ventilation, heating and, where applicable, pressurisation systems shall be designed to provide the cabin with an adequate environment during the anticipated flight and ground or water operating conditions. The systems design shall also consider likely emergency conditions.

4.5 ELECTRICAL BONDING AND PROTECTION AGAINST LIGHTNING AND STATIC ELECTRICITY

4.5.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, electrical bonding and protection against lightning and static electricity shall be such as to:

a) protect the aeroplane, its systems, its occupants and those who come in contact with the aeroplane on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) Prevent dangerous accumulation of electrostatic charge.

4.5.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall also be protected against catastrophic effects of lightning. Due account shall be taken of the material used in the construction of the aeroplane.

4.6 EMERGENCY LANDING PROVISIONS

4.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

4.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane and shall be shown to be suitable for their intended purpose.

4.7 GROUND HANDLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design provisions and procedures for safe ground-handling (e.g. towing, jacking) shall be defined. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5 – POWERPLANT

5.1 ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Section VI of this SD shall apply to each engine that is used on the aeroplane as a primary propulsion unit.

5.2 PROPELLERS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Section VII of this SD shall apply to each propeller that is used on the aeroplane.

5.3 POWERPLANT INSTALLATION

5.3.1 COMPLIANCE WITH ENGINE AND PROPELLER LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of functioning reliably in the anticipated operating conditions. In conditions established in the flight manual, the aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with this chapter and Parts VI and VII.

5.3.2 CONTROL OF ENGINE ROTATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the failed engine in flight or to reduce it to a safe level.

5.3.3 TURBINE ENGINE INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for a turbine engine installation:

a) The design shall minimise the hazards to the aeroplane in the event of failure of engine rotating parts, or an engine fire which burns through the engine case; and

b) The powerplant installation shall be designed to give reasonable assurance that those engine operating limitations that adversely affect the structural integrity of rotating parts shall not be exceeded in service.

5.3.4 ENGINE RESTARTING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude

5.3.5 ARRANGEMENT AND FUNCTIONING

5.3.5.1 Independence of engines. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplane for which application for certification was submitted before 24 February 2013, the powerplant shall be arranged and installed so that each engine together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical engine.

5.3.5.2 Independence of engines and associated systems. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, the engines together with their associated systems shall be arranged and isolated from each other to allow operation, in at least one configuration, so that the failure or malfunction of any engine, or the failure or malfunction (including destruction by fire in the engine compartment) of any system that can affect an engine (other than a fuel tank if only one fuel tank is installed), will not:

a) Prevent the continued safe operation of the remaining engine(s); or

b) Require immediate action by any crew member for continued safe operation of the remaining engine(s).

5.3.5.3 Propeller vibration. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the aeroplane.

5.3.5.4 Cooling. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cooling system shall be capable of maintaining the temperature of powerplant components and fluids within the established limits (see 5.3.1) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the aeroplane.

5.3.5.5 Associated systems. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the fuel, oil, air induction, and other systems associated with the powerplant shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power or thrust, aeroplane attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

5.3.5.6 Fire protection. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.2 f).

a) Isolation. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, such regions shall be isolated by fireproof material from other regions of the aeroplane where the presence of fire would jeopardise continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) Flammable fluids. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, flammable fluid system components located in such regions shall be fire resistant. Drainage of each region shall be provided to minimise hazards resulting from the failure of any component containing flammable fluids. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs. Where sources of flammable fluid exist in such regions, the whole of the related system within the region, including supporting structure, shall be fire proof or shielded from the effects of the fire.

c) Fire detection. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions of the following aeroplane types: aeroplanes with more than one engine powered by turbine or turbo-charged engines, or aeroplanes where the engine(s) are not readily visible from the cockpit.

CHAPTER 6 - SYSTEMS AND EQUIPMENT

6.1 GENERAL

6.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be provided with approved instruments, equipment and systems, including guidance and flight management systems necessary for the safe operation of the aeroplane in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the aeroplane within its operating limitations. Instruments and equipment design shall consider Human Factors principles.

Note 1: Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in ICAO Annex 6, Parts I and II, for particular circumstances or on particular kinds of routes.

Note 2: Guidance material on Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683).

6.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the instruments, equipment and systems required by 6.1.1 and their installation shall be such that:

a) An inverse relationship exists between the probability of a failure condition and the severity of its effect on the aircraft and its occupants, as determined by a system safety assessment process;

b) They perform their intended function under all anticipated operating conditions; and

c) Electromagnetic interference between them is minimised.

6.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to warn the crew of unsafe system operating conditions and to enable them to take corrective action.

6.1.4 ELECTRICAL POWER SUPPLY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations and shall also be such that no single failure or malfunction could impair the ability of the system to supply essential loads for safe operation.

6.1.5 DEVELOPMENT ASSURANCE OF COMPLEX ELECTRONIC HARDWARE AND SYSTEM SOFTWARE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, complex electronic hardware and system software shall be developed, verified and validated such as to ensure that the systems in which they are used perform their intended functions at a level of safety that complies with the requirements of this part, notably those of 6.1.2 a) and 6.1.2 b).

Note: Some States accept the use of national or international industry standards for the development assurance (development, verification and validation) of complex electronic hardware and systems software.

6.2 INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, instrument and equipment installations shall comply with the Standards of Chapter 4.

6.3 SAFETY AND SURVIVAL EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

6.4 NAVIGATION LIGHTS AND ANTI-COLLISION LIGHTS

6.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the lights required by ICAO Annex 2 — Rules of the Air to be displayed by aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note: *It is likely that* lights will be viewed against a variety of backgrounds, such as typical city lighting, *clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk* situations *are most likely to arise in termina*l *control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).*

6.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, lights shall be installed in aeroplanes so as to minimise the possibility that they will adversely affect the satisfactory performance of the flight crews' duties.

Note: *In order to avoid the effects mentioned in 6.4.2, it will be necessary in some cases to provide means whereby the pilot can adjust the intensity of the flashing lights.*

6.5 ELECTROMAGNETIC INTERFERENCE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, aeroplane electronic systems, particularly flight-critical and flight-essential systems, shall be protected against electromagnetic interference from both internal and external sources.

6.6 ICE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, if certification for flight in icing conditions is requested, the aeroplane shall be shown to be able to operate safely in icing conditions likely to be encountered in all anticipated operating environments.

CHAPTER 7 – OPERATING LIMITATIONS AND INFORMATION

7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the operating limitations within which compliance with the Standards of this SD is determined, together with any other information necessary to the safe operation of the aeroplane, shall be made available by means of a flight manual, markings and placards, and such other means as may effectively accomplish the purpose.

7.2 OPERATING LIMITATIONS

7.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations which might be exceeded in flight and which are defined quantitatively shall be expressed in suitable units. These limitations shall be corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

7.2.2 LOADING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see 1.2.2).

7.2.3 AIRSPEED LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the airspeed limitations shall include all speeds (see 3.5.2) that are limiting from the standpoint of structural integrity or flying qualities of the aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate aeroplane configurations and other pertinent factors.

7.2.4 POWERPLANT LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant limitations shall include all those established for the various powerplant components as installed in the aeroplane (see 5.3.1 and 5.3.5.4).

7.2.5 LIMITATIONS ON EQUIPMENT AND SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the aeroplane.

7.2.6 MISCELLANEOUS LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the aeroplane (see 1.2.1).

7.2.7 FLIGHT CREW LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the aeroplane, having regard, among other things, to the accessibility to the appropriate crew members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note: *See ICAO Annex 6 — Operation of Aircraft, Parts I and II, for the circumstances in which the flight crew shall include members in addition to the minimum flight crew defined in this SD.*

7.3 OPERATING INFORMATION AND PROCEDURES

7.3.1 TYPES OF ELIGIBLE OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the particular types of operations for which the aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

7.3.2 LOADING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading information shall include the empty mass of the aeroplane, together with a definition of the condition of the aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note: *Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.*

7.3.3 OPERATING PROCEDURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a description shall be given of normal and emergency operating procedures which are peculiar to the particular aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more engines.

7.3.4 HANDLING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any significant or unusual features of the aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by 2.4.2.3 shall be scheduled.

7.4 PERFORMANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance of the aeroplane shall be scheduled in accordance with 2.2. There shall be included information regarding the various aeroplane configurations and powers or thrusts involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as scheduled.

7.5 FLIGHT MANUAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a flight manual shall be made available. It shall identify clearly the specific aeroplane or series of aeroplanes to which it is related. The flight manual shall include at least the limitations, information and procedures specified in 7.2, 7.3, 7.4 and 7.6.1.

7.6 MARKINGS AND PLACARDS

7.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

7.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (towing, refuelling, etc.) that could pass unnoticed and that could jeopardise the safety of the aeroplane in subsequent flights.

7.7 CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

7.7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, information for use in developing procedures for maintaining the aeroplane in an airworthy condition shall be made available. The information shall include that described in 7.7.2, 7.7.3 and 7.7.4.

7.7.2 MAINTENANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance information shall include a description of the aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

7.7.3 MAINTENANCE PROGRAMME INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

Note: *The development of initial maintenance programme information at the time of aircraft type certification is sometimes referred to as the Maintenance Review Board (MRB) process or the process of developing instructions for continued airworthiness.*

7.7.4 Mandatory maintenance requirements resulting from the type design approval

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of 7.7.3.

Note: *Mandatory requirements identified as part of the type design approval are often referred to as Certification Maintenance Requirements (CMR) and/or airworthiness limitations.*

CHAPTER 8 – CRASHWORTHINESS AND CABIN SAFETY

8.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, crashworthiness shall be taken into account in the design of aeroplanes to improve the probability of occupant survival.

8.2 DESIGN EMERGENCY LANDING LOADS

8.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted before 24 February 2013, emergency landing (crash) loads shall be determined for all categories of aeroplanes so that the interiors, furnishings, support structure and safety equipment can be designed to maximise survivability for the occupants. Items to be considered shall include:

a) Dynamic effects;

b) Restraint criteria for items that could cause a hazard;

c) Distortion of the fuselage in the areas of emergency exits;

d) Fuel cell integrity and position; and

e) Integrity of electrical systems to avoid sources of ignition.

8.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, emergency landing (crash) loads shall be determined so that the interiors, furnishings, support structure and safety equipment can be designed to protect the occupants under emergency landing conditions. Items to be considered shall include:

a) Dynamic effects;

b) Restraint criteria for items that could cause a hazard;

c) Deformation of the fuselage in the areas of emergency exits;

d) Fuel cell integrity and position; and

e) Integrity of electrical systems to avoid sources of ignition.

8.3 CABIN FIRE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cabin shall be so designed as to provide fire protection to the occupants in the event of airborne systems failures or a crash situation. Items to be considered shall include:

a) Flammability of cabin interior materials;

b) Fire resistance and the generation of smoke and toxic fumes

c) Provision of safety features to allow for safe evacuation; and

d) Fire detection and suppression equipment.

8.4 EVACUATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be equipped with sufficient emergency exits to allow for cabin evacuation within an appropriate time period. Items to be considered, appropriate to the size of the aeroplane, shall include:

a) Number of seats and seating configuration;

b) Number, location and size of exits;

c) Marking of exits and provision of instructions for use;

d) Likely blockages of exits;

e) Operation of exits; and

f) Positioning and weight of evacuation equipment at exits, e.g. rafts.

8.5 LIGHTING AND MARKING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, emergency lighting, if installed, shall have the following characteristics:

a) Independence from main electrical supply;

b) Automatic activation upon loss of normal power/impact;

c) Visual indication of emergency exits;

d) Illumination both inside and outside the aeroplane during evacuation; and

e) No additional hazards in the event of fuel spillage, emergency landings and minor crash events.

CHAPTER 9 – OPERATING ENVIRONMENT AND HUMAN FACTORS

9.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be designed to allow safe operation within the performance limitations of its passengers and those who operate, maintain and service it.

Note: *The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the aeroplane is capable of being controlled at all phases of the flight (including any degradation due to failures) and that neither the crew nor passengers are harmed by the environment in which they have been placed for the duration of the flight.*

9.2 FLIGHT CREW

9.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be designed in such a way as to allow safe and efficient control by the flight crew. The design shall allow for variations in flight crew skill and physiology commensurate with flight crew licensing limits. Account shall be taken of the different expected operating conditions of the aeroplane in its environment, including operations degraded by failures.

9.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the workload imposed on the flight crew by the design of the aeroplane shall be reasonable at all stages of flight. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the aeroplane, such as a contained engine failure or windshear encounter.

Note: *Workload can be affected by both cognitive and physiological factors.*

9.3 ERGONOMICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, during design of the aeroplane, account shall be taken of ergonomic factors including:

a) Ease of use and prevention of inadvertent misuse;

b) Accessibility;

c) Flight crew working environment;

d) Cockpit standardization; and

e) Maintainability.

9.4 OPERATING ENVIRONMENTAL FACTORS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the aeroplane shall take into consideration the flight crew operating environment including:

a) Effect of aeromedical factors such as level of oxygen, temperature, humidity, noise and vibration;

b) Effect of physical forces during normal flight;

c) Effect of prolonged operation at high altitude; and

d) Physical comfort.

PART VB – AEROPLANES NOT EXCEEDING 5 700 KG FOR WHICH APPLICATION FOR CERTIFICATION IS SUBMITTED ON OR AFTER 7 MARCH 2021

CHAPTER 1. GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part are applicable in respect of all aeroplanes designated in 1.1.2 for which an application for the issue of a Type Certificate is submitted to the appropriate national authorities on or after 7 March 2021.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, , except for those Standards and Recommended Practices which specify a different applicability, the Standards and Recommended Practices of this part shall apply to all aeroplanes having a maximum certificated take-off mass not exceeding 5 700 kg intended for the carriage of passengers or cargo or mail in international air navigation.

Note 1. — Guidance material concerning the appropriate airworthiness safety levels commensurate with acceptable risk levels is contained in the Airworthiness Manual *(Doc 9760).*

Note 2. — The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

1.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the aeroplanes designated in 1.1.2 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, the Standards apply to the complete aeroplane including its powerplant, systems and equipment.

1.2 OPERATING LIMITATIONS

1.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting conditions shall be established for the aeroplane, its powerplant, systems and equipment (see 7.2). Compliance with the Standards of this part shall be established assuming that the aeroplane is operated within the limitations specified. The limitations shall include a margin of safety to render the likelihood of accidents arising therefrom extremely remote.

1.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting ranges of any parameter whose variation may compromise the safe operation of the aeroplane, e.g. mass, centre of gravity location, load distribution, speeds, ambient air temperature and altitude, shall be established within which compliance with all the pertinent Standards in this part is shown.

Note 1. — The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

Note 2.— Maximum operating mass may be limited by the application of Noise Certification Standards (see Annex 16 — Environmental Protection, *Volume I* — Aircraft Noise, *and Annex 6* — Operation of Aircraft, *Part I* — International Commercial Air Transport — Aeroplanes *and Part II* — International General Aviation — Aeroplanes*).*

1.3 UNSAFE FEATURES AND CHARACTERISTICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, under all anticipated operating conditions, the aeroplane shall not possess any feature or characteristic that renders it unsafe.

1.4 PROOF OF COMPLIANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the means by which compliance with the appropriate airworthiness requirements is demonstrated shall ensure that in each case the accuracy achieved will be such as to provide reasonable assurance that the aeroplane, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

Note. — Guidance material on the proportionality approach in respect of reasonable assurance for compliance with appropriate airworthiness requirements is contained in Doc 9760.

CHAPTER 2. FLIGHT

2.1 GENERAL

2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the Standards prescribed in this chapter shall be established by flight or other tests conducted upon an aeroplane or aeroplanes of the type for which a Type Certificate is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with each Standard shall be established for all applicable combinations of aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where necessary, appropriate aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the aeroplane's flying qualities.

2.2 PERFORMANCE

2.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient data on the performance of the aeroplane shall be determined and furnished in the flight manual to provide operators with the necessary information for the purpose of determining the maximum total mass of the aeroplane at the time of take-off that would allow the flight to be made with reasonable assurance that a safe minimum performance for that flight will be achieved considering the values of the operational parameters peculiar to the proposed flight.

2.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, achieving the performance scheduled for the aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the flight crew.

Note. — *Guidance material on human performance can be found in the* Human Factors Training Manual *(Doc 9683)*.

2.2.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the scheduled performance of the aeroplane shall be consistent with compliance with 1.2.1 and with the operation in logical combinations of those of the aeroplane's systems and equipment, the operation of which may affect performance.

2.2.4 MINIMUM PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, Minimum performance shall be scheduled for aeroplanes with more than one engine that are turbine-powered or have a maximum certificated take-off mass of over 2 721 kg as follows:

a) at the maximum masses scheduled (see 2.2.7) for take-off and for landing, as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions; and

b) for seaplanes in specified conditions in smooth water,

the aeroplane shall be capable of accomplishing the minimum performances specified in 2.2.5 a) and 2.2.6 a) respectively, not considering obstacles, or runway or water run length.

Note. — *This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the flight manual against, for example:*
— aerodrome elevation, or
— pressure-altitude at aerodrome level, or
— pressure-altitude and atmospheric temperature at aerodrome level,

so as to be readily usable when applying the national code on aeroplane performance operating limitations.

2.2.5 TAKE-OFF

a) For aeroplanes with more than one engine that are turbine-powered or have a maximum certificated take-off mass of over 2 721 kg, after the end of the period during which the take-off power or thrust may be used, the aeroplane shall be capable of continuing to climb, with the critical engine inoperative and the remaining engine(s) operated within their maximum continuous power or thrust limitations, up to a height that it can maintain and at which it can continue safe flight and landing.

b) The minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data is scheduled (see 2.2.7), the departure from the scheduled values is not disproportionate.

2.2.6 LANDING

a) For aeroplanes for which application for certification was submitted on or after 24 February 2013, aeroplanes with one engine, or a single propeller, or aeroplanes with more than one engine that cannot maintain a positive climb gradient following an engine or propeller failure, the design shall, in the case of engine or propeller failure, enable the aeroplane to be operated to a safe forced landing in favourable conditions.

b) For aeroplanes with more than one engine that are turbine-powered or have a maximum certificated take-off mass of over 2 721 kg, starting from the approach configuration and with the critical engine inoperative, the aeroplane shall be capable, in the event of a missed approach, of continuing the flight to a point from which another approach can be made.

c) Starting from the landing configuration, the aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all engines operating.

2.2.7 SCHEDULING OF PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, performance data shall be determined and scheduled in the flight manual in order to provide a safe relationship between the performance of the aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing surface for landplanes;

water surface conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the aeroplane is to be certificated.

a) *Take-off.* The take-off performance data shall include the distance required to take-off and climb to a selected height above the take-off surface. It shall be determined for each mass, altitude and temperature within the operational limits established for take-off with:

— take-off power on each engine;
— wing flaps in the take-off position(s); and
— landing gear extended.

b) *En route*. For aeroplanes with more than one engine, the en-route climb performance shall be the climb (or descent) performance with the aeroplane in the en-route configuration with the critical engine inoperative. The operating engine(s) shall not exceed maximum continuous power or thrust.

c) *Landing.* The landing distance shall be the horizontal distance traversed by the aeroplane from a point on the approach flight path at a selected height above the landing surface to the point on the landing surface at which the aeroplane comes to a complete stop, or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations there from.

2.3 FLYING QUALITIES

2.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the aeroplane is approved.

2.3.2 CONTROLLABILITY

2.3.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power or thrust, changes of aeroplane configurations) without requiring exceptional skill, alertness or strength on the part of the pilot even in the event of failure of any engine. A technique for safely controlling the aeroplane shall be established for all stages of flight and aeroplane configurations for which performance is scheduled.

Note. — *This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air*.

2.3.2.2 *Controllability on the ground (or water)*. The aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.2.3 *Controllability during take-off.* The aeroplane shall be controllable in the event of sudden failure of the critical engine at any point in the take-off.

2.3.2.4 *Take-off safety speed*. The take-off safety speeds assumed when the performance of the aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the aeroplane remains controllable after sudden failure of the critical engine.

2.3.3 TRIM

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall have such trim characteristics as to ensure that the demands made on the pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more engines for which performance characteristics are established.

2.4 STABILITY AND CONTROL

2.4.1 STABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. aeroplane configurations and speed ranges) as to

ensure that demands made on the pilot's powers of concentration are not excessive when the stage of the flight at which however, be such that excessive demands are made on the pilot's strength or that the safety of the aeroplane is prejudiced by lack of manoeuvrability in emergency conditions. The stability may be achieved by natural or artificial means, or a combination of both. In those cases where artificial stability is necessary to show compliance with the Standards of this part, it shall be shown that any failure condition that would result in the need for exceptional pilot skill or strength for recovery of aeroplane stability is extremely improbable.

2.4.2 STALLING

2.4.2.1 *Stall warning*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when the aeroplane approaches a stall both in straight and turning flight, a clear and distinctive stall warning shall be apparent to the pilot with the aeroplane in all permissible configurations, except those which are

not considered to be essential for safe flying. The stall warning and other characteristics of the aeroplane shall be such as to enable the pilot to arrest the development of the stall after the warning begins and, without altering the engine power or thrust, to maintain full control of the aeroplane.

2.4.2.2 *Behaviour following a stall.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in any configuration and at any level of power or thrust in which it is considered that the ability to recover from a stall is essential, the behaviour of the aeroplane following a stall shall not be so extreme

as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the aeroplane.

2.4.2.3 *Stalling speeds*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of flight (e.g. take-off, en route, landing) shall be established. One of the values of the power or thrust used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

2.4.3 FLUTTER AND VIBRATION

2.4.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be demonstrated by suitable tests, analyses or any acceptable combination of tests and analyses that all parts of the aeroplane are free from flutter and excessive vibration in all aeroplane configurations under all speed conditions within the operating limitations of the aeroplane (see 1.2.2). There shall be no vibration or buffeting severe enough to cause structural damage.

2.4.3.2 There shall be no vibration or buffeting severe enough to interfere with control of the aeroplane or to cause excessive fatigue to the flight crew.

Note. — Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.

2.4.4 SPINNING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be demonstrated that the aeroplane during normal operation does not exhibit any tendency to inadvertently enter into a spin. If the design is such that spinning is allowed or for aeroplanes with one engine inadvertently possible, it shall be demonstrated that with normal use of the controls and without the use of exceptional piloting skill the aeroplane can be recovered from a spin within appropriate recovery limits.

CHAPTER 3. STRUCTURE

3.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding catastrophic failure throughout its operational life.

3.2 MASS AND MASS DISTRIBUTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.3 LIMIT LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.6 shall be considered as limit loads.

3.4 STRENGTH AND DEFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in the various loading conditions prescribed in 3.6, no part of the aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the aeroplane structure shall be capable of supporting the ultimate load.

3.5 AIRSPEEDS

3.5.1 DESIGN AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design airspeeds shall be established for which the aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads. To avoid inadvertent exceedences due to upsets or atmospheric variations, the design airspeeds shall provide sufficient margin for the establishment of practical operational limiting airspeeds. In addition, the design airspeeds shall be sufficiently greater than the stalling speed of the aeroplane to safeguard against loss of control in turbulent air. Consideration shall be given to a design manoeuvring speed, a design cruising speed, a design dive speed and any other design airspeeds necessary for configurations with high lift or other special devices.

3.5.2 LIMITING AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.2.1, shall be included in the flight manual as part of the operating limitations (see 7.2).

3.6 STRENGTH

3.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all structural elements shall be designed to withstand the maximum loads expected in service under all anticipated operating conditions without failure, permanent distortion or loss of functionality. In determining these loads, account shall be taken of:

a) the expected operational life of the aeroplane;
b) the vertical and horizontal gust environment, taking into consideration the expected variations in mission profile and loading configurations;

c) the manoeuvre spectrum, taking into account variations in mission profile and loading configurations;
d) asymmetrical as well as symmetrical loading;
e) the ground and water loads, including taxi, landing and take-off loads, and ground/water handling loads;
f) the speed range of the aeroplane, taking into account the aeroplane characteristics and operation limitations;
g) vibration and buffeting loads;
h) corrosion or other degradation, given the maintenance specified, and various operating environments; and
i) any other loads, such as flight control loads, cabin pressurization loads, engine loads, or dynamic loads due to changes to the steady state configuration.

3.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.7 SURVIVABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be designed so as to provide the occupants with the maximum practicable protection in the event of structural failure, or in the event of damage due to ground, water or object impact. Consideration shall be given to at least the following:

a) energy absorption by the airframe, occupant seats and restraints; and
b) allowing egress in the shortest practicable time.

3.8 STRUCTURAL DURABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure of the aeroplane shall conform to damage tolerance, safe-life or failsafe principles and shall be such as to avoid catastrophic failure during the operational life, taking into account, where appropriate:

a) the expected environment;
b) the expected repeated loads applied in service;
c) c) expected vibrations from aerodynamic interaction or internal sources;
d) thermal cycles;
e) accidental and discrete source damage;
f) likely corrosion or other degradation;

g) specified maintenance; and
h) likely structural repairs.

3.9 SPECIAL FACTORS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for aeroplanes for which application for certification was submitted on or after 24 February 2013, design features (e.g. castings, bearings or fittings), the strength of which is subject to variability in manufacturing processes, deterioration in service, or any other cause, shall be accounted for by a suitable factor.

CHAPTER 4. DESIGN AND CONSTRUCTION

4.1 GENERAL

4.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, details of design and construction shall be such as to give reasonable assurance that all aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider human factors principles.

Note. — *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683)*.

4.1.2 SUBSTANTIATION OF MOVING PARTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the functioning of all moving parts essential to the safe operation of the aeroplane shall be demonstrated in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.3 MATERIALS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all materials used in parts of the aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.4 MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.5 PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the aeroplane will receive.

4.1.6 INSPECTION PROVISIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the aeroplane that require such attention, either periodically or after unusually severe operations.

4.2 SYSTEMS DESIGN FEATURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, special consideration shall be given to design features that affect the ability of the flight crew to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operation including prevention of mis-assembly, and unintentional engagement of control surface locking devices.

1) Each control and control system shall operate with the ease, smoothness and precision appropriate to its functions.

2) Each element of each flight control system shall be designed, or distinctively and permanently marked, to minimize the probability of any incorrect assembly that could result in the malfunction of the system.

b) *System survivability.* Aeroplane systems shall be designed and arranged to maximize the potential for continued safe flight and landing after events resulting in damage to the aeroplane structure or systems.

c) *Crew environment.* The design of the flight crew compartment shall be such as to minimize the possibility of incorrect or restricted operation of the controls by the crew, due to fatigue, confusion or interference. Consideration shall be given at least to the following: layout and identification of controls and instruments, rapid identification of emergency situations, sense of controls, ventilation, heating and noise.

d) *Pilot vision.* The arrangement of the flight crew compartment shall be such as to afford a sufficiently extensive, clear and undistorted field of vision for the safe operation of the aeroplane, and to prevent glare and reflections that would interfere with the pilot's vision. The design features of the windshield shall permit, under precipitation conditions of moderate rain, sufficient vision for the normal conduct of flight and for the execution of approaches and landings.

e) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the flight crew to deal with, emergencies resulting from foreseeable failures of equipment and systems, the failure of which would endanger the aeroplane. Reasonable provisions shall be made for continuation of essential services following engine or system failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this SD and in Annex 6, Parts I and II.

f) *Fire precautions.* The design of the aeroplane and the materials used in its manufacture shall be such so as to minimize the risk of in-flight and ground fires, and to minimize the production of smoke and toxic gases in the event of a fire.

g) *Cargo compartment protection*.

1) Sources of heat within the compartment which are capable of igniting the cargo or baggage shall be shielded or insulated to prevent such ignition; and

2) Each cargo and baggage compartment shall be constructed of materials which are at least flame resistant.

3) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended that as of 7 March 2025, the elements of the aeroplane design associated with cargo compartment fire protection, and a summary of the demonstrated standards that were considered in the process of aeroplane certification should be included in the required aeroplane documentation and made available to the operator.

h) *Incapacitation of occupants.* Design precautions shall be taken to protect against possible instances of cabin depressurization and against the presence of smoke or other toxic gases that could incapacitate the occupants of the aeroplane.

4.3 AEROELASTICITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be free from flutter, structural divergence, control reversal, loss of control due to structural deformation and aeroelastic effects, at all speeds within and sufficiently beyond the design envelope to comply with 1.2.1. Account shall be taken of the characteristics of the aeroplane.

4.4 OCCUPANT ACCOMMODATION FEATURES

4.4.1 SEATING AND RESTRAINTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate seating and restraints shall be provided for the occupants, taking account of the likely flight and emergency landing loads to be encountered. Attention shall be paid to minimizing injury to occupants due to contact with surrounding structures during the operation of the aeroplane.

4.4.2 CABIN ENVIRONMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, ventilation, heating and, where applicable, pressurization systems shall be designed to provide the cabin with an adequate environment during the anticipated flight and ground or water operating conditions. The systems design shall also consider likely emergency conditions.

4.5 ELECTRICAL BONDING AND PROTECTION AGAINST LIGHTNING AND STATIC ELECTRICITY

4.5.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, electrical bonding, protection against static electricity and lightning protection when appropriate for the type of approved operations shall be such as to:

a) protect the aeroplane, its systems, its occupants and those who come in contact with the aeroplane on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) prevent dangerous accumulation of electrostatic charge.

4.5.2 When appropriate for the type of approved operation, the aeroplane shall also be protected against catastrophic effects of lightning. Due account shall be taken of the material used in the construction of the aeroplane.

4.6 EMERGENCY LANDING PROVISIONS

4.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, provisions shall be made in the design of the aeroplane to protect the occupants, in the event of an emergency landing, from fire and from the direct effects of deceleration forces as well as from injuries arising from the effect of deceleration forces on the aeroplane's interior equipment.

4.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, facilities shall be provided for the rapid evacuation of the aeroplane in conditions likely to occur following an emergency landing. Such facilities shall be related to the passenger and crew capacity of the aeroplane and shall be shown to be suitable for their intended purpose.

4.7 GROUND HANDLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design provisions and procedures for safe ground handling (e.g. towing, jacking) shall be defined. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5. POWERPLANT

5.1 ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part VI of this SD shall apply to each engine that is used on the aeroplane as a primary propulsion unit.

5.2 PROPELLERS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part VII of this SD shall apply to each propeller that is used on the aeroplane.

5.3 POWERPLANT INSTALLATION

5.3.1 COMPLIANCE WITH ENGINE AND PROPELLER LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of functioning reliably in the anticipated operating conditions. In conditions established in the flight manual, the aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with this chapter and Parts VI and VII.

5.3.2 CONTROL OF ENGINE ROTATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided for the crew to stop the rotation of the failed engine in flight or to reduce it to a safe level.

5.3.3 TURBINE ENGINE INSTALLATION

For a turbine engine installation:

a) the design shall minimize the hazards to the aeroplane in the event of failure of engine rotating parts, or an engine fire which burns through the engine case; and

b) the powerplant installation shall be designed to give reasonable assurance that those engine operating limitations that adversely affect the structural integrity of rotating parts shall not be exceeded in service.

5.3.4 ENGINE RESTARTING

Means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

5.3.5 ARRANGEMENT AND FUNCTIONING

5.3.5.1 *Independence of engines*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant shall be arranged and installed so that each engine together with its associated systems is capable of being controlled and operated independently from the others and so that there is at least one arrangement of the powerplant and systems in which any failure, unless the probability of its occurrence is extremely remote, cannot result in a loss of more power than that resulting from complete failure of the critical engine.

5.3.5.2 *Independence of engines and associated systems*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the engines together with their associated systems shall be arranged and isolated from each other to allow operation, in at least one configuration, so that the failure or malfunction of any engine, or the failure or malfunction (including destruction by fire in the

engine compartment) of any system that can affect an engine (other than a fuel tank if only one fuel tank is installed), will not:

a) prevent the continued safe operation of the remaining engine(s); or

b) require immediate action by any crew member for continued safe operation of the remaining engine(s).

5.3.5.3 *Propeller vibration*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the aeroplane.

5.3.5.4 *Cooling*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cooling system shall be capable of maintaining the temperature of powerplant components and fluids within the established limits (see 5.3.1) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the aeroplane.

5.3.5.5 *Associated systems*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the fuel, oil, air induction and other systems associated with the powerplant shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power or thrust, aeroplane attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

5.3.5.6 *Fire protection*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.2 f).

a) *Isolation.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, such regions shall be isolated by fireproof material from other regions of the aeroplane where the presence of fire would jeopardize continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, flammable fluid system components located in such regions shall be fire resistant. Drainage of each region shall be provided to minimize hazards resulting from the failure of any component containing flammable fluids. Means shall be provided for the crew to shut off the flow of flammable fluids into such regions if a fire occurs. Where sources of flammable fluid exist

in such regions, the whole of the related system within the region, including supporting structure, shall be fireproof or shielded from the effects of the fire.

c) *Fire detection*. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions of the following aeroplane types: aeroplanes with more than one engine powered by turbine or turbo-charged engines, or aeroplanes where the engine(s) are not readily visible from the cockpit.

CHAPTER 6. SYSTEMS AND EQUIPMENT

6.1 GENERAL

6.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be provided with approved instruments, equipment and systems, including guidance and flight management systems necessary for the safe operation of the aeroplane in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the crew to operate the aeroplane within its operating limitations. Instruments and equipment design shall consider human factors principles.

Note 1. — *Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Parts I and II, for particular circumstances or on particular kinds of routes.*

Note 2.— *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683)*.

6.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the instruments, equipment and systems required by 6.1.1 and their installation shall be such that:

a) an inverse relationship exists between the probability of a failure condition and the severity of its effect on the aircraft and its occupants, as determined by a system safety assessment process;

b) they perform their intended function under all anticipated operating conditions; and

c) electromagnetic interference between them is minimized.

6.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to warn the crew of unsafe system operating conditions and to enable them to take corrective action.

6.1.4 ELECTRICAL POWER SUPPLY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations and shall also be such that no single failure or malfunction could impair the ability of the system to supply essential loads for safe operation.

6.1.5 DEVELOPMENT ASSURANCE OF COMPLEX ELECTRONIC HARDWARE AND SYSTEM SOFTWARE

For aeroplanes for which application for certification was submitted on or after 24 February 2013, complex electronic hardware and system software shall be developed, verified and validated such as to ensure that the systems in which they are used perform their intended functions at a level of safety that complies with the requirements of this part, notably those of 6.1.2 a) and 6.1.2 b).

Note. — *Some States accept the use of national or international industry standards for the development assurance (development, verification and validation) of complex electronic hardware and systems software.*

6.2 INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, instrument and equipment installations shall comply with the Standards of Chapter 4.

6.3 SAFETY AND SURVIVAL EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, prescribed safety and survival equipment that the crew or passengers are expected to use or operate at the time of an emergency shall be reliable, readily accessible and easily identified, and its method of operation shall be plainly marked.

6.4 NAVIGATION LIGHTS AND ANTI-COLLISION LIGHTS

6.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the lights required by Annex 2 — *Rules of the Air* to be displayed by aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft or personnel on the ground with as much time as possible for interpretation and for subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note. — It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry sky, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

6.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, lights shall be installed in aeroplanes so as to minimize the possibility that they will adversely affect the satisfactory performance of the flight crews' duties.

Note. — In order to avoid the effects mentioned in 6.4.2, it will be necessary in some cases to provide means whereby the pilot can adjust the intensity of the flashing lights.

6.5 ELECTROMAGNETIC INTERFERENCE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, aeroplane electronic systems, particularly flight-critical and flight-essential systems, shall be protected against electromagnetic interference from both internal and external sources.

6.6 ICE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, if certification for flight in icing conditions is requested, the aeroplane shall be shown to be able to operate safely in icing conditions likely to be encountered in all anticipated operating environments.

CHAPTER 7. OPERATING LIMITATIONS AND INFORMATION

7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the operating limitations within which compliance with the Standards of this SD is determined, together with any other information necessary to the safe operation of the aeroplane, shall be made available by means of a flight manual, markings and placards, and such other means as may effectively accomplish the purpose.

7.2 OPERATING LIMITATIONS

7.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations which might be exceeded in flight and which are defined quantitatively shall be expressed in suitable units. These limitations shall be corrected if necessary for errors in measurements so that the flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

7.2.2 LOADING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading limitations shall include all limiting masses, centre of gravity positions, mass distributions and floor loadings (see 1.2.2).

7.2.3 AIRSPEED LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the airspeed limitations shall include all speeds (see 3.5.2) that are limiting from the standpoint of structural integrity or flying qualities of the aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate aeroplane configurations and other pertinent factors.

7.2.4 POWERPLANT LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant limitations shall include all those established for the various powerplant components as installed in the aeroplane (see 5.3.1 and 5.3.5.4).

7.2.5 LIMITATIONS ON EQUIPMENT AND SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the aeroplane.

7.2.6 MISCELLANEOUS LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the aeroplane (see 1.2.1).

7.2.7 FLIGHT CREW LIMITATIONS

The flight crew limitations shall include the minimum number of flight crew personnel necessary to operate the aeroplane, having regard, among other things, to the accessibility to the appropriate crew

members of all necessary controls and instruments and to the execution of the established emergency procedures.

Note. — The circumstances in which the flight crew shall include members in addition to the minimum flight crew are defined in Annex 6, Part I and Part II.

7.3 OPERATING INFORMATION AND PROCEDURES

7.3.1 TYPES OF ELIGIBLE OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the particular types of operations for which the aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

7.3.2 LOADING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading information shall include the empty mass of the aeroplane, together with a definition of the condition of the aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note. — Usually the empty mass excludes the mass of the crew and payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.

7.3.3 OPERATING PROCEDURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a description shall be given of normal and emergency operating procedures which are peculiar to the particular aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more engines.

7.3.4 HANDLING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any significant or unusual features of the aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by 2.4.2.3 shall be scheduled.

7.4 PERFORMANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance of the aeroplane shall be furnished in accordance with 2.2. There shall be included information regarding the various aeroplane configurations and powers or thrusts involved and the relevant speeds, together with information that would assist the flight crew in attaining the performance as furnished.

7.5 FLIGHT MANUAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a flight manual shall be made available. It shall identify clearly the specific aeroplane or series of aeroplanes to which it is related. The flight manual shall include at least the limitations, information and procedures specified in 7.2, 7.3, 7.4 and 7.6.1.

7.6 MARKINGS AND PLACARDS

7.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the flight crew during flight.

7.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in ground servicing (towing, refuelling, etc.) that could pass unnoticed and that could jeopardize the safety of the aeroplane in subsequent flights.

7.7 CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

7.7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, information for use in developing procedures for maintaining the aeroplane in an airworthy condition shall be made available. The information shall include that described in 7.7.2, 7.7.3 and 7.7.4.

7.7.2 MAINTENANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance information shall include a description of the aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

7.7.3 MAINTENANCE PROGRAMME INFORMATION

Maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

Note. — The development of initial maintenance programme information at the time of aircraft type certification is sometimes referred to as the Maintenance Review Board (MRB) process or the process of developing instructions for continued airworthiness.

7.7.4 MANDATORY MAINTENANCE REQUIREMENTS RESULTING FROM THE TYPE DESIGN APPROVAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of 7.7.3.

Note. — *Mandatory requirements identified as part of the type design approval are often referred to as Certification Maintenance Requirements (CMR) and/or airworthiness limitations*.

CHAPTER 8. CRASHWORTHINESS AND CABIN SAFETY

8.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, crashworthiness shall be taken into account in the design of aeroplanes to improve the probability of occupant survival.

8.2 DESIGN EMERGENCY LANDING LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, emergency landing (crash) loads shall be determined so that the interiors, furnishings, support structure and safety equipment can be designed to protect the occupants under emergency landing conditions. Items to be considered shall include:

a) dynamic effects;
b) restraint criteria for items that could cause a hazard;
c) deformation of the fuselage in the areas of emergency exits;
d) fuel cell integrity and position; and
e) integrity of electrical systems to avoid sources of ignition.

8.3 CABIN FIRE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cabin shall be so designed as to provide fire protection to the occupants in the event of airborne systems failures or a crash situation. Items to be considered shall include:

a) flammability of cabin interior materials;
b) fire resistance and the generation of smoke and toxic fumes;
c) provision of safety features to allow for safe evacuation; and
d) fire detection and suppression equipment.

8.4 EVACUATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be equipped with sufficient emergency exits to allow for cabin evacuation within an appropriate time period. Items to be considered, appropriate to the size of the aeroplane, shall include:

a) number of seats and seating configuration;
b) number, location and size of exits;
c) marking of exits and provision of instructions for use;
d) likely blockages of exits;
e) operation of exits; and
f) positioning and weight of evacuation equipment at exits, e.g. rafts.

8.5 LIGHTING AND MARKING

Emergency lighting, if installed, shall have the following characteristics

a) independence from main electrical supply;
b) automatic activation upon loss of normal power/impact;
c) visual indication of emergency exits;
d) illumination both inside and outside the aeroplane during evacuation; and
e) no additional hazards in the event of fuel spillage, emergency landings and minor crash events.

CHAPTER 9. OPERATING ENVIRONMENT AND HUMAN FACTORS

9.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be designed to allow safe operation within the performance limitations of its passengers and those who operate, maintain and service it.

Note.— The human/machine interface is often the weak link in an operating environment; so, it is necessary to ensure that the aeroplane is capable of being controlled at all phases of the flight (including any degradation due to failures) and that neither the crew nor passengers are harmed by the environment in which they have been placed for the duration of the flight.

9.2 FLIGHT CREW

9.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the aeroplane shall be designed in such a way as to allow safe and efficient control by the flight crew. The design shall allow for variations in flight crew skill and physiology commensurate with flight crew licensing limits. Account shall be taken of the different expected operating conditions of the aeroplane in its environment, including operations degraded by failures.

9.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the workload imposed on the flight crew by the design of the aeroplane shall be reasonable at all stages of flight. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the aeroplane, such as a contained engine failure or windshear encounter.

Note. — Workload can be affected by both cognitive and physiological factors.

9.3 ERGONOMICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, during design of the aeroplane, account shall be taken of ergonomic factors including:

a) ease of use and prevention of inadvertent misuse;
b) accessibility;
c) flight crew working environment;
d) cockpit standardization; and
e) maintainability.

9.4 OPERATING ENVIRONMENTAL FACTORS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the aeroplane shall take into consideration the flight crew operating environment including:

a) effect of aeromedical factors such as level of oxygen, temperature, humidity, noise and vibration;
b) effect of physical forces during normal flight;

c) effect of prolonged operation at high altitude; and
d) physical comfort.

PART VI – ENGINES
CHAPTER 1 – GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as noted below, the Standards of this part are applicable to engines of all types, used as primary propulsion units, as required in Parts IIIB, IVB and V. The Standards of this part are applicable to an engine type at the time of submission of an application to the appropriate national authority for a type approval.

Note: The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code for the engines designated in 1.1.1 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.2 ENGINE INSTALLATION AND INTERFACES

1.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all necessary information for the safe and correct interfaces between the engine and the aircraft shall be made available.

1.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the installation instructions shall specify those assumptions concerning the conditions that may be imposed on the engine when it is eventually installed in an aircraft.

1.3 DECLARED RATINGS, CONDITIONS AND LIMITATIONS

1.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the thrust or power ratings and the conditions of the atmosphere upon which they are based and all operating conditions and limitations which are intended to govern the operation of the engine shall be declared.

1.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, within the stated limits of 1.3.1, the engine shall produce the thrust or power demanded of it at all required flight conditions, taking into account environmental effects and conditions.

1.4 CONTINUING AIRWORTHINESS – MAINTENANCE INFORMATION

1.4.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, information for use in developing procedures for maintaining the engine in an airworthy condition shall be made available. The information shall include that described in 1.4.2, 1.4.3 and 1.4.4.

1.4.2 MAINTENANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance information shall include a description of the engine and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

1.4.3 MAINTENANCE PROGRAMME INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

1.4.4 MANDATORY MAINTENANCE REQUIREMENTS RESULTING FROM THE TYPE DESIGN APPROVAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of 1.4.3.

CHAPTER 2 – DESIGN AND CONSTRUCTION

2.1 FUNCTIONING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the engine shall be designed and constructed so as to function reliably within its operating limitations under its anticipated operating conditions when installed in accordance with Parts IIIB, IVB or V of this SD and, if applicable, fitted with a propeller approved for the installation.

2.2 FAILURE ANALYSIS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for turbine engines, a safety assessment of the engine shall be conducted to ensure that it functions safely throughout the full range of operating conditions. A summary shall be made of all foreseeable failures and combinations of failures that result in hazardous engine effects. If the primary failure of single elements (for example, disks) is likely to result in hazardous engine effects, reliance shall be placed on meeting prescribed integrity requirements.

2.3 MATERIALS AND MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the selection of materials and the manufacturing methods and processes shall account for the operational environment of the engine expected in service. The materials and manufacturing methods and processes used in the construction of the engine shall result in known and reproducible structural behaviour.

2.4 INTEGRITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the integrity of the engine shall be demonstrated throughout its operating envelope and be maintained for its operational life. The effects of cyclic loading, environmental and operational degradation and likely subsequent part failures shall not reduce the integrity of the engine below acceptable levels. All necessary instructions for ensuring continued airworthiness in this regard shall be promulgated.

CHAPTER 3 – TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the engine type shall complete satisfactorily such tests as are necessary to verify the validity of the declared ratings conditions and limitations and to ensure that it will operate satisfactorily and reliably. The tests shall include at least the following:

a) Power calibration. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests shall be conducted to establish the power or thrust characteristics of the engine when new and also after the tests in b) and c). There shall be no excessive decrease in power at the conclusion of all the tests specified.

b) Operation. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests shall be conducted to ensure that starting, idling, acceleration, vibration, over-speeding and other characteristics are satisfactory and to demonstrate adequate margins of freedom from detonation, surge, flutter or other detrimental conditions as may be appropriate to the particular type engine.

c) Endurance. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests of sufficient duration shall be conducted at such powers, thrust, speeds, temperatures and other operating conditions as are necessary to demonstrate reliability and durability of the engine. They shall also include operation under conditions in excess of the declared limits to the extent that such limitations might be exceeded in actual service.

d) Operating Environment. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests shall be conducted to ensure that the engine characteristics are satisfactory with regard to the operating environment.

Note: Operating environment may include encounter with birds, rain and hail, electromagnetic interference and lightning.

PART VII – PROPELLERS
CHAPTER 1 – GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part are applicable to all propellers, as required in Parts IIIB and V. The Standards of this part are applicable to a propeller at the time of submission of an application to the appropriate national authority for a type approval.

Note: The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code for the propellers designated in 1.1.1 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.2 DECLARED RATINGS, CONDITIONS AND LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the power ratings and all operating conditions and limitations which are intended to govern the operation of the propeller shall be declared.

1.3 CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

1.3.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, information for use in developing procedures for maintaining the propeller in an airworthy condition shall be made available. The information shall include that described in 1.3.2, 1.3.3 and 1.3.4.

1.3.2 MAINTENANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance information shall include a description of the propeller and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis.

1.3.3 MAINTENANCE PROGRAMME INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

1.3.4 MANDATORY MAINTENANCE REQUIREMENTS RESULTING FROM THE TYPE DESIGN APPROVAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of 1.3.3

CHAPTER 2 – DESIGN AND CONSTRUCTION

2.1 FUNCTIONING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the propeller assembly shall be designed and constructed so as to function reliably within its operating limitations under its anticipated operating conditions when installed in accordance with Parts IIIB or V of this SD and shown to be not hazardous.

2.2 FAILURE ANALYSIS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a safety assessment of the propeller shall be conducted to ensure that it functions safely throughout the full range of operating conditions. A summary shall be made of those failures which could result in hazardous propeller effects. If the primary failure of single elements (for example, blades) is likely to result in hazardous propeller effects, reliance must be placed on meeting prescribed integrity requirements.

2.3 MATERIALS AND MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the selection of materials and the manufacturing methods and processes shall account for the operational environment of the propeller expected in service. The materials and manufacturing methods and processes used in the construction of the propeller shall result in known and reproducible structural behaviour.

2.4 PITCH CONTROL AND INDICATION

2.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, no loss of normal propeller pitch control shall cause a hazardous overspeeding under anticipated operating conditions.

2.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, no single failure or malfunction in the propeller control system during normal or emergency operation shall result in unintended travel of the propeller blades to a position below the in-flight low-pitch position. Failure of structural elements need not be considered if the occurrence of such a failure is shown to be extremely remote.

CHAPTER 3 – TESTS AND INSPECTIONS

3.1 BLADE RETENTION TEST

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, propeller assemblies with detachable blades shall be subjected to a centrifugal load with sufficient margin to ensure that the hub and blade retention system will operate satisfactorily and reliably under the expected loads in service under all anticipated operating conditions.

3.2 OPERATIONAL AND ENDURANCE TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the propeller shall satisfactorily complete such tests as are necessary to ensure that it will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) Function. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests shall be conducted to demonstrate proper and reliable functioning of the pitch control system.

b) Endurance. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, tests of sufficient duration shall be conducted at such powers, speeds and other operating conditions as are necessary to demonstrate reliability and durability of the propeller.

c) Operating Environment. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except for fixed pitch wood propellers, it shall be demonstrated by tests or analysis based on tests or experience on similar designs, that the propeller is capable of withstanding the likely impact of a bird or a lightning strike without causing a hazardous propeller effect.

PART VIII – REMOTELY PILOTED AEROPLANES

Applicable as of 26 November 2026.

CHAPTER 1 – GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part are applicable in respect of all remotely piloted aeroplanes for which an application for the issue of a Type Certificate is submitted to the appropriate national authorities on or after 26 November 2026.

Note 1. — The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

Note 2. — The provisions in this part support remotely piloted aeroplane operations SARPs in Annex 6, Part IV

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the remotely piloted aeroplanes designated in 1.1.1 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, the Standards apply to the complete remotely piloted aeroplane including its powerplant, systems and equipment.

1.2 OPERATING LIMITATIONS

1.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting conditions shall be established for the remotely piloted aeroplane, its powerplant, systems and equipment (see 7.2). Compliance with the Standards of this part shall be established assuming that the remotely piloted aeroplane is operated within the limitations specified. The limitations shall include a margin of safety to render the likelihood of accidents arising therefrom extremely remote.

1.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting ranges of any parameter whose variation may compromise the safe operation of the remotely piloted aeroplane, e.g. mass, centre of gravity location, load distribution, speeds, ambient air temperature, altitude and C2 Link performance, shall be established within which compliance with all the pertinent Standards in this part is shown.

Note 1. — The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each separate operating condition, e.g. take-off, en route, landing.

Note 2.— Maximum operating mass may be limited by the application of noise certification Standards (see Annex 16 — Environmental Protection*, Volume I —* Aircraft Noise*, and Annex 6 —* Operation of Aircraft, Part IV – International Operations – Remotely Piloted Aircraft Systems.

1.3 UNSAFE FEATURES AND CHARACTERISTICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, under all anticipated operating conditions, the remotely piloted aeroplane shall not possess any feature or characteristic that renders it unsafe.

1.4 PROOF OF COMPLIANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the means by which compliance with the appropriate airworthiness requirements is demonstrated shall ensure that

in each case the accuracy achieved will be such as to provide reasonable assurance that the remotely piloted aeroplane, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2. FLIGHT

2.1 GENERAL

2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the Standards prescribed in this chapter shall be established by flight or other tests conducted upon a remotely piloted aeroplane or remotely piloted aeroplanes of the type for which a Type Certificate is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with each Standard shall be established for all applicable combinations of remotely piloted aeroplane mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where necessary, appropriate remotely piloted aeroplane configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the remotely piloted aeroplane's flying qualities.

2.2 PERFORMANCE

2.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient data on the performance of the remotely piloted aeroplane shall be determined and scheduled in the remotely piloted aeroplane flight manual to provide operators with the necessary information for the purpose of determining the total mass of the remotely piloted aeroplane on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, achieving the performance scheduled for the remotely piloted aeroplane shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the remote flight crew.

Note. — *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

2.2.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the scheduled performance of the remotely piloted aeroplane shall be consistent with compliance with 1.2.1 and with the operation in logical combinations of those of the remotely piloted aeroplane's systems and equipment, the operation of which may affect performance.

2.2.4 MINIMUM PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, minimum performance shall be scheduled for remotely piloted aeroplanes with more than one engine:

a) at the maximum masses scheduled (see 2.2.7) for take-off and for landing, as functions of the aerodrome elevation or pressure-altitude either in the standard atmosphere or in specified still air atmospheric conditions; and

b) for seaplanes in specified conditions in smooth water, the remotely piloted aeroplane shall be capable of accomplishing the minimum performances specified in 2.2.5 a) and 2.2.6 a) respectively, not considering obstacles, or runway or water run length.

Note. — *This Standard permits the maximum take-off mass and maximum landing mass to be scheduled in the remotely piloted aeroplane flight manual against, for example:*

— aerodrome elevation, or
— pressure-altitude at aerodrome level, or
— pressure-altitude and atmospheric temperature at aerodrome level,

so as to be readily usable when applying the national code on remotely piloted aeroplane performance operating limitations.

2.2.5 TAKE-OFF

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted aeroplanes with more than one engine after the end of the period during which the take-off power or thrust may be used, the remotely piloted aeroplane shall be capable of continuing to climb, with the critical engine inoperative and the remaining engine(s) operated within their maximum continuous power or thrust limitations, up to a height that it can maintain and at which it can continue safe flight and landing.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the minimum performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data is scheduled (see 2.2.7), the departure from the scheduled values is not disproportionate.

Note. — *For remotely piloted aeroplanes that are assisted during take-off, related SARPs can be found in 11.3 of this part.*

2.2.6 LANDING

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted aeroplanes with one engine, or a single propeller, or remotely piloted aeroplanes with more than one engine that cannot maintain a positive climb gradient following an engine or propeller failure, the design shall, in the case of engine or propeller failure, enable the remotely piloted aeroplane to be operated to a safe forced landing in favourable conditions, or to initiate the emergency recovery capability, as specified in Chapter 11 of this part.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted aeroplanes with more than one engine starting from the approach configuration and with the critical engine inoperative, the remotely piloted aeroplane shall be capable, in the event of a missed approach, of continuing the flight to a point from which another approach can be made.

c) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, starting from the landing configuration, the remotely piloted aeroplane shall be capable, in the event of a balked landing, of making a climb-out, with all engines operating.

Note. — *For remotely piloted aeroplanes that are assisted during landing recovery, related SARPs can be found in 11.4 of this part.*

2.2.7 SCHEDULING OF PERFORMANCE

2.2.7.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, performance data shall be determined and scheduled in the remotely piloted aeroplane flight manual in order to provide a safe relationship between the performance of the remotely piloted aeroplane and the aerodromes and routes on which it is capable of being operated. Performance data shall be determined and scheduled for the following stages for the ranges of mass, altitude or pressure-altitude, wind velocity, gradient of the take-off and landing surface for landplanes; water surface

conditions, density of water and strength of current for seaplanes; and for any other operational variables for which the remotely piloted aeroplane is to be certificated.

a) *Take-off.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off performance data shall include the distance required to take-off and climb to a selected height above the take-off surface. It shall be determined for each mass, altitude and temperature within the operational limits established for take-off with:

— take-off power on each engine;
— wing flaps in the take-off position(s); and
— landing gear extended.

b) *En route.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted aeroplanes with more than one engine, the en-route climb performance shall be the climb (or descent) performance with the remotely piloted aeroplane in the en-route configuration with the critical engine inoperative. The operating engine(s) shall not exceed maximum continuous power or thrust.

c) *Landing.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing distance shall be the horizontal distance traversed by the remotely piloted aeroplane from a point on the

approach flight path at a selected height above the landing surface to the point on the landing surface at which the remotely piloted aeroplane comes to a complete stop, or, for a seaplane, comes to a satisfactorily low speed. The selected height above the landing surface and the approach speed shall be appropriately related to operating practices. This distance may be supplemented by such distance margin

as may be necessary; if so, the selected height above the landing surface, the approach speed and the distance margin shall be appropriately interrelated and shall make provision for both normal operating practices and reasonable variations therefrom.

Note. — If the landing distance includes the distance margin specified in this Standard, it is not necessary to allow for the expected variations in the approach and landing techniques in applying 5.2.11 of Annex 6 — Operation of Aircraft*, Part I* — International Commercial Air Transport — Aeroplanes *and Part IV – International Operations – Remotely Piloted Aircraft Systems.*

2.2.7.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is recommended that f*or remotely piloted aeroplanes that are assisted during take-off or landing recovery, the effects of launch and recovery methods on the scheduling of performance should be considered.*

Note. — Related SARPs can be found in 11.3 and 11.4 of this part.

2.3 FLYING QUALITIES

2.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the remotely piloted aeroplane is approved.

2.3.2 CONTROLLABILITY

2.3.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to

another (e.g. turns, sideslips, changes of engine power or thrust, changes of remotely piloted aeroplane configurations) without requiring exceptional skill or alertness on the part of the remote pilot even in the event of failure of any engine. A means or technique for safely controlling the remotely piloted aeroplane shall be established for all stages of flight and remotely piloted aeroplane configurations for which performance is scheduled.

Note. — *This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.*

2.3.2.2 *Controllability on the ground (or water).* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.2.3 *Controllability during take-off.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall be controllable in the event of sudden failure of the critical engine at any point in the take-off.

2.3.2.4 *Take-off safety speed.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the take-off safety speeds assumed when the performance of the remotely piloted aeroplane (after leaving the ground or water) during the take-off is determined shall provide an adequate margin above the stall and above the minimum speed at which the remotely piloted aeroplane remains controllable after sudden failure of the critical engine.

2.3.3 TRIM

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall have such trim characteristics as to ensure that the demands made on the remote pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. This shall apply both in normal operation and in the conditions associated with the failure of one or more engines for which performance characteristics are established.

2.4 STABILITY AND CONTROL

2.4.1 STABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. remotely piloted aeroplane configurations and speed ranges) as to ensure that demands made on the remote pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the remotely piloted aeroplane shall not, however, be such that excessive demands are made on the remote pilot's skill or that the safety of the remotely piloted aeroplane is prejudiced by lack of manoeuvrability in emergency conditions. The stability may be achieved by natural or artificial means, or a combination of both. In those cases where artificial stability is necessary to show compliance with the Standards of this part, it shall be shown that any failure or condition that would result in the need for exceptional remote pilot skill for recovery of remotely piloted aeroplane stability is extremely improbable.

2.4.2 STALLING

2.4.2.1 *Stall warning.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, when the remotely piloted aeroplane approaches a stall both in straight and turning flight, a clear and distinctive stall warning shall be apparent to the remote pilot with the remotely piloted aeroplane in all permissible configurations and powers or thrusts, except those which are not considered to be essential for safe flying. The stall warning and other characteristics of the remotely piloted aeroplane shall be such as to enable the remote pilot to arrest the development of the stall after the warning

begins and, without altering the engine power or thrust, to maintain full control of the remotely piloted aeroplane.

2.4.2.2 *Behaviour following a stall.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in any configuration and at any level of power or thrust in which it is considered that the ability to recover from a stall is essential, the behaviour of the remotely piloted aeroplane following a stall shall not be so extreme as to make difficult a prompt recovery without exceeding the airspeed or strength limitations of the remotely piloted aeroplane.

2.4.2.3 *Stalling speeds.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the stalling speeds or minimum steady flight speeds in configurations appropriate for each stage of flight (e.g. take-off, en route, landing) shall be established. One of the values of the power or thrust used in establishing the stalling speeds shall be not more than that necessary to give zero thrust at a speed just above the stall.

2.4.3 FLUTTER AND VIBRATION

2.4.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be demonstrated by suitable tests, analyses or any acceptable combination of tests and analyses that all parts of the remotely piloted aeroplane are free from flutter and excessive vibration in all remotely piloted aeroplane configurations under all speed conditions within the operating limitations of the remotely piloted aeroplane (see 1.2.2). There shall be no vibration or buffeting severe enough to cause structural damage.

2.4.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, there shall be no vibration or buffeting severe enough to interfere with normal functioning of on-board equipment used for control of the remotely piloted aeroplane.

Note. — Buffeting as a stall warning is considered desirable and discouragement of this type of buffeting is not intended.

2.4.4 SPINNING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be demonstrated that the remotely piloted aeroplane during normal operation does not exhibit any tendency to inadvertently enter into a spin. If the design is such that spinning is allowed or for remotely piloted aeroplanes with one engine inadvertently possible, it shall be demonstrated that without the use of exceptional piloting skill the remotely piloted aeroplane can be recovered from a spin within appropriate recovery limits.

CHAPTER 3. STRUCTURE

3.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding catastrophic failure throughout its operational life.

3.2 MASS AND MASS DISTRIBUTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.3 LIMIT LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.6 shall be considered as limit loads.

3.4 STRENGTH AND DEFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in the various loading conditions prescribed in 3.6, no part of the remotely piloted aeroplane structure shall sustain detrimental deformation at any load up to and including the limit load, and the remotely piloted aeroplane structure shall be capable of supporting the ultimate load.

3.5 AIRSPEEDS

3.5.1 DESIGN AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design airspeeds shall be established for which the remotely piloted aeroplane structure is designed to withstand the corresponding manoeuvring and gust loads. To avoid inadvertent exceedances due to upsets or atmospheric variations, the design airspeeds shall provide sufficient margin for the establishment of practical operational limiting airspeeds. In addition, the design airspeeds shall be sufficiently greater than the stalling speed of the remotely piloted aeroplane to safeguard against loss of control in turbulent air. Consideration shall be given to a design manoeuvring speed, a design cruising speed, a design dive speed, and any other design airspeeds necessary for configurations with high lift or other special devices.

3.5.2 LIMITING AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.2.1, shall be included in the remotely piloted aeroplane flight manual as part of the operating limitations (see 7.2).

3.6 STRENGTH

3.6.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all structural elements shall be designed to withstand the maximum loads expected in service under all anticipated operating

conditions without failure, permanent distortion or loss of functionality. In determining these loads, account shall be taken of:

a) the expected operational life of the remotely piloted aeroplane;

b) the vertical and horizontal gust environment, taking into consideration the expected variations in mission profile and loading configurations;

c) the manoeuvre spectrum, taking into account variations in mission profiles, and loading configurations;

d) asymmetrical as well as symmetrical loading;

e) the ground and water loads, including taxi, landing and take-off loads, launch and recovery loads as required in Chapter 11, and ground/water handling loads;

f) the speed range of the remotely piloted aeroplane, taking into account the remotely piloted aeroplane characteristics and operation limitations;

g) vibration and buffeting loads;

h) corrosion or other degradation, given the maintenance specified, and various operating environments; and

i) any other loads, such as flight control loads, pressurization loads, engine loads, or dynamic loads due to changes to the steady state configuration.

3.6.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively.

3.7 STRUCTURAL DURABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure of the remotely piloted aeroplane shall conform to damage tolerance, safe-life or failsafe principles and shall be such as to avoid catastrophic failure during the operational life, taking into account, where appropriate:

a) the expected environment; and

b) the expected repeated loads applied in service.

3.8 SPECIAL FACTORS

For remotely piloted aeroplanes, design features (e.g. castings, bearings or fittings), the strength of which is subject to variability in manufacturing processes, deterioration in service, or any other cause, shall be accounted for by a suitable factor.

CHAPTER 4. DESIGN AND CONSTRUCTION

4.1 GENERAL

4.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, details of design and construction shall be such as to give reasonable assurance that all remotely piloted aeroplane parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider human factors principles.

Note. — *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

4.1.2 SUBSTANTIATION OF MOVING PARTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the functioning of all moving parts essential to the safe operation of the remotely piloted aeroplane shall be demonstrated in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.3 MATERIALS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all materials used in parts of the remotely piloted aeroplane essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.4 MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the methods of manufacturing and assembly shall be such as to produce a consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.5 PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the remotely piloted aeroplane will receive.

4.1.6 INSPECTION PROVISIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the remotely piloted aeroplane that require such attention, either periodically or after unusually severe operations.

4.2 SYSTEMS DESIGN FEATURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, special consideration shall be given to design features that affect the ability of the remote flight crew member to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operation including prevention of mis-assembly, and unintentional engagement of control surface locking devices.

1) each control and control system shall operate with the ease, smoothness and precision appropriate to its functions;

2) each element of each flight control system shall be designed, or distinctively and permanently marked, to minimize the probability of any incorrect assembly that could result in the malfunction of the system; and

3) the influence of any systems design features and their failure conditions that affect structural performance must be taken into account when showing compliance with the requirements in Chapters 3 and 4;

b) *System survivability.* Remotely piloted aeroplane systems shall be designed and arranged to maximize the potential for continued safe flight and landing after events resulting in damage to the remotely piloted aeroplane structure or systems.

c) *Pilot vision.* The arrangement of design features for remote pilot vision, if implemented on the remotely piloted aeroplane, shall permit, under normal and precipitation conditions of moderate rain, sufficient vision for the normal conduct of flight and for the execution of approaches and landings as assumed in the design to support safe operation of the remotely piloted aeroplane.

d) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the remote flight crew to deal with, emergencies resulting from foreseeable failures of equipment, systems, the C2 Link, and the remote pilot station, the failure of which would endanger the remotely piloted aeroplane. Reasonable provisions shall be made for continuation of essential services following engine or systems' failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this SD and in Annex 6, Part IV.

e) *Fire precautions.* The design of the remotely piloted aeroplane and the materials used in its manufacture shall be such so as to minimize the risk of in-flight and ground fires, to minimize the production of smoke and toxic gases in the event of a fire.

f) *Cargo compartment protection.*

1) sources of heat which are capable of igniting the cargo shall be shielded or insulated to prevent such ignition; and

3) each cargo compartment shall be constructed of materials which are at least flame resistant.

4.3 AEROELASTICITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall be free from flutter, structural divergence, and loss of control due to structural deformation and aeroelastic effects, at all speeds within and sufficiently beyond the design envelope to comply with 1.2.1. Account shall be taken of the characteristics of the remotely piloted aeroplane, the lack of the proprioceptive sensory information (e.g. vibration and acceleration), and variations in remote pilot skill and workload.

4.4 ELECTRICAL BONDING AND PROTECTION AGAINST LIGHTNING AND STATIC ELECTRICITY

4.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, electrical bonding and protection against lightning and static electricity shall be such as to:

a) protect the remotely piloted aeroplane, its systems and persons who come in contact with the remotely piloted aeroplane on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) prevent dangerous accumulation of electrostatic charge.

4.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall also be protected against catastrophic effects of lightning. Due account shall be taken of the material used in the construction of the remotely piloted aeroplane.

4.5 GROUND HANDLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design provisions and procedures for safe ground handling (e.g. towing, jacking) shall be defined. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5. POWERPLANT

5.1 ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part VI of this SD shall apply to each engine that is used on the remotely piloted aeroplane as a primary propulsion unit.

5.2 PROPELLERS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part VII of this SD shall apply to each propeller that is used on the remotely piloted aeroplane.

5.3 POWERPLANT INSTALLATION

5.3.1 COMPLIANCE WITH ENGINE AND PROPELLER LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation shall be so designed that the engines and propellers (if applicable) are capable of functioning reliably in the anticipated operating conditions. In conditions established in the remotely piloted aeroplane flight manual, the remotely piloted aeroplane shall be capable of being operated without exceeding the limitations established for the engines and propellers in accordance with this chapter and Parts VI and VII.

5.3.2 CONTROL OF ENGINE ROTATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in those installations where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided to stop the rotation of the failed engine in flight or to reduce it to a safe level.

5.3.3 TURBINE ENGINE INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for a turbine engine installation:

a) the design shall minimize the hazards to the remotely piloted aeroplane in the event of failure of engine rotating parts, or an engine fire which burns through the engine case; and

b) the powerplant installation shall be designed to give reasonable assurance that those engine operating limitations that adversely affect the structural integrity of rotating parts shall not be exceeded in service.

5.3.4 ENGINE RESTARTING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude, unless the remotely piloted aeroplane can be safely controlled without engine restart by means of an approved emergency recovery capability, as specified in Chapter 11 of this part.

5.3.5 ARRANGEMENT AND FUNCTIONING

5.3.5.1 *Independence of engines and associated systems.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted aeroplanes, the engines together with their associated systems shall be arranged and isolated from each other to allow operation, in at least one configuration, so that the failure or malfunction of any engine, or the failure or malfunction (including destruction by fire in the engine compartment) of any system that can affect an engine (other than a fuel tank if only one fuel tank is installed), will not:

a) prevent the continued safe operation of the remaining engine(s); or

b) require immediate action for continued safe operation.

5.3.5.2 *Propeller vibration.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the propeller vibration stresses shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the remotely piloted aeroplane.

5.3.5.3 *Cooling.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cooling system shall be capable of maintaining the temperature of powerplant components and fluids within the established limits (see 5.3.1) at ambient air temperatures up to the maximum air temperature appropriate to the intended operation of the remotely piloted aeroplane.

5.3.5.4 *Associated systems.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the fuel, oil, air induction, and other systems associated with the powerplant shall be capable of supplying each engine in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power or thrust, remotely piloted aeroplane attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

5.3.5.5 *Fire protection.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.2 f).

a) *Isolation.* Such regions shall be isolated by fireproof material from other regions of the remotely piloted aeroplane where the presence of fire would jeopardize continued flight, taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such regions shall be fire resistant. Drainage of each region shall be provided to minimize hazards resulting from the failure of any component containing flammable fluids. Means shall be provided for the remote flight crew to shut off the flow of flammable fluids into such regions if a fire occurs. Where sources of flammable fluid exist in such regions, the whole of the related system within the region, including supporting structure, shall be fire proof or shielded from the effects of the fire.
c) *Fire detection.* A sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions.

CHAPTER 6. SYSTEMS AND EQUIPMENT

6.1 GENERAL

6.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall be provided with approved equipment and systems, including guidance and flight management systems necessary for the safe operation of the remotely piloted aeroplane in the anticipated operating conditions. These shall include the equipment necessary to enable the remote flight crew to operate the remotely piloted aeroplane within its operating limitations. Equipment design shall consider human factors principles.

Note 1.— *Equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, IV, for particular circumstances or on particular kinds of routes. Systems are addressed in Part X —* Remote Pilot Station *of this SD.*

Note 2.— *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

6.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the equipment and systems required by 6.1.1 and their installation shall be such that:

a) an inverse relationship exists between the probability of a failure condition and the severity of its effect, as determined by a system safety assessment process;

b) they perform their intended function under all anticipated operating conditions; and

c) electromagnetic interference between them is minimized.

Note. — *The system safety assessment process includes integration of the RPS and the specification of the C2 Link. See also 10.3.3 of this part.*

6.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to warn the remote crew of unsafe system operating conditions on both the remote pilot station and the remotely piloted aeroplane and to enable corrective action to be taken automatically or by the remote crew.

6.1.4 ELECTRICAL POWER SUPPLY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the electrical power supply system shall be such as to enable it to supply power loads during normal

operations and shall also be such that no single failure or malfunction could impair the ability of the system to supply essential loads for safe operation.

6.1.5 DEVELOPMENT ASSURANCE OF COMPLEX ELECTRONIC HARDWARE AND SYSTEM SOFTWARE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, complex electronic hardware and system software shall be developed, verified and validated such as to ensure that the systems in which they are used perform their intended functions at a level of safety that complies with the requirements of this part, notably those of 6.1.2 a) and 6.1.2 b).

Note. — *Some States accept the use of national or international industry standards for the development assurance (development, verification and validation) of complex electronic hardware and systems software.*

6.2 INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, instrument and equipment installations shall comply with the Standards of Chapter 4.

6.3 NAVIGATION LIGHTS AND ANTI-COLLISION LIGHTS

6.3.1. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the lights required by Annex 2 — *Rules of the Air* to be displayed by remotely piloted aeroplanes in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft, or remote pilot of another remotely piloted aircraft, or personnel on the ground with as much time as possible for interpretation and the subsequent manoeuvre necessary to avoid a collision. In the design of such

lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note. — It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry night, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

6.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, lights shall be installed in remotely piloted aeroplanes so as to minimize the possibility that they will adversely affect the satisfactory performance of any required sensors.

Note. — In order to avoid the effects mentioned in 6.3.2, it will be necessary in some cases to provide means whereby the remote pilot can adjust the intensity of the flashing lights.

6.4 ELECTROMAGNETIC INTERFERENCE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, remotely piloted aeroplane electronic systems, particularly flight-critical and flight-essential systems, shall be protected as appropriate against electromagnetic interference from internal and external sources.

6.5 ICE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, if certification for flight in icing conditions is requested, the remotely piloted aeroplane shall be shown to be able to operate safely in icing conditions likely to be encountered in all anticipated operating environments.

CHAPTER 7. OPERATING LIMITATIONS AND INFORMATION

7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the operating limitations within which compliance with the Standards of this SD is determined, together with any other information necessary to the safe operation of the remotely piloted aeroplane, shall be made available by means of a remotely piloted aeroplane flight manual, markings and placards, and such other means as may effectively accomplish the purpose.

7.2 OPERATING LIMITATIONS

7.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations which might be exceeded in flight and which are defined quantitatively shall be expressed in suitable units. These limitations shall be corrected if necessary for errors in measurements so that the remote flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

7.2.2 LOADING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see 1.2.2).

7.2.3 AIRSPEED LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the airspeed limitations shall include all speeds (see 3.5.2) that are limiting from the standpoint of structural integrity or flying qualities of the remotely piloted aeroplane, or from other considerations. These speeds shall be identified with respect to the appropriate remotely piloted aeroplane configurations and other pertinent factors.

7.2.4 POWERPLANT LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant limitations shall include all those established for the various powerplant components as installed in the remotely piloted aeroplane (see 5.3.1 and 5.3.5.3).

7.2.5 LIMITATIONS ON EQUIPMENT AND SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the remotely piloted aeroplane.

7.2.6 MISCELLANEOUS LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the remotely piloted aeroplane (see 1.2.1).

7.2.7 REMOTE FLIGHT CREW LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote flight crew limitations shall include the minimum number of remote flight crew personnel necessary to operate the remotely piloted aeroplane.

Note. — The circumstances in which the remote flight crew shall include members in addition to the minimum remote flight crew are defined in Annex 6, Part IV

7.3 OPERATING INFORMATION AND PROCEDURES

7.3.1 TYPES OF ELIGIBLE OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the particular types of operations for which the remotely piloted aeroplane has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

7.3.2 LOADING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading information shall include the empty mass of the remotely piloted aeroplane, together with a definition of the condition of the remotely piloted aeroplane at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note. — Usually the empty mass excludes the mass of the payload, the usable fuel supply and the drainable oil; it includes the mass of all fixed ballast, unusable fuel supply, undrainable oil, total quantity of engine coolant and total quantity of hydraulic fluid.

7.3.3 OPERATING PROCEDURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a description shall be given of normal and emergency operating procedures which are peculiar to the particular remotely piloted aeroplane and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more engines.

7.3.4 HANDLING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any significant or unusual features of the remotely piloted aeroplane characteristics. Those stalling speeds or minimum steady flight speeds required to be established by 2.4.2.3 shall be scheduled.

7.4 PERFORMANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance of the remotely piloted aeroplane shall be scheduled in accordance with 2.2. There shall be included information regarding the various remotely piloted aeroplane configurations and powers or thrusts involved and the relevant speeds, together with information that would assist the remote flight crew in attaining the performance as scheduled.

7.5 REMOTELY PILOTED AEROPLANE FLIGHT MANUAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a remotely piloted aeroplane flight manual shall be made available. It shall identify clearly the specific remotely piloted aeroplane or series of remotely piloted aeroplanes to which it is related. The remotely piloted aeroplane flight manual shall include at least the limitations, information and procedures specified in 7.2, 7.3, 7.4 of this part and Part X of this SD.

7.6 MARKINGS AND PLACARDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in taxi, launch, recovery, and ground servicing (towing, refuelling, etc.) that could pass unnoticed and that could jeopardize the safety of the remotely piloted aeroplane in subsequent flights and safety of the ground crew.

7.7 CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

7.7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, information for use in developing procedures for maintaining the remotely piloted aeroplane in an airworthy condition shall be made available. The information shall include that described in 7.7.2, 7.7.3 and 7.7.4.

7.7.2 MAINTENANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance information shall include a description of the remotely piloted aeroplane and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on transportation, storage and assembly, and defect diagnosis.

7.7.3 MAINTENANCE PROGRAMME INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

Note. — The development of initial maintenance programme information at the time of remotely piloted aeroplane type certification can take advantage of the Maintenance Review Board (MRB) process or the process of developing instructions for continuing airworthiness.

7.7.4 MANDATORY MAINTENANCE REQUIREMENTS RESULTING FROM THE TYPE DESIGN APPROVAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of 7.7.3.

Note. — Mandatory requirements identified as part of the type design approval are often referred to as Certification Maintenance Requirements (CMR) and/or airworthiness limitations.

7.8 C2 LINK INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any relevant C2 Link relating to configuration, operation, performance, emergency procedures, and operating limitations.

CHAPTER 8. RESERVED

[To be developed]

CHAPTER 9. OPERATING ENVIRONMENT AND HUMAN FACTORS

9.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall be designed to allow safe operation within the performance limitations of those who operate, maintain and service it.

Note. — The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the remotely piloted aeroplane is capable of being controlled at all phases of the flight (including any degradation due to failures).

9.2 REMOTE FLIGHT CREW

9.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall be designed in such a way as to allow safe and efficient control by the remote flight crew. The design shall allow for variations in remote flight crew skill and physiology commensurate with remote flight crew licensing limits. Account shall be taken of the different expected operating conditions of the remotely piloted aeroplane in its environment, including operations degraded by failures.

9.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the workload imposed on the remote flight crew by the design of the remotely piloted aeroplane shall be reasonable at all stages of flight. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the remotely piloted aeroplane, such as a contained engine failure or wind shear encounter.

Note. — Workload can be affected by both cognitive and physiological factors.

9.3 ERGONOMICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, during design of the remotely piloted aeroplane, account shall be taken of ergonomic factors, where applicable, including:

a) ease of use and prevention of inadvertent misuse;

b) accessibility;

c) maintainability; and

d) transportation storage and assembly/disassembly.

CHAPTER 10. REMOTE PILOT STATION INTEGRATION

10.1 GENERAL

10.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part X of this SD shall apply to each remote pilot station that is used to pilot the remotely piloted aeroplane.

10.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote pilot station shall be compatible with the type of remotely piloted aeroplane and appropriate to the intended operation.

10.2 INTEGRATION

10.2.1 *Compliance with remote pilot station limitations.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall be so designed that the remote pilot station is capable of performing satisfactorily and reliably its intended functions in the anticipated operating conditions when connected to the remotely piloted aeroplane. In conditions established in the flight manual, the remotely piloted aeroplane shall be capable of being operated within the limitations established for the remote pilot station in accordance with this chapter and with Part X.

10.2.2 *Integration tests.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane shall complete satisfactorily tests with all approved types of remote pilot stations, as are necessary to verify the validity of the declared conditions and limitations and to ensure that remote pilot stations will operate satisfactorily and reliably using any specified C2 Link and supporting C2 Link communication service providers, as specified under the anticipated operating conditions.

10.3 CONTROLS AND INFORMATION

10.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote pilot station shall be integrated in such a way as to allow timely control as required for safe and efficient control of the remotely piloted aeroplane by the remote flight crew. This shall include at least the following:

a) processing the data provided by the remotely piloted aeroplane regarding:

— attitude, altitude, position, heading, speed, vertical speed, turning information;
— powerplant and propeller speed;
— detect and avoid;
— weather conditions;
— C2 Link state and performance according to the SARPs defined in the applicable sections of Annex 10 for remotely piloted aircraft systems; and
— status of automated systems, including the current lost C2 Link state;

b) controlling the remotely piloted aeroplane in the anticipated operating condition;

c) controlling the powerplant according to Chapter 5 of this part;

d) information on predicted QoSD in the geographical area of the flight based on the QoSR and C2 Link specification; and

d) status of automated systems, including flight controls exceedance or malfunctions.

10.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all required information shall be provided through the remote pilot station for the remote flight crew to safely and efficiently operate the remotely piloted aeroplane (e.g. set or monitor flight parameters for the flight, navigation, and powerplant) using any specified C2 Link and supporting C2 Link communication service providers in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the remote flight crew to operate the remotely piloted aeroplane within its anticipated operating limitations. Instruments and equipment design shall consider human factors principles.

Note 1.— Instruments and equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Part IV, for particular circumstances or on particular kinds of routes.

Note 2.— Guidance material on human factors principles can be found in the Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

10.3.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the instruments, equipment and systems required by 10.3.2 and their installation shall be such that:

a) an inverse relationship exists between the probability of a failure condition and the severity of its effect, as determined by a system safety assessment process;

b) they perform their intended function under all anticipated operating conditions; and

c) electromagnetic interference between them is minimized.

10.3.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to warn the remote flight crew of unsafe system operating conditions and to enable them to take corrective action.

10.3.5 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the remote flight crew during flight.

10.4 C2 LINK

10.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane and remote pilot station system architecture shall be compatible with any specified C2 Link and supporting C2 Link communication service providers as specified, to enable the remotely piloted aeroplane to be operated safely under the anticipated operating conditions.

10.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to monitor the C2 Link performance and the C2 Link state according to metrics defined in the applicable parts of Annex 10, reacting according to the transaction completion criteria defined in Annex 6, Part IV.

10.5 FLIGHT MANUAL

10.5.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane flight manual shall address all combinations of remote pilot station models listed in the approved type design of the remotely piloted aeroplane. There may be substantial variations between different remote pilot stations used with the same remotely piloted aeroplane.

10.5.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in developing the remotely piloted aeroplane flight manual, specific consideration shall be given to human

performance aspects, including transfer of control within and between remote pilot stations if envisaged by operational requirements, remote pilot handovers, procedures, remote crew communications, e.g. remote pilot to remote pilot, remote pilot to remotely piloted aeroplane observer or other support personnel, and remote pilot to ATC.

10.5.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane flight manual shall contain all necessary information for operation of the RPAS.

10.5.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is therefore recommended that in addition to those specified in 7.5, the following procedures should be included, inter alia:

a) remotely piloted aeroplane handover procedures from one RPS to another;
b) C2 Link specifications and procedures for switchover of remotely piloted aeroplane command and control from one C2 Link to another and to respond to temporary interruption or loss of the C2 Link;
c) flight termination procedures, if applicable
d) security procedures unique to remotely piloted aircraft system (e.g. remote pilot station security, C2 Link, etc.); and
e) detect and avoid.

CHAPTER 11. REMOTELY PILOTED AEROPLANE UNIQUE CONSIDERATIONS

11.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this Chapter shall apply to additional aspects of remotely piloted aeroplane features that are not common to manned aviation.

11.2 TRANSPORTATION, STORAGE AND ASSEMBLY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted aeroplane is designed to be transportable while non-operational, it shall be shown that environmental factors and other foreseeable conditions likely to be encountered during transportation or storage do not adversely affect any requirement of this part. Limitations, information and markings for the safe transport and assembly of the remotely piloted aeroplane shall be developed and made available as defined under Chapter 7 of this part.

Note. — *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

11.3 LAUNCH METHODS

11.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted aeroplane is designed to be assisted during launch, the effects of the launch method shall be taken into account in calculating launch loads as required in Chapter 3, and in establishing operational limitations, markings, and placards as required in Chapter 7.

11.3.2 *Take-off performance.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted aeroplane is designed to be assisted during launch, the remotely piloted aeroplane shall achieve sufficient energy and controllability at the end of the launch phase to ensure safe and controllable flight under all anticipated operating conditions.

11.4 RECOVERY METHODS

11.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted aeroplane is designed to be assisted during normal landing recovery, the effects of the recovery method shall be taken into account in calculating recovery loads as required in Chapter 3, and in establishing operational limitations, markings, and placards as required in Chapter 7 of this part.

11.4.2 *Recovery performance.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted aeroplane is designed to be assisted during normal landing recovery, the remotely piloted aeroplane flight performance and control characteristics shall be adequate for the intended landing procedures under all anticipated operating conditions.

11.5 EMERGENCY RECOVERY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted aeroplanes that have an emergency recovery capability or a flight termination system initiated through

remote pilot command or through automatic means with the intent to reduce the risk of fatal injuries to people on the ground in case of emergency landing:

a) any systems on board the remotely piloted aeroplane that are critical to an emergency recovery capability to reach a safe area shall perform their intended functions in the entire flight envelope under the remotely piloted aeroplane anticipated operating conditions;

b) any systems on board the remotely piloted aeroplane that are critical to a flight termination system, procedure or function that aims to immediately end normal flight shall be shown to perform their intended functions for the entire flight envelope under the remotely piloted aeroplane anticipated operating conditions; and

c) operating limitations, procedures, instructions and any additional information necessary for the safe operation of the remotely piloted aeroplane shall be established and provided in the remotely piloted aeroplane flight manual as required in Chapter 7 of this part.

Note 1. — Emergency recovery capability consists of functions that could be implemented through remote pilot crew command or through an automatic pre-programmed course of action, and are intended to navigate the remotely piloted aeroplane to a pre-selected emergency site and then to make an emergency landing.

Note 2. — A flight termination system (e.g. a whole remotely piloted aeroplane recovery parachute) aims to immediately end the flight and to reduce the kinetic energy at impact, but does not necessarily ensure the impact point location.

Note 3. — When considering the protection of people on the ground, in case of emergency landing, items to be considered include:

a) restraint criteria for items that could cause a hazard to people on the ground;
b) fuel cell integrity and position; and
c) integrity of electrical systems to avoid sources of ignition.

11.6 AUTOMATIC TAXI, TAKE-OFF AND LANDING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, any systems installed on the remotely piloted aeroplane that are required for automatic taxi, take-off or landing shall ensure that loss, degradation, or interruption of navigational information or C2 Link does not adversely affect safety during taxi, takeoff or landing.

11.7 C2 LINK

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the C2 Link, as integrated in the remotely piloted aircraft system, shall perform its intended function under all anticipated operating conditions. Considerations regarding the C2 Link shall include:

a) a means to maintain C2 Link through foreseeable operating conditions;

b) a means to regain C2 Link in the event that it is temporarily interrupted;

c) a means to ensure continued safe flight and landing in the event that the RPAS enters a lost C2 Link state;

d) incorporation of C2 Link performance and operational limitations as required in Chapter 7 of this part; and

e) a means to monitor the performance and status of the C2 Link.

11.8 DETECT AND AVOID, AND OTHER EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, any equipment specifically required for remotely piloted aeroplane operation, such as the detect and avoid system, shall comply with the Standards of Chapter 6.

11.9 MISSION EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the installation of the mission equipment on the remotely piloted aeroplane shall be taken into consideration when showing compliance with the requirements of this part, in order to show that it does not affect the safe flight of the remotely piloted aeroplane.

11.10 SECURITY

11.10.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted aeroplane design shall ensure security protection of the remotely piloted aeroplane system from unauthorized physical and electronic access by sources external to the remotely piloted aeroplane, including during maintenance activity.

11.10.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is therefore recommended that Security threats should be identified and assessed, and risk mitigation strategies should be implemented to protect the remotely piloted aeroplane from adverse impacts on safety, functionality, and continuing airworthiness.

PART IX. REMOTELY PILOTED HELICOPTERS (RPH)

Applicable as of 26 November 2026.

CHAPTER 1. GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this part are applicable in respect of all remotely piloted helicopters for which an application for the issue of a Type Certificate is submitted to the appropriate national authorities on or after 26 November 2026.

Note.1 — The provisions in this part support remotely piloted helicopter operation SARPs in Annex 6, Part IV.

Note.2 — The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code referred to in 1.2.1 of Part II for the remotely piloted helicopters designated in 1.1.1 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, the Standards apply to the complete remotely piloted helicopter including its powerplant, rotors, systems and equipment.

1.2 OPERATING LIMITATIONS

1.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting conditions shall be established for the remotely piloted helicopter, its powerplant, rotors, systems and equipment (see 7.2). Compliance with the Standards of this part shall be established assuming that the remotely piloted helicopter is operated within the limitations specified. The safety implications of exceeding these operating limits shall be considered.

1.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting ranges of any parameter whose variation may compromise the safe operation of the remotely piloted helicopter, e.g. mass, centre of gravity location, load distribution, speeds, ambient air temperature, altitude and C2 Link performance, shall be established within which compliance with all the pertinent Standards of this part is shown.

Note 1. — The maximum operating mass and centre of gravity limits may vary, for example, with each altitude and with each practicably separate operating condition, e.g. take-off, en route, landing.

Note 2.— Maximum operating mass may be limited by the application of noise certification Standards (see Annex 16 — Environmental Protection*, Volume I —* Aircraft Noise *and Annex 6 —* Operation of Aircraft*, Part IV – International Operations – Remotely Piloted Aircraft Systems.*

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1.3 UNSAFE FEATURES AND CHARACTERISTICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, under all anticipated operating conditions, the remotely piloted helicopter shall not possess any feature or characteristic that renders it unsafe.

1.4 PROOF OF COMPLIANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the means by which compliance with the appropriate airworthiness requirements is demonstrated shall ensure that in each case the accuracy achieved will be such as to provide reasonable assurance that the remotely piloted helicopter, its components and equipment comply with the requirements and are reliable and function correctly under the anticipated operating conditions.

CHAPTER 2. FLIGHT

2.1 GENERAL

2.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with the Standards prescribed in this chapter shall be established by flight or other tests conducted upon a remotely piloted helicopter or remotely piloted helicopters of the type for which a Type Certificate is sought, or by calculations (or other methods) based on such tests, provided that the results obtained by calculations (or other methods) are equal in accuracy to, or conservatively represent, the results of direct testing.

2.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, compliance with each Standard shall be established for all applicable combinations of remotely piloted helicopter mass and centre of gravity position, within the range of loading conditions for which certification is sought.

2.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where necessary, appropriate remotely piloted helicopter configurations shall be established for the determination of performance in the various stages of flight and for the investigation of the remotely piloted helicopter's flying qualities.

2.2 PERFORMANCE

2.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient data on the performance of the remotely piloted helicopter shall be determined and scheduled in the remotely piloted helicopter flight manual to provide operators with the necessary information for the purpose of determining the total mass of the remotely piloted helicopter on the basis of the values, peculiar to the proposed flight, of the relevant operational parameters, in order that the flight may be made with reasonable assurance that a safe minimum performance for that flight will be achieved.

2.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, achieving the performance scheduled for the remotely piloted helicopter shall take into consideration human performance and in particular shall not require exceptional skill or alertness on the part of the remote flight crew.

Note. — *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

2.2.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the scheduled performance of the remotely piloted helicopter shall be consistent with compliance with 1.2.1 and with the operation in logical combinations of those of there motely piloted helicopter's systems and equipment, the operation of which may affect performance.

2.2.4 MINIMUM PERFORMANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, at the maximum masses scheduled (see 2.2.7) for take-off and for landing as functions of the take-off and landing site

pressure altitude and temperature in still air conditions, and, for water operations, in specified conditions of smooth water, the remotely piloted helicopter shall be capable of accomplishing the minimum

performances specified in 2.2.5 and 2.2.6, respectively, not considering obstacles or final approach and take-off area length.

2.2.5 TAKE-OFF

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance at all stages of take-off and climb shall be sufficient to ensure that under conditions of operation departing slightly from the idealized conditions for which data are scheduled (see 2.2.7), the departure from the scheduled values is not disproportionate.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for Category A remotely piloted helicopters, in the event of critical engine failure at or after the take-off decision point, the remotely piloted helicopter shall be capable of continuing safe flight, the remaining engine(s) being operated within the approved limitations.

Note. — For remotely piloted helicopters that are assisted during take-off, related SARPs can be found in 11.3 of this part.

2.2.6 LANDING

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it shall be possible to make a safe landing on a prepared landing surface after complete power failure occurring during normal cruise, or it shall be possible to initiate the remotely piloted helicopter emergency recovery capability, as specified in Chapter 11 of this part;

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for Category A remotely piloted helicopters, starting from the landing configuration in the event of critical engine failure at or before the landing decision point, the remotely piloted helicopter shall be capable of continuing safe flight, the remaining engine(s) being operated within the approved limitations.

Note. — For remotely piloted helicopters that are assisted during landing recovery, related SARPs can be found in 11.4 of this part.

2.2.7 SCHEDULING OF PERFORMANCE

2.2.7.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, performance data shall be determined and scheduled in the remotely piloted helicopter flight manual as follows for the ranges of mass, altitude, temperature and other operational variables for which the remotely piloted helicopter is

to be certificated, and additionally for amphibians, water surface conditions and strength of current shall be included.

a) *Hover performance.* The hover performance shall be determined for both in-ground effect and out-of-ground effect with all engines operating.

b) *Climb.* The steady rate of climb with the engine(s) operating at or within approved limits shall be established.

c) *Height-velocity envelope.* If there are any combinations of height and forward velocity (including hover) under which a safe landing cannot be made after failure of the critical engine and with the remaining engine(s) (if applicable) operating within approved limits, a height-velocity envelope shall be established.

d) *Take-off distance — all engines operating.* Where required by the operating rules, the take-off distance — all engines operating shall be the horizontal distance required from the start of the take-off to the point where a selected speed up to the best rate of climb speed (Vy) and selected height above the take-off surface are achieved, all engines operating at approved take-off power required.

In addition, for Category A remotely piloted helicopters:

e) *Minimum performance.* The minimum climb performance shall be established for both take-off and landing.

f) *Take-off decision point.* The take-off decision point shall be the point in the take-off phase used in determining take-off performance and from which either a rejected take-off may be made or a take-off safely continued, with the critical engine inoperative.

g) *Take-off distance required.* The take-off distance required shall be the horizontal distance required from the start of the take-off to the point at which the take-off safety speed (VTOSS), a selected height above the take-off surface, and a positive climb gradient are achieved, following failure of the critical engine at take-off decision point, the remaining engine(s) operating within approved operating limits. If procedures involve rearward flight, the back-up distance shall be included.

h) *Rejected take-off distance required.* The rejected take-off distance required shall be the horizontal distance required from the start of the take-off to the point where the remotely piloted helicopter comes to a complete stop following engine failure and rejection of the take-off at the take-off decision point.

i) *Take-off path — climb gradients.* The take-off path — climb gradient shall be the steady gradient(s) of climb for the appropriate configuration(s) with the critical engine inoperative from the end of the take-off distance required to a defined point above the take-off surface.

j) *Engine inoperative climb.* The engine inoperative climb shall be the steady rate of climb/descent with the critical engine inoperative and the operating engine(s) not exceeding the power for which they are certificated.

k) *Landing decision point.* The landing decision point shall be the latest point in the approach phase from which either a landing may be made or a rejected landing (go-around) safely initiated, with the critical engine inoperative.

l) *Landing distance required.* The landing distance required shall be the horizontal distance required to land and come to a complete stop from a point on the approach flight path at a selected height above the landing surface with the critical engine inoperative.

2.2.7.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is therefore recommended that for remotely piloted helicopters that are assisted during landing recovery, the effects of recovery methods on the scheduling of performance should be considered.

Note. — Related SARPs can be found in 11.3 and 11.4 of this part.

2.3 FLYING QUALITIES

2.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall comply with the Standards of 2.3 at all altitudes up to the maximum anticipated altitude relevant to the particular requirement in all temperature conditions relevant to the altitude in question and for which the remotely piloted helicopter is approved.

2.3.2 CONTROLLABILITY

2.3.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall be controllable and manoeuvrable under all anticipated operating conditions, and it shall be possible to make smooth transitions from one flight condition to another (e.g. turns, sideslips, changes of engine power, changes of remotely piloted helicopter configuration)

without requiring exceptional skill or alertness on the part of the remote pilot even in the event of failure of any engine. A means or technique for safely controlling the remotely piloted helicopter shall be established for all stages of flight and remotely piloted helicopter configurations for which performance is scheduled.

Note. — *This Standard is intended, among other things, to relate to operation in conditions of no appreciable atmospheric turbulence and also to ensure that there is no undue deterioration of the flying qualities in turbulent air.*

2.3.2.2 *Controllability on the ground (or water).* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall be controllable on the ground (or on the water) during taxiing, take-off and landing under the anticipated operating conditions.

2.3.2.3 *Controllability during take-off.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall be controllable in the event of sudden failure of the critical engine at any point in the take-off, when the remotely piloted helicopter is handled in the manner associated with the scheduling of the take-off data.

2.3.3 TRIM

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall have such trim and handling capabilities as to ensure that the demands made on the remote pilot's attention and ability to maintain a desired flight condition are not excessive when account is taken of the stage of flight at which these demands occur and their duration. In the event of a

malfunction of the systems associated with the flight controls, there shall not be any significant deterioration of the handling characteristics.

2.4 STABILITY AND CONTROL

2.4.1 STABILITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall have such stability in relation to its other flight characteristics, performance, structural strength, and most probable operating conditions (e.g. remotely piloted helicopter configurations and speed ranges) as to ensure that demands made on the remote pilot's powers of concentration are not excessive when the stage of the flight at which these demands occur and their duration are taken into account. The stability of the remotely piloted helicopter shall not, however, be such that excessive demands are made on the remote pilot's skill or that the safety of the remotely piloted helicopter is prejudiced by lack of manoeuvrability in emergency conditions.

2.4.2 AUTOROTATION

2.4.2.1 *Rotor speed control.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the autorotation characteristics of the remotely piloted helicopter shall be such as to enable control of the rotor speed to within prescribed limits and to maintain full control of the remotely piloted helicopter.

2.4.2.2 *Behaviour following a power loss.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the behaviour of the remotely piloted helicopter following a power loss shall not be so extreme as to make difficult a prompt recovery of rotor speed without exceeding the airspeed or strength limitations of the remotely piloted helicopter.

2.4.2.3 *Autorotation airspeeds.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for Category A remotely piloted helicopters, airspeeds for autorotative landings shall be

established. For other remotely piloted helicopters, the autorotation airspeeds recommended for maximum range and minimum rate of descent shall be established.

2.4.3 VIBRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, there shall be no vibration or buffeting severe enough to interfere with the control of the remotely piloted helicopter.

2.4.4 GROUND RESONANCE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall have no dangerous tendency to oscillate on the ground with the rotor turning.

CHAPTER 3. STRUCTURE

3.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter structure shall be designed, manufactured and provided with instructions for its maintenance and repair with the objective of avoiding hazardous and catastrophic failure throughout its operational life.

Note. — *Structure includes the airframe, undercarriage, control system, blades and rotor head, rotor pylon and auxiliary lifting surfaces.*

3.2 MASS AND MASS DISTRIBUTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, unless otherwise stated, all structural Standards shall be complied with when the mass is varied over the applicable range and is distributed in the most adverse manner, within the operating limitations on the basis of which certification is sought.

3.3 LIMIT LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as might be otherwise qualified, the external loads and the corresponding inertia loads, or resisting loads obtained for the various loading conditions prescribed in 3.7, 3.8 and 3.9 shall be considered as limit loads.

3.4 STRENGTH AND DEFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in the various loading conditions prescribed in 3.7, 3.8 and 3.9, no part of the remotely piloted helicopter structure shall sustain detrimental deformation at any load up to and including the limit load, and the remotely piloted helicopter structure shall be capable of supporting the ultimate load.

3.5 AIRSPEEDS

3.5.1 DESIGN AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design airspeeds shall be established for which the remotely piloted helicopter structure is designed to withstand the corresponding manoeuvring and gust loads in accordance with 3.7.

3.5.2 LIMITING AIRSPEEDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limiting airspeeds, based on the corresponding design airspeeds with safety margins, where appropriate, in accordance with 1.2.1, shall be included in the remotely piloted helicopter flight manual as part of the operating limitations (see 7.2.3). When airspeed limitations are a function of mass, mass distribution, altitude, rotor speed, power or other factors, airspeed limitations based on the critical combination of these factors shall be established.

3.6 MAIN ROTOR(S) ROTATIONAL SPEED LIMITS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a range of main rotor(s) speeds shall be established that:

a) with power on, provides adequate margin to accommodate the variations in rotor speed occurring in any appropriate manoeuvre, and is consistent with the kind of governor or synchronizer used; and

b) with power off, allows each appropriate autorotative manoeuvre to be performed throughout the ranges of airspeed and mass for which certification is requested.

3.7 LOADS

3.7.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading conditions of 3.7, 3.8 and 3.9 shall consider the range of mass and mass distributions prescribed in 3.2, the main rotor rpm ranges established in 3.6, and airspeeds established in accordance with 3.5.1. Asymmetrical as well as symmetrical loading shall be taken into account. The air, inertia and other loads resulting from the specific loading conditions shall be distributed so as to approximate actual conditions closely or to represent them conservatively in consideration of all anticipated operating conditions.

3.7.2 MANOEUVRING LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, manoeuvring loads shall be computed on the basis of manoeuvring load factors appropriate to the manoeuvres permitted by the operating limitations. They shall not be less than values that experience indicates will be adequate for the anticipated operating conditions.

3.7.3 GUST LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, gust loads shall be computed for vertical and horizontal gust velocities that statistics or other evidence indicate will be adequate for the anticipated operating conditions.

3.8 GROUND AND WATER LOADS

3.8.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be able to withstand all the loads due to the reactions of the ground or water surface, as applicable, that arise during start-up, ground and water taxiing, lift-off, touchdown and rotor braking.

3.8.2 LANDING CONDITIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the landing conditions at the maximum certificated take-off mass and at the maximum certificated landing mass shall include such symmetrical and asymmetrical attitudes of the remotely piloted helicopter at ground or water contact, such velocities of descent, and such other factors affecting the loads imposed upon the structure as might be present in the anticipated operating conditions.

3.9 MISCELLANEOUS LOADS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in addition to or in conjunction with, the manoeuvring and gust loads and with the ground and water loads, consideration shall be given to all other loads (flight control loads, pilot forces, engine torque, loads due to changes of configuration, external loads, etc.) that are likely to occur in the anticipated operating conditions.

3.10 FATIGUE STRENGTH

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the strength and fabrication technique of the remotely piloted helicopter structure shall be such as to avoid catastrophic fatigue failure under repeated loads and vibratory loads in the anticipated operating conditions. Environmental degradation, accidental damage and other likely failures shall be considered.

3.11 SPECIAL FACTORS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design features (e.g. castings, bearings or fittings), the strength of which are subject to variability in manufacturing processes, deterioration in service or any other cause, shall be accounted for by a suitable factor.

CHAPTER 4. DESIGN AND CONSTRUCTION

4.1 GENERAL

4.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, details of design and construction shall be such as to give reasonable assurance that all remotely piloted helicopter parts will function effectively and reliably in the anticipated operating conditions. They shall be based upon practices that experience has proven to be satisfactory or that are substantiated by special tests or by other appropriate investigations or both. They shall also consider human factors principles.

Note. — *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

4.1.2 SUBSTANTIATION OF MOVING PARTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the functioning of all moving parts essential to the safe operation of the remotely piloted helicopter shall be demonstrated in order to ensure that they will function correctly under all operating conditions for such parts.

4.1.3 MATERIALS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all materials used in parts of the remotely piloted helicopter essential for its safe operation shall conform to approved specifications. The approved specifications shall be such that materials accepted as complying with the specifications will have the essential properties assumed in the design.

4.1.4 MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the methods of manufacturing and assembly shall be such as to produce consistently sound structure which shall be reliable with respect to maintenance of strength in service.

4.1.5 PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the structure shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes, which could pass unnoticed, taking into account the maintenance the remotely piloted helicopter will receive.

4.1.6 INSPECTION PROVISIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provision shall be made to permit any necessary examination, replacement or reconditioning of parts of the remotely piloted helicopter that require such attention, either periodically or after unusually severe operations.

4.1.7 CRITICAL PARTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all critical parts used in the remotely piloted helicopter shall be identified and procedures shall be established to ensure that the required level of integrity for critical parts is controlled during design, manufacture and throughout the service life of those parts.

4.2 SYSTEMS DESIGN FEATURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, special consideration shall be given to design features that affect the ability of the remote flight crew member to maintain controlled flight. This shall include at least the following:

a) *Controls and control systems.* The design of the controls and control systems shall be such as to minimize the possibility of jamming, inadvertent operation and unintentional engagement of control locking devices.

1) each control and control system shall operate with the ease, smoothness and precision appropriate to its function;

2) each element of each flight control system shall be designed, or distinctively and permanently marked, to minimize the probability of any incorrect assembly that could result in the malfunction of the system; and

3) within the range of adjustment available to the remote pilot, the control system shall not produce hazardous loads on the remotely piloted helicopteror create hazardous deviations in the flight path, under any flight condition appropriate to its use, either during normal operation or in the event of a malfunction, assuming that corrective action begins within a reasonable period of time. Where multiple control systems are installed, subsequent malfunction conditions shall be considered in sequence unless their occurrence is shown to be extremely improbable.

b) *Pilot vision.* The arrangement of design features for remote pilot vision, if implemented on the remotely piloted helicopter, shall permit, under normal and precipitation conditions of moderate rain, sufficient vision for the normal conduct of flight and for the execution of approaches and landings as assumed in the design to support safe operation of the remotely piloted helicopter.

c) *Provision for emergencies.* Means shall be provided which shall either automatically prevent, or enable the remote flight crew to deal with emergencies resulting from foreseeable failures of equipment, systems, the C2 Link, and the remote pilot station, the failure of which would endanger the remotely piloted helicopter. Reasonable provisions shall be made for continuation of essential services following engine or system failures to the extent that such failures are catered for in the performance and operating limitations specified in the Standards in this SD and in Annex 6, Part IV.

d) *Fire precautions.* The remotely piloted helicopter shall have adequate fire protection.

4.3 FLUTTER

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, each aerodynamic surface of the remotely piloted helicopter shall be free from flutter under each appropriate speed and power condition.

4.4 ELECTRICAL BONDING AND PROTECTION AGAINST LIGHTNING AND STATIC ELECTRICITY

4.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, electrical bonding and protection against lightning and static electricity shall be such as to:

a) protect the remotely piloted helicopter, its systems and persons who come in contact with the remotely piloted helicopter on the ground or water from the dangerous effects of lightning discharge and electrical shock; and

b) prevent dangerous accumulation of electrostatic charge.

4.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall also be protected against catastrophic effects of lightning. Due account shall be taken of the material used in the construction of the remotely piloted helicopter.

4.5 GROUND HANDLING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate provisions shall be made in the design to minimize the risk that normal ground-handling operations (e.g. towing, jacking) may cause damage, which could pass unnoticed, to the parts of the remotely piloted helicopter essential for its safe operation. The protection that any limitations and instructions for such operations might provide may be taken into account.

CHAPTER 5. ROTORS AND POWERPLANT

5.1 ENGINES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part VI of this SD shall apply to each engine that is used on the remotely piloted helicopter as a primary propulsion unit(s).

5.2 ROTORS AND POWERPLANT INSTALLATION

5.2.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation and rotors shall comply with the Standards of Chapter 4 and with the Standards of 5.2.

5.2.2 DESIGN, CONSTRUCTION AND FUNCTIONING

a) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the rotors and rotor drive systems assembly complete with accessories shall be designed and constructed so as to function reliably within their operating limitations under the anticipated operating conditions when properly fitted to the engine and installed in the remotely piloted helicopter in accordance with this chapter.

b) Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted helicopters which are certificated to Category A Standard, an assessment shall be conducted for the rotors and rotor drive systems to ensure that they function safely throughout the full range of operating conditions. Where this assessment identifies a failure which could prevent continued safe flight or landing of the remotely piloted helicopter, means shall be prescribed to minimize the likelihood of that failure.

5.2.3 DECLARED RATINGS, CONDITIONS AND LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the power ratings and all operating conditions and limitations which are intended to govern the operation of the rotors and rotor drive systems shall be declared.

a) *Maximum and minimum rotor rotational speed limitations.* Maximum and minimum speeds for the rotors in both power-on and power-off conditions shall be established. Any operating conditions (e.g. airspeed) that affect such maxima or minima shall be declared.

b) *Rotor under speed warnings for single engine remotely piloted helicopters, and for multi-engine remotely piloted helicopters not having an approved device for automatically increasing power when an engine fails.* When the remotely piloted helicopter approaches a rotor rotational speed limit, with or without engines inoperative, clear and distinctive warnings shall be apparent to the remote pilot. The warnings or initial characteristics of the condition shall be such as to enable the remote pilot or system to arrest the

development of the condition after the warning begins and to recover the rotor rotational speed to within prescribed normal limits and to maintain full control of the remotely piloted helicopter.

5.2.4 TESTS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, rotors and rotor drive systems shall complete satisfactorily such tests as are necessary to ensure that they will operate satisfactorily and reliably within the declared ratings, conditions and limitations. The tests shall include at least the following:

a) *Operation.* Tests shall be conducted to ensure that strength and vibration characteristics are satisfactory and to demonstrate proper and reliable functioning of pitch changing and control mechanisms and free wheel mechanisms.

b) *Endurance.* Tests of sufficient duration shall be conducted at such powers, engine and rotor speeds, and other operating conditions as are necessary to demonstrate reliability and durability of the rotors and rotor drive systems.

5.2.5 COMPLIANCE WITH ENGINE, ROTOR AND ROTOR DRIVE SYSTEM LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant installation shall be so designed that the engines, rotors and rotor drive systems are capable of functioning reliably in the anticipated operating conditions. In conditions established in the remotely piloted helicopter flight manual, the remotely piloted helicopter shall be capable of being operated without exceeding the limitations established for the engines, rotors and rotor drive systems in accordance with this chapter and Part VI.

5.2.6 CONTROL OF ENGINE ROTATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted helicopters which are certificated to Category A Standard, where continued rotation of a failed engine would increase the hazard of fire or of a serious structural failure, means shall be provided to stop the rotation of the failed engine in flight or to reduce it to a safe level.

5.2.7 ENGINE RESTARTING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted helicopters which are certificated to Category A Standard, a means shall be provided for restarting an engine in flight at altitudes up to a declared maximum altitude.

5.2.8 ARRANGEMENT AND FUNCTIONING

5.2.8.1 *Independence of engines and associated systems.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for Category A remotely piloted helicopters, the engines together with their associated systems shall be arranged and isolated from each other to allow operation, in at least one configuration, so that the failure or malfunction of any engine, or the failure of any system that can affect any engine, will not:

a) prevent the continued safe operation of the remaining engine(s); or

b) require immediate action, other than normal remote pilot action to maintain safe operation.

5.2.8.2 *Rotors and rotor drive systems vibration.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the vibration stresses for the rotors and rotor drive systems shall be determined and shall not exceed values that have been found safe for operation within the operating limitations established for the remotely piloted helicopter.

5.2.8.3 *Cooling.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the cooling system shall be capable of maintaining the temperature of powerplant components and fluids within the established limits (see 5.2.5) at all ambient temperatures approved for operation of the remotely piloted helicopter. The maximum and minimum ambient air temperatures for which the powerplant has been established as being suitable shall be scheduled in the remotely piloted helicopter flight manual.

5.2.8.4 *Associated systems.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the fuel, oil, air induction, and other systems associated with the powerplant and the rotor(s), shall be capable of supplying the appropriate unit in accordance with its established requirements, under all conditions affecting the functioning of the systems (e.g. engine power setting, remotely piloted helicopter attitudes and accelerations, atmospheric conditions, fluid temperatures) within the anticipated operating conditions.

5.2.8.5 *Fire protection.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for regions of the powerplant where the potential fire hazards are particularly serious because of the proximity of ignition sources to combustible materials, the following shall apply in addition to the general Standard of 4.2 d).

a) *Isolation.* Such regions shall be isolated by fire resistant material from other regions of the remotely piloted helicopter where the presence of fire would jeopardize continued flight and landing (Category A remotely piloted helicopters) or would jeopardize safe landing (other remotely piloted helicopters), taking into account the probable points of origin and paths of propagation of fire.

b) *Flammable fluids.* Flammable fluid system components located in such regions shall be fire resistant. Drainage of each region shall be provided to minimize hazards resulting from the failure of any component containing flammable fluids. Means shall be provided to shut off the flow of flammable fluids into such regions if a fire occurs. Where sources of flammable fluid exist in such regions, the whole of the related system within the region, including supporting structure, shall be fireproof or shielded from the effects of fires.

c) *Fire detection.* For engine installations, a sufficient number of fire detectors shall be provided and located to ensure rapid detection of any fire that might occur in such regions.

CHAPTER 6. SYSTEMS AND EQUIPMENT

6.1 GENERAL

6.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall be provided with approved equipment and systems, including guidance and flight management systems necessary for the safe operation of the remotely piloted helicopter in the anticipated operating conditions. These shall include the equipment necessary to enable the remote crew to operate the remotely piloted helicopter within its operating limitations. Equipment design shall consider human factors principles.

Note 1.— *Equipment additional to the minimum necessary for the issuance of a Certificate of Airworthiness are prescribed in Annex 6, Part IV, for particular circumstances or on particular kinds of routes. Systems are addressed in Part X* — Remote Pilot Station (RPS) *of this SD.*

Note 2.— *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

6.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the equipment and systems required by 6.1.1 and their installation shall be such that:

a) for a Category A remotely piloted helicopter, an inverse relationship exists between the probability of a failure condition and the severity of its effect, as determined by a system safety assessment process;

b) they perform their intended function under all anticipated operating conditions; and

c) electromagnetic interference between them is minimized.

Note. — The system safety assessment process includes integration of the remote pilot station and the specification of the C2 Link. See also 10.3.3 of this part.

6.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to warn the remote crew of unsafe system operating conditions on both the remote pilot station and the remotely piloted helicopter and to enable corrective action to be taken automatically or by the remote crew.

6.1.4 ELECTRICAL POWER SUPPLY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations and shall also be such that no single failure or malfunction could impair the ability of the system to supply essential loads for safe operation.

6.1.5 DEVELOPMENT ASSURANCE OF COMPLEX ELECTRONIC HARDWARE AND SYSTEM SOFTWARE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, complex electronic hardware and system software shall be developed, verified and validated such as to ensure that the systems in which they are used perform their intended functions at a level of safety that complies with the requirements of this part, notably those of 6.1.2 a) and 6.1.2 b).

Note. — Some States accept the use of national or international industry standards for the development assurance (development, verification and validation) of complex electronic hardware and systems software.

6.2 INSTALLATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, instrument and equipment installations shall comply with the Standards of Chapter 4.

6.3 NAVIGATION LIGHTS AND ANTI-COLLISION LIGHTS

6.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the lights required by Annex 2 — *Rules of the Air* to be displayed by remotely piloted helicopters in flight or operating on the movement area of an aerodrome shall have intensities, colours, fields of coverage and other characteristics such that they furnish the pilot of another aircraft, the remote pilot of another remotely piloted aircraft, or personnel on the ground with as much time as possible for interpretation and the subsequent manoeuvre necessary to avoid a collision. In the design of such lights, due account shall be taken of the conditions under which they may reasonably be expected to perform these functions.

Note. — It is likely that lights will be viewed against a variety of backgrounds, such as typical city lighting, clear starry night, moonlit water and daytime conditions of low background luminance. Furthermore, collision risk situations are most likely to arise in terminal control areas in which aircraft are manoeuvring in the intermediate and lower flight levels at closing speeds that are unlikely to exceed 900 km/h (500 kt).

6.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, lights shall be installed in remotely piloted helicopters so as to minimize the possibility that they will adversely affect the satisfactory performance of any required sensors.

Note. — In order to avoid the effects mentioned in 6.3.2, it will be necessary in some cases to provide means whereby the remote pilot can adjust the intensity of the flashing lights.

6.4 ELECTROMAGNETIC INTERFERENCE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, remotely piloted helicopter electronic systems, particularly flight-critical and flight- essential systems shall be protected as appropriate against electromagnetic interference from internal and external sources.

6.5 ICE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, if certification for flight in icing conditions is requested, the remotely piloted helicopter shall be shown to be able to operate safely in icing conditions likely to be encountered in all anticipated operating environments.

CHAPTER 7. OPERATING LIMITATIONS AND INFORMATION

7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the operating limitations within which compliance with the Standards of this SD is determined, together with any other information necessary to the safe operation of the remotely piloted helicopter, shall be made available by means of a remotely piloted helicopter flight manual, markings and placards, and such other means as may effectively accomplish the purpose.

7.2 OPERATING LIMITATIONS

7.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations which might be exceeded in flight and which are defined quantitatively shall be expressed in suitable units. These limitations shall be corrected if necessary for errors in measurements so that the remote flight crew can, by reference to the instruments available to them, readily determine when the limitations are reached.

7.2.2 LOADING LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading limitations shall include all limiting masses, centres of gravity positions, mass distributions and floor loadings (see 1.2.2).

7.2.3 AIRSPEED LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the airspeed limitations shall include all speeds (see 3.5.2) that are limiting from the standpoint of structural integrity or flying qualities of the remotely piloted helicopter, or from other considerations. These speeds shall be identified with respect to the appropriate remotely piloted helicopter configurations and other pertinent factors.

7.2.4 POWERPLANT LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the powerplant limitations shall include all those established for the various powerplant components as installed in the remotely piloted helicopter (see 5.2.5 and 5.2.8.3).

7.2.5 ROTOR LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, limitations on rotor speeds shall include maximum and minimum rotor speeds for power-off (autorotation) and power-on conditions.

7.2.6 LIMITATIONS ON EQUIPMENT AND SYSTEMS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the limitations on equipment and systems shall include all those established for the various equipment and systems as installed in the remotely piloted helicopter.

7.2.7 MISCELLANEOUS LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, miscellaneous limitations shall include any necessary limitations with respect to conditions found to be prejudicial to the safety of the remotely piloted helicopter (see 1.2.1).

7.2.8 REMOTE FLIGHT CREW LIMITATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote flight crew limitations shall include the minimum number of remote flight crew personnel necessary to operate the remotely piloted helicopter.

Note. — The circumstances in which the remote flight crew shall include members in addition to the minimum remote flight crew are defined in Annex 6 —, Part IV.

7.3 OPERATING INFORMATION AND PROCEDURES

7.3.1 TYPES OF ELIGIBLE OPERATIONS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the particular types of operations for which the remotely piloted helicopter has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

7.3.2 LOADING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the loading information shall include the empty mass of the remotely piloted helicopter, together with a definition of the condition of the remotely piloted helicopter at the time of weighing, the corresponding centre of gravity position, and the reference points and datum lines to which the centre of gravity limits are related.

Note. — Usually the empty mass excludes the mass of the payload, and the usable fuel supply; it includes the mass of all fixed ballast, unusable fuel supply and total quantity of oil, engine coolant and hydraulic fluid.

7.3.3 OPERATING PROCEDURES

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a description shall be given of normal and emergency operating procedures which are peculiar to the particular remotely piloted helicopter and necessary for its safe operation. These shall include procedures to be followed in the event of failure of one or more engines.

7.3.4 HANDLING INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any significant or unusual features of the remotely piloted helicopter characteristics.

7.4 PERFORMANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the performance of the remotely piloted helicopter shall be scheduled in accordance with 2.2. There shall be included information regarding the various remotely piloted helicopter configurations and powers involved and

the relevant speeds, together with information which will assist the remote flight crew in attaining the performance as scheduled.

7.5 REMOTELY PILOTED HELICOPTER FLIGHT MANUAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a remotely piloted helicopter flight manual shall be made available. It shall identify clearly the specific remotely piloted helicopter or series of remotely piloted helicopters to which it is related. The remotely piloted helicopter flight manual shall include at least the limitations, information and procedures specified in 7.2, 7.3 and 7.4 of this part and Part X of this SD.

7.6 MARKINGS AND PLACARDS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards or instructions shall be provided to give any information that is essential to the ground crew in order to preclude the possibility of mistakes in taxi, take-off, landing, shutdown, and ground servicing (towing, refuelling, etc.), that could pass unnoticed and that could jeopardize the safety of the remotely piloted helicopter in subsequent flights and the safety of the ground crew.

7.7 CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

7.7.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, information for use in developing procedures for maintaining the remotely piloted helicopter in an airworthy condition shall be made available. The information shall include that described in 7.7.2, 7.7.3 and 7.7.4.

7.7.2 MAINTENANCE INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance information shall include a description of the remotely piloted helicopter and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on transportation, storage and assembly, and defect diagnosis.

7.7.3 MAINTENANCE PROGRAMME INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

Note. — The development of initial maintenance programme information at the time of remotely piloted helicopter type certification can take advantage of the Maintenance Review Board (MRB) process or the process of developing instructions for continuing airworthiness.

7.7.4 MANDATORY MAINTENANCE REQUIREMENTS RESULTING FROM THE TYPE DESIGN APPROVAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of 7.7.3.

Note. — Mandatory requirements identified as part of the type design approval are often referred to as Certification Maintenance Requirements (CMR) and/or airworthiness limitations.

7.8 C2 LINK INFORMATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, sufficient information shall be given on any relevant C2 Link relating to configuration, operation, performance, emergency procedures, and operating limitations.

CHAPTER 8. RESERVED

[To be developed]

CHAPTER 9. OPERATING ENVIRONMENT AND HUMAN FACTORS

9.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall be designed to allow safe operation within the performance limitations of those who operate, maintain and service the aircraft.

Note. — The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the remotely piloted helicopter is capable of being controlled at all phases of the flight (including any degradation due to failures).

9.2 REMOTE FLIGHT CREW

9.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall be designed in such a way as to allow safe and efficient control by the remote flight crew. The design shall allow for variations in remote flight crew skill and physiology commensurate with remote flight crew licensing limits. Account shall be taken of the different expected operating conditions of the remotely piloted helicopter in its environment, including operations degraded by failures.

9.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the workload imposed on the remote flight crew by the design of the remotely piloted helicopter shall be reasonable at all stages of flight. Particular consideration shall be given to critical stages of flight and critical events which may reasonably be expected to occur during the service life of the remotely piloted helicopter, such as engine failure.

Note. — Workload can be affected by both cognitive and physiological factors.

9.3 ERGONOMICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, during design of the remotely piloted helicopter, account shall be taken of ergonomic factors, where applicable, including:

a) ease of use and prevention of inadvertent misuse;

b) accessibility;

c) maintainability; and

d) transportation, storage and assembly/disassembly.

CHAPTER 10. REMOTE PILOT STATION INTEGRATION

10.1 GENERAL

10.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of Part X of this SD shall apply to each remote pilot station that is used to pilot the remotely piloted helicopter.

10.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote pilot station shall be compatible with the type of the remotely piloted helicopter and appropriate to the intended operation.

10.2 INTEGRATION

10.2.1 *Compliance with remote pilot station limitations.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall be so designed that the remote pilot station is capable of performing satisfactorily and reliably its intended functions in the anticipated operating conditions when connected to the remotely piloted helicopter. In conditions established in the flight manual, the remotely piloted helicopter shall be capable of being operated within the limitations established for the remote pilot station in accordance with this chapter and with Part X.

10.2.2 *Integration tests.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter shall complete satisfactorily tests with all approved types of remote pilot stations, as are necessary to verify the validity of the declared conditions and limitations and to ensure that the remote pilot station will operate satisfactorily and reliably using any specified C2 Link and supporting C2 Link communication service providers, as specified under the anticipated operating conditions.

10.3 CONTROLS AND INFORMATION

10.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote pilot station shall be integrated in such a way as to allow timely control as required for safe and efficient control of the remotely piloted helicopter by the remote flight crew. This shall include at least the following:

a) processing the data provided by the remotely piloted helicopter regarding:

— attitude, altitude, position, heading, speed, vertical speed, turning information;
— powerplant;
— detect and avoid;
— weather conditions;
— rotor speed;
— C2 Link state and performance according to the SARPs defined in the applicable sections of Annex 10 for remotely piloted aircraft systems; and
— status of automated systems, including the current lost C2 Link state;

c) controlling the remotely piloted helicopter in the anticipated operating condition;

c) controlling the powerplant according to Chapter 5 of this part;

d) information on predicted QoSD in the geographical area of the flight based on the QoSR and C2 Link specification; and

e) status of automated systems, including flight controls exceedance or malfunctions.

10.3.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all required information shall be provided through the remote pilot station for the remote flight crew to safely and efficiently operate the remotely piloted helicopter (e.g. set or monitor flight parameters for the flight, navigation, and powerplant) using any specified C2 Link and supporting C2 Link communication service providers in the anticipated operating conditions. These shall include the instruments and equipment necessary to enable the remote crew to operate the remotely piloted helicopter within its anticipated operating limitations. Instrument and equipment design shall consider human factors principles.

Note 1.— Instruments and equipment, additional to the minimum necessary for the issuance of a Certificate of Airworthiness, are prescribed in Annex 6, Part IV, for particular circumstances or on particular kinds of routes.

Note 2.— Guidance material on human factors principles can be found in the Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

10.3.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the instruments, equipment and systems required by 10.3.2 and their installation shall be such that:

a) an inverse relationship exists between the probability of a failure condition and the severity of its effect as determined by a system safety assessment process;

b) they perform their intended function under all anticipated operating conditions; and

c) electromagnetic interference between them is minimized.

10.3.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to warn the remote flight crew of unsafe system operating conditions and to enable the crew to take corrective action.

10.3.5 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, markings and placards on instruments, equipment, controls, etc., shall include such limitations or information as necessary for the direct attention of the remote flight crew during flight.

10.4 C2 LINK

10.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter and remote pilot station system architecture shall be compatible with any specified C2 Link and supporting C2 Link communication service providers as specified, to enable the remotely piloted helicopter to be operated safely under the anticipated operating conditions.

10.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to monitor the C2 Link performance and the C2 Link state according to metrics defined in the applicable parts of Annex 10, reacting according to the transaction completion criteria defined in Annex 6, Part IV.

10.5 FLIGHT MANUAL

10.5.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter flight manual shall address all combinations of remote pilot station models listed in the approved type design of the remotely piloted helicopter. There may be substantial variations between different remote pilot stations used with the same remotely piloted helicopter.

10.5.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, in developing the remotely piloted helicopter flight manual, specific consideration shall be given to human performance aspects, including transfer of control within and between remote pilot station if

envisaged by operational requirements, remote pilot handovers, control link switchovers, appropriate contingency planning procedures, remote crew communications, e.g. remote pilot to remote pilot, remote pilot to remotely piloted helicopter observer or other support personnel, and remote pilot to ATC.

10.5.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter flight manual shall contain all necessary information for operation of the RPAS.

10.5.4 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is therefore recommended that in addition to those specified in 7.5, the following procedures should be included, inter alia*:*

a) remotely piloted helicopter handover procedures from one remote pilot station to another;

b) C2 Link specifications and procedures for switchover of remotely piloted helicopter command and control from one C2 Link to another and to respond to temporary interruption or loss of the C2 Link;

c) flight termination procedures, if applicable;

d) security procedures unique to remotely piloted aircraft systems (e.g. remote pilot station security, C2 Link, etc.); and

e) detect and avoid.

CHAPTER 11. REMOTELY PILOTED HELICOPTER UNIQUE CONSIDERATIONS

11.1 GENERAL.

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the Standards of this Chapter shall apply to additional aspects of remotely piloted helicopter features that are not common to manned aviation.

11.2 TRANSPORTATION, STORAGE AND ASSEMBLY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted helicopter is designed to be transportable while non-operational, it shall be shown that environmental factors and other foreseeable conditions likely to be encountered during transportation or storage do not adversely affect any requirement of this part. Limitations, information and markings for the safe transport and assembly of the remotely piloted helicopter shall be developed and made available as defined under Chapter 7 of this part.

Note. — *Guidance material on human factors principles can be found in the* Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

11.3 LAUNCH METHODS

11.3.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted helicopter is designed to be assisted during launch, the effects of the launch method shall be taken into account in calculating launch loads as required in Chapter 3, and in establishing operational limitations, markings, and placards as required in Chapter 7.

11.3.2 Take-off performance. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted helicopter is designed to be assisted during launch, the remotely piloted helicopter shall achieve sufficient energy and controllability at the end of the launch phase to ensure safe and controllable flight under all anticipated operating conditions.

11.4 RECOVERY METHODS

11.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted helicopter is designed to be assisted during normal landing recovery, the effects of the recovery method shall be taken into account in calculating recovery loads as required in Chapter 3, and in establishing operational limitations, markings, and placards as required in Chapter 7.

11.4.2 Recovery performance. Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, where the remotely piloted helicopter is designed to be assisted during normal landing recovery, the remotely piloted helicopter flight performance and control characteristics shall be adequate for the intended landing procedures under all anticipated operating conditions.

11.5 EMERGENCY RECOVERY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, for remotely piloted helicopters that have an emergency recovery capability or a flight termination system initiated through remote pilot command or through automatic means with the intent to reduce the risk of fatal injuries to people on the ground in case of emergency landing:

a) any systems on board the remotely piloted helicopter that are critical to an emergency recovery capability to reach a safe area shall perform their intended functions in the entire flight envelope under the remotely piloted helicopter anticipated operating conditions;

b) any systems on board the remotely piloted helicopter that are critical to a flight termination system, procedure or function that aims to immediately end normal flight shall be shown to perform their

intended functions in the entire flight envelope under the remotely piloted helicopter anticipated operating conditions; and

c) operating limitations, procedures, instructions and any additional information necessary for the safe operation of the remotely piloted helicopter shall be established and provided in the remotely piloted helicopter flight manual as required in Chapter 7.

Note 1. — A flight termination system (e.g. a whole remotely piloted helicopter recovery parachute) aims to immediately end the flight and to reduce the kinetic energy at impact, but does not necessarily ensure the impact point location.

Note 2. — Emergency recovery capability consists of functions that could be implemented through remote pilot crew command or through an automatic pre-programmed course of action, and are intended to navigate the remotely piloted helicopter to a pre-selected emergency site and then to make an emergency landing.

Note 3. — When considering the protection of people on the ground, in case of emergency landing, items to be considered include:

a) restraint criteria for items that could cause a hazard to people on the ground;

b) fuel cell integrity and position; and

c) integrity of electrical systems to avoid sources of ignition.

11.6 AUTOMATIC TAXI, TAKE-OFF AND LANDING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, any system installed on the remotely piloted helicopter that is required for automatic taxi, take-off or landing shall ensure that loss, degradation, interruption of navigational information or C2 Link does not adversely affect safety during taxi, take-off or landing.

11.7 C2 LINK

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the C2 Link, as integrated in the remotely piloted aircraft system, shall perform its intended function under all anticipated operating conditions. Considerations regarding the C2 Link shall include at least:

a) a means to maintain C2 Link through foreseeable operating conditions;

b) a means to regain C2 Link in the event that it is temporarily interrupted;

c) a means to ensure continued safe flight and landing in the event that the RPAS enters a lost C2 Link state;

d) incorporation of C2 Link performance and operational limitations as required in Chapter 7 of this part; and

e) a means to monitor the performance and status of the C2 Link.

11.8 DETECT AND AVOID, AND OTHER EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, any equipment required for remotely piloted helicopter operation, such as the detect and avoid system, shall comply with the Standards of Chapter 6 of this part.

11.9 MISSION EQUIPMENT

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the installation of the mission equipment on the remotely piloted helicopter shall be taken into consideration when showing compliance with the requirements of this part, in order to show that it does not affect the safe flight of the remotely piloted helicopter.

11.10 SECURITY

11.10.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remotely piloted helicopter design shall ensure system security protection of the remotely piloted helicopter system from unauthorized physical and electronic access by sources external to the remotely piloted helicopter, including during maintenance activity.

11.10.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is therefore recommended that security threats should be identified and assessed, and risk mitigation strategies should be implemented to protect the remotely piloted helicopter from adverse impacts on safety, functionality, and continuing airworthiness.

PART X. REMOTE PILOT STATION (RPS)

Applicable as of 26 November 2026.

CHAPTER 1. GENERAL

1.1 APPLICABILITY

1.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, except as noted below, the Standards of this part are applicable to remote pilot stations of all types as required in Parts VIII and IX. The Standards of this part are applicable to a remote pilot station type at the time of submission of an application to the appropriate national authority for a type approval.

Note 1. — The following Standards do not include quantitative specifications comparable to those found in national airworthiness codes. In accordance with 1.2.1 of Part II, these Standards are to be supplemented by requirements established, adopted or accepted by Contracting States.

Note.2 — The provisions in this part support RPAS operation SARPs in Annex 6, Part IV.

1.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the level of airworthiness defined by the appropriate parts of the comprehensive and detailed national code for the remote pilot stations designated in 1.1.1 shall be at least substantially equivalent to the overall level intended by the broad Standards of this part.

1.2 RPS INTERFACES AND INTEGRATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all necessary information for the safe and correct interfaces between the remote pilot station and the remotely pilot aircraft shall be made available, including those limitations concerning the C2 Link and information necessary for intended function of any C2 Link as specified in the type design.

1.3 CONTINUING AIRWORTHINESS — MAINTENANCE INFORMATION

1.3.1 *General.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, information for use in developing procedures for maintaining the remote pilot station in an airworthy condition shall be made available. The information shall include that described in 1.3.2, 1.3.3 and 1.3.4.

1.3.2 *Maintenance information.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance information shall include a description of the remote pilot station and recommended methods for the accomplishment of maintenance tasks. Such information shall include guidance on defect diagnosis. Such information shall clearly distinguish between:

a) defect diagnosis and rectification tasks that may be performed while the remote pilot station is operational if necessary for the safe conclusion of the flight; and

b) maintenance tasks that must not be performed when the remote pilot station is operational.

1.3.3 *Maintenance programme information.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, maintenance programme information shall include the maintenance tasks and the recommended intervals at which these tasks are to be performed.

1.3.4 *Mandatory maintenance requirements resulting from the type design approval.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design shall be identified as such and included in the maintenance information of 1.3.3.

CHAPTER 2. DESIGN AND CONSTRUCTION

2.1 FIRE, SMOKE AND TOXIC GAS PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to minimize the risk of fires, the production of smoke and toxic gases in the event of a fire.

2.2 FUNCTIONING

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote pilot station shall be designed and constructed so as to function reliably within its operating limitations under its anticipated operating conditions when integrated within a remote piloted aircraft system using any C2 Link and supporting communications services, as specified under the anticipated operating conditions in the type design.

2.3 FAILURE ANALYSIS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a safety assessment of the remote pilot station shall be conducted to ensure that it functions safely throughout the full range of operating conditions. A failure analysis shall be conducted to identify the potential RPS failure conditions, their effect at the RPS level and their probability of occurrence that will allow performing the overall system safety assessment at the RPA level, as required in Chapter 6 of Part VIII or Part IX.

2.4 MATERIALS AND MANUFACTURING METHODS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the selection of materials and the manufacturing methods and processes shall account for the operational environment of the remote pilot station expected in service.

2.5 ELECTRICAL BONDING AND PROTECTION AGAINST LIGHTNING AND STATIC ELECTRICITY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, electrical bonding and protection against lightning and static electricity shall be such as to:

a) protect the remote pilot station, its systems, its occupants and those who come in contact with the remote pilot station from the dangerous effects of lightning discharge and electrical shock; and

b) prevent dangerous accumulation of electrostatic charge.

2.6 HANDLING OF THE REMOTE PILOT STATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, design provisions and procedures for safe handling of the remote pilot station shall be defined.

CHAPTER 3. SYSTEM AND EQUIPMENT

3.1 GENERAL

3.1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, systems and equipment installed on the RPS shall be so designed and installed as to ensure compliance with all Standards set in this part, as well as those applicable to the RPA controlled by the RPS.

3.1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the RPS shall be able to display to the remote flight crew all information necessary to safely operate the RPA.

3.1.3 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the RPS shall provide means to warn the remote flight crew of unsafe conditions related to its own systems or received from the RPA controlled by the RPS and to enable them to take corrective action.

3.2 ELECTRICAL POWER SUPPLY

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the design of the electrical power supply system shall be such as to enable it to supply power loads during normal operations of the remote pilot station.

3.3 ELECTROMAGNETIC INTERFERENCE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, electronic systems pertaining to the remote pilot station, particularly those the malfunction of which may adversely affect the safe operation of the remotely piloted aircraft, shall be protected against electromagnetic interference from both internal and external sources.

3.4 DEVELOPMENT ASSURANCE OF COMPLEX ELECTRONIC HARDWARE AND SYSTEM SOFTWARE

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, complex electronic hardware and system software shall be developed, verified and validated to ensure that the systems in which they are used on the remote pilot station perform their intended functions at a level of safety commensurate with the failure condition classification for the remotely piloted aircraft in which RPS certification is sought.

Note. — Some States accept the use of national or international industry standards for the development assurance (development, verification and validation) of complex electronic hardware and systems software.

CHAPTER 4. REMOTE FLIGHT CREW COMPARTMENT SAFETY

4.1 FIRE PROTECTION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided for fire protection to the remote flight crew.

4.2 EVACUATION

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to allow adequate evacuation in case of emergency.

CHAPTER 5. OPERATING ENVIRONMENT AND HUMAN FACTORS

5.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote pilot station shall be designed to allow safe operation within the performance limitations of those who operate, maintain and service the remote pilot station.

Note.— The human/machine interface is often the weak link in an operating environment and so it is necessary to ensure that the remotely piloted aircraft is capable of being controlled at all phases of the flight (including any degradation due to failures and/or remote pilot station located on mobile/moving platforms where inputs from equipment-based sources could conflict with sensory sources) and that the remote crew is not harmed by the environment in which they have been placed for the duration of the remotely piloted aircraft operation.

5.2 REMOTE FLIGHT CREW

5.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote pilot station shall be designed in such a way as to allow safe and efficient control of the remotely piloted aircraft by the remote flight crew. The design shall allow for variations in remote flight crew skill and physiology commensurate with remote flight crew licensing limits. Account shall be taken of the different expected operating conditions of the remotely piloted aircraft, including operations degraded by failures.

5.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is therefore recommended that the human performance implications of the lack of sensory information directly from the remotely piloted aircraft (e.g. vibration, g-load, fumes, flames) resulting from the pilot being remote to the aircraft should be considered and, where necessary, such information should be accordingly addressed.

Note. — Guidance material on human factors principles can be found in the Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

5.3 ERGONOMICS

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, during design of the remote pilot station, account shall be taken of ergonomic factors including:

a) ease of use and prevention of inadvertent misuse;

b) accessibility;

c) remote pilot station design philosophy; and

d) maintainability.

5.4 OPERATING ENVIRONMENTAL FACTORS

5.4.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the operating environment of the remote pilot station shall be designed in accordance with human performance principles.

Note. — Guidance material on human factors principles can be found in the Human Factors Training Manual *(Doc 9683) and the* Manual on Remotely Piloted Aircraft Systems (RPAS) *(Doc 10019).*

5.4.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, adequate seating shall be provided for the remote flight crew. Attention shall be paid to minimize injury to the remote flight crew due to contact with surrounding structures during the operation of the remotely piloted aircraft.

CHAPTER 6. OPERATING LIMITATIONS AND INFORMATION

6.1 GENERAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, all operating conditions and limitations which are intended to govern the operation of the remote pilot station shall be declared.

6.2 OPERATING INFORMATION AND PROCEDURES

6.2.1 *Types of eligible operations.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the particular types of operations for which the remote pilot station has been shown to be eligible by virtue of compliance with the appropriate airworthiness requirements shall be listed.

6.2.2 *Operating procedures.* Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, a description shall be given of normal and emergency operating procedures which are peculiar to the particular remote pilot station and necessary for its safe operation.

6.3 RPS OPERATING MANUAL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, an RPS operating manual shall be provided:

a) identifying clearly the specific remote pilot station or series of remote pilot stations to which it is related;

b) identifying the specific remotely piloted aircraft/remotely piloted aircraft system or series of remotely piloted aircraft/remotely piloted aircraft systems to which it is related; and

c) including at least the limitations, information and procedures specified in 6.1 and 6.2.

CHAPTER 7. SECURITY

7.1 REMOTE PILOT STATION ACCESS CONTROL

Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, means shall be provided to adequately prevent unauthorized access to the RPS.

7.2 SYSTEMS SECURITY

7.2.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, the remote pilot station design shall ensure security protection of the remotely piloted aircraft system from unauthorized physical and electronic access by sources external to the remote pilot station, including during maintenance activity.

7.2.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is therefore recommended that security threats should be identified and assessed, and risk mitigation strategies should be implemented to protect the remote pilot station from adverse impacts on safety, functionality, and continuing airworthiness.

APPENDIX. APPROVED MAINTENANCE ORGANIZATION (AMO) CERTIFICATE

1. PURPOSE AND SCOPE

1.1 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is therefore recommended that the AMO certificate should contain the minimum information required in paragraph 2.

1.2 Further to the provisions of Section 12, 13 and 14 of the Air Navigation Regulations, it is therefore recommended that the AMO certificate should define the scope of approval for which a maintenance organization is authorized.

Note. — Detailed guidance material and examples for the completion of the AMO template in paragraph 2 is contained in the Airworthiness Manual *(Doc 9760).*

2. AMO TEMPLATE

APPROVED MAINTENANCE ORGANIZATION CERTIFICATE		
Issuing authority:[1]		
Approval reference number:[2]	Organization name:[3] Registered address: Telephone: E-mail:	Expiration date (if applicable):[4]
Class(es) and rating(s) authorized		
Class[5]	Rating[6]	Limitations[7]
Aircraft maintenance		
Engine maintenance		
Component maintenance		
Specialized maintenance		

Terms of Approval

This certificate certifies that[8] _____ is authorized to engage in activities specified in the Terms of Approval annexed hereto, subject to the compliance with the9 _____ and the latest maintenance organization's procedures manual (MOPM).

Locations of maintenance facilities: As per10 _____ of the latest MOPM.

This certificate shall remain valid during the period of validity specified above unless it is surrendered, superseded, suspended or revoked.

Name:[11]_____ Date of original issue:[12] _____

Title:[13] _____ Date of current issue:[15] _____

Signature:[14] _____

Notes:

1. Name of the authority issuing the approval.

2. Unique approval reference number as issued by the State of Registry.

3. Registered address, telephone and email.

4. Expiry date (dd-mm-yyyy) if applicable, if not applicable, insert N/A.

5. Scope of approval using the classes as follows: aircraft, engine, component or specialized maintenance.

6. Scope of approval using the ratings as follows:

a) aircraft maintenance — large aeroplane, small aeroplane, helicopter, other kind of aircraft (such as glider, balloon, airship, light sport aircraft);

b) engine maintenance — categories of engine (such as reciprocating, turbine and electric);

c) components maintenance — standard numbering system (SNS) code derived from ASD/ATA S1000D specification for identifying the aircraft system applicable to the rating (*Airworthiness Manual* (Doc 9760, Chapter 10, Attachment F refers); and

d) specialized maintenance — class of approval necessary for the specialized maintenance using the following ratings: composite material maintenance, surface treatment such as peening, plating, painting, non-destructive testing, welding, other unique processes accepted/approved by the State (Doc 9760, Chapter 10, Attachment F refers).

7. Limitation in the scope of approval if required for aircraft, components or specialized maintenance. If the limitations are described in the approved maintenance organization's procedures manual a reference to the manual should be included in the AMO certificate.

8. Name of organization authorized to perform maintenance. In the case where a State does not annex terms of approval to the AMO certificate, the State should amend this item as follows:

"This certificate certifies that[8] _____ is authorized to engage in activities listed in this certificate, subject to compliance with the _____ and the latest maintenance organization's procedures manual."

9. Reference to relevant State regulations.
10. Reference to the appropriate section/chapter and paragraph of the maintenance organization's procedures manual in which the approved locations of the organization's facilities are listed; for example, Section/Chapter 1, paragraph 1.1.
11. Name of the authority representative signing the AMO certificate.
12. Date of original issue (if different from the date of current issue), if not, use N/A.
13. Title of the authority representative signing the AMO certificate.
14. Signature of the authority representative. In addition, an official stamp may be applied on the AMO certificate.
15. Issuance date of the AMO certificate (dd-mm-yyyy).

— END —