



ICAO

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Airworthiness Manual

Fourth Edition, 2020



Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION



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FOREWORD

The *Airworthiness Manual* (Doc 9760) was first published in 2001 in two volumes and contained a consolidation of airworthiness-related information previously found in other ICAO documents. As a result, the first edition of the *Airworthiness Manual* replaced the following ICAO documents: the *Airworthiness Technical Manual* (Doc 9051), the *Manual of Procedures for an Airworthiness Organization* (Doc 9389) and the *Continuing Airworthiness Manual* (Doc 9642).

The advance second edition (unedited) of the *Airworthiness Manual* was developed from material previously found in the 2001 edition. The content was reviewed, edited, and expanded on by the Airworthiness Panel (AIRP) during several working group meetings from 2003 to 2007. It incorporated changes to Annex 8 to the Chicago Convention — *Airworthiness of Aircraft*, and to Annex 6 — *Operation of Aircraft*. The content also responded to the request from the ICAO Universal Safety Oversight Audit Programme for additional guidance to States on how to meet their airworthiness responsibilities under the Convention on International Civil Aviation. A new chapter on production activities was also added.

The advance second edition (unedited) was placed on ICAO-NET in 2008 in an electronic format because of the urgency to provide States with the updated guidance. The second edition remained unedited until it was further updated to better assist States in meeting their respective airworthiness responsibilities.

The third edition was presented based on States' roles and responsibilities, thus as State of Registry, State of the Operator, State of Design and State of Manufacture. It also described the interface between different States and their related responsibilities.

The breadth and depth of the guidance material provided in this edition have been intentionally limited to keep the manual manageable. In order to avoid specific references to material that may become dated, it was decided instead to provide a listing of potential sources of additional, and more detailed, information on the subjects covered in this manual.

The fourth edition includes additional and enhanced guidance delivered by the AIRP as part of the Air Navigation Commission (ANC) work programme for airworthiness. These include guidance on the approval of approved maintenance organization (AMO) to facilitate the harmonization and global recognition of AMO approvals. Also included is enhanced guidance on various States' responsibilities when a type certificate is suspended or revoked, and new guidance on the type certification and production approvals of small aeroplanes using a risk-based approach. The AIRP has also provided enhanced guidance on the use, recognition and acceptance of electronic aircraft continuing airworthiness records including electronic maintenance records for aircraft in anticipation to changes in the SARPs involving these records.

Although this manual provides guidance on the suggested content of various State airworthiness regulations, no attempt has been made to formulate specific regulations. A Contracting State should establish and implement a system that enables it to discharge satisfactorily its international obligations and responsibilities. It is recognized, however, that a number of States, particularly those which are still in the early stages of establishing an effective civil aviation organization, do require assistance in developing a framework of appropriate airworthiness regulations.

It is recognized that in some cases it may not be feasible for a State, due to the limited scale of aviation activities or lack of technical and economic resources, to establish and maintain the full airworthiness organization it needs to meet its international obligations. This problem may be particularly acute for some States in respect of their obligation to assess and approve or disapprove the maintenance programme of an air operator utilizing large and complex aircraft. A State finding itself in this position should not in any way diminish the stringency of its regulations; however, it is essential that the State either enter into an agreement with another Contracting State to assist it with the detailed tasks, or obtain the services, on a temporary basis, of qualified inspectors from a State, fully experienced in the matter in question. The ICAO Regional Office accredited to the State may be of assistance to the State in working out cooperative inspection

arrangements. It is also recognized that a group of States may elect to discharge their responsibilities through a multinational organization or agency. It is essential that the related agreements clearly define the respective functions of each national authority and the multinational organization or agency, so as to ensure that all obligations of the States are fully discharged.

Procedural information in this manual is generally applicable to all types of aeronautical products unless specifically indicated otherwise. Limited applicability may be ascertained directly from the text or indirectly through the associated applicability of a referenced Annex provision.

Comments on this manual, particularly with regard to its application and usefulness, would be appreciated from all States, safety oversight audit missions and ICAO technical cooperation field missions. These will be taken into consideration in the preparation of subsequent editions. Comments should be addressed to:

The Secretary General
International Civil Aviation Organization
999 Robert-Bourassa Boulevard
Montréal, Quebec H3C 5H7
Canada

Some sources of additional airworthiness information:**For information on ICAO publications and audio-visual training aids please contact:****ICAO, Customer Services**

999 Robert-Bourassa Boulevard , Montréal, Quebec H3C 5H7, Canada
Tel.: + 1 (514) 954-8219; Fax: + 1 (514) 954-6077
E-mail: sales@icao.int

ICAO Regional Offices:**Asia and Pacific (APAC) Office**

ICAO, Asia and Pacific Office
252/1 Vibhavadi Rangsit Road, Chatuchak, Bangkok 10900, Thailand
Mail: P.O. Box 11, Samyaek Ladprao, Bangkok 10901, Thailand
Tel.: + (662) 537-8189; Fax: + (662) 537-8199;
E-mail: apac@icao.int

Asia & Pacific Regional Sub-Office (APAC RSO)

1st floor, C Section, China Service Mansion
No. 9 Erwei Road, Shunyi District, Beijing, China
100621
Tel: +86-10-64557169
Fax: +86-10-64557164
E-mail: apac-rso@icao.int

Eastern and Southern African (ESAF) Office

ICAO, Eastern and Southern African Office
New Office Facility, Block 4, South wing, Ground floor
United Nations Office at Nairobi,
Limuru Rd., Gigiri, Nairobi, Kenya
Mail: P.O. Box 46294, 00100 GPO, Nairobi, Kenya
Tel.: + (254 20)7622395/96; Fax: + (254 20) 7621092/7623028
E-mail: icaoesaf@icao.int

European and North Atlantic (EUR/NAT) Office

ICAO, European and North Atlantic Office
3 bis villa Émile-Bergerat, 92522 Neuilly-sur-Seine Cedex, France
Tel.: + 33 1 46 41 85 85; Fax: + 33 1 46 41 85 00
E-mail: icaoeurnat@paris.icao.int

Middle East (MID) Office

ICAO, Middle East Office
Egyptian Civil Aviation Complex, Cairo Airport Road, Cairo, Egypt
Mail: P.O. Box 85, Cairo Airport Post Office Terminal One, Cairo 11776, Arab Republic of Egypt
Tel.: + (202) 2267-4840; Fax: + (202) 2267-4843
E-mail: icaomid@icao.int

North American, Central American and Caribbean (NACC) Office

ICAO, North American, Central American and Caribbean Office
Calz. Mariano Escobedo No. 526 – 2nd floor
Col. Anzures, C.P. 11590, Ciudad de México

Mail: Apartado postal 5-377, C.P. 06500, México, D.F.
Tel.: + (52 55) 52-50-32-11
E-mail: icaonacc@icao.int

South American (SAM) Office

ICAO, South American Regional Office
Av. Víctor Andrés Belaúnde No. 147
San Isidro, Lima, Perú
(Centro Empresarial Real, Via Principal No. 102,
Edificio Real 4, Floor 4,
Tel.: + (51 1) 611-8686; Fax: + (51 1) 611-8689
E-mail: icaosam@icao.int

Western and Central African (WACAF) Office

ICAO, Western and Central African Office
Leopold Sedar Senghor International Airport
P.O. Box 38050, YOFF, Dakar, Sénégal
Tel.: + (221) 33 869 24 24; Fax: + (221) 33 820 32 59;
E-mail: icaowacaf@dakar.icao.int

ICAO websites related to airworthiness**Flight Safety Information:** www.icao.int/fsix

This site is intended as a portal to existing safety-related websites as well as a place to exchange information through various newsgroups. This site contains the following areas:

Resolving Safety Deficiencies – Material to help States resolve safety deficiencies grouped by topic based on the results of ICAO audit reports. It also contains information on how to set up a Regional Safety Oversight Organization, which is one path for a set of States to pool resources to solve safety deficiencies.

Safety Oversight Information – Contains links to audit reports as well as to the ICAO Universal Safety Oversight Audit Programme page which is restricted to Contracting States. It also contains links to information on aircraft accidents and incidents as well as aircraft registration.

Regulations – Provides links to the civil aviation regulations of Contracting States.

Safety Management – Refers to the ICAO Safety Management initiative website.

Safety-Related Links – Contains links to other ICAO and industry safety initiatives.

Website links for civil aviation authorities and International Organizations:

<http://www.icao.int/Pages/links.aspx>

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PART I
DEFINITIONS AND ABBREVIATIONS

GLOSSARY

DEFINITIONS

When the following terms are used in this manual, they have the meanings shown. Specific definitions found in Annexes 1, 6, 7, 8 and 16 are reproduced to facilitate their use in this manual. The additional definitions are appropriate to use in this document only.

Aeronautical product. Any aircraft, aircraft engine, aircraft propeller or a part to be installed thereon.

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.

Aeroplane system. An aeroplane system includes all elements of equipment necessary for the control and performance of a particular major function. It includes both the equipment specifically provided for the function in question and other basic related aeroplane equipment such as that required to supply power for the equipment operation. The engine is not considered to be an aeroplane system.

Air operator certificate (AOC). A certificate authorizing an operator to carry out specified commercial air transport operations.

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.

Aircraft operating manual. A manual, acceptable to the State of the Operator, containing normal, abnormal and emergency procedures, checklists, limitations, performance information, details of the aircraft systems and other material relevant to the operation of the aircraft.

Note.— The aircraft operating manual is part of the operations manual.

Airworthiness Directive (AD). A regulatory document which identifies aeronautical products in which an unsafe condition exists, and where the condition is likely to exist or develop in other aeronautical products of the same type design. It prescribes mandatory corrective actions to be taken or the conditions or limitations under which the aeronautical products may continue to be operated. The AD is the common form of mandatory continuing airworthiness information mentioned in Annex 8.

Airworthiness Standards. Detailed and comprehensive design and safety criteria applicable to the category of the aeronautical product (aircraft, engine and propeller) that satisfy, at a minimum, the applicable standards of Annex 8.

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.

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.

Approved maintenance organization. An organization approved by a Contracting State, in accordance with the requirements of Annex 8, Part II, Chapter 6 — Maintenance Organization Approval, to perform maintenance of aircraft, engine, propeller or parts thereof and operating under supervision approved by that State.

Note.— Nothing in this definition is intended to preclude that the organization and its supervision be approved by more than one State.

Certificate holder. An individual or organization that meets the established requirements and functions at the level of competency and safety required by the State to undertake an aviation-related activity for which it has been licensed, certified, authorized and/or approved to perform.

Certification basis. The applicable airworthiness and environmental standards established by a State as the basis by which the type design of an aeronautical product, or change to that type design, is approved or accepted. The certification basis may also include special conditions of airworthiness, findings of equivalent level of safety, and/or exemptions when determined by the State to apply to the type design.

Certification maintenance requirement. Scheduled maintenance that is required by design to help show compliance with the appropriate type certification basis by detecting the presence of a safety-significant latent failure that would result in a hazardous or catastrophic failure condition.

Configuration deviation list (CDL). A list established by the organization responsible for the type design with the approval of the State of Design which identifies any external parts of an aircraft type which may be missing at the commencement of a flight, and which contains, where necessary, any information on associated operating limitations and performance correction.

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

Environmental Standards. The specifications defined in Annex 16 — *Environmental Protection* for the certification of aircraft noise and engine smoke and gaseous emissions, including the standards for the prevention of intentional fuel venting into the atmosphere.

Equivalent level of safety. As used in type certification, a finding where literal compliance with a specific airworthiness requirement cannot be demonstrated but compensating factors exist in the type design that can be shown to provide a level of safety equivalent to that intended by the certification basis.

Exception/Exemption. A relief from compliance with the requirement(s) of airworthiness or environmental standards, or operating rules, based on the determination by a civil aviation authority that granting such relief will not adversely affect safety.

Extended diversion time operation (EDTO). Any operation by an aeroplane with two or more turbine engines where the diversion time to an en-route alternate aerodrome is greater than the threshold time established by the State of the Operator.

EDTO — configuration, maintenance and procedures (CMP) requirements. The particular aeroplane configuration minimum requirements including any special inspection, hardware life limits, master minimum equipment list (MMEL) constraints and maintenance practices found necessary to establish the suitability of an airframe-engine combination for extended diversion time operation.

EDTO — significant system. An aeroplane system whose failure or degradation could adversely affect the safety particular to an EDTO flight, or whose continued functioning is specifically important to the safe flight and landing of an aeroplane during an EDTO diversion.

Failure condition. The effect on the aircraft and its occupants, both direct and consequential, caused or contributed to by one or more failures, considering relevant adverse operational or environmental conditions.

Instructions for continuing airworthiness (ICA). A set of descriptive data, maintenance planning and accomplishment instructions, developed by a design approval holder in accordance with the certification basis for the aeronautical product. The ICAs provide air operators with the necessary information to develop their own maintenance programme and also for approved maintenance organizations to establish the accomplishment instructions.

Latent failure. A failure that is not detected and/or enunciated when it occurs.

Life-limited part. Any part for which a mandatory replacement limit (in hours, cycles or calendar time) is specified in the type design, the mandatory continuing airworthiness information or instructions for continuing airworthiness. These parts must be permanently removed from service on or before this limit is reached.

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

Maintenance 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.

Major modification. In respect of an aeronautical product for which a type certificate has been issued, a change in the type design that has an appreciable effect, or other than a negligible effect, on the mass and balance limits, structural strength, engine operation, flight characteristics, reliability, operational characteristics, or other characteristics or qualities affecting the airworthiness or environmental characteristics of an aeronautical product.

Major repair. Any repair of an aeronautical product that might appreciably affect the structural strength, performance, engine, operation flight characteristics or other qualities affecting airworthiness or environmental characteristics.

Mandatory Continuing Airworthiness Information (MCAI). The mandatory requirements for the modification, replacement of parts, or inspection of aircraft and amendment of operating limitations and procedures for the safe operation of the aircraft. Among such information is that issued by Contracting States in the form of airworthiness directives.

Master minimum equipment list (MMEL). A list established for a particular aircraft type by the organization responsible for the type design with the approval of the State of Design containing items, one or more of which is permitted to be unserviceable at the commencement of a flight. The MMEL may be associated with special operating conditions, limitations or procedures.

Minimum equipment list (MEL). A list which provides for the operation of aircraft, subject to specified conditions, with particular equipment inoperative, prepared by an operator in conformity with, or more restrictive than, the MMEL established for the aircraft type.

Minor modification. A modification other than a major modification.

Minor repair. A repair other than a major repair.

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.

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

Operator's maintenance control manual. A document which describes the operator's procedures necessary to ensure that all scheduled and unscheduled maintenance is performed on the operator's aircraft on time and in a controlled and satisfactory manner.

Organization 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.

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.

Propulsion system. A system consisting of an engine and all other equipment utilized to provide those functions necessary to sustain, monitor and control the power/thrust output of any one engine following installation on the airframe.

Repair. The restoration of an aircraft, engine, propeller or associated part to an airworthy condition in accordance with the appropriate airworthiness requirements after it has been damaged or subjected to wear.

Safety management system. A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

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

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

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

State of the Operator. The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

Structural inspection. A detailed inspection of the airframe structure that may require special inspection techniques to determine the continuous integrity of the airframe and its related parts.

Threshold time. The range, expressed in time, established by the State of the Operator to an en-route alternate aerodrome, whereby any time beyond requires an EDTO approval from the State of the Operator.

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 design. The set of data and information necessary to define an aircraft, engine or propeller type for the purpose of airworthiness determination.

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ABBREVIATIONS

When the following abbreviations and acronyms are used in this manual, they have the meanings shown.

AD	Airworthiness directive
AED	Airworthiness engineering division
AFM	Aircraft flight manual
AID	Airworthiness inspection division
ALI	Airworthiness limitation items
AMO	Approved maintenance organization
AOC	Air operator certificate
APU	Auxiliary power unit
CAA	Civil aviation authority
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CDL	Configuration deviation list
CG	Centre of gravity
CMR	Certification maintenance requirements
DGCA	Director General of Civil Aviation
EAMR	Electronic Aircraft Maintenance Records
EDTO	Extended diversion time operations
ETOPS	Extended range twin engine operations
ICA	Instructions for continuing airworthiness
Kg	Kilogram
LoV	Limit of validity
MCAI	Mandatory continuing airworthiness information
MCM	Maintenance control manual
MEL	Minimum equipment list
MMEL	Master minimum equipment list
MOPM	Maintenance organization's procedures manual
MRB	Maintenance review board
MSG	Maintenance steering group
MTOM	Maximum certificated take-off mass
OEM	Original equipment manufacturer
RVSM	Reduced vertical separation minima
SB	Service bulletin
SDR	Service difficulty report
SIP	Structural integrity programme
STC	Supplemental type certificate
TBO	Time between overhauls
TC	Type Certificate
TCB	Type certification board
TSN	Time since new
TSO	Time since overhaul

PART II

**AIRWORTHINESS ORGANIZATIONAL STRUCTURE
AND STATES' RESPONSIBILITIES**

Chapter 1

STATE AIRWORTHINESS RESPONSIBILITIES

1.1 OBLIGATIONS UNDER THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

1.1.1 The Convention on International Civil Aviation was signed at Chicago on 7 December 1944. The preamble states in part, "Whereas the future development of international civil aviation can greatly help to create and preserve friendship and understanding among the nations and peoples of the world. Therefore undersigned governments have agreed on certain principles and arrangements in order that international civil aviation is developed in a safe and orderly manner".

1.1.2 With respect to airworthiness, Article 29 of the Convention provides that every aircraft of a Contracting State, engaged in international navigation, carries a Certificate of Registration and a Certificate of Airworthiness. Article 31 of the Convention provides that the Certificate of Airworthiness is issued or rendered valid by the State in which the aircraft is registered. Furthermore, Article 33 of the Convention requires that Contracting States recognize as valid the Certificate of Airworthiness issued or rendered valid by the State of Registry provided that the requirements under which the certificate was issued or rendered valid are equal to or above the minimum Standards established by ICAO. Article 54 of the Convention allows ICAO to issue Standards and Recommended Practices (SARPs) and to designate them as Annexes to the Convention. The Annexes largely covering the airworthiness of aircraft are:

Annex 6 — Operations of Aircraft

Annex 8 — Airworthiness of Aircraft.

Note.— Annex 1 — Personnel Licensing, Annex 7 — Aircraft Nationality and Registration Marks and Annex 16 — Environmental Protection, also provide the requirements for the licensing of maintenance personnel, registration of aircraft and noise certification, respectively.

1.1.3 Annex 8 outlines a framework of airworthiness standards for the design and manufacture of large aeroplanes, helicopters, small aeroplanes, engines and propellers. Annex 6 outlines minimum requirements for the operation and maintenance of aircraft. Annex 6 is issued in three Parts: Part I — *International Commercial Transport — Aeroplanes*, Part II — *International General Aviation — Aeroplanes*, and Part III — *International Operations — Helicopters*.

1.1.4 Article 12 of the Convention points out that each Contracting State undertakes to keep its own regulations in these respects uniform, to the greatest extent possible, with those established from time to time under this Convention. Through national regulations, States are expected to implement and enforce the Standards contained in the Annexes to the Convention.

1.1.5 Article 37 of the Convention requires each Contracting State to collaborate in securing the highest practical degree of uniformity in regulations, standards, procedures and organization in relation to aircraft. Contracting States have the responsibility for the safe operation and performance of maintenance in accordance with the SARPs. Each State should develop its own airworthiness standards based on the framework provided in Annex 8, or adopt those already developed by another State.

1.1.6 Article 38 of the Convention provides when the State finds it impracticable to comply with any international standard or procedure, or to bring its regulations or practices in accord with any international standard or procedure after amendment, that it notify ICAO of differences between its own practice and that established by the ICAO Standards. ICAO publishes these differences, and each Contracting State can decide if an aircraft from a State that filed a difference can be allowed to operate over its territory.

1.1.7 In the development of national airworthiness regulations and rules, the State of Registry is responsible to make certain that every aircraft on its register conforms to the approved type design in accordance with the airworthiness code it has adopted or accepted for that class of aircraft. The State of Registry also has the responsibility to make certain that every aircraft on its register is maintained in an airworthy condition throughout its operational service life. Therefore, effective continuing airworthiness requirements are most important. Although methods of discharging the foregoing State airworthiness responsibilities may vary, and in some cases may involve the transfer of certain tasks to authorized organizations or other States, such arrangements do not relieve the State of Registry from its overall responsibility (see Annex 8, Part II, 4.2.3).

1.1.8 The State of Registry is responsible for the maintenance performed by an approved maintenance organization (AMO) or any qualified person or organization that is acceptable to the State. A review of the aircraft register and of the authorizations granted to an AMOs or other qualified persons and organizations will assist the State in determining if the operations are within its safety oversight capability. Where this is not the case, the State is urged to take immediate and appropriate actions to enhance the State oversight system.

1.1.9 In those States where the State is both the regulatory authority and an air operator, the requirements of the Convention on International Civil Aviation should be met and public interest should be best served by the separation of authority and responsibility between the State regulatory authority and the State operating agency. The necessary certification procedures should be followed as though the air operator was a non-government entity.

1.1.10 A State regulatory system and safety oversight organization are described in the subsequent chapters of this manual.

1.1.11 A State may find that it does not have the resources to establish a system for the effective certification and oversight of its air operators and/or approval holders. Experience has been gained with the formation of regional safety oversight organizations (RSOO) where economies of scale can be achieved through the sharing and pooling of human and financial resources. The Cooperative Development of Operational Safety and Continuing Airworthiness Projects (COSCAP) were designed to achieve the necessary level of regional cooperation in this context. Guidance is provided in the *Safety Oversight Manual*, Part B — *The Establishment and Management of a Regional Safety Oversight System* (Doc 9734).

1.1.12 As an alternative, for a State in need of assistance and where regional cooperation is not viable, the Director General of Civil Aviation may consider the employment of a competent and independent commercial organization to supply the necessary qualified personnel to perform the required inspection functions in an advisory capacity to the Civil Aviation Authority (CAA). The State retains responsibility under the Chicago Convention and as such is responsible to ensure the delegated tasks are performed in accordance with international and national requirements.

1.2 DISCHARGE OF STATE RESPONSIBILITIES

1.2.1 In order to discharge its overall responsibilities under the Convention, the State needs to enact primary aviation legislation providing the legal basis for the development and promulgation of civil air regulations and practices, including airworthiness regulations, consistent with the Annexes. The State regulatory system should:

- a) represent a well-balanced allocation of responsibility between the State and those persons or

organizations conducting airworthiness-related activities (e.g., provisions for surveillance and enforcement of the regulations);

- b) be capable of economic justification within the resources of the State;
- c) result in a proportional level of rigour where the overall States' safety system can meet and/or increase safety objectives thus realizing a right balance between safety and societal burden (proportionality approach, Part V, Attachment C to Chapter 7);

Note.— Level of rigour is intended as qualifying full or extreme severity of rules and regulations as well as careful accuracy and stringency when adopting procedures for their implementation. A proportional level of rigour should apply flexibility in that respect when supported and balanced by an appropriate assessment of the involved risk to safety.

- d) enable the State to maintain continuing regulation and supervision of the airworthiness activities of the air operator, design organization, manufacturer and maintenance facility without unduly inhibiting their effective direction and control of their organizations; and
- e) result in the cultivation and maintenance of harmonious relationships between the State and those persons or organizations applying airworthiness regulations in practice.

1.2.2 The airworthiness regulatory system to be established will vary depending upon the level of complexity and scope of aviation activity within the State. The airworthiness regulatory system should include:

- a) drafting and amendment of rules relating to the airworthiness of aircraft;
- b) issuance, acceptance or validation of type certificate of aircraft, engine and propeller;
- c) approval and continuing inspection of approved design and production organization of aircraft and parts;
- d) registration of aircraft;
- e) certification and approval of initial applications of air operators (airworthiness aspects);
- f) continuing inspection and surveillance of certificated air operators (airworthiness aspects);
- g) issuance, acceptance or validation of noise certificate;
- h) issuance, renewal and continuing validation of the Certificate of Airworthiness;
- i) approval of maintenance programme;
- j) approval of modifications and mandatory inspection;
- k) approval of repairs;
- l) approval and continuing inspection of AMOs;
- m) monitoring and control of mandatory continuing airworthiness information (MCAI);
- n) approval and continuing inspection of approved maintenance training organizations; and

- o) licensing of aviation personnel.

1.2.3 Through the proper process of registering aircraft and the issuance of the certificates and approvals, the State ensures public safety and interest are addressed. Furthermore, the State will be able to exercise appropriate influence and control of airworthiness activities without encroaching upon its air operators, design organizations, manufacturers and maintenance organizations' responsibilities for safety.

1.3 AIRWORTHINESS RESPONSIBILITIES IN ANNEX 6 AND ANNEX 8

1.3.1 Additional equipment

Annex 6 includes additional aircraft equipment requirements that must be incorporated into the aircraft for particular types of operation. The aircraft should satisfy the airworthiness requirements of Annex 8, but may not be usable for a specific operational task without meeting the additional requirements of Annex 6. Therefore, any specific operational equipment required by Annex 6 should meet the current airworthiness requirements of Annex 8, unless otherwise specified. However, should operational equipment be required by an amendment to Annex 8, the applicable date will be three years after the date of the adoption of the amendments in accordance with Article 41 of the Convention.

1.3.2 Aircraft maintenance

Annex 6 includes provisions for continuing airworthiness of aircraft, including air operators' maintenance responsibilities, the maintenance control manual (MCM), maintenance programme requirements, maintenance record-keeping, modification and repair data approval requirements and maintenance release requirements for qualified persons and authorized organizations other than AMOs. Additionally, Annex 8 provides the requirements for AMO approval as well as the maintenance release requirements for AMOs. These requirements are intended to ensure that an aircraft remains in a safe condition throughout the operational life of the aircraft and continues to conform to the approved design data.

1.4 CONTINUING AIRWORTHINESS RESPONSIBILITIES IN ANNEX 6 AND ANNEX 8

1.4.1 Annex 6 includes a requirement for the air operator to monitor and assess maintenance and operational experience with respect to continuing airworthiness, provide this information as prescribed by the State of Registry and report through a system as specified Annex 8, Part II, Chapter 4. The air operator should also obtain and assess continuing airworthiness information and recommendations available from the organization responsible for the type design and should implement any necessary actions in accordance with a procedure acceptable to the State of Registry.

1.4.2 Annex 8, Part II, 4.2 includes requirements for the continuing airworthiness of aircraft. Along with relevant airworthiness responsibilities of the State of Design, State of Manufacture, State of Registry, and all Contracting States, the chapter also includes requirements for States to transmit information.

1.4.3 Annex 8, Part II, 4.2.1 provides that the State of Design transmits information which it has found necessary for the continuing airworthiness of aircraft and provides notification of the transfer, suspension or revocation of a type certificate.

1.4.4 Annex 8, Part II, 4.2.3 requires the State of Registry, when it first enters an aircraft on its register, to advise the State of Design of such action. This is done to ensure the State of Design will transmit MCAI to the State of Registry.

1.4.5 The State of Registry, upon receipt of MCAI from the State of Design, either adopts the information or will assess the information and take appropriate action.

1.4.6 The State of Registry shall transmit to the State of Design all MCAI originated by it in respect of the aircraft on its register.

1.4.7 The State of Registry shall establish a system where information on faults, malfunctions, defects and other occurrences that may have adverse effects on the continuing airworthiness of the aircraft be transmitted to the organization responsible for type design.

1.4.8 Each Contracting State shall require its air operators, organizations responsible for type design and maintenance organizations to report to its airworthiness authority such information.

Chapter 2

PRIMARY AVIATION LEGISLATION

2.1 INTRODUCTION

2.1.1 Article 12 of the Convention stipulates that a Contracting State is obligated to adopt measures to ensure safety through conformity with international standards in its safety oversight obligations. The elements of a State oversight system include promulgating legislation and regulations and empowering the CAA.

2.1.2 It is important that a State promulgates primary aviation legislation, such as a national civil aviation code or a civil aviation act that establishes a State's civil aviation organization. The Convention in most of its Articles refers to national laws and regulations relating to departure from its territory of civil aircraft engaged in international air commerce. The Convention also refers to State regulations in respect to operation, airworthiness and registration of such aircraft within its territory. Additionally, Article 12 of the Convention requires each Contracting State to keep its own regulations uniform to the greatest extent possible with those established under the Convention. Article 12 of the Convention not only requires uniformity of such regulations with the Convention but obligates States to ensure the prosecution of all persons violating relevant regulations.

2.2 STRUCTURE AND CONTENT

2.2.1 Primary aviation legislation should contain provisions to establish a civil aviation administration that proactively supervises and regulates civil aviation activities. The legislation should contain provisions for the approval and safety oversight of air operators, aircraft maintenance organizations, and maintenance training organizations for the safe operation of aircraft. It should also establish requirements for the qualification and licensing of maintenance personnel. The legislation should also reference appropriate support functions with the establishment of an airworthiness inspection division (AID) and airworthiness engineering division (AED). The AID and AED duties should include the registering of aircraft, airworthiness certification of air operators, issuance and renewal of the Certificate of Airworthiness, issuance of documents attesting noise certification, approval of maintenance organization, approval of maintenance programme, the evaluation and issuance of modification and repair approvals, and the evaluation and issuance of design approvals and approval of manufacturing organizations. In addition to the certification duties it will be necessary for the legislation to stipulate the need for the State to perform surveillance of its aviation industry adequate to ensure that at least annual audits are conducted of its certified air operators, AMOs, training organizations, and design and production organizations. The surveillance programme should sufficiently cover the complexity of the State's aviation industry. The legislation should also contain provisions for the issuance and compliance of mandatory continuing airworthiness information (MCAI), as necessary.

2.2.2 Primary aviation legislation is essential to an effective safety oversight programme. The extent of the CAA's authority and empowerment and that of its Director General of Civil Aviation (DGCA) must be reflected in the legislation thereby giving the CAA a solid foundation in a legal document. The legislation should also provide for the independent airworthiness investigation of aircraft accidents and incidents to ensure impartial and objective investigations to correct shortcomings not only within the aviation industry but also within the CAA.

2.2.3 With the enactment of primary aviation legislation the State can develop and promulgate civil aviation regulations and practices, including airworthiness regulations consistent with the Annexes. In the development of these regulations, the State is responsible to ensure that the regulations are consistent with and relevant to the Convention, Annexes and its aviation industry. Further, the State will need to ensure a process exists for the amendment of its regulations and the notification to ICAO of differences, when necessary.

2.2.4 With the enactment of a comprehensive civil aviation law that allows provisions to establish a civil aviation administration, with competent personnel and ample airworthiness regulations and requirements, the State is encouraged to enact a system of interactive participation in airworthiness matters through the establishment of an AID and, when necessary, an AED. The divisions should enable the State to maintain the well-balanced, continuing certification, surveillance, supervision and certificate management of the air operator, maintenance facilities, maintenance training, maintenance personnel and, when necessary, design and manufacturing organizations without inhibiting the efficiency of the authority's ability to perform its certification and oversight functions. Accident and incident prevention provisions should be referenced in the legislation to enable the CAA to focus towards continuous improvement in regard to the performance of maintenance and other airworthiness matters within the State.

2.2.5 The promulgation of civil airworthiness regulations and procedures is necessary for the CAA to effectively discharge its official airworthiness responsibilities and to carry out those duties associated with the design, manufacture, operation, maintenance of aircraft and aeronautical products and the certification of maintenance personnel consistent with the Chicago Convention and its Annexes.

Note.— Guidance on the establishment of a State's Safety Oversight System is available in the Safety Oversight Manual (Doc 9734), Part A — The Establishment and Management of a State Safety Oversight System.

Chapter 3

STATE REGULATORY SYSTEM

3.1 GENERAL

3.1.1 The State's law and regulations should conform to the Chicago Convention and its Annexes. The regulations may be viewed as minimum requirements that may be exceeded by the certificate holder. Contracting States are responsible for developing regulations with sufficient detail that, at a minimum, support the complexity of the aviation industry within their State and achieve a satisfactory level of safety. The development of regulations should include an amendment process that includes publishing the amendment for comment within the State. The comment review process should consist of a review, consideration, disposition, and appropriate revision of any proposed amendment. The review should take into consideration the benefit to aviation safety, the public's ability to comply with the amendment and any potential undue burden the amendment may pose on the industry.

3.1.2 Annexes are published to supplement the Convention, as referenced in Article 54. Annexes specify SARPs that a Contracting State can reference in order to ensure the highest practicable degree of uniformity in its national regulations. Regulations developed by States should be supported by law. The law should address the types of regulations necessary to facilitate a capable authority oversight system and licensing system. The regulations should also address the requirements needed for the applicability, qualification, certification, design, manufacturers, maintenance organizations, training organizations, air operators, and aircraft engaged in international air transportation to be consistent with the Annexes. In some instances States may have a need to develop regulations that go beyond the minimum standards. In this case, States should expect the certificate holder, e.g. air operator or AMO, to take responsibility in providing a specific expectation, for example, approval of major modification and repair designs by the CAA, prior to returning the aircraft to service.

3.1.3 A State's regulations should be worded in legal terms and written so they can be used by the authority in licensing, certificating and approvals during the day-to-day functions of the State safety oversight system. The regulations should be performance based and form a framework of a minimum standard unless the provision calls for a higher standard.

3.1.4 The State has an option of adopting other Contracting States' regulations. Adopting another State's regulations has some advantages but should be considered only after ensuring the other State's regulations are consistent with the ICAO Standards. The complexity of the other State's aviation environment should also be considered. A State with a limited aviation environment should be careful not to place an undue burden on its aviation community by adopting complex regulations. A State may consider adapting its regulations to meet the needs of its aviation environment while still maintaining consistency with other States. A State adopting regulations from another Contracting State would be expected to maintain a currency with the amendments of the adopted regulations and report differences to ICAO in accordance with Article 38 of the Convention.

3.1.5 Article 38 of the Convention specifies if the State finds it impracticable to comply in all respects with any international standards or to bring its own regulations in full accord with international standards as amended, or if it deems it necessary to adopt regulations or practices differing from ICAO Standards, the State immediately notifies ICAO of the differences between its own practice and that established by the international standards. ICAO is obliged to immediately notify all other States of the difference which exists between one or more aspects of the Standard and the corresponding national practice of the notifying State. Several Articles of the Convention make it clear that if standards adopted by a State are lower than those required by ICAO, aircraft, certificate holders, or persons with licenses or certificates may not be able to participate in international air navigation, except with the permission of the State or States whose territory is entered. A State may request blanket permission on behalf of its certificate holders or licence holders.

3.1.6 Compliance with the regulations is not optional. Occasionally, there might be an instance where there is a geographical, physical or operational environmental problem that places an undue burden upon the certificate holder in complying with the relevant regulation. With well documented regulations in place a State may grant an exception or exemption to a regulation provided there exists a mechanism within the State's criteria to establish that exception or exemption. The relief granted should be considered the exception and not the norm. The person requesting relief should prove that the current requirement places an undue burden upon the certificate holder. A risk assessment should also be conducted to ensure that the exemption sought will not cause an adverse impact towards safety. The request for exemption should also contain an equivalent level of safety commensurate with the regulation and will be practiced should the exemption be granted by the State. If an exemption is granted it should be accompanied by conditions and limitations, including a time limitation to the exemption. The authority granting the exemptions should monitor such exemptions to ensure that continuation of the relief is warranted.

3.2 AIRWORTHINESS REGULATIONS

The airworthiness regulations developed, adopted or accepted by the State should include provisions for:

- a) mandatory registration of all aircraft;
- b) implementation of the airworthiness provisions meeting the requirements of the Convention and the Annexes;
- c) all aircraft on the State's aircraft register to meet relevant airworthiness criteria approved or adopted by the State;
- d) the issuance, validation or acceptance of the type certificate for aircraft intended to be entered on the State's aircraft register;
- e) the issuance of production certificates or approvals of manufacturing organizations when applicable;
- f) the issuance, renewal, validation or acceptance of aircraft certificates of airworthiness;
- g) the issuance of export certificates of airworthiness;
- h) the issuance or acceptance of ADs, bulletins and orders;
- i) the issuance, amendment, cancellation and suspension of airworthiness approvals, licences and certificates;
- j) the authorization of persons or organizations, on behalf of the CAA, to perform particular tasks in relation to the design, manufacture and maintenance of aircraft, components and parts for the issuance of State approvals, licences and certificates, as appropriate;
- k) the authorization of persons and organizations, on behalf of the CAA, to inspect and test aircraft, aircraft components, standard parts, materials or processes and systems for the purpose of ascertaining whether the processes and activities covered by an approval, licence or certificate have been carried out in a satisfactory manner, as appropriate; and

- l) the imposition of penalties for a contravention of, or failure to comply with, a provision of the State's civil aviation laws, regulations or directives, or conditions issued, given, made or imposed under, or in force by virtue of, the State laws, regulations or directives.
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Chapter 4

AIRWORTHINESS ORGANIZATION

4.1 STRUCTURE OF THE CAA

4.1.1 Pursuant to delegated authority, the Director General of Civil Aviation (DGCA) should establish an effective organization and employ the necessary qualified personnel to carry out its responsible functions. The structure and size of the CAA's airworthiness organization will vary considerably depending on the number, size and complexity of civil air operations (commercial and private) in the State and on the size and scope of the State's aviation manufacturing and maintenance industry.

4.1.2 In deciding upon the required airworthiness organizational structure, the DGCA should review the requirements for certification and surveillance of air operators as outlined in this Airworthiness Manual and also in the *Manual of Procedures for Operations Inspection, Certification and Continued Surveillance* (Doc 8335), in light of the number and size of potential air operators in the State. The DGCA should consider the level of civil aviation activity and the size of the State's aviation manufacturing and maintenance industry when establishing the organizational structure. In those States where there are extensive aviation operations, manufacturing and maintenance, it will generally be necessary to establish within the CAA airworthiness organization an airworthiness engineering division (AED) and an airworthiness inspection division (AID). The establishment and functioning of these two divisions are discussed in this manual. To be effective, the CAA should provide an adequate level of administrative support, including comprehensive information technologies, facilities, and means of transportation for members of the organization.

4.1.3 It is also recognized that a State or group of States may elect to discharge their responsibilities through agreements with a regional safety oversight organization or agency. It is essential that the agreements clearly define the respective functions each party is to perform, so as to ensure that all obligations of the States are fully discharged. Responsibility for proper execution of ICAO SARPs remains with the Contracting State.

Note.—The Safety Oversight Manual (Doc 9734), Part B — The Establishment and Management of a Regional Safety Oversight Organization provides guidance on such agreements.

4.1.4 In those States which do not have an aviation manufacturing industry, the airworthiness organization within the CAA will be mainly concerned with inspection, authorization and approval functions. Furthermore, in some States which do not have an aviation manufacturing industry and the size and number of commercial and general aviation operations is relatively small, the responsibilities of the DGCA may be fulfilled in a more cost-effective manner through cooperative inspection arrangements with neighbouring States or regional inspection organizations. Where the frequency of certain airworthiness inspection or examination activities is low, such as the activity associated with the validation of type certificates and issue of certificates of airworthiness, it may be advantageous to enter into an arrangement for another State or an approved organization or person to perform work on behalf of the State of Registry. The State of Registry remains responsible under the Convention for the work performed.

Note.— The ICAO Regional Office accredited to the State may be of assistance to the DGCA in working out cooperative inspection arrangements.

4.1.5 The DGCA must ensure that the CAA retains effective control of important inspection functions. Such functions should not be delegated in such a manner that commercial air operators, aircraft manufacturers, maintenance

facilities and general aviation aircraft owners, in effect, regulate themselves in airworthiness matters. Regardless of the organizational arrangements established, the DGCA must bear in mind that the obligations of each State to comply with the provisions of Annexes 6 and 8 remain unchanged.

4.1.6 The Convention requires that a number of approvals be issued by the State, but the CAA may wish to authorize an organization or a delegated person to make approvals on behalf of the CAA. A system of delegations implemented by the CAA will generally satisfy this requirement, providing it incorporates the following features:

- a) the national law and/or regulation permit the CAA to designate its functions;
- b) the standards to be achieved are clearly documented by the CAA. A designee can apply only a documented standard approved by the CAA;
- c) the designees are required to meet technical and regulatory competency requirements and are authorized to make approvals only in areas of their demonstrated competence;
- d) the CAA has an interest in the continuing proficiency of the designees and monitors their continued training so that they remain competent in the fields of their authorization;
- e) the designees' procedures have been approved by the CAA, and the CAA audits the designees to ensure they follow those procedures. The procedures should clearly identify where an approval is made, and will normally include a clear differentiation between the development of data and the approval of that data;
- f) the basis for making the approval is clearly documented; and
- g) the designees make approvals for and on behalf of the CAA.

An approval made by a correctly authorized designee will be accepted as if it was made by the CAA. However, responsibility for the issuance of the approval remains with the State.

Note.— The Safety Oversight Manual (Doc 9734), Part B — The Establishment and Management of a Regional Safety Oversight Organization provides guidance on such arrangements.

4.2 GENERAL FUNCTIONS AND RESPONSIBILITIES

The major function of the airworthiness organization is to provide technical advice to the DGCA on all matters affecting it including:

- a) design and manufacturing approvals and continuing airworthiness of the design, when applicable;
- b) granting or validation of aircraft noise certification and issuance of attestation of noise certification;
- c) continuing airworthiness of aircraft and parts thereof;
- d) issuance of approvals based on the successful assessment of maintenance organizations, air operators, aircraft maintenance training organizations, and aircraft maintenance technician/engineer/mechanic;
- e) approval of modifications and repairs;

- f) issuance of approvals (Certificate of Airworthiness, Certificate of Airworthiness for Export and special flight permits), based on the successful assessment of aircraft produced in the State or of foreign-manufactured aircraft intended to be placed on the State aircraft register;
- g) the manufacture of aeronautical products in the State, when applicable;
- h) registration of aircraft;
- i) issuance and renewal of certificates of airworthiness;
- j) taking of appropriate action with MCAI;
- k) continuing airworthiness oversight, enforcement actions;
- l) training and licensing; and
- m) distribution of airworthiness information to the public.

The specific responsibilities assigned within the airworthiness organization will vary somewhat depending upon the scope of the aviation industry in the State, but should normally include those tasks defined in this chapter.

4.3 REGULATIONS, POLICIES AND GUIDANCE

The airworthiness organization should:

- a) develop national airworthiness regulations, standards, policy and guidance;
- b) amend, as appropriate, national airworthiness regulations, policy and guidance, based on a continual review of the viability and effectiveness of those regulations, policy and guidance;
- c) examine changes in ICAO requirements for incorporation into national requirements, or the filing of appropriate differences;
- d) examine current and, as necessary, new foreign regulations and determine the need for adoption of critical features of the foreign regulations in the national requirements;
- e) establish working relationships with other CAAs and industry that facilitate the certification of foreign aeronautical products to enable their import and export;
- f) conduct research and development, as necessary, to support issuance of regulations, standards, policy and guidance; and
- g) identify and resolve regulatory problems associated with continuing airworthiness and establish appropriate general and technical regulations, policies and procedures.

4.4 SURVEILLANCE, INVESTIGATIONS AND ENFORCEMENT

The airworthiness organization should:

- a) develop and implement periodic surveillance programmes based on the airworthiness complexity of the aviation industry. These programmes should include, but not be limited to, design organizations, manufacturers, air operators, maintenance organizations, maintenance training organizations and delegated tasks;
- b) establish a programme for the surveillance of operations by foreign air operators;

Note.— The Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335) provides guidance on the surveillance of operations by foreign air operators.

- c) perform periodic and unannounced surveillance of industry activities to ensure compliance with national requirements and ICAO Standards. This includes:
 - i) ensuring the proper functioning of any designees or designation systems;
 - ii) evaluating changes to a certificate or approval to ensure continued compliance with the applicable airworthiness requirements;
 - iii) coordinating requests for deviations from requirements and specifications, and ensuring adequate treatment for those deviations;
 - iv) discovering and assessing industry problems which threaten timely and satisfactory achievement of safety objectives related to national requirements, including issuing recommendations for corrective action; and
 - v) witnessing critical tests performed and approving testing methods and test reports.
- d) investigate major problems or defects discovered in aeronautical products or parts in service, and determine appropriate corrective action to be taken, when the airworthiness objectives of national requirements are not being met;
- e) monitor manufacturer's service bulletins (SB) to consider their implications on design, production and maintenance;
- f) evaluate accidents, incidents and service difficulties to determine possible unsatisfactory designs or processes; and
- g) take enforcement action, when necessary, to ensure compliance with airworthiness requirements.

4.5 STAFFING AND TRAINING

4.5.1 General

4.5.1.1 In order to meet its responsibilities, the airworthiness organization must be staffed with qualified, experienced and competent personnel capable of successfully undertaking the wide variety of tasks required in aviation safety oversight. The conditions of service and remuneration should be consistent with their education, technical knowledge and experience.

As a guide, the conditions of service and remuneration should be comparable to airworthiness personnel whose activities they will audit, certificate, and supervise. The CAAs need to ensure that they attract and retain technically competent personnel with the credibility and competence to interact with industry in an efficient and effective manner. It is essential that the personnel be selected with considerable care. To carry out the functions of certification and oversight, all airworthiness personnel should be appropriately qualified and hold appropriate credentials issued by the State identifying them as experts with unhindered access to inspect aerodromes, aircraft and documents, and the facilities and offices of air operators, AMOs and maintenance training organizations.

4.5.1.2 In addition to the importance of technical competency in performing certification, inspection and surveillance functions, it is critical that inspectors possess a high degree of integrity, be impartial in carrying out their tasks, be tactful, have a good understanding of human nature and possess good communication skills. Considering the specialized and sensitive nature of the CAA inspector's mission, it is vitally important that the qualifications, previous experience and personal characteristics of each person employed, whether directly or on contract, to perform licensing, certification, inspection and surveillance duties be verified and carefully evaluated before selections are made.

4.5.1.3 It is preferable that personnel also possess aeronautical licenses, certificates and/or aeronautical degrees commensurate with their job responsibilities (e.g. engineering degrees, aircraft maintenance license).

4.5.1.4 The State's technical personnel performing certification and surveillance functions on behalf of the State should be at least as qualified as the personnel to be inspected or supervised. Although the CAA aviation inspector should be fully qualified, it is not expected that in all cases any one inspector within the airworthiness organization would possess the same experience as all the personnel being audited. However, the organization, as a team, should have personnel who are knowledgeable, qualified and experienced in the appropriate areas of the organization being inspected.

4.5.1.5 States may determine it is not feasible to maintain a full range of CAA technical personnel to carry out completely the CAA safety oversight function. The State may consider an option to establish a small, technically competent and experienced core of CAA technical personnel. To supplement this experienced CAA unit in carrying out its full safety oversight responsibilities, the CAA may consider entering into an agreement with other States for assistance, on a part-time or cooperative basis. Additionally, the CAA may also consider the employment of a competent commercial organization that would supply the qualified personnel as needed to perform the required inspections in an advisory capacity for the CAA.

Note.— The ICAO Regional Office accredited to the State may be of assistance in working out cooperative inspection arrangements among States in the region.

4.5.1.6 It must be clear that regardless of the arrangements made by a State, it is in no way relieved of the ultimate responsibility for the safe, regular and efficient conduct of aviation within its jurisdiction.

4.5.2 AED staff qualification and experience

An AED staff generally should:

- a) have the relevant knowledge, background and experience related to the design, manufacture and airworthiness certification of aircraft and its related aeronautical products within the scope of the national regulations;
- b) have the proficiency necessary to apply design and manufacture standards relating to the original airworthiness certification of aircraft and component parts to ensure the prototype, modified aircraft or parts meet national airworthiness requirements;

- c) be proficient in the skills necessary to audit manufacturing operations that will ensure compliance with national airworthiness requirements, design specifications and safety standards;
- d) be able to make national airworthiness compliance determinations with regard to manufacturing operations and be able to ensure that the organization conforms to their quality control programme. In making these determinations, the staff member should have prior experience with first article, in process, final assembly inspections, and/or special process functions, e.g., heat treatment, brazing, welding, plating, robotics, software quality control and non-destructive testing; such experience can come from engineering or quality control positions at manufacturing organizations;
- e) be able to make airworthiness determinations and issue initial certificates of airworthiness including export certificates of airworthiness;
- f) have good writing skills in order to communicate clearly in writing any shortcomings detected during certification or surveillance ensuring that timely corrective action is taken; and
- g) have good interpersonal skills to conduct meetings and audits in a fair and professional manner.

4.5.3 AID inspector qualification and experience

An AID inspector generally should:

- a) have the relevant knowledge, background and appropriate experience related to aircraft continuing airworthiness management including:
 - i) aircraft maintenance programme development, approval and control, including applicable reliability programmes;
 - ii) evaluation and approval of modifications and repairs;
 - iii) maintenance release;
 - iv) applicability of MCAI and operational directives with a continuing airworthiness impact;
 - v) correction or deferment of defects;
 - vi) coordination of scheduled maintenance, the application of MCAI, the replacement of life-limited parts and the inspection of components;
 - vii) management of continuing airworthiness records;
 - viii) airworthiness requirements of relevant parts of operations specifications; and
 - ix) knowledge of quality systems;
- b) have experience in the actual performance of maintenance, repair and modification of aircraft, engines and aircraft systems or components in one or a combination of the following:
 - i) AMO;
 - ii) approved air operator maintenance facility;

- iii) approved maintenance training organization;
- iv) military aircraft repair facility; or
- v) maintenance facility of an appropriate State government agency;
- c) hold an aircraft maintenance license;
- d) have experience in certifying as airworthy aircraft or parts after maintenance has been performed in accordance with national regulations;
- e) have experience with the requirements for issuing a maintenance release for maintenance work performed;
- f) be able to make national airworthiness compliance determinations with regard to the auditing of air operators, AMOs and approved aircraft maintenance training organizations;
- g) have good writing skills in order to communicate in writing any shortcomings detected during certification or surveillance ensuring that timely corrective action is taken; and
- h) have good interpersonal skills to conduct meetings and audits in a fair and professional manner.

4.5.4 Qualification of AID inspectors by academic study

4.5.4.1 Ideally, an AID inspector should be as qualified as the personnel to be inspected or supervised. This is usually accomplished by the inspectors having previous engineering or aircraft maintenance experience. There may be occasions where there is a shortage of such qualified AID inspectors as described in 4.5.3. As an alternative and on a case-by-case basis, AID inspectors may be deemed qualified by the successful completion of a course of relevant academic aeronautical study at a recognized approved training organization or university.

4.5.4.2 To perform their duties adequately it is important that these new inspectors undergo a comprehensive technical on-the-job training programme that provides the inspector with the necessary expertise, experience and skills necessary to perform the tasks required of an AID inspector. The new inspector should be teamed with an experienced inspector who will ensure the on-the-job training is performed and documented. AID inspectors holding academic credentials with no previous aircraft maintenance experience should only be appointed in extraordinary circumstances.

4.5.5 Training requirements

4.5.5.1 The CAA should determine the minimum qualifications for their technical personnel performing safety oversight functions and also provide for their technical training on an initial and recurrent basis. Additionally, periodic practical and specialized technical training including supervisory courses will enable the technical personnel to perform their duties effectively. Training should not be limited to strictly professional elements; technical personnel should receive training on subjects such as applicable CAA regulations, inspector handbooks, auditing techniques, safety management systems (SMS) and quality systems, Human Factors principles, enforcement procedures and topics dealing with advances in aviation technology.

4.5.5.2 The CAA should have an indoctrination programme for induction of new personnel that includes training in:

- a) organizational responsibilities;

- b) appropriate airworthiness standards, practices and policies;
- c) working procedures;
- d) certification and surveillance procedures; and
- e) the role of a regulator.

4.5.5.3 The CAA should have a structured programme to educate the personnel on new CAA requirements, policies and procedures as they are being implemented. To keep personnel abreast of new industry developments a training programme should be developed that provides at regular intervals (initial and recurrent) technical training to gain first-hand knowledge of new developments, including management principles. As a general policy, it is not desirable for CAA personnel to obtain technical qualifications from those entities under their direct regulatory jurisdiction.

4.5.6 On-the-job training

To further ensure a structured training environment a CAA should consider an on-the-job (OJT) training programme that ensures new inspectors are mentored by experienced inspectors in all tasks the inspector is required to perform on behalf of the CAA prior to performing the tasks unaccompanied. The OJT training should be comprehensive and cover the CAA regulations, policies, procedures and current practices. The OJT should allow for the new inspector to observe the experienced inspector actually perform the task. Once this has occurred the new inspector should perform the task being observed and coached by an experienced inspector. Following this the new inspector is debriefed by the experienced inspector. The new inspector then performs the task and is evaluated by an experienced inspector. The new inspector should be evaluated on successfully performing the task in accordance with CAA requirements. The new inspector training records should be updated upon successful completion of each OJT task.

4.5.7 Nomination of AID inspectors

The CAA should have a process to nominate and authorize appropriately qualified technical personnel as inspectors. The process of authorizing an inspector should consider the following:

- a) qualifications of personnel;
- b) training provided (including specialized training); and
- c) OJT completed.

The CAA should issue inspectors with the appropriate credentials (e.g. letter of nomination or authority card) identifying them as technical experts employed by the State authorities, with the right to unhindered access to inspect aircraft, documents and other relevant facilities, as well as normally restricted civil aviation-related sites.

4.6 AIRWORTHINESS ENGINEERING DIVISION (AED) RESPONSIBILITIES

4.6.1 General

4.6.1.1 States with a significant aviation manufacturing industry should establish an airworthiness engineering division (AED) within the CAA airworthiness organization. The size and structure of the AED should be appropriate to the

aviation manufacturing industry and the various types of aircraft on the State's aircraft register. The AED's activity will normally be directed toward design approvals, type certification, manufacturing approvals, evaluations of modifications and repairs proposed by manufacturers, aircraft owners, air operators, and AMOs, to correct deficiencies of aircraft already in service.

4.6.1.2 In States with significant manufacturing activity it may be useful to organize the AED along functional lines by organizing sections dealing with specific technical specialties, such as structures, propulsion, electrical and mechanical systems (including software), certification of production organizations, and surveillance and oversight functions. Furthermore, specialized areas such as non-destructive inspection, plating, welding, software quality assurance and special manufacturing processes should be considered.

4.6.1.3 When the physical size of the State is large and the level of aviation activity is relatively high, it may be necessary to establish regional offices in the proximity of the aviation industry. In such cases, it is necessary that proper lines of communication and responsibility exist between headquarters and regional offices.

4.6.2 Approvals and certificates

The AED should:

- a) approve design organizations and ensure they have the technical competency and organization to enable them to show compliance with the appropriate design requirements and national requirements;
- b) validate or accept aircraft type certificates issued by another State including its components, engines, systems, instruments and equipment;
- c) issue type certificates or design approvals for aircraft, including its components, engines, systems, instruments and equipment;
- d) grant or validate aircraft noise certification;
- e) evaluate and approve modification and repair designs;
- f) issue production certificates or approval for a manufacturer that produces aeronautical products or parts;
- g) amend a production certificate or approval, as necessary;
- h) approve manufacturing organizations and ensure proper communication with the design organization. Ensure the adequacy of manufacturing and test facilities, the competence of skilled personnel, and the existence of satisfactory quality control systems, including coverage of suppliers;
- i) evaluate aircraft for issuance or validation or acceptance and maintenance of type data of aircraft on the register of the State;
- j) issue special flight permits for aircraft that do not meet applicable airworthiness requirements, but are capable of safe flight (e.g. prototype aircraft or production flight tests); and
- k) issue initial certificates of airworthiness for aircraft on the State aircraft register or in preparation for export to another State.

4.6.3 Support of type certification activities

The AED should:

- a) review and process an application for issuance of a type certificate for an aircraft, engine, or propeller, designed or manufactured domestically;
- b) participate in and manage the activities of the type certification board (TCB) as they apply to manufacturing processes and techniques to be used (guidelines for the establishment of a TCB are given in Part V, 2.2.5 of this manual);
- c) inspect prototype aircraft, test specimens and test installation, as necessary. This includes:
 - i) determine the conformity of each part, article and test installation with its applicable design data, as well as with the approved test proposal; and
 - ii) issue conformity inspection reports;
- d) evaluate proposals pertinent to manufacturing aspects of the design, repair and modification of an aircraft or its parts to ensure conformity with CAA specifications; and
- e) support flight preparation.

4.6.4 Continuing airworthiness functions

The AED should:

- a) ensure that a system is in place through which the air operator will report malfunctions, failures, defects and other occurrences that might cause adverse effects on continuing airworthiness to the type design organization. Ensure the type design organization, under its authorization, reviews the reports it receives on malfunctions, failures, defects and other occurrences that might cause adverse effects on continuing airworthiness and takes appropriate corrective action(s) on unsafe conditions, where necessary;
- b) monitor SBs from the manufacturer (both foreign and domestic) to determine likely effects on the continuing airworthiness of aeronautical products and to establish procedures to avoid or correct service difficulties;
- c) mandate actions to correct any unsafe conditions and disseminate the information to all air operators and to CAAs located in States that have the affected aeronautical product on their respective national aircraft register;
- d) ensure that a system is in place for the receipt, review and appropriate action on MCAI from the State of Design;
- e) ensure that a structural integrity programme (SIP) is in place for each aeroplane above 5 700 kg MTOM and monitor its effectiveness with a view to determine the need for supplemental inspections to maintain the aircraft in airworthy condition;
- f) participate in maintenance review board (MRB) activities related to the development and approval of initial maintenance and inspection requirements for newly type certificated aircraft and engines being introduced into service for the first time; and

- g) prepare and recommend regulatory changes and amendments to the national aviation legislation concerning all matters of airworthiness within the scope and function of the AED.

4.6.5 Duties and responsibilities

The AED should:

- a) develop standards and procedures for the type certification of an aircraft including its components, engines, systems, instruments and equipment in conformity with Annex 8;
- b) develop and evaluate changes in engineering standards, procedures and practices to reflect current requirements and limitations and to keep pace with changes in aviation technology;
- c) evaluate engineering and airworthiness of new aircraft designs with regard to structures, applied air and ground loads, dynamics, stress analysis, structural testing and materials;
- d) analyse aerodynamic performance, flying qualities and systems functioning during the certification process to determine compliance with the applicable airworthiness standards;
- e) monitor manufacturers' engineering work for the design and testing of aircraft engines, propellers, equipment and instruments to ensure compliance with airworthiness requirements and related manufacturing specifications;
- f) evaluate proposals relevant to the engineering aspects of the design, repair and modification of an aircraft engine;
- g) evaluate proposals relevant to the design and modification of systems, instruments and equipment, including their installations;
- h) evaluate, plan and coordinate complex aircraft modifications;
- i) evaluate proposals for major repairs to aircraft and its components, engines and propellers;
- j) evaluate effects of specific engineering changes on aerodynamics, flight dynamics, performance, and stability and control of an aircraft;
- k) evaluate equipment and materials to be used in aircraft construction and modifications to ensure their conformity with CAA specifications;
- l) investigate unsatisfactory occurrences to identify and prepare necessary design, maintenance and operational corrections;
- m) process all continuing mandatory airworthiness information initiated by the manufacturers and air operators in the State and review of mandatory continuing airworthiness information issued by manufacturer of imported aircraft and recommend implementation action in coordination with the AID;
- n) evaluate reports of accidents, incidents and malfunctions with a view to determine trends for unsatisfactory design features and take action on cases that affect aviation safety;
- o) monitor aerodynamic performance, structural integrity and system functioning of aircraft in service and scrutiny of failures and service difficulties to initiate improvement and corrective action;

- p) ensure that the type data necessary to support the type certificate of aircraft on the State aircraft register is maintained; and
- q) provide technical advice on matters relating to production, inspection and flight operations, as required.

4.6.6 Liaison functions

The AED should:

- a) work with the organization responsible for accident and incident investigations to ensure that recommendations are adequately addressed;
- b) work with the aviation industry, other governmental organizations, and the public in safety matters;
- c) coordinate with the AID on major problems or defects discovered in aeronautical products or parts in service, and determine the manufacturing corrective action to be taken where airworthiness may be affected;
- d) maintain continuous and effective cooperation with the AID regarding all aspects of manufacturing that affect the approved design and continuing airworthiness of the aeronautical product;
- e) maintain continuous and effective communication with the manufacturing organization to evaluate and advise on any changes to the production system that may affect the inspection, conformity or airworthiness of the aeronautical product; and
- f) establish relationships with foreign authorities for cooperation on production surveillance of suppliers.

4.7 AIRWORTHINESS INSPECTION DIVISION (AID) RESPONSIBILITIES

4.7.1 General

4.7.1.1 All States should establish some form of airworthiness organization to meet the requirements set forth in the Convention and in Annexes 6 and 8. The organizational structure of an inspection organization within the CAA, hereinafter referred to as the airworthiness inspection division (AID), will vary depending upon the level and scope of aviation activity within the State and whether an AED has also been established.

4.7.1.2 The primary responsibilities of the AID should cover all matters concerning the continuing airworthiness of aircraft and should cover, at a minimum:

- a) continuing airworthiness of aircraft and parts thereof;
- b) approval of maintenance organizations;
- c) maintenance certification of air operators;
- d) where no separate licensing division exists, the approval of maintenance training organizations; and
- e) where no separate personnel licensing division exists, the licensing of aircraft maintenance personnel.

In States where an AED is not established, it may be necessary for the AID to be responsible for those engineering tasks associated with continuing airworthiness. These tasks may include evaluation and approval of repair and modification requests related to the continued operation of aircraft.

4.7.2 Approvals and certificates

The AID should:

- a) review, process and record applications for registration of aircraft, registering and de-registering aircraft as appropriate, and issuing certificates of registration;
- b) grant or validate aircraft noise certification;
- c) survey aircraft for issuance, renewal and validation or acceptance of certificates of airworthiness and processing of documents, as appropriate;
- d) issue and review of maintenance organization approvals, air operators, and where no separate licensing division exists, aircraft maintenance training organizations' approvals;
- e) record, review and process application forms of aircraft maintenance personnel for issuance, renewal validation and extension of licenses and ratings, when no personnel licensing division is established;
- f) evaluate and approve aircraft maintenance programmes, including special maintenance programme requirements for extended diversion time operations (EDTO);
- g) evaluate and approve aircraft condition monitoring, aircraft reliability, and aircraft structural integrity programmes, as appropriate;
- h) evaluate equipment required for specific operations as appropriate for the intended purpose, e.g. minimum equipment list, reduced vertical separation minima, Category II and III precision approach equipment, and EDTO;
- i) evaluate and issue export certificates of airworthiness for aircraft;
- j) evaluate and approve or accept air operators' MCMs, maintenance organization procedures manuals, and where no separate licensing division exist, maintenance training organization curriculums;
- k) evaluate and issue approval of modification and repair-designs, when no separate AED exists and those engineering tasks are associated with continuing airworthiness. The evaluation of the proposed modification or repair design should be accomplished by experienced personnel in the areas where design approval is sought; and
- l) issue special flight permits with operating limitations for aircraft that do not meet airworthiness requirements but are capable for safe flight. Examples of special flight permits include: flights after a modification or repair or during a process of applying for a supplemental type certificate, delivering or export of aircraft, evacuation of aircraft from impending danger, overweight aircraft carrying extra fuel or navigation equipment, aircraft flying to a location for maintenance.

4.7.3 Duties and responsibilities

The AID should:

- a) maintain the national civil aircraft register and make the information from the register available, when needed;
- b) evaluate and accept air operator's mass and balance programmes;
- c) periodically review the airworthiness records of aircraft on the State's aircraft register to assess the adequacy of their maintenance and status of aircraft and the competence and diligence of the persons and organizations who perform the maintenance;
- d) establish a service difficulty reporting (SDR) system as provided in Part III, Chapter 9, Section 9.8 of this manual. Analyse and investigate significant defects discovered in aircraft and determine corrective action to be taken where airworthiness may be affected and correct any trends, where necessary;
- e) where no separate AED exists, review aircraft and component manufacturers' SBs and ADs issued by foreign airworthiness authorities to determine their applicability to national aircraft, and take action where airworthiness may be affected. Provide guidance on the implementation of MCAI;
- f) where no separate AED exists, monitor the implementation of the ADs and/or related SBs issued by the manufacturer (both foreign and domestic) to ensure air operator's compliance to the continuing airworthiness of aeronautical products with an established procedure to avoid or correct service difficulties;
- g) review current and new international and foreign airworthiness standards related to continuing airworthiness and determine the need for adoption of critical features of those standards into national requirements;
- h) review air operator's airworthiness main base and line stations maintenance provisions including training provisions, organizations and quality assurance procedures of applicants for issuance and renewal of an AOC in coordination with OPS section of the CAA and making recommendations as appropriate with regard to the application;
- i) review the facilities and procedures of applicants for issuance and renewal of certificates of approval to conduct maintenance of aircraft, including qualifications of persons issuing a maintenance release;
- j) assess qualifications of persons who may be eligible to perform tasks on behalf of the CAA when found qualified and properly authorized (designees);
- k) provide assistance to the AED, or evaluate the design and suitability when qualified, of aircraft components and equipment and their approval for use in aircraft, and assess and approve the installation of aircraft components and equipment;
- l) evaluate and approve aircraft maintenance programmes, including condition monitoring programmes, reliability programmes, structural integrity programmes, as applicable;
- m) evaluate and approve or accept MCMs, maintenance procedures manuals, and where no separate licensing division exists, aircraft maintenance training organizations' curriculums;
- n) assist in the airworthiness investigation of aircraft accidents, as necessary;

- o) investigate possible violation of the national air law or regulations in regard to airworthiness and take appropriate enforcement action, when necessary;
- p) issue directives concerning maintenance, overhaul and repair of aircraft and components thereof, and procedures to be followed by the aviation industry to comply with the national air law and/or regulations related to airworthiness;
- q) issue advisory material to the aviation industry concerning airworthiness practices and procedures, where such advice may make a significant contribution to aviation safety;
- r) resolve regulatory problems associated with continuing airworthiness, formulating amendments to regulations as necessary, establishing general and technical policies and procedures on which airworthiness requirements can be improved upon and based;
- s) take appropriate action on MCAI issued by the State of Design or by the State of Registry; and
- t) provide advice and recommendations in other areas of CAA responsibility, such as the identification and handling of dangerous goods, and on other technical matters relating to airworthiness as may be required.

Note.— Annex 6, Part I, Attachment D provides guidance concerning approval and acceptance actions.

4.7.4 Surveillance

4.7.4.1 The AID should develop periodic surveillance work programmes based on the complexity of the State aviation industry taking into account the quantity of AOCs, types of aircraft operated, AMOs, and approved aircraft maintenance training organizations (ATO), when applicable. The surveillance programme should include periodic and unannounced surveillance visits of the certificate holders. The surveillance should cover compliance to approved or accepted procedures to obtain an accurate depiction of the day-to-day operations and also compliance with airworthiness requirements. In addition to periodic surveillance, the AID should focus follow-up surveillance visits on areas where deficiencies were noted on previous audits. The AID should establish procedures to ensure that all surveillance that is performed is properly documented and referenced and retained for future audits. Analysis of previous audit reports is recommended and may indicate a pattern of weakness the certificate holder may be experiencing. The AID should take steps to ensure AOCs have an effective system to monitor the performance and efficiency of the maintenance programme. The AID needs to ensure that an AMO has an independent quality assurance system to monitor compliance with the requirements or a system of inspection to make sure all maintenance is properly performed.

4.7.4.2 The AID should promptly advise the certificate holder in writing should discrepancies exist in regard to compliance with the State's national airworthiness requirements. The AID should include in their written reply a time period for the certificate holder to take corrective action on any discrepancies noted during the surveillance. When the AID has been notified in writing of corrective action, a follow-up visit should take place to verify correction of the discrepancies and compliance with the airworthiness requirements. Should the certificate holder not address the discrepancies in the time period allotted by the AID or be unable to correct the discrepancy, enforcement action may be necessary.

4.7.4.3 There may be instances during the performance of surveillance where the AID may identify a serious safety concern. The AID should have procedures in place to take prompt action, should conditions warrant, that will ensure that aircraft are operated in an airworthy condition.

4.7.4.4 The specific surveillance functions of AID inspectors will vary based on the technical specialty, e.g., aircraft, engine, avionics, but in general terms should include at least the following:

- a) conduct periodic and unannounced surveillance of maintenance-related facilities including line stations that perform maintenance of its air operators' aircraft, making appropriate directions and recommendations and approving amendments to the air operator's AOC authorizations and to the MCMs, as appropriate;
- b) conduct periodic and unannounced surveillance of maintenance-related facilities of AMOs on the ramp and in the hangars, workshops, and repair facilities. This includes contracted work that the AMO may outsource;
- c) conduct periodic and unannounced surveillance of its air operators' aircraft undergoing maintenance on the ramp and in the hangar and ensure work is being performed in accordance with the MCM, aircraft maintenance programme, maintenance organization procedure manual, current technical data, and by authorized maintenance personnel;
- d) conduct ongoing surveillance of its air operators' aircraft reliability programmes and take action should results indicate degraded levels of safety;
- e) conduct periodic and unannounced surveillance of its air operators' aircraft during operations to ensure aircraft are airworthy;
- f) conduct periodic and unannounced surveillance of foreign air operators' aircraft operations with regard to airworthiness matters;
- g) conduct periodic and unannounced surveillance on personnel certificated and/or authorized to issue a maintenance release; and
- h) investigate possible violations of the national law or regulations in regard to airworthiness and to enforce corrective and legal actions, if required.

4.7.5 Liaison functions

The AID should:

- a) participate in type certification board activities;
- b) participate in maintenance review board activities for newly type certificated aircraft;
- c) prepare and distribute to the public documents containing all issued MCAI and airworthiness advisory material; and
- d) confer at national and international levels on matters relating to the regulations and technical matters concerning airworthiness.

4.8 AIRWORTHINESS ORGANIZATIONAL CHART

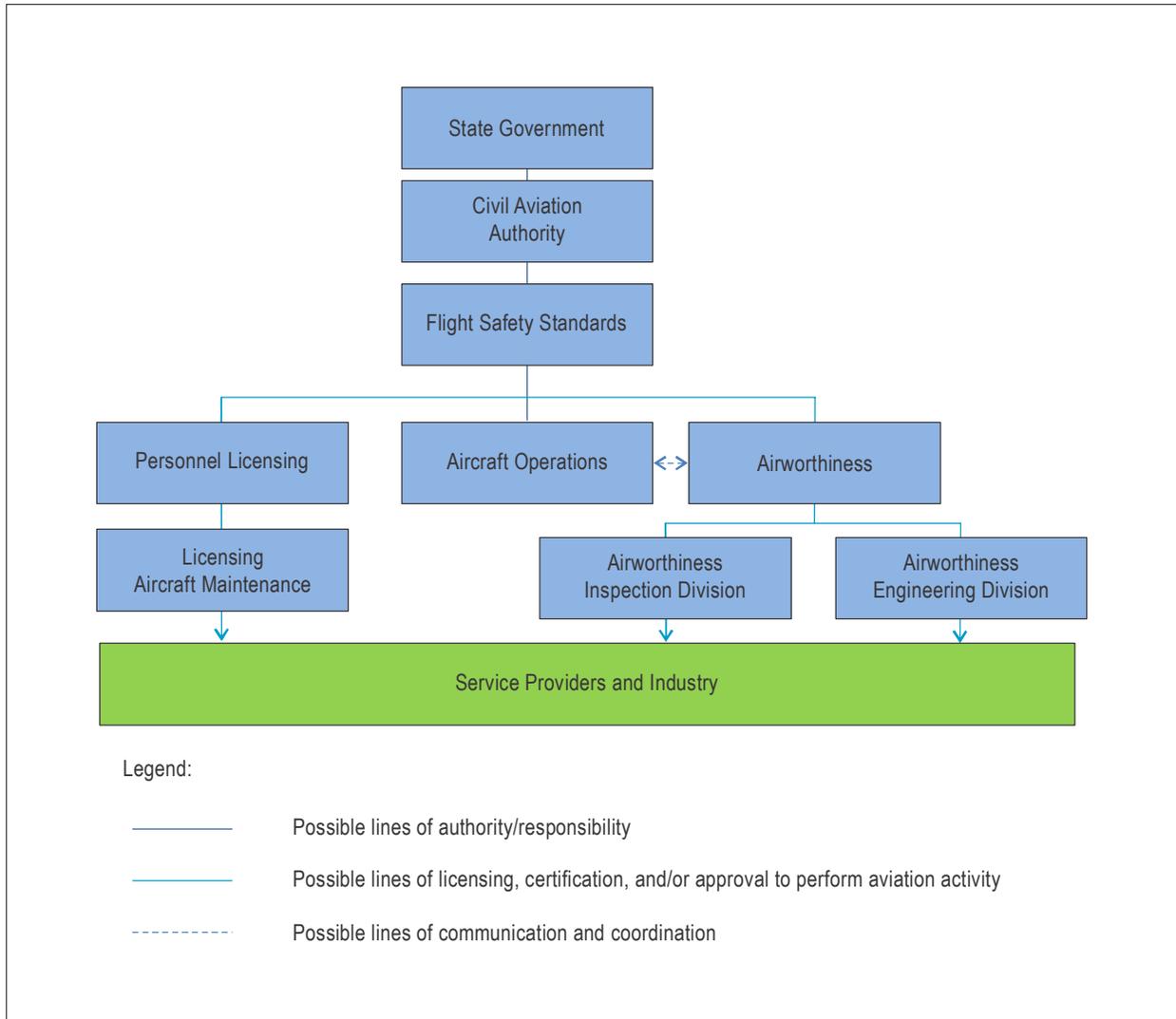


Figure II-4-1. Example of organizational structure of a State civil aviation airworthiness system

4.9 AIRWORTHINESS TECHNICAL LIBRARY AND RECORDS

4.9.1 The CAA should have in place a properly established, organized and administered process to access technical information, so that it allows the airworthiness personnel to keep up to date with technical and regulatory issues relating to design, maintenance and operation of aircraft, engines and propellers. Arrangements should be made with each State of Design or State of Manufacturer to provide adequate access to the documents related to the airworthiness of aircraft on the State's aircraft register. Arrangements should also be made with each air operator to provide adequate

access to documents related to the airworthiness for all aircraft the air operator is authorized to operate. The technical library should also be able to reference all documents issued by ICAO relating to the operation and airworthiness of aircraft. It is important that all documents in the library be promptly amended and kept up to date. This assists the airworthiness personnel in determining whether or not mandatory modifications, inspections and repairs approved by the State of Design are appropriately carried out.

4.9.2 The reference documents can be in paper or electronic form. Reference documents can be considered to be available if they appear on the internet. Manufacturers generally ensure that documents that are made available on the internet are up to date. However, means will need to be provided to ensure that the data continue to be available if the manufacturer ceases to support the internet documents, or the internet data are temporarily unavailable. Furthermore, if access to the manufacturer's data is password protected, a means will be needed to ensure all relevant staff of the AID and AED have access to the password. There will also need to be a procedure in place to provide changes in the information to users. If the CAA is not able to obtain the necessary data when the manufacturer ceases its activity, it should assess if the continued safe operation of affected aircraft is still achievable.

4.9.3 The CAA will need to have an effective record-keeping system to keep track of airworthiness correspondence from the public, industry and certificate holders. The record-keeping system should have a controlled correspondence system that allows for prompt identification, filing and retrieval of correspondence as the need arises. All written correspondence received by the CAA should receive a written response. All written correspondence requiring a response should be given a due date for a reply.

4.9.4 All records kept by the CAA should be catalogued, controlled and secured as required by State legislation, according to procedures defined by the CAA. The following are examples of the records controlled by the CAA:

- a) air operator certification records, including aircraft maintenance programmes, minimum equipment lists and MCMs;
- b) AMO certification records, including maintenance organization procedure manuals;
- c) aircraft maintenance training organization certification records, including approved curriculum;
- d) aircraft maintenance licensing records;
- e) foreign air operator approval records, if applicable;
- f) major modification and major repair approval records;
- g) corporate air operators, if applicable;
- h) surveillance records;
- i) records of type certificates (TCs) and supplemental TCs;
- j) records of design approvals;
- k) records of type certification board meeting minutes;
- l) records of maintenance review board meeting minutes;
- m) records of flight operations evaluation board meeting minutes;
- n) records of design and manufacturing approvals issued;

- o) records of MCAI and SBs mandated by ADs;
- p) records of all approved alternate means of compliance issued against MCAI;

- q) records of aircraft incident and occurrence investigations;

- r) records of faults, malfunctions and defects in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM that may cause an adverse effect on the continuing airworthiness of aircraft;

- s) records of designee appointments and authorizations; and

- t) other permits and approvals granted including noise certificates and special operations requiring AID or/and AED inputs.

4.9.5 The CAA will also need to keep files for each aircraft registered in the State. The files should contain records detailing applications and supporting documents for the certificates of registration and airworthiness, copies of certificates issued, the maintenance programme approved for the aircraft, records of major modifications, together with any other information relevant to the continuing airworthiness of the aircraft.

PART III
STATE OF REGISTRY

Chapter 1

STATE AIRWORTHINESS LEGISLATION AND ORGANIZATIONAL STRUCTURE

1.1 GENERAL

1.1.1 In order for a State of Registry to effectively perform its duties and responsibilities, an effective organization and regulatory system should be firmly in place. The foundation of a solid safety oversight system by which a State of Registry can exercise its certification and surveillance responsibilities is to have a primary legislation that establishes the framework for the creation of a CAA to develop and amend regulations to ensure the airworthiness of aircraft that are designed, manufactured, maintained and operated in the State. The primary legislation or law should ensure the regulations are uniform to the greatest extent possible with those required by Article 12 of the Convention, and the Annexes to the Convention on International Civil Aviation. The CAA needs to ensure it is appropriately organized, funded, staffed and empowered to carry out its duties and responsibilities. Further, the State of Registry should assess its aviation industry and ensure sufficient qualified technical personnel are available to fulfil the needs of the industry. The State may consider reviewing Annexes 6 and 8 and assessing its aviation industry and anticipated growth in determining the organizational structure needed for the State. For all States of Registry it will be necessary to establish a certification and surveillance group or division within the organization. Included in the organization should be a group to monitor the necessity to amend the regulations with regard to the continuing airworthiness of aircraft.

1.1.2 The overall responsibility of the State of Registry can be found in Annex 8, Part II, Chapters 3 and 4. The State of Registry should also establish a State Safety Programme as provided by Annex 19, Chapter 3. Additional State of Registry responsibilities can be found in Annex 6, Parts I, II and III.

1.2 STATE OF REGISTRY RESPONSIBILITIES

The following are the responsibilities normally associated with the State of Registry. There may be additional responsibilities based on the complexity of the State aviation industry.

- a) Ensure the development and promulgation of regulations and national standards regarding the airworthiness of aircraft, continuing airworthiness of aircraft, registration of aircraft and noise certification of aircraft.

Note.— Guidance on the process for the registration of aircraft is contained in this manual

- b) Ensure the development and promulgation of national regulations regarding import requirements and, if required, export requirements of aeronautical products.
- c) If applicable, ensure development and promulgation of national regulations for validation of type certificates for which the State of Registry is not the State of Design.
- d) Approve or accept modifications and repairs relevant to the continuing airworthiness of an aircraft.

- e) Notify ICAO of differences between ICAO Standards and national regulations and practices.
- f) Ensure the aircraft register is properly maintained and an aircraft is issued a registration certificate that conforms to the provisions of Annex 7.
- g) 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, it advises the State of Design that it has entered such an aircraft on its register.
- h) Determine the continuing airworthiness of aircraft in relation to the appropriate airworthiness requirements in force for the aircraft.
- i) Develop or adopt requirements to ensure continuing airworthiness of an aircraft during its service life.
- j) Upon receipt of MCAI from the State of Design, adopt the information directly or assess the information and take appropriate action.
- k) Ensure the State of Design is kept informed of all MCAI it issues, where applicable.
- l) Ensure a system exists for aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM whereby information on faults, malfunctions, defects and other occurrences that might cause adverse effects on the continuing airworthiness of the aircraft is transmitted to the organization responsible for the aircraft type design.
- m) Establish in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM the type of service information to be reported to its airworthiness authority by air operators, and maintenance organizations.
- n) Issue C of R, C of A, special flight permits, export C of A and aircraft noise certification.
- o) Evaluate and approve or accept MCMs, maintenance organization procedures manuals, modifications and repairs, and aircraft maintenance programmes, including, if applicable, maintenance programmes for aircraft operating under EDTO.
- p) Perform certification inspections of maintenance organizations and air operators with respect to airworthiness requirements.
- q) Maintain appropriate records for aircraft on its register.
- r) Develop annual surveillance work plans.

Note.— It is recommended to refer to the Safety Oversight Manual (Doc 9734), Part A — The Establishment and Management of a State Safety Oversight System, Section 3.7 during the planning of surveillance work programmes.

- s) Conduct surveillance of its certified air operators (airworthiness requirements), maintenance and training organizations.
 - t) Ensure timely corrective action on deficiencies noted during oversight of certified air operators, maintenance and training organizations.
 - u) Take appropriate enforcement action of certified air operators, maintenance and training organizations and licensed technical personnel, where necessary.
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Chapter 2

REGISTRATION OF AIRCRAFT

2.1 GENERAL

2.1.1 Article 3 of the Convention states that: “This Convention shall be applicable only to civil aircraft ...” . Registration of aircraft is the basis to regulate the international aircraft operations and is therefore accorded considerable attention in the Convention on International Civil Aviation, of which the Chapter III — Nationality of Aircraft, lays down the principles of the aircraft registration that must be reflected by the State national laws and regulations.

2.1.2 According to Article 17 of the Convention, aircraft have the nationality of the State in which they are registered. Article 18 of the Convention, states that an aircraft cannot be validly registered in more than one State, but its registration may be changed from one State to another.

2.1.3 Article 20 of the Convention requires that every aircraft engaged in international operations bear the appropriate nationality and registration. Article 21 of the Convention further requires that each Contracting State must, on demand, supply to any other Contracting State or ICAO, information concerning the registration and ownership of any particular aircraft registered in that State. In addition, Article 29 of the Convention requires each aircraft to carry its Certificate of Registration on board when engaged in international navigation.

2.1.4 The Convention does not provide for an aircraft to be registered by an international organization such as an agency of the United Nations. However, Article 77 of the Convention does provide for two or more Contracting States to establish joint air transport operating agencies subject to ICAO Council determination as to how the provisions of the Convention will apply concerning the registration and nationality of the aircraft operated by such agencies. Subject to any future action the Council might take in respect of joint operating agencies, each aircraft must have only one State of Registry and that State has, amongst a number of responsibilities in respect of each aircraft on its aircraft register, a fundamental responsibility to ensure that the aircraft is operated in an airworthy condition. A transfer of responsibilities may be agreed but only under the specific formal arrangements required by Article 83 *bis* of the Convention.

2.1.5 Annex 7 describes the definitions, location and measurement of nationality and registration marks. It provides the minimum standards for the display of marks to indicate the appropriate nationality and registration, which have been determined to comply with Article 20 of the Convention. It also requires the Certificate of Registration to be a replica of the certificate shown in Annex 7. When certificates of registration are issued in a language other than English, they should include an English translation.

2.2 APPLICATION FOR REGISTERING AIRCRAFT

2.2.1 General

Under Article 19 of the Convention, registration or transfer of registration of aircraft in any Contracting State should be in accordance with the laws and regulations of that State. Accordingly, the State will need to adopt detailed regulations covering all aspects of registration including such matters as the basic requirement for aircraft to be registered and

de-registered together with the State's application procedures, data required, display of the Certificate of Registration and fees, where applicable. The State will also need to issue internal administrative instructions on the issuance of certificates and the maintenance of the aircraft register.

Note.— ICAO Circular 95, The Continuing Airworthiness of Aircraft in Service, was published to assist States in establishing contacts with the authorities responsible for continuing airworthiness of aircraft and their equipment. The Online Airworthiness Information Network located within ICAO's Integrated Safety Trend Analysis and Reporting System, launched in October 2014, replaces and expands on Circular 95.

2.2.2 Basic requirement for aircraft to be registered

2.2.2.1 Annex 7 classifies the aircraft that need to be registered as well as the location and measurement of nationality and registration marks for each type. According to paragraph 9 of Annex 7, the provisions should not apply to meteorological pilot balloons used exclusively for meteorological purposes or to unmanned free balloons without a payload.

2.2.2.2 In accordance with Article 18 of the Convention, an aircraft cannot be validly registered in more than one State, but its registration may be changed from one State to another. For imported aircraft, a State's applications procedures may require evidence of de-registration or non-registration to ensure that it is not on another State's aircraft register. This evidence could be a statement from the registration authority of the State of export describing the aircraft by make, model, serial number and stating that the aircraft has been de-registered or never been registered in the State.

2.2.3 Application procedure and data requirements

2.2.3.1 Application for aircraft registration and issuing a Certificate of Registration will usually be followed by the airworthiness certification process. The State may need to ensure that the procedure for aircraft registration requires the applicant to submit the basic information and documents supported by an application form to provide the required information for the issuance of a Certificate of Registration.

2.2.3.2 This information may include aircraft make, model and serial number, aircraft type certificate, operational and equipment data, aircraft owner's name and address and documentary evidence of ownership, aircraft manufacturer's data and any other basic data the State may require. A sample of the details required for an application form for a Certificate of Registration and guidance for processing an application can be found in Attachment A and Attachment B, respectively, to this chapter.

2.3 CERTIFICATE OF REGISTRATION (C OF R)

2.3.1 The Certificate of Registration should be a replica of the certificate shown in Annex 7. When Certificates of Registration are issued in a language other than English, they should include an English translation.

2.3.2 Article 29 of the Convention requires that the Certificate of Registration should be carried in the aircraft engaged in international air navigation.

2.4 MAINTENANCE OF THE AIRCRAFT REGISTER

Annex 7 stipulates that each Contracting State maintains a current register showing for each aircraft registered by that State, the information recorded in the Certificate of Registration. The State will need to issue internal administrative instructions on the maintenance of the aircraft register.

2.5 NOTIFICATION TO THE STATE OF DESIGN

2.5.1 A large number of States operate aircraft that have been manufactured and/or certificated in another State. In order to continue to maintain aircraft at a safe level of airworthiness it is necessary that the State of Registry regularly receive all continuing airworthiness information relating to aircraft on its register. Such information pertaining to the continuing airworthiness of aircraft and their equipment includes ADs issued by the State of Design or Manufacture and SBs issued by the manufacturer.

2.5.2 Annex 8 provides that the State of Registry, when it first enters on its register an aircraft of a particular type for which it is not the State of Design, advise the State of Design that it has entered such an aircraft on its register. States should establish direct contact with the authorities responsible for continuing airworthiness of aircraft and their equipment and agree upon the method of communication for the required information.

Note.— ICAO Circular 95, The Continuing Airworthiness of Aircraft in Service, was published to assist States in establishing contacts with the authorities responsible for continuing airworthiness of aircraft and their equipment. The Online Airworthiness Information Network located within ICAO's Integrated Safety Trend Analysis and Reporting System, launched in October 2014, replaces and expands on Circular 95.

Attachment A to Chapter 2

CONTENT OF APPLICATION FORM FOR A CERTIFICATE OF REGISTRATION

(Example only)

The application for registration of aircraft should include the following information:

1. Full name of aircraft owner (submit document on ownership);
2. Address of aircraft owner (needs to be a physical address, P.O. box is not acceptable);
3. Contact information of the aircraft owner (telephone number, e-mail address, etc.);
4. Full name and address of aircraft manufacturer;
5. Proposed purpose: Commercial/Private or others (specify);
6. Aircraft details:
 - a) Type;
 - b) Model;
 - c) Serial number;
 - d) Year of manufacture;
 - e) Maximum certificated take-off mass (kg);
7. Category of aircraft: Aeroplane/Helicopter or others (specify);
8. Engine details:
 - a) Type;
 - b) Model;
 - c) Serial number(s);
9. Category of engine: Turbo Jet/Turbo Prop/Piston or others (specify);
10. Has the aircraft been previously registered?

If Yes, submit evidence of de-registration;

If no, submit evidence of non-registration;

11. Declaration by aircraft owner or authorized person:

- a) "I am/we are the sole person/entity that has/have legal custody and control of the aircraft described herein"; or
- b) "I am authorized by the owner(s) of the aircraft described herein to make this application (documentary proof is required)";

12. Declaration by person submitting the application:

- a) "I declare that the information provided herein and documents submitted with this application are true in every respect";
- b) Name and signature of applicant and date.

Attachment B to Chapter 2

GUIDANCE FOR PROCESSING AN APPLICATION FOR A CERTIFICATE OF REGISTRATION

(Example only)

The process for the issue of a Certificate of Registration (C of R) consists of the following steps:

1. Review the application:
 - An incomplete application (including necessary supporting documents) should be rejected.
2. Ensure ownership:
 - Review and confirm the evidence of ownership.
3. Ensure aircraft is not registered with another State:
 - Review and confirm the evidence of de-registration or non-registration.
4. For registration of first of type aircraft, inform State of Design.
5. Issue C of R.
6. Enter information into Aircraft Register.
7. File completed application, supporting documents and copy of C of R.

Chapter 3

AIRCRAFT NOISE CERTIFICATION

3.1 GENERAL

3.1.1 Annex 6, Part I, 6.13; Part II, 2.4.9; and Part III, Section III, 4.6 require all aircraft to comply with the noise certification standards in Annex 16. These Standards also require that an aircraft carry a document attesting noise certification. When the document, or a suitable statement attesting to noise certification as contained in another document approved by the State of Registry, is issued in a language other than English, it should include an English translation

3.1.2 Annex 16, Volume I, Part II contains the provisions for noise certification applicable to certain classes of aircraft, where such aircraft are engaged in international air navigation. Chapter 1 of that Part prescribes common administrative requirements for noise certification, including their format. Further guidance on the administration of noise certification documentation can be found in Annex 16, Volume I, Attachment G. Subsequent Chapters of the Part specify the respective noise standards for each relevant class of aircraft.

3.1.3 Annex 16, Volume I, Part II, Chapter 1, 1.4 provides that for an aircraft engaged in international air navigation, a document attesting noise certification be approved by the State of Registry and carried on the aircraft. Additionally, Annex 16, Volume I, Part II, Chapter 1, 1.2 provides that the noise certification be granted or validated by the State of Registry on the basis of satisfactory evidence that the aircraft complies with requirements that are at least equal to the applicable standards specified in Annex 16.

3.1.4 The Appendices to Volume I of Annex 16 describe evaluation methods for noise certification. The *Environmental Technical Manual* (Doc 9501), Volume I — *Procedures for the Noise Certification of Aircraft* provides guidance on the wider application of equivalent procedures that, while differing from the ones specified in Annex 16, Volume I, have been accepted as a technical means for demonstrating compliance with the noise certification requirements of Annex 16, Volume I.

3.1.5 States may assign the responsibilities for establishing, and finding compliance with, the noise standards to their airworthiness organization or to another organization.

3.1.6 Noise certification of an aircraft should follow the same principle used for airworthiness certification. The first step is to certify that the type design of the aircraft complies with the noise standards. Then, every aircraft conforming to the approved type design is assumed to comply with the standards and entitled noise certification.

3.1.7 In the development of procedures concerning noise certification, the appropriate authority of the State will need to consider two aspects:

- a) noise type certification, which certifies that the aircraft type design complies with the applicable noise standards (refer to 3.2 below); and
- b) noise certification of each aircraft (refer to 3.3 below).

3.2 AIRCRAFT NOISE TYPE CERTIFICATION

3.2.1 Implementation of the noise type certification regulations can be accomplished most effectively and efficiently in conjunction with the performance of airworthiness type certification activities. Accordingly, the governmental organization carrying out the responsibility for implementing the noise type certification regulations should work closely with the AED. In some States, this responsibility is assigned to the AED directly.

Note.— Some States assign the responsibilities for establishing, and finding compliance with, the environmental standards to another governmental organization, and not necessarily to their AED. States need to ensure that both the environmental and airworthiness certifications are addressed at the conclusion of the type certification activity for the affected aeronautical product.

3.2.2 States should establish their environmental standards, in which the noise requirements are included and which should be at least equal to those in Annex 16.

3.2.3 Each State should have a procedure to ensure applicable noise standards are complied with when certifying or validating a new type design or a modification to an approved type design. A widely accepted practice is to treat the noise requirements the same as airworthiness standards and incorporate them into the certification basis. In this case, aircraft should show compliance with the applicable airworthiness and environmental requirements for getting the type design approval. The type certificate finally issued will include both airworthiness and environmental approval.

3.2.4 States issuing a type certificate that has included a noise approval should establish procedures to ensure that appropriate information about the noise certification is provided for the aircraft type. The certification basis indicated in the type certificate data sheet of the aircraft should include the applicable noise standards with which the aircraft has shown compliance. The aircraft flight manual, aircraft operating manual or other appropriate documents acceptable to the State should present the noise information determined in accordance with the applicable noise requirements.

3.3 NOISE CERTIFICATION OF AN AIRCRAFT

3.3.1 General

3.3.1.1 Annex 16, Volume I, Part II, 1.2 states that noise certification should be granted or validated by the State of Registry of an aircraft on the basis of satisfactory evidence that the aircraft complies with requirements that are at least equal to the applicable standards specified in Annex 16.

3.3.1.2 An aircraft conforming to an approved type design which has shown compliance with the applicable noise standards is entitled to noise certification.

3.3.1.3 As both noise certification and airworthiness certification are related to the conformity of an aircraft, the implementation of the noise certification can be accomplished most effectively and efficiently in conjunction with the performance of aircraft airworthiness certification activities. Some documents and findings could be shared, and duplicate works should be avoided.

3.3.1.4 The State of Registry should accept, to the maximum extent possible, the finding of noise certification made by other Contracting States, when validating or otherwise reviewing a type design or modifications made to an aircraft prior to issuance of noise certification.

3.3.2 Formats for noise certification documentation

3.3.2.1 Annex 16, Volume I, Part II, Chapter 1 defines the minimum information to be provided in the documents attesting noise certification. In consideration of the wide variety of administrative needs for systems for noise certification documentation, Annex 16, Volume I, Attachment G provides the following three alternative standardized options:

- Option 1: A stand-alone noise certificate which contains the mandatory information provisions of Annex 16, Volume I.
- Option 2: Two complementary documents of which one may be the aircraft flight manual or the aircraft operating manual.
- Option 3: Three complementary documents.

3.3.2.2 Further explanations of these options are provided in Annex 16, Volume I, Attachment G. For Option 1, Figure G-1 in the Attachment has given a standard format of the stand-alone noise certificate. For Options 2 and 3, the first official document attests to noise certification but is limited to identification of the aircraft and the statement of compliance. It can be either in the form of a (limited) noise certificate or in the form of a Certificate of Airworthiness for those States that include noise requirements in their airworthiness requirements.

3.3.3 Issuing a noise certificate to attest noise certification

3.3.3.1 States may choose to use noise certificates to attest noise certification of an aircraft. It could be either a stand-alone noise certificate under Option 1 in Annex 16, Volume I, Attachment G or a (limited) noise certificate which acts in combination with other noise certification documents under Options 2 and 3 in the Attachment.

3.3.3.2 The noise certificates adopted by States must be in a form which complies with the provisions of Annex 16, Volume I, Part II, Chapter 1. A stand-alone noise certificate should use a form generally similar to the format given in Figure G-1 in the Attachment. A (limited) noise certificate may contain less information as it is limited to the identification of the aircraft and the statement of compliance. In this case, the complementary document(s) issued under Option 2 or 3 must contain the remaining items of the required information.

3.3.3.3 The procedures developed by the State of Registry for the issuance of a noise certificate should cover the following requirements, the completion of some of which may be delegated to suitably approved organizations. In the case of imported aircraft, depending on the State's assessment of the adequacy of the exporting State's noise code, these procedures may be adjusted:

- a) an application should be completed and submitted to the CAA. The application should specify the noise requirements according to which the aircraft type was certified and the noise information accordingly determined. This information should be included in the noise certificate if Option 1 is used, or in the relevant complementary document(s) as described in Options 2 or 3. (The details required for an application form for a noise certificate are at Attachment A to this chapter.);
- b) for a new aircraft, satisfactory evidence that the aircraft was produced in conformity with its approved type design including noise data should be provided; and
- c) for used aircraft, all relevant records of previously completed repairs and modifications which may affect aircraft acoustic performance should be made available for inspection by the CAA.

3.3.3.4 The State of Registry should assess if the application for a noise certificate is justified. The applicant should provide access to the aircraft for which the noise certificate is being applied or has been issued upon request by the CAA of the State of Registry. It should also be the responsibility of the applicant to provide personnel and equipment so that these checks and inspections may be carried out satisfactorily.

3.3.3.5 When the CAA is satisfied that the applicable requirements are being met, the noise certificate should be issued. Guidance for the processing of an application for a noise certificate is detailed in Attachment B of this Part.

3.3.4 Use of Certificate of Airworthiness to attest noise certification

3.3.4.1 Under Options 2 and 3 in Annex 16, Volume I, Attachment G for those States that include noise requirements in their airworthiness requirements, one official document attesting noise certification could be in the form of a Certificate of Airworthiness. In these cases, the status of the compliance with noise requirements should be checked when issuing the Certificate of Airworthiness.

3.3.4.2 Before the issuing of a Certificate of Airworthiness to an aircraft, in addition to the work required for aircraft airworthiness certification, the CAA of the State of Registry should check the following items for noise certification:

- a) the aircraft certification basis as stated in its type certificate data sheet should include appropriate noise requirements; and
- b) the complementary noise certification document(s), as described in Option 2 or 3, contain appropriate noise information determined in accordance with the applicable noise requirements, as listed in Annex 16, Volume I, Part II, Chapter 1, 1.5 and 1.6, and further detailed in Annex 16, Volume I, Attachment G.

3.4 VALIDITY OF DOCUMENT ATTESTING NOISE CERTIFICATION AND RECERTIFICATION

3.4.1 The State of Registry should suspend or revoke the noise certificate of an aircraft on its register if the aircraft ceases to comply with the applicable noise standards. Upon suspension or revocation, the certificate should be returned to the CAA of the State of Registry. The State of Registry should not reinstate a noise certificate or grant a new noise certification unless the aircraft is found, on reassessment, to comply with the applicable noise standards.

3.4.2 A noise certificate should remain valid if the aircraft:

- a) is in compliance with the applicable type design, noise standards and continuing airworthiness requirements;
- b) remains on the same register (unless validated by another State); and
- c) is not suspended or revoked under 3.4.1.

3.4.3 In case that, as a result of repairs or modifications affecting acoustic characteristics of the aircraft, a noise recertification is requested, the State of Registry, upon completion of all required inspections, should grant or validate it on the basis of satisfactory evidence that the aircraft complies with the requirements that are at least equal to applicable Standards specified in Annex 16.

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Attachment A to Chapter 3

CONTENT OF APPLICATION FORM FOR DOCUMENTS ATTESTING NOISE CERTIFICATION

(Example only)

The application for the issue of an aircraft noise certificate should include the following information:

1. Aircraft registration
2. Name of aircraft owner and owner's address
3. Contact information of aircraft owner (telephone number and e-mail address, etc.)
4. Aircraft details
 - a) Aircraft manufacturer
 - b) Aircraft type and model
 - c) Aircraft serial number
 - d) Aircraft category
5. Engines details
 - a) Engines type and model
 - b) Engine(s) serial number(s)
6. Other details
 - a) Maximum take-off mass (kg)
 - b) Maximum taxiing mass (kg)
7. Basis of noise certification for this application
8. Description of documents submitted to support application
9. Declaration by person making application
 - a) "I declare that the information provided herein and documents submitted with this application are true in every respect."

b) Name, designation and signature of applicant and date.

Note.— This application must be accompanied by all necessary supporting documents.

Attachment B to Chapter 3

GUIDANCE FOR PROCESSING AN APPLICATION FOR DOCUMENTS ATTESTING NOISE CERTIFICATION

(Example only)

The process for the issue of a noise certificate consists of the following steps:

1. Application form:
 - An incomplete application form (including necessary supporting documents) should be rejected;
2. Evidence of aircraft registration:
 - Ensure aircraft is appropriately registered;
3. Evidence of supporting documents, which may include one of the following:
 - a) a noise certificate issued by the State of Design/Manufacture; or
 - b) a noise certificate issued by the original equipment manufacturer (OEM); or
 - c) a statement made in the aircraft flight manual or equivalent that the aircraft conforms to the applicable noise standard and the associated noise data in the aircraft flight manual; or
 - d) a statement made in the type certificate that the aircraft conforms to the applicable noise standards and the associated noise data in the type certificate data sheet for noise.

Ensure the aircraft complied with relevant noise standards that are at least equal to the applicable standards specified in Annex 16, Volume I, Part II.

4. Issuance of a noise certificate.
5. File application package including a copy of the noise certificate.

Chapter 4

CERTIFICATE OF AIRWORTHINESS

4.1 GENERAL

4.1.1 Article 31 of the Convention states that “Every aircraft engaged in international navigation shall be provided with a valid Certificate of Airworthiness issued or rendered valid by the State in which the aircraft is registered”. Annex 8, Part II, Chapter 1 provides the requirements for certification of the aircraft type and Annex 8, Part II, Chapter 3 provides for the requirements for the issuance of the certificates of airworthiness together with the required format for the Certificate of Airworthiness. When the Certificate of Airworthiness is issued in a language other than English, it should include an English translation.

4.1.2 This chapter describes some recommended procedures in issuing and rendering valid certificates of airworthiness. Normally, the responsibility for developing the procedures for the issuance of certificates of airworthiness should be assigned to the AID.

4.1.3 In the development of procedures concerning certificates of airworthiness, the AID will need to consider four basic situations:

- a) the issuance of a Certificate of Airworthiness when an aircraft is first registered in the State. This can be a newly manufactured aircraft or a used aircraft coming from a foreign State (refer to 4.5 below);
- b) the renewal of a Certificate of Airworthiness issued by the State (refer to 4.6 below);
- c) the validation of a Certificate of Airworthiness issued by another State for an aircraft entered on the State register (refer to 4.7 below); and
- d) the delegation of the issuance or renewal of a Certificate of Airworthiness to a suitable approved organization or individual in accordance with the State regulations.

4.2 APPLICATION FOR A CERTIFICATE OF AIRWORTHINESS

Note.— Guidance on the content of an application form for the issuance of a Certificate of Airworthiness is provided in Attachment A to this chapter.

4.2.1 An application should be completed and submitted to the AID. The applicant should specify the design standards and airworthiness requirements according to which the aircraft type was certified. Prior to submitting an application to the CAA the applicant should demonstrate that the aircraft is registered in the State or is in the process of being registered.

4.2.2 An applicant for the issue of a Certificate of Airworthiness will be required to provide sufficient details concerning the aircraft, its engines and, if applicable, its propellers in order to enable the AID to make an initial judgment concerning the aircraft’s history, current status, equipment fit, modifications embodied, AD compliance and potential certification status.

4.2.3 The information to be submitted to the CAA's AID in support of the application is therefore intended to provide basic details. Subsequent surveys of the aircraft, its logbooks and other supporting documentation by personnel of the AID or by its delegated representatives will allow detailed consideration of whether the aircraft conforms to the requirements of the State for the issue of a Certificate of Airworthiness. An application form therefore needs to contain sufficient information for the initial assessment to be made. The AID should keep in mind that further detailed information will be readily obtainable later in the process.

4.2.4 In the case where an aircraft changes ownership, the C of A is transferrable to the new aircraft owner providing the aircraft remains on the State's register. The CAA has to ensure that the State regulations provide for the transfer of all maintenance records to the new aircraft owner.

4.3 TYPE DESIGN CERTIFICATION, VALIDATION AND ACCEPTANCE

4.3.1 Annex 8, Part II, Chapter 3 states the requirements to be met for the issuance of a C of A. Paragraph 3.2.1 states that: "A Certificate of Airworthiness shall be issued by a Contracting State on the basis of satisfactory evidence that the aircraft complies with the design aspects of the appropriate airworthiness requirements." Paragraph 3.2.2 states that: "A Contracting State 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 Annex through compliance with appropriate airworthiness requirements." In order to meet these requirements the State of Registry has to have satisfactory evidence that the design of the aircraft meets its airworthiness requirements. This can be achieved in three ways:

- a) Type certification;
- b) Type validation; or
- c) Type acceptance.

4.3.2 The evidence that is used by a majority of Contracting States, for the purpose of the Certificate of Airworthiness, is the aircraft type certificate. Amendment 98 to Annex 8 introduced the formal requirement for a State of Design to issue a type certificate as evidence of approval for any new application for aircraft certification on or after 2 March 2004. Some aircraft certified before that date may not have been issued a type certificate, but were in such a case "individually" certified.

4.3.3 The original issuance of an aircraft type certificate by the State of Design is regarded as satisfactory evidence that the design and details of such aircraft type have been reviewed and found to comply with the airworthiness standards, the aircraft type has been subjected to the required ground and flight tests, and that no known or suspected unsafe aircraft characteristics exist against those standards with which it had shown compliance. Part V, Chapter 2, of this manual describes the process of application for type certification and the approval process.

4.3.4 It is neither expected nor encouraged that the State of Registry perform the same in-depth determination of compliance that the State of Design already did in order to get its own satisfactory evidence of appropriate compliance with airworthiness standards.

4.3.5 Subsequently, a State of Registry may accept the original type certificate in lieu of issuing its own or use it as a basis for issuing its own type certificate when processing an aircraft type intended to be entered on the State's civil aircraft register for the first time. It should be done through regulations or bilateral agreements to give maximum credit to the type certification work already done by the State of Design and minimize duplicate or redundant testing that adds little or no value to the overall airworthiness of the aeronautical product.

4.3.6 Some States of Registry validate type certificates to establish if an imported aircraft complies with their own applicable airworthiness standards. The activities associated with the validation of a type certificate are similar to those performed for an initial type certificate (see Part V of this manual), except for the actual amount of certification work involved. Typically, a State of Registry would confine its certification review to the differences that exist between its airworthiness requirements and those of the State of Design, or on those requirements where the State of Registry retains exclusive approval authority under its certification system. A validation exercise between two Contracting States is conducted on the basis of confidence and a strong commitment to cooperate in reducing the unnecessary duplication of work already accomplished. Under a validation exercise, a complete re-investigation of compliance is not necessary.

4.3.7 At the completion of the type validation activity, the State of Registry should confirm its approval or acceptance of the type design by issuing its own type certificate, or by issuing a letter of approval or acceptance to the type certificate holder and the State of Design. The certification basis by which the State of Registry grants its type design approval or acceptance should be clearly documented in the type certificate data sheet or in the approval letter.

4.3.8 Many States do not have an aviation manufacturing industry and, consequently, do not necessarily have in their airworthiness organization the engineering capability to perform type design review or technical validation of a foreign type certificate. States in this category should establish, through regulations or policy, the recognition and direct acceptance of the type certification already done by the State of Design.

4.3.9 Independent of the type design approval process the State of Registry has to set up procedures in order to ensure the continuing airworthiness of that aircraft. The procedures should be applicable to all aircraft of the same type design it has accepted or validated.

4.4 REVIEW OF THE APPLICATION FOR A CERTIFICATE OF AIRWORTHINESS

4.4.1 The AID should perform the following:

- a) application form review;
- b) aircraft configuration identification;
- c) aircraft documentation review; and
- d) aircraft inspection.

4.4.2 Application form review

4.4.2.1 A completed and signed application form (refer to Attachment A to this chapter) should be submitted to the AID together with the supporting documents and fees (if applicable) to initiate the process.

Note.— Payment of the fees before initiating the process will support the applicant's commitment to the process and could avoid the misuse of AID resources on a project that may not be completed.

4.4.2.2 The application form should be reviewed to ensure all requested information is included and accurate, the signatures are legitimate and the aircraft is registered. The information on the form should be validated with the supporting documentation. The details required in an application form for the issue of a C of A are at Attachment A.

4.4.3 Aircraft configuration identification

4.4.3.1 *New aircraft*

4.4.3.1.1 Based on the approved type design the AID should identify the aircraft configuration. This is mainly supported by evidence from the manufacturer that identifies which components and changes to type design have been necessary to build and deliver the considered aircraft. Generally, the manufacturer starts from a configuration that is a known type identified in the relevant type certificate and then lists all additional changes that are embodied on the aircraft.

4.4.3.1.2 In particular, some of those changes involve optional items that have been ordered by the customer. The customer may prefer some particular equipment from a specific supplier in order to harmonize with the rest of its fleet, or for any other suitable reason.

4.4.3.1.3 All changes embodied on the aircraft should be identified and are used to determine the applicable maintenance programme for that aircraft.

4.4.3.1.4 A declaration issued by the State of Manufacture, for example, an export Certificate of Airworthiness, may be convenient to document all those particularities of the configuration.

4.4.3.2 *Used aircraft*

4.4.3.2.1 In order to determine the approved configuration of the aircraft, the AID should start from a known configuration (identified on the aircraft type certificate), for example, from the configuration known by the previous State which delivered the Certificate of Airworthiness. The AID should review the aircraft maintenance records to determine all changes that have been incorporated on the aircraft.

4.4.3.2.2 A review of the aircraft interior configuration may be necessary to determine if modifications had been made to the original configuration. Such aircraft interior modifications should be found in a modification approval document.

4.4.3.2.3 All changes embodied on the aircraft should be approved by the AED, either by recognition of those within the approved type certificate, or individually approved as changes to the type certificate.

4.4.3.2.4 A declaration issued by the previous State of Registry, for example an export Certificate of Airworthiness, may be helpful to document those configuration particularities.

4.4.4 Aircraft documentation review

Note.— The AID can request any necessary documentation to substantiate the process and review these documents for accuracy and validity.

The AID should review the following to establish the history of the aircraft, the status of the continuing airworthiness and the compliance of the documentation submitted:

- a) Export C of A (if available).
- b) The aircraft flight manual (AFM). This is to determine if the AFM is compatible with the aircraft configuration.

- c) Maintenance programme, together with any bridging results from the previous programme. The applicant should also furnish, where applicable, the maintenance review board report for the aircraft type, or the manufacturer's current maintenance planning data.
- d) Status of all maintenance tasks contained in the maintenance programme, including: airworthiness limitations, certification maintenance requirements (CMRs) and scheduled checks.
- e) Details and certification of any major modifications or major repairs incorporated since the first C of A was issued. Particular attention should be given to any supplemental inspection described in the approval documents, for the performance of the inspection and the inclusion in the maintenance programme.
- f) Status of compliance with MCAI mandated by the State of Registry.
- g) Details of equipment installations intended for particular operational roles, if applicable, e.g. towing, agricultural spraying and provision for the carriage of any external loads.
- h) Mass and balance report together with the equipment list.
- i) Log books that document the history of the aircraft, as well as maintenance records.
- j) Records that demonstrate the origin of parts and components that were installed new or repaired on the aircraft.
- k) Records of all maintenance performed at time of the C of A application process.
- l) Records of previous maintenance repairs and modifications. This is to determine if such tasks have modified airworthiness limitations or may necessitate additional checks to be included in the maintenance programme in addition to those from the manufacturer.

Note.— The AID should accept, to the maximum extent possible, the findings generated by other Contracting States, when validating or otherwise reviewing modifications and repairs made to an aircraft prior to the issuance of a Certificate of Airworthiness.

4.4.5 Aircraft inspection

4.4.5.1 The applicant should make the aircraft available, at a time and place acceptable, for checks and inspections considered necessary by the AID. It is the responsibility of the applicant to provide personnel and equipment so that these checks and inspections may be satisfactorily carried out.

4.4.5.2 The AID should perform an exterior inspection to check that (but not be limited to):

- a) there is no damage to the fuselage, engines, propellers, wings, control surfaces and landing gears;
- b) major repairs and modifications, if any, are recorded and accomplished in accordance with the requirements of the State of Registry;
- c) the aircraft, engines and propellers identification (data) plate are installed and correspond to the identity of the aircraft, engines and propellers in their records;
- d) components' serial numbers conform to the aircraft records; and

- e) the aircraft identification (data) plate corresponds to the identity of the aircraft, where applicable.

4.4.5.3 The AID should perform an interior inspection to check for (but not be limited to):

- a) conformity to aircraft interior configuration, emergency equipment, safety equipment;
- b) installation of the aircraft identification (data) plate and that it corresponds to the identity of the aircraft, where applicable;
- c) markings and placards' location and language; and
- d) additional markings, if required, to meet the regulatory requirements of the State.

4.5 ISSUANCE OF A CERTIFICATE OF AIRWORTHINESS

4.5.1 The issuance of a Certificate of Airworthiness for an aircraft is dependent upon the aircraft being registered in the State.

4.5.2 The application form should be completed and signed by an appropriately delegated person to apply for a C of A on behalf of the air operator or aircraft owner.

4.5.3 The application should include particulars of all work done to restore the aircraft to an airworthy condition prior to the issuance of a Certificate of Airworthiness, including any defects identified during AID inspections.

4.5.4 Full particulars of the work done should be entered in the appropriate log book, and a maintenance release should be completed and signed.

4.5.5 An organization or a suitably authorized person should certify that the aircraft is airworthy as determined from inspections of the aircraft and records. All applicable MCAI and other applicable requirements of the State of Design and the State of Registry should also be carried out and certified accordingly.

4.5.6 The AID, when satisfied that the relevant requirements are met, will issue the C of A. The AID should retain copies of documents, where practicable, submitted with the application for the C of A. Guidance for the processing of an application for a C of A is at Attachment B to this chapter.

4.6 CONTINUING VALIDITY OF A CERTIFICATE OF AIRWORTHINESS

4.6.1 General

4.6.1.1 This chapter provides guidance to the CAA in fulfilling its obligations under Annex 8, in relation to the continuing validity or renewal of certificates of airworthiness. Annex 8, Part II, Chapter 3, provides that a Certificate of Airworthiness should be renewed or remain valid, subject to the laws of the State of Registry, if it is not an orphan aircraft as per Annex 8, Part II, Chapter 1, provided that the continuing airworthiness of the aircraft is determined by a periodic inspection at appropriate intervals having regard to lapse of time and service or, alternatively, by means of a system of inspection approved by the State which will produce at least an equivalent result.

4.6.1.2 The most common practice for Contracting States is to control the validity of certificates of airworthiness. This can be done in either of the following two ways:

- a) the issue of a Certificate of Airworthiness with an expiring period of validity ranging from one to three years. Renewal is subject to a determination of continuing airworthiness by the CAA by either direct inspection or by a recommendation from an organization approved by the CAA (refer to 4.6.2 below for further information); or
- b) the issue of a Certificate of Airworthiness with a non-expiring period of validity, where the continuing airworthiness is determined through a system of inspections approved by the State (refer to 4.6.3 below for further information).

4.6.1.3 Regardless of the period of validity associated with a C of A, failure to comply with any of the following will invalidate the Certificate of Airworthiness:

- a) the aircraft remains in conformity with the type design approved by the State of Registry. Particular attention should be given to the following:
 - i) modifications or repairs completed in accordance with procedures and methods approved by the State of Registry (Part III, Chapter 8 and Part IV, Chapter 3 of this manual refer);
 - ii) replacement components, parts, equipment or material are in accordance with the design requirements and installed in accordance with the prescribed procedures;
 - iii) all markings and placards included in the approval of the type design by the State of Registry are present;
 - iv) in addition to the information specified in Annex 8, the aircraft flight manual includes any changes made mandatory by the State of Registry as required by Annex 6, Part I, Chapter 11 or Part III, Section II, Chapter 9, as applicable;
 - v) if an aircraft is released to service with any airworthiness significant systems, components or equipment unserviceable, it is in compliance with a minimum equipment list approved by the State of the Operator;
 - vi) if an aircraft is released to service with any parts missing, it is in compliance with procedures approved by the State of Registry; and

Note.— Information of this nature is sometimes included as a configuration deviation list in the aircraft flight manual.

- vii) unrepaired damage is within limits acceptable to the State of Registry (reference could be made to the structural repair manual for the concerned aircraft type to determine acceptable limits);
- b) the aircraft has been maintained in an airworthy condition, including:

Note.— Annex 6, Part I, 8.3, mandates that operators of commercially operated aeroplanes have a maintenance programme, approved by the State of Registry. Additionally, Annex 6, Part I, 11.3 and Part III, Section II, 9.3, describe the information required in a maintenance programme.

- i) it complies with a maintenance programme approved by the State of Registry;

- ii) the aircraft is the subject of a reliability programme, if applicable, including in particular engine trend monitoring, and corrective action has been taken to rectify any adverse trends;
- iii) it complies with any certification maintenance requirements at the prescribed intervals;
- iv) it complies with all modifications or inspections declared mandatory by the State of Registry;

Note.— The responsibilities of States of Registry in relation to continuing airworthiness requirements of this nature are contained in Annex 8, Part II, Chapter 4.

- v) those parts of the aircraft that are life-limited items declared by the organization responsible for the type design or the State of Registry have not exceeded their approved life limits;

Note.— Chapter 5 of an aircraft maintenance manual usually contains information on airworthiness limitations. For some older aircraft types, this information may sometimes be published in the aircraft flight manual or type certificate data sheet.

- vi) conformity of the aircraft mass and balance data with the requirements of the State of Registry, including re-weighing, if appropriate, and/or compliance with a system for recording progressive mass and balance change; and
- vii) conformity of the aircraft records with the requirements of the State of Registry, which must at a minimum meet the requirements of Annex 6, Part I, Chapters 6, 7 and 8, or Part III, Section II, Chapters 4, 5 and 6, as applicable.

4.6.2 Certificate of airworthiness with an expiring period of validity

4.6.2.1 The following paragraphs set out an acceptable process for the periodic renewal of the Certificate of Airworthiness by the AID. The periodic renewal is intended to ensure that the State is able to administer its Annex 8 continuing airworthiness responsibilities by imposing a finite calendar life on the certificate's validity, typically one, two or three years. Direct involvement by the AID is required in the form of sample inspections of the aircraft and its supporting documentation, in order to assure itself that the aircraft continues to remain in compliance with the applicable airworthiness requirements. Once satisfied, the AID will renew the validity of the certificate for a further period.

4.6.2.2 Some States facilitate the renewal of a Certificate of Airworthiness by the approval of individuals or organizations who make renewal recommendations to the AID. The AID would renew the period of validity of the certificate on receipt of a satisfactory recommendation. In this case the approved organizations themselves are subject to periodic audits by the AID to ensure that they are correctly discharging their responsibilities.

Note.— The periodic renewal of a C of A allows closer continuous oversight and airworthiness monitoring of a State's aircraft fleet but requires more resources that cannot be allocated to other safety oversight tasks.

4.6.2.3 Application for Certificate of Airworthiness renewal

The applicant is required to make an application for renewal in a timely manner and to provide the necessary information.

4.6.2.4 Status of continuing airworthiness

The applicant for renewal of a Certificate of Airworthiness should provide, if required, the following status, which may be substantiated by appropriate documents for AID examination:

- a) current aircraft hours and cycles: a record of the total flying hours and cycles for the aircraft since new and since the last renewal;
- b) engine and propeller types, serial numbers, hours and cycles: a record of the total flying hours and cycles for each engine and each propeller since new and since the last renewal;
- c) a record showing compliance with all MCAI. When an alternate means of compliance is used, the approval of the alternate means by the CAA should be provided;
- d) current mass and balance report: the mass of the aircraft should have been determined periodically as required by the regulations. The current mass and balance report should be provided to the AID;
- e) status of all maintenance tasks contained in the maintenance programme, including airworthiness limitations, CMRs and scheduled checks;
- f) all work for the maintenance of the aircraft should have been carried out under the supervision of appropriately licensed technical personnel or of an organization approved by, or acceptable to, the AID. Such work should be carried out in a proper manner and in conformity with the requirements, specifications, drawings and instructions relating to the approved design of the subject aircraft;
- g) full particulars of the work accomplished in f) above should have been entered in the appropriate log book, and a maintenance release should be issued;
- h) a record of modifications and their approval by the CAA;
- i) a record of repairs and their approval by the CAA; and
- j) in the case that the C of A becomes invalid following an accident or major repairs as a result of an accident or at any time when significant structural replacement becomes necessary, the AID of the State of Registry may wish to have a more direct role in the aircraft's return to service. This could include conducting an inspection of the aircraft or requiring the submission of a report prior to the restoration of the Certificate of Airworthiness. An aircraft inspection prior to repair to determine the extent of the damages and during the repair may be advisable.

4.6.2.5 **Inspection of records**

All relevant records should be made available for inspection by the AID or its designated organization.

4.6.2.6 **Inspection of the aircraft**

- a) The applicant is required to make the aircraft available, at a time and place acceptable to the AID, for such checks and inspections required by the AID.
- b) The applicant is required to provide the necessary personnel and equipment so that the required checks and inspections may be satisfactorily carried out.
- c) Any ground or flight tests, if such tests are required by the AID, should have been completed. Reports of those tests should be available for review.

4.6.2.7 **Renewal of the Certificate of Airworthiness**

4.6.2.7.1 After satisfactory completion of the inspections, the AID should renew the validity of the C of A by either extending the validity on the certificate or re-issuing a certificate with a new validity date. The results of the inspection and a copy of the renewed certificate should be kept by the AID.

4.6.2.7.2 The certificate should be renewed only if the aircraft complies with all applicable airworthiness requirements including all maintenance tasks established by the regulatory framework. The C of A should not be renewed for a shorter period simply because the aircraft has outstanding deficiencies. Guidance on the details required in an application for the renewal of C of A is at Attachment C to this chapter. A guide for processing an application for the renewal of a C of A is at Attachment D to this chapter.

4.6.3 **Certificate of airworthiness with a non-expiring period of validity**

4.6.3.1 When the Certificate of Airworthiness has a non-expiring period of validity, the State of Registry must approve a system of inspection that ensures the continuing airworthiness of the aircraft is monitored and determined.

4.6.3.2 The system of inspection should produce results at least equivalent to the system of periodic renewal of a Certificate of Airworthiness specified in 4.6.2.

4.6.3.3 In some States, unless surrendered, suspended or cancelled, a C of A will remain in force so long as the aircraft continues to meet the conditions subject to which the C of A was issued. These conditions should be stipulated in the regulatory framework of the State.

4.6.3.4 Failure to comply with any of the following will invalidate the Certificate of Airworthiness:

- a) the aircraft remains in conformity with the type design approved by the State of Registry (refer to 4.6.1.3 a)); and
- b) the aircraft has been correctly maintained in an airworthy condition (refer to 4.6.1.3 b)).

4.6.4 **Orphan Aircraft**

4.6.4.1 As stated in Annex 8, Part II, Chapter 1, an aircraft is considered orphaned when the type certificate issued by the State of Design is revoked and there is no longer a State of Design to fulfil the responsibilities under Annex 8, Part II, Chapter 4.

4.6.4.2 Orphan aircraft type must be rendered ineligible for a Certificate of Airworthiness. However, the State of Registry can issue a "Special Certificate of Airworthiness" or equivalent document to denote that an aircraft does not meet the Standards of Annex 8. While not valid for the purpose of international flight, such a document provides conditions and limitations that may be required by other Contracting States for purpose of granting approvals to fly within or through their jurisdiction.

4.7 **VALIDATION OF A CERTIFICATE OF AIRWORTHINESS**

4.7.1 When a State of Registry, in accordance with Annex 8, Part II, Chapter 3, renders valid a Certificate of Airworthiness issued by another Contracting State, it should provide a suitable statement of authorization to be carried with the original certificate. The validity of the authorization should be for a short period only and should not extend beyond the period of validity of the original certificate.

4.7.2 When entering an aircraft onto its register, the State of Registry assumes full responsibility for continuing airworthiness and airworthiness monitoring of that aircraft. The State may consider the previous valid Certificate of Airworthiness as satisfactory evidence, in whole or in part, that the aircraft is airworthy and in compliance with the appropriate airworthiness requirements.

4.8 AIRWORTHINESS FLIGHT TEST

Note.— This section is not intended to specify any particular necessity to carry out airworthiness flight tests additional to test flights for normal production or initial Certificate of Airworthiness issuance, or maintenance or modification approval flight tests. Such flight tests are expected to be part of regular production procedures or be specified in the aircraft manufacturer's maintenance data or in the requirements pertaining specifically to the approval of a particular modification and be under the control of an organization, or person, approved to do such test flying.

It is intended to ensure that, should a CAA require airworthiness flight tests in support of continuing airworthiness assurance, the flight tests are carried out with due care and attention to safety and under appropriate management by the CAA and the organization conducting the flight tests.

4.8.1 A State may require airworthiness flight tests to be performed in support of continuing airworthiness assurance. Such flight tests should be carried out by pilots and crew approved for the purpose by the CAA. The crew should be appropriately licensed for the specific aircraft type and competent to conduct the tests defined in the flight test schedule. The number of persons conducting the flight test should be restricted to the minimum crew specified in the aircraft flight manual or authorization, except when additional crew are required to be carried for a specific flight test purpose.

4.8.2 A flight test schedule, specific to the aircraft involved, will be prepared and agreed to with the CAA, before the flight test. The test flight schedule should define the purpose of the test(s), the requirements and/or the conditions to be met and any particular limitations for the test(s) which may apply, in addition to the normal limitations of the Certificate of Airworthiness and the aircraft flight manual.

4.8.3 Prior to each flight the aircraft should be certified safe for the intended flight.

4.8.4 A flight test report, in a format acceptable to the CAA, should be prepared and submitted to the CAA, as required, after the test flight.

Attachment A to Chapter 4

CONTENT OF APPLICATION FORM FOR THE ISSUANCE OF A CERTIFICATE OF AIRWORTHINESS

(Example only)

The application for the issue of the Certificate of Airworthiness should include the following information:

1. aircraft registration;
2. full name of the air operator or aircraft owner as stated in the Certificate of Registration;
3. address of the air operator;
4. contact information of the air operator (telephone number and e-mail address, etc.);
5. aircraft details:
 - a) aircraft manufacturer;
 - b) aircraft type and model; and
 - c) aircraft serial number and hours/cycles;
6. engine/propellers details:
 - a) engine/propeller type and model; and
 - b) engine/propeller serial number and hours/cycles;
7. other details:
 - a) certification basis (certification code with which the aircraft complies);
 - b) operational category (e.g. commercial, aerial work or private);
 - c) mass and balance report number (attach equipment list);
 - d) Export Certificate of Airworthiness reference, if applicable;
 - e) approved aircraft flight manual reference and revision status;
 - f) approved maintenance programme reference and revision status;
 - g) list of modification and repairs carried out since the aircraft was new (attach a list(s) of modifications/repairs); and

- h) location of aircraft for physical aircraft inspection.
9. Declaration by person submitting the application:
- a) "I hereby certify that all requirements of the approved maintenance programme and appropriate airworthiness directives have been complied with. I further declare that all information herein and documents submitted with this application are true in every respect"; and
 - b) name, designation and signature of applicant and date.
10. Declaration of aircraft airworthiness:
- a) "The aircraft described above has been inspected and found airworthy in accordance with national requirements (provide relevant reference)"
 - b) name, designation and signature of qualified person.

Attachment B to Chapter 4

GUIDANCE FOR PROCESSING AN APPLICATION FORM FOR THE ISSUANCE OF A CERTIFICATE OF AIRWORTHINESS

(Example only)

The process for the initial issue of the C of A consists of the following steps:

New aircraft:

1. Review application form:
 - an incomplete application form (including supporting documents) should be rejected;
2. Verify aircraft registration:
 - ensure aircraft is registered locally before C of A can be issued;
3. If this is a first of type aircraft in the State, ensure the aircraft type certificate (TC) is type certificated/validated/accepted;
4. If this is a first of type aircraft in the State, ensure the State of Design is informed;
5. If this is a first of type aircraft in the State, ensure the maintenance programme is approved:
 - ensure the maintenance programme is customized from the maintenance planning document (MPD).
6. Air operator to submit a compliance checklist:
 - ensure air operator submits the checklist to show that the aircraft has met the type certification, airworthiness and national requirements;
 - ensure MEL is customized from the MMEL;
8. Review airworthiness limitation items (ALI) list:
 - ensure the list is part of the aircraft records;
9. Review Export C of A, if applicable;
10. Conduct aircraft inspection:
 - sample configuration and work done on the aircraft;
11. Approve aircraft radio station, if applicable;

12. Review flight test reports (if applicable), OEM inspection reports and log books:
 - ensure all deficiencies and deviations are appropriately addressed and corrected;
13. Issue C of A; and
14. File complete application package and copy of C of A.

Used aircraft

1. Review application form:
 - incomplete application forms (including supporting documents) should be rejected;
2. Verify aircraft registration:
 - ensure aircraft is registered locally before C of A can be issued;
3. Verify previous C of R and C of A:
 - establish that the aircraft had not previously been denied the certificates. If yes, investigate reasons;
4. If this is a first of type aircraft in the State, ensure aircraft type certificate (TC) is type certified/validated/accepted;
5. If this is a first of type aircraft in the State, ensure the State of Design is informed;
6. If this is a first of type aircraft in the State, ensure the maintenance programme is approved:
 - ensure the maintenance programme is customized from the MPD. Compliance checklist (see 7.):
7. Air operator to submit a compliance checklist:
 - ensure air operator submits the checklist to show that the aircraft has met the type certification, airworthiness and national requirements and should also include:
 - a) current aircraft/engines/propellers hours/cycles;
 - b) bridging checks, if applicable;
 - c) ageing aircraft programme, if applicable;
 - d) list of all modifications and repairs;
 - e) ALI list;
 - f) AD compliance list;
 - g) maintenance records; and
 - h) aircraft damage chart.

8. Review Export C of A, if applicable;
9. Conduct aircraft inspection, if necessary:
 - sample configuration and work done on the aircraft;
10. Approve aircraft radio station, if applicable;
11. Review flight test reports (if applicable), inspection reports and log books:
 - ensure all deficiencies and deviations are appropriately addressed and corrected;
12. Issue C of A; and
13. File complete application package and copy of C of A.

Attachment C to Chapter 4

CONTENT OF APPLICATION FORM FOR THE RENEWAL OF A CERTIFICATE OF AIRWORTHINESS

(Example only)

The application for the renewal of the Certificate of Airworthiness should include the following information:

1. Aircraft registration;
2. Full name of the air operator;
3. Address of the air operator;
4. Contact information of the air operator (telephone number and e-mail address, etc.);
5. Aircraft details:
 - a) manufacturer, aircraft type and model; and
 - b) aircraft serial number and aircraft hours/cycles;
6. Engine/propellers details:
 - a) type and model; and
 - b) serial number and hours;
7. Certificate of airworthiness number and date of expiry;
8. Approved aircraft flight manual document number and revision status;
9. Approved MEL document number and revision status;
10. Location of aircraft for physical inspection;
11. Declaration by person submitting application:
 - a) "I hereby certify that all requirements of the approved maintenance programme and appropriate airworthiness directives have been complied with. I further declare that all documents submitted in support of this application are true in every respect." and
 - b) name, designation and signature of applicant and date.

12. Declaration of aircraft airworthiness:

- a) "The aircraft described above has been inspected and found airworthy in accordance with national requirements (provide relevant reference)";
- b) name, designation and signature of qualified person.

Note.— This application must be accompanied by all necessary supporting documents.

Attachment D to Chapter 4

GUIDANCE FOR PROCESSING AN APPLICATION FOR THE RENEWAL OF A CERTIFICATE OF AIRWORTHINESS

(Example only)

The process for the renewal of a C of A consists of the following steps:

1. Review application form:
 - incomplete forms (including supporting documents) should be rejected;
2. Air operator to submit compliance checklist and ensure the aircraft has complied with the type certification, airworthiness and national requirements. The compliance checklist should include:
 - a) current aircraft and engines/propellers hours/cycles;
 - b) maintenance checks, if required;
 - c) ageing aircraft programme, if applicable;
 - d) all modifications and repairs;
 - e) ALI list;
 - f) aircraft damage chart;
 - g) AD compliance; and
 - h) maintenance record;
3. Inspect aircraft, if necessary:
 - sampling inspection to verify Item 2;
4. Approve aircraft radio station, if applicable;
5. Review flight test reports (if applicable), maintenance records and aircraft log books:
 - ensure all deficiencies and deviations are appropriately addressed and corrected in an acceptable manner;
6. Issue C of A; and
7. File completed application, all documents and copy of C of A.

Chapter 5

APPROVAL FOR SPECIAL FLIGHTS

5.1 GENERAL

When an aircraft is not fully in compliance with its *airworthiness requirements*, the CAA airworthiness regulations should have provisions for the issuance of a special flight approval or authorization or permit, providing the aircraft is capable of safe flight. Such occasions may include:

- a) a flight test required after a modification or repair during a process of applying for a supplemental type certificate;
- b) relocating the aircraft to a base where maintenance is to be performed, or to a point of storage;
- c) delivering the aircraft; or
- d) evacuating the aircraft from an area of impending danger, or in cases of force majeure.

5.2 APPLICATION FOR SPECIAL FLIGHT APPROVAL/ AUTHORIZATION/PERMIT

Application for a special flight approval or authorization or permit should be submitted in a manner prescribed by the CAA, indicating at least the following:

- a) the make, model, serial number and registration marks of the aircraft;
- b) the purpose of the flight;
- c) the proposed itinerary;
- d) the details of crew required to operate the aircraft;
- e) details of non-compliance with applicable airworthiness requirements;
- f) any restriction the applicant considers necessary for safe operation of the aircraft; and
- g) any other information considered necessary by the AID for the purpose of prescribing operating limitations.

(Attachment A to this chapter provides guidance for an application for a special flight approval/authorization/permit.)

5.3 ISSUANCE OF SPECIAL FLIGHT APPROVAL/AUTHORIZATION/PERMIT

5.3.1 When issuing a special flight permit, appropriate limitations should be prescribed to minimize hazard to persons or property. The following limitations are considered to be essential in all special flight permits:

- a) a copy of the permit should be on board the aircraft at all times when operating under the terms of the permit;
- b) the registration marks assigned to the aircraft by the State of Registry should be displayed on the aircraft in conformity with the requirements of that State;
- c) persons or property should not be carried for compensation or hire;
- d) no person should be carried in the aircraft unless that person is essential to the purpose of the flight and has been advised of the contents of the authorization and the airworthiness status of the aircraft;
- e) the aircraft should be operated only by crew who are aware of the purpose of the flight and any limitations imposed, and who hold appropriate certificates or licenses acceptable to the State of Registry;
- f) all flights should be conducted so as to avoid areas where flights might create hazardous exposure to persons or property;
- g) all flights should be conducted within the performance operating limitations prescribed in the aircraft flight manual and any additional limitations specified by the State of Registry for the particular flight; and
- h) the period of validity of the permit should be specified.

5.3.2 If the aircraft is not in compliance with Annex 8 and the flight involves operations over States other than the State of Registry, the air operator of the aircraft should obtain the necessary overfly authorizations from the respective authorities of each of those States prior to undertaking the flight.

5.3.3 The aircraft should be inspected and repaired to a degree necessary to ensure safe flight, and a maintenance release should be signed by a person licensed in accordance with Annex 1 or issued by an AMO approved in accordance with Annex 8.

5.3.4 If required, the aircraft may be inspected to confirm its airworthiness status.

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Attachment A to Chapter 5

CONTENT OF APPLICATION FORM FOR A SPECIAL FLIGHT APPROVAL/AUTHORIZATION/PERMIT

(Example only)

The application for a special flight approval/authorization/permit should include the following information:

1. Full name of aircraft owner as stated in the C of R and aircraft owner's address;
2. Contact information of aircraft owner (telephone number and e-mail address, etc.);
3. Name of applicant and address of applicant;
4. Contact information of the applicant (telephone number and e-mail address, etc.);
5. Name of aircraft manufacturer;
6. Aircraft type/model;
7. Aircraft registration;
8. Aircraft serial number;
9. Year of construction;
10. Persons operating the flight:
 - a) name(s); and
 - b) designation(s);
11. Purpose of flight;
12. Route of flight;
13. Details of non-compliance to airworthiness requirements (attach supporting documents);
14. Details of restrictions to be applied;
15. Declaration by person making application;
 - a) "I declare that the above particulars and all documents submitted in support of this application are true in every respect"; and

b) name, designation and signature of applicant and date.

Note.— This application must be accompanied by all necessary supporting documents.

Chapter 6

AIRWORTHINESS APPROVAL FOR EXPORT

6.1 GENERAL

6.1.1 Annex 8, Part II, 3.2.4 contains the following 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 (Doc 9760).”

Note.— The issuance of an “Export Certificate of Airworthiness” is not mandatory.

6.1.2 In establishing procedures for facilitating the export of aircraft, States have adopted various titles for the export document, e.g. “Export Certificate of Airworthiness” or “Certificate of Airworthiness for Export”. While differing in their titles, all such certifications are intended to achieve the same goal which is a statement by the exporting State confirming to the importing State the acceptable airworthiness status of the aircraft. The Export Certificate of Airworthiness confirms not only the aircraft’s conformity with the approved type design and its acceptable airworthiness status, stating in effect that if the aircraft were to remain on the aircraft register of the exporting State it would continue to qualify for the continuance of its C of A. Nevertheless, it should be noted that some States have neither provisions for export certification nor any requirement for such certificates from States from which they receive exported aircraft.

Note.— Although the guidance provided in this document in relation to the Export Certificate of Airworthiness has been mainly developed for situations where the Export Certificate of Airworthiness attests compliance with the requirements of the exporting State, it also covers cases where, if agreed between the exporting and importing States through bilateral agreements or other means, the Export Certificate of Airworthiness attests compliance with the requirements of the importing State.

6.2 PROCEDURE FOR ISSUANCE

6.2.1 The AID of a State issuing an Export Certificate of Airworthiness should closely follow the procedures required for the issuance of a Certificate of Airworthiness or renewal of a C of A described in Chapter 4 of this Part. The depth to which the AID wishes to apply these procedures will however depend to a large extent on how recent its involvement with the aircraft in question has been. The maintenance records to be kept may also be restricted to those performed since the AID of the exporting State carried out the last inspection.

6.2.2 If the exporting and importing States have agreed, through bilateral agreements or other means, that the Export Certificate of Airworthiness attests compliance with the requirements of the importing State instead of compliance with the requirements of the exporting State, then the AID of the exporting State should contact the AID of the importing State in order to identify any special requirements specified by the importing State.

Note 1.— Guidance on the content of an application form for the issue of an Export Certificate of Airworthiness is given in Attachment A to this chapter. Guidance is also provided at Attachment B for the processing of an application for an Export C of A.

Note 2.— A sample Export Certificate of Airworthiness is shown in Attachment C to this chapter.

6.3 EXCEPTIONS

. Exceptions to the requirements of the exporting State are a matter of agreement between the States concerned. If the exporting and importing States have agreed, through bilateral agreements or other means, that the Export Certificate of Airworthiness attests compliance with the requirements of the importing State instead of compliance with the requirements of the exporting State, then the importing State shall make available to the exporting State any specific certification requirements they may have in place, in addition to those adopted or required by the exporting State. In addition, the importing State may agree that they should be listed as exceptions to the Export Certificate of Airworthiness or require compliance with the additional requirements before accepting the Export Certificate of Airworthiness.

6.4 EXPORT CERTIFICATE OF AIRWORTHINESS STATUS

It is very important to understand that an Export Certificate of Airworthiness is not a Certificate of Airworthiness as defined by Article 31 of the Convention and therefore does not grant the right of international flight and cannot be validated in accordance with Annex 8, Part II, 3.2.4. To be eligible for international flight, an aircraft having an Export Certificate of Airworthiness should carry a valid Certificate of Airworthiness issued by the State of Registry, or some equivalent document mutually acceptable to the exporting and importing States, as well as any State over which the aircraft will fly on its delivery flight.

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Attachment A to Chapter 6

CONTENT OF APPLICATION FORM FOR AN EXPORT CERTIFICATE OF AIRWORTHINESS

(Example only)

The application for the issue of an Export Certificate of Airworthiness should include the following information:

1. Aircraft registration;
2. Name of owner and address of owner;
3. Contact information of the aircraft owner (telephone number and e-mail address, etc.);
4. Aircraft details:
 - a) aircraft manufacturer;
 - b) aircraft type and model;
 - c) aircraft serial number; and
 - d) aircraft category;
5. Engines/propellers details:
 - a) engines type and model; and
 - b) engines serial number;
6. Other details:
 - a) maximum taxi mass (kg); and
 - b) maximum take-off mass (kg);
7. Country of import;
8. Name and address of importer;
9. Additional information or special requirements of the importing State;
10. Location of aircraft for physical inspection, if necessary;
11. Declaration by person making the application:

- a) "I hereby certify that the particulars given in this form are true in every respect. I further declare that all documents submitted in support of this application are true in every respect"; and
- b) name, designation and signature of applicant and date.

Note.— This application must be accompanied by all necessary supporting documents.

Attachment B to Chapter 6

GUIDANCE FOR PROCESSING AN APPLICATION FOR AN EXPORT CERTIFICATE OF AIRWORTHINESS

(Example only)

The process for the issue of an Export Certificate of Airworthiness consists of the following steps:

1. Application form:
 - incomplete application forms (including supporting documents) should be rejected;
2. Compliance checklist:
 - air operator to submit checklist and ensure that the aircraft continues to meet the type certification, airworthiness and national requirements of the exporting State;
3. Maintenance check records, if required:
 - to ensure all deficiencies are appropriately addressed and closed;
4. Aircraft inspection conducted, if required;
5. In those cases where the Export C of A will attest compliance with the requirements of the importing State, review any request for exceptions/additional conditions received from the importing authority:
 - consider if the requested exceptions/conditions are appropriate/applicable and can be entered into the Export C of A;
6. Issuance of Export C of A; and
7. Filing of complete application package and copy of Export C of A.

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Attachment C to Chapter 6

SAMPLE EXPORT CERTIFICATE OF AIRWORTHINESS

[INSERT CIVIL AVIATION AUTHORITY NAME]

No.

EXPORT CERTIFICATE OF AIRWORTHINESS

THIS CERTIFIES that the aircraft identified below and detailed in [INSERT TYPE CERTIFICATE NO. OF EXPORTING STATE] has been examined and, as of the date of this certificate, is considered airworthy in accordance with the regulations of [INSERT EXPORTING STATE]*.

Note: This certificate does not attest to compliance with any agreements or contracts between the vendor and purchaser, nor does it constitute authority to operate an aircraft.

Aircraft: _____

Manufacturer: _____

Model: _____

Serial No.: _____

New

Used

State to which exported (if known): _____

Exceptions: _____

Signature of Approving Officer

Date

Specify installed engines (manufacturer, model and serial number) and, if applicable, installed propellers (manufacturer, model and serial number).

List the applicable specification or Type Certificate Data Sheet numbers for the aircraft, engine and propeller. Listed applicable specifications or Type Certificate Data Sheet(s), if not attached to this Export Certificate, will have been forwarded to the appropriate governmental office of the importing State.

CAA Form No.

* The certificate may attest compliance with the requirements of the importing State and list applicable exceptions to those requirements, if this has been agreed between the exporting and importing States through bilateral agreements or other means.

Chapter 7

AIR OPERATOR'S CONTINUING AIRWORTHINESS RESPONSIBILITIES

7.1 INTRODUCTION

7.1.1 Annex 6, in Part I, 8.1.1 and Part III, Section II, 6.1.1, requires operators to ensure that:

- a) each aircraft they operate is maintained in an airworthy condition;
- b) the operational and emergency equipment necessary for an intended flight is serviceable; and
- c) Certificate of Airworthiness of each aircraft they operate remains valid.

7.1.2 Annex 6, Part I, 8.1.2 and Part III, Section II, 6.1.2 require operators to ensure that maintenance on their aircraft and any associated part of their aircraft is carried out by:

- a) an AMO that is either approved by the State of Registry of the aircraft or is approved by another Contracting State and is acceptable to the State of Registry; or
- b) by a person or organization in accordance with procedures authorized by the State of Registry.

7.1.3 Annex 6, Part I, 8.1.2 and Part III, Section II, 6.1.2 also require operators to ensure that there is a maintenance release in relation to the maintenance carried out on the aircraft.

7.1.4 Annex 6, in Part I, 8.1.4 and Part III, Section II, 6.1.4 require operators to employ a person or group of persons to ensure that all maintenance is controlled in accordance with the policies and procedures set out in the operator's maintenance control manual (MCM).

7.1.5 Annex 6, in Part I, 8.1.5 and Part III, Section II, 6.1.5 require operators to ensure that the maintenance required of its aircraft is performed in accordance with the requirement of the approved maintenance programme.

Note.— The air operator should monitor the compliance of its maintenance procedures by establishing a quality assurance system or equivalent.

7.1.6 Annex 8, Part II, 4.2.3 requires that the State of Registry shall determine the continuing airworthiness of an aircraft. This should be done by developing or adopting appropriate airworthiness requirements for the aircraft, adopting the mandatory information from the State of Design and ensuring the transmission to the State of Design of all MCAI originated from the State of Registry.

7.1.7 For aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM, Annex 8, Part II, 4.2.3 also requires the State of Registry to implement a system that ensures information on faults, malfunctions, defects and other occurrences in an aircraft that cause or might cause adverse effects on the continuing airworthiness of the aircraft is transmitted to the organization responsible for the type design of that aircraft. If such information relates to an engine or propeller of an aircraft, the information shall be transmitted to the organization responsible for the type design of the engine or propeller and the organization responsible for type design of the aircraft. Where such information relates to a modification, the State of Registry needs to ensure that the information is transmitted to the organization responsible for the design of the modification.

7.1.8 The State of Registry's responsibilities include the approval of the maintenance programme, acceptance of mass and balance programme for the aircraft and implementation of appropriate requirements for the continuing validity of the Certificate of Airworthiness of the aircraft. The State of Registry is also responsible for acceptance of an AMO's procedures for:

- a) the performance and certification of maintenance including modifications and repairs;
- b) the issue of maintenance release and;
- c) maintenance record-keeping.

7.1.9 When a State of Registry allows a person or organization other than an AMO to carry out maintenance in accordance with Annex 6, Part I, 8.1.2, or Part III, Section II, 6.1.2, the State of Registry needs to ensure that policies and procedures that govern performance of maintenance are acceptable to the State. In this case, the air operator's MCM should describe the maintenance procedures including the procedures for completing a maintenance record and signing a maintenance release. The MCM in this case should also include the scope of maintenance to be performed by such persons or organizations.

7.2 AIR OPERATOR'S MAINTENANCE CONTROL MANUAL (MCM)

7.2.1 Annex 6, Part I, 8.2 and Part III, Section II, 6.2 require operators to ensure that an MCM, acceptable to the State of Registry, is provided for the use and guidance of maintenance and operational personnel, as applicable. The operator is accountable for the manual and also required to ensure that the manual is amended and revised as necessary by means of establishing an appropriate revision control system and that copies of changes are distributed to holders of the manual. Additionally, Annex 6, Part III, Section II, 6.2 and Part I, 8.2.1 require that the design of this manual observe Human Factors principles. Some of the basic aspects requiring Human Factors optimization include:

- a) written language, which involves not only correct vocabulary and grammar, but also the manner in which they are used;
- b) typography, including the form of letters and printing and the layout, which has a significant impact on the comprehension of the written material;
- c) the use of photographs, diagrams, charts or tables replacing long descriptive text to help comprehension and maintain interest. The use of colour in illustrations reduces the discrimination workload and has a motivational effect;
- d) consideration of the working environment in which the document is going to be used, when print and page size are determined.

7.2.2 Annex 6, Part I, 11.2 and Part III, Section II, 9.2 specify the information that should be included in the MCM. The MCM should contain the following information:

- a) a description of the procedures required by air operators to ensure that:
 - i) each aircraft is maintained in an airworthy condition;
 - ii) the operational and emergency equipment necessary for the intended flight is serviceable; and

- iii) the Certificate of Airworthiness of each aircraft remains valid;
- b) a description of the administrative arrangements between the air operator and the AMO, when applicable, including how to review the arrangements, when applicable;
- c) a description of the maintenance procedures and the procedures for completing and signing a maintenance release when maintenance is carried out by a person or organization other than that of an AMO;
- d) the names and duties of the person or group of persons employed to ensure that all maintenance is controlled in accordance with the MCM;
- e) a reference to the maintenance programme for each aircraft type operated (refer to paragraph 7.3 of this chapter);
- f) a description of the methods used for the completion and retention of the air operator's continuing airworthiness records (refer to paragraph 7.8 of this chapter);
- g) in the case of aeroplanes over 5 700 kg or helicopters over 3 175 kg MTOM:
 - i) a description of the procedures for monitoring, assessing and reporting maintenance and operational experience to the State of Registry;
 - ii) a description of the procedures for complying with the service information reporting requirements of Annex 8, Part II, 4.2.3 f) and 4.2.4; and
 - iii) a description of the procedures for assessing continuing airworthiness information and recommendations available from the organization responsible for the type design, and for implementing resulting actions considered necessary as a result of the assessment in accordance with a procedure acceptable to the State of Registry;
- h) a description of the procedures for implementing action resulting from MCAI and, if applicable, how their alternative means of compliance is requested and complied with;
- i) a description of the establishment and maintenance of a system of analysis and the continued monitoring of performance and efficiency of the maintenance programmes, in order to correct any deficiency in the programme;
- j) a description of aircraft types and models to which the manual applies;
- k) a description of procedures for ensuring that unserviceable systems and components affecting airworthiness are recorded and rectified; and
- l) a description of the procedures for advising the State of Registry of significant in-service occurrences.

7.2.3 Additional procedures may be necessary to ensure the air operator's maintenance personnel responsibilities and aircraft maintenance programme requirements are met. The following additional procedures are recommended:

- a) a description of the procedures to ensure the aircraft is maintained in accordance with the maintenance programme;

- b) a description of the training programme for the maintenance personnel employed by the air operator applicable to their assigned duties and responsibilities;
- c) a description of the air operator's safety management system;
- d) a description of the procedure to ensure that modifications and repairs comply with the State of Registry's airworthiness requirements; and
- e) a description of the procedure used for the MCM revision and control.

Note.— Where an operator's safety management system (SMS) is already addressed in some other document, an appropriate reference to such document together with its relevant interfaces with the MCM can be described instead. Guidance material on SMS can be found in the Safety Management Manual (Doc 9859).

7.2.4 Annex 6, in Part I, 8.2.4 and Part III, 6.2.4, requires the air operator to provide the State of the Operator and the State of Registry with a copy of the air operator's MCM, together with all amendments and/or revisions to it and should incorporate in it such mandatory material as the State of the Operator or the State of Registry may require.

7.3 MAINTENANCE PROGRAMME

7.3.1 General

7.3.1.1 Annex 6, Part I, 8.3 and Part III, Section II, 6.3 require operators to provide a maintenance programme approved by the State of Registry for the use and guidance of maintenance and operational personnel. When the State of Registry is different from the State of the Operator, the review of the programme may be coordinated with the State of the Operator. Additionally, Annex 6, Part I, 8.3 and Part III, Section II, 6.3 require that the design and application of the air operator's maintenance programme observe the Human Factors principles as described in 7.2.1.

7.3.1.2 Annex 6, Part I, 11.3 for aeroplanes and Part III, Section II, 9.3 for helicopters also require that maintenance tasks and intervals that have been specified as mandatory in approval of the type design be identified as such.

7.3.1.3 Annex 6, Part I, 11.3.3 for aeroplanes and Part III, Section II, 9.3.3 for helicopters also recommend that the maintenance programme be based on information made available by the State of Design or by the organization responsible for the type design, and any additional applicable experience. For large aeroplanes, this information is normally issued in the form of a maintenance review board report for the particular aircraft type and is one of the main sources for the maintenance programme.

7.3.1.4 A maintenance programme is applicable to aircraft, engines, propellers and parts. Annex 6, in Part I, 8.3 and Part III, Section II, 6.3, requires each aircraft and helicopter to have a maintenance programme which should contain the following information:

- a) maintenance tasks and the intervals at which these are to be performed, taking into account the anticipated utilization of the aircraft and operating environment of the aircraft. It is recommended that the maintenance programme be based on information made available by the State of Design or by the organization responsible for the type design and any additional applicable experience. The basic requirements for a maintenance programme include but are not limited to:
 - i) inspection;

- ii) scheduled maintenance;
 - iii) overhaul and repairs;
 - iv) structural inspection; and
 - v) maintenance tasks and intervals specified and identified as mandatory in approval of the type design;
- b) when applicable, a continuing structural integrity programme (SIP) which includes at least:
- i) supplemental inspections;
 - ii) corrosion prevention and control;
 - iii) structural modification and associated inspections;
 - iv) repair assessment methodology; and
 - v) widespread fatigue damage (WFD) review;
- c) procedures for changing or deviating from a) and b) above for tasks that do not have mandatory designations from the State of Design; and
- d) when applicable, condition monitoring and reliability programme descriptions for aircraft systems, components and engines.

Note.— In the context of d) above, “when applicable” means that the condition monitoring and reliability programmes are only applicable to aircraft types where the maintenance programme was derived using the maintenance review board process.

7.3.2 Maintenance programme development basis

7.3.2.1 Air operators' maintenance programmes should normally be based upon the manufacturer recommended instructions for continuing airworthiness (ICAs) such as, but not limited to, the maintenance review board (MRB) report, where available, and the type certificate holder's maintenance planning document (MPD) and/or any appropriate chapter in the maintenance manual (i.e., the manufacturer's recommended maintenance programme). The structure and format of these maintenance instructions may be required to be written in a format acceptable to the CAA for the issuance of the approval.

7.3.2.2 For a newly type-certificated aircraft, where no previously approved maintenance programme exists, it will be necessary for the air operator to comprehensively appraise the manufacturer's recommendations (and the MRB report, where applicable), together with other airworthiness information, in order to produce a realistic programme for approval.

7.3.2.3 During the approval of the proposed maintenance programme, the State of Registry should consider the following requirements for the content of the maintenance programme:

- a) MRB report approved by the State of Design;
- b) MPD issued by the type certificate holder or manufacturer;

- c) Airworthiness limitation items (ALIs) specified in the type certificate data sheet. These may include CMRs, safe life airworthiness limitation items, and damage-tolerant ALIs;
- d) specific operation requirements of the State of Registry and the State of the Operator. These requirements may relate to maintenance of additional configuration items required by these States for the type of operations approved and to any additional maintenance tasks required by national regulations. Examples include maintenance requirements relating to operations over uninhabited terrain, operations over water, extended diversion time operations (EDTO), reduced vertical separation minima (RVSM) operations, all-weather operations (AWOPS) and navigation system requirements relating to polar operations and minimum navigation performance specifications (MNPS). Additional maintenance requirements relating to extreme climates (temperature, humidity, salt spray, ice or dust) in the area of operations may also be required by national regulations. Also, these States may have specific maintenance requirements relating to the flight data recorder (FDR) system, the cockpit voice recorder (CVR) system, emergency equipment and other systems;
- e) mandatory life limits for engine life-limited parts specified by the manufacturer;
- f) engine and auxiliary power unit (APU) off-wing maintenance as specified in the engine and APU work scope planning guides; and
- g) ICAs specified for air-operator-installed equipment or required by supplemental type certificate (STC) modifications, including emergency equipment.

All items in the maintenance programme should have the source document clearly identified and mandatory items (such as CMRs, ALIs and ADs) must be clearly distinguished from items that are subject to adjustments or changes based on operating experience.

7.3.2.4 The following provides some guidance on task intervals:

- a) the task intervals are commonly specified in the MRB report in terms of relevant usage parameters such as cycles, flight hours or calendar time. For planning convenience, it is usual for the air operator (or the MRB) to group the tasks into packages or scheduled maintenance checks (for example, A-check or 150-hour check). When this is done, it is important to retain visibility of the original MRB recommended usage parameter for use when task and/or scheduled maintenance check interval adjustments are evaluated; and
- b) some air operators prefer to accomplish scheduled maintenance checks in separate “phases” which combine to make up a complete check. This is acceptable provided that the interval between repetitions of tasks is not exceeded (this may require some phases to be accomplished long before they are due during the first cycle).

7.3.2.5 For existing aircraft types, it is permissible for the air operator to make comparisons with maintenance programmes previously approved. It should not be assumed that a programme approved for one air operator should automatically be approved for another air operator. The air operator should fit the maintenance programme around its expected utilization and operating environment. The State of Registry should evaluate the maintenance programme against the air operators’ aircraft fleet utilization, landing rate and equipment fit. In particular, the experience of the air operator should be assessed. Where the CAA of the State of Registry is not satisfied that the proposed maintenance programme can be used as is by the air operator, the CAA should request the air operator to introduce appropriate changes to it, such as adding maintenance tasks, de-escalating check intervals, or developing the aircraft initial maintenance programme based upon the manufacturer’s recommendations.

7.3.3 Maintenance programme approval

The legislation of the State of Registry should provide the CAA of the State with the authority and responsibility for the approval of each air operator's aircraft maintenance programme. The approval of the maintenance programme establishes the maintenance tasks and intervals for the aircraft, engines, propellers and parts.

7.3.4 Updating the maintenance programme

7.3.4.1 Revisions to the approved programme should be raised by the air operator, in order to reflect changes in the type certificate holder's recommendations, modifications, service experience, or as required by the CAA of the State of Registry (in coordination with the State of the Operator where the two are different). Reliability programmes form one important method of updating approved programmes (see 7.4 below).

7.3.4.2 The air operator may vary the periods prescribed by the programme only with the approval of the State of Registry (in coordination with the State of the Operator where the two are different). The CAA should not approve intervals escalations or task modifications related to MCAI, ALIs and CMRs without appropriate coordination with the State of Design.

7.3.4.3 The air operator's approved aircraft maintenance programme should be subject to periodic review to ensure that all mandatory requirements are addressed. These include MCAI, ICAs, revisions to the MRB report and maintenance needs of the aircraft as identified by the reliability programme or other monitoring of in-service performance.

7.3.4.4 The State of Registry needs to ensure that the air operator has the necessary resources, organization and documented processes to perform the continuous assessment of the type certificate holder's latest recommendations and maintenance requirements of the aircraft as required by Annex 6, Part I, Chapter 8 and Part III, Section II, Chapter 6.

7.3.4.5 The air operator should review the content of the maintenance programme periodically for continued validity in view of operating experience and ensure that the programme is amended and revised as necessary by means of establishing an appropriate revision and control system and that copies of all amendments to the maintenance programme are furnished promptly to all organizations or persons to whom the maintenance programme has been issued.

7.4 RELIABILITY PROGRAMME

7.4.1 General

7.4.1.1 The State of Registry may require that the air operator develop a reliability programme in conjunction with the maintenance programme in order to ensure the continuing airworthiness of the aircraft. Specifically, the programme may be required in the following cases:

- a) the aircraft maintenance programme is based upon MSG-3 logic; or
- b) the aircraft maintenance programme includes condition monitored components; or
- c) the aircraft maintenance programme does not include overhaul time periods for all significant system components; or
- d) when specified by the manufacturer's MPD or MRB report.

Note 1.— For the purpose of this paragraph 7.4.1.1, c) “significant system” is a system whose failure could cause a hazard to the safe operation of the aircraft.

Note 2.— Notwithstanding paragraph 7.4.1.1, an operator that is not required to develop a reliability programme may however develop its own reliability monitoring programme when it may be deemed beneficial from a maintenance point of view.

Note 3.— Two primary maintenance procedures that are currently being used for the purpose of a maintenance programme: MSG-2 for maintenance processes, i.e. hard time (HT), on condition (OC) and condition monitoring (CM); MSG-3 for maintenance tasks, i.e. lubrication and servicing, operational and visual check, inspection and function and functional check, restoration and discard.

7.4.1.2 The purpose of a reliability programme is to ensure that the aircraft maintenance programme tasks are effective, and their recurrence at regular intervals is adequate. The reliability programme therefore may give rise to the optimization of a maintenance task interval, as well as the addition or deletion of a maintenance task. In this respect, the reliability programme provides an appropriate means of monitoring the effectiveness of the maintenance programme.

7.4.1.3 Reliability programmes are designed to supplement the operator's overall programme for maintaining aircraft in a continuous state of airworthiness. There are a number of maintenance reliability programmes now in operation that use new and improved maintenance management techniques. Although the design and methods of application vary to some degree, the basic goals are the same — by recognizing access and acting upon meaningful symptoms of deterioration before malfunction or failure in order to establish and monitor the MCM requirements.

7.4.1.4 Performance standards (e.g. alert value) are established by actuarial study of service experience using statistical methods coupled with application of technical judgment. These standards are used to identify trends or patterns of malfunction or failures experienced during programme operation. Even though reliability programmes vary, they should provide means for measurement, evaluation, and improvement predictions. The programme should contain the following elements:

- a) an organizational structure;
- b) a data collection system;
- c) a method of data analysis and display;
- d) procedures for establishing performance standards or levels;
- e) procedures for programme revision;
- f) procedures for time control; and
- g) a paragraph containing definitions of terms used in the programme.

7.4.1.5 The specific needs of operators, in terms of operating philosophy and record-keeping practices, should be reflected in their reliability programmes. The extent of statistical and data processing required for programme operation is entirely dependent on the character of the particular programme. Programmes may be simple or complex, depending on the size of the operator and other factors. Smaller as well as larger operators may develop maintenance reliability programmes to meet their own specific needs.

7.4.2 Reliability programme criteria

7.4.2.1 The word "reliable" is a broad term meaning dependable or stable. The term, as used by the aviation industry, applies to the dependability or stability of an aircraft system or part thereof under evaluation. A system or component is considered "reliable" if it follows an expected law of behaviour and is regarded "unreliable" if it departs from this expectation. These expectations differ greatly, depending upon how the equipment is designed and operated.

7.4.2.2 Reliability programmes should describe the techniques used for measuring the performance and calculating the remaining service life of the component sufficiently in advance in order to take corrective maintenance action prior to failure or reaching an unacceptable performance level. Essentially, reliability programmes are used for the control of maintenance by establishing performance levels for each type of unit and/or system individually or as a class. Generally, reliability programmes depend on the collection of data which can be analysed and compared to previously established programme goals.

7.4.2.3 A good reliability programme should contain means for ensuring that the reliability which is forecast is actually achieved; a programme which is very general may lack the details necessary to satisfy this requirement. It is not intended to imply that all of the following information should be contained in one programme, since the operating philosophy and programme management practices for each operator are different. However, the following information could be applied to the specific needs of either a simple or a complex programme.

7.4.3 Organizational structure

The programme should contain an organizational chart which includes:

- a) a diagram of the relationship of key organizational blocks;
- b) a listing of the organizational elements by title responsible for the administration of the programme. The organizations responsible for instituting changes to maintenance controls and maintenance programmes should be clearly defined;
- c) a statement describing lines of authority and responsibility. The programme should identify the organization responsible to management for the overall reliability functions. It should define the authority delegated to these organizations to enforce policy and assure necessary follow-up and corrective actions;
- d) a procedure for the preparation, approval and implementation of revisions to the programme; and
- e) a description of reliability board or committee membership and meeting frequency, as appropriate.

7.4.4 Data collection system

It is important that the data be accurate and factual to support a high degree of confidence for any derived conclusion. It should be obtained from units functioning under operational conditions and should relate directly to the established level of performance. Typical sources of information are: unscheduled removals, confirmed failures, pilot reports, sampling inspections, functional checks, shop findings, bench checks and SDRs, flight cancellations and delays and other sources the operator considers appropriate. The data should be collected at specific intervals and should be sufficient to appropriately support the analysis.

7.4.5 Data analysis and display

7.4.5.1 Data display and reporting provide a timely and systematic source of information that is necessary for correcting existing deficiencies. Reporting is not an end objective, but rather a necessary link in the chain of events leading to system improvement. The principal reason for gathering reliability data is to use it for making various determinations and predictions. Among these are such items as the failure rate of parts and components, serviceability, and maintainability. Root cause analysis is also frequently required as a prerequisite to determining effective corrective action. Data analysis is the process of evaluating mechanical performance data to identify characteristics indicating a need for programme adjustment, revising maintenance practices, improving hardware, and equipment. The first step in analysis is to compare or measure data against acceptable performance levels. The standard may be a running average, tabulation of removal rates for past periods, graphs, charts, or any other acceptable means of establishing a norm.

7.4.5.2 In general, almost any desired information can be extracted from these data if they are obtained in a planned and organized manner and carefully recorded and collated. The methods used to analyse the results should also be made clear. The programme should provide the information necessary to properly evaluate the graphic presentations submitted in support of the programme.

7.4.6 Performance standard

7.4.6.1 Each reliability programme should include a performance standard expressed in mathematical terms. This standard becomes the point of measure of maximum tolerable unreliability. Thus, satisfactory reliability trend measurements are those which fall at or preferably below the performance standard. Conversely, a reliability trend measurement exceeding the performance standard is unsatisfactory and calls for some type of follow-up and corrective action.

7.4.6.2 A performance standard may be expressed in terms of system or component failures per thousand hours of aircraft operation, number of landings, operating cycles, departure delays, or of other findings obtained under operational conditions. In some instances, an upper and lower figure may be used. This is known as a reliability band or range and provides the standard by which equipment behaviour may be interpreted or explained.

7.4.6.3 When the performance standard is not met, the programme should provide for an active investigation which leads to suitable corrective action.

7.4.6.4 A description of the types of action appropriate to the circumstances revealed by the trend and the level of reliability experience should be included in the programme. This is the core of maintenance control by reliability measurement. It is the element that relates operating experience to maintenance control requirements. Statistical techniques used in arriving at reliability measurements presented in support of maintenance control actions should be described. Appropriate corrective actions might be:

- a) verify that engineering analysis is appropriate on the basis of collective data in order to determine the need to change the maintenance programme;
- b) actual maintenance programme changes involving inspection frequency and content, functional checks, or overhaul times;
- c) aircraft system or component modification, or repair; or
- d) other actions peculiar to the condition that prevails.

7.4.6.5 The results of corrective action programmes should become evident within a reasonable time from the date of implementation of corrective action. An assessment of the time permitted should be commensurate with the severity or safety impact of the problem. Each corrective action programme should have an identified completion date.

7.4.6.6 Due to the constantly changing state of the art, no performance standard should be considered fixed — it is subject to change as reliability changes. The standard should be responsive and sensitive to the level of reliability experienced. It should be “stable” without being “fixed”. If, over a period of time, the performance of a system or component improves to a point where even abnormal variations would not produce an alert, then the performance standard has lost its value and should be adjusted downward. Conversely, should it become evident that the standard is consistently exceeded in spite of taking the best-known corrective measures to produce the desired reliability, then the performance standard should be re-evaluated and a more realistic standard established. Each programme should contain procedures to accomplish, when required, such changes to the prescribed performance standards.

7.4.7 Establishing initial standards

7.4.7.1 In order to establish the initial standards for structural components, engines and systems, the past operating experience with the same (or, in the case of new aircraft, similar) equipment should be reviewed in sufficient depth to obtain a cross-section of the subject system's performance. Normally, a period of six months to one year should be sufficient. For a system common to a large fleet of aircraft, a representative sample may be used, while small fleet systems may require 100 per cent review. Examples of industry experience are past and present individual operators' industry experience of similar equipment and performance analysis of the similar equipment currently in service. Operators introducing a new aircraft into service may establish their alert values by using this available data. If industry experience is used in establishing a reliability programme's performance standards, the programme should include a provision for reviewing the standards after the operator has gained one year of operating experience.

7.4.7.2 Due to different operating conditions and system design, it is necessary to use different measuring devices (either singly or combined) to obtain satisfactory performance criteria. As stated before, there are various methods used to evaluate and control performance — aircraft diversions, mechanical interruptions in flight, delays and flight cancellations and component unscheduled removal rates.

7.4.7.3 The following are typical examples of methods that can be used to establish and maintain alert values. It should be understood that the methods of evaluation given below are only illustrative and that other suitable methods of evaluation could be used:

- a) pilot reports per 1 000 aircraft departures:
 - i) some operators have selected pilot reports as related to the number of departures as the primary measure of their aircraft systems' performance reliability. The reference base for the computation of alert values is a cumulative rate of the previous calendar year experience. This provides a large statistical base and takes into consideration the extremes in seasonal effects. The baseline for each system is initially calculated by compiling the number of pilot reports logged for the previous twelve-month period times 1 000 divided by the number of aircraft departures for the same twelve-month period. The purpose of multiplying the pilot reports by 1 000 is to arrive at a figure that expresses the rate per 1 000 departures;
 - ii) in order for this to be a cumulative or rolling rate for the immediate previous twelve-month period, it should be recalculated each month. The data for the first month of the existing twelve-month data set is dropped, and the data compiled for the last month is added; i.e. if the initial calculation was from March 2008 to February 2009, the next month's calculation would cover the period from April 2008 to March 2009;

- iii) when the baseline is computed for a particular system, an alert value is established at a point above the baseline equal to, say, five pilot reports per 1 000 aircraft departures. The alert values assigned to each system represent the maximum rate of pilot-reported malfunctions considered to deviate sufficiently from the baseline to require investigation;
- b) pilot reports per 1 000 aircraft hours:
- i) for the purpose of measuring reliability, pilot reports per 1 000 aircraft flight hours may be selected as the indicator of the aircraft systems' performance. Performance standards in terms of pilot reports per 1 000 hours are established for each of the aircraft systems. Several programmes in current use utilize two performance numbers, an "alert" number and a "target" number. A review and evaluation of a minimum of six to twelve months' history of pilot reports are done to establish the initial alert and target numbers. Established alert and target numbers are valid for a six-month period, at the end of which all alert and target numbers are reviewed and adjusted as necessary;
 - ii) the alert number is defined as the three-month moving (running) average which is considered to indicate unsatisfactory performance;
 - iii) historically, alert numbers show seasonal variations. To provide a more realistic alert number, the year is divided into six-month periods. One period encompasses the winter months, the other, the summer months. When reviewing a particular six-month period to ascertain if the alert number is still practical, it is important that the comparison is made between similar periods;
 - iv) the target number is defined as the operator's goal and predicted level of performance at the end of a six-month period. Target numbers are set to specify the operator's desires and expectations for future system performance. The target number is established in the same manner as the alert number; the difference being that the alert number is the upper limit of the range and, when exceeded, indicates unsatisfactory performance. The target or the lower limit is set as a goal which represents a level that the operator believes is attainable;
 - v) each month a three-month running average for each system is calculated. First, a three-month average is obtained by compiling and analysing data for three consecutive months — the total pilot reports for three months are divided by the number of aircraft hours flown during the same three-month period. To maintain a running average, each month the first month's data are deleted and the data for the current month added. Any system which either exceeds the alert or which has a trend indicating the target will not be met is considered to be in need of special attention.

7.4.8 Establishing alert values statistically (alert type)

7.4.8.1 Many programmes establish alert values by reviewing past performance and establishing the numerical value for the alert. Some operators prefer the statistical or mathematical approach. The development of alert values may be based on industry accepted statistical methods such as standard deviations, or the Poisson distribution. Some programmes use the average or baseline method. The standard should be adjustable with reference to the operator's experience and should reflect seasonal and environmental considerations. The programme should include procedures for periodic review of, and either upward or downward adjustment of, the standards as indicated. It should also include monitoring procedures for new aircraft until sufficient operating experience is available for computing performance standards. All methods, however, require a sufficient quantity of accurate data be available for analysis.

Note.— Poisson distribution is a discrete probability distribution that expresses the probability of a number of events occurring in a fixed period of time if these events occur with a known average rate and independently of the time since the last event.

7.4.8.2 In order to establish system alert values, an evaluation is made of the operational performance of each system to be controlled by the programme. The yardsticks covering failure performance are clearly defined in the programme. Using these definitions, the failure data for each system are extracted from pilot-reported malfunctions for at least a 12-month period. The "mean" and the "standard deviation" are then computed from those data, and each system's alert value is established equal to the mean plus three standard deviations.

7.4.8.3 The current performance level of each system is computed on a monthly basis as a three-month cumulative performance rate. This rate is computed by multiplying the number of in-flight malfunctions for a three-month period by 1 000 and dividing by the total aircraft flight hours for the same period. Maintaining a cumulative rate requires that the first month's data be deleted and the data for the current month added to the sum of the previous two months. When a trend of deteriorating system performance is detected, or if a system is over the alert value, an active investigation is conducted to assess the causes of the change in system performance and to develop an active corrective programme, if required, to bring the system performance under control.

7.4.9 Establishing standards using other analysis (non-alert type)

Data on the maintenance programme that are compiled on a day-to-day basis may be effectively used as a basis for continuous performance analysis. Mechanical interruption summaries, flight log reviews, engine monitoring reports, incident reports, and engine and component analysis reports are some examples of the types of information suitable for this monitoring method. For this arrangement to be effective the quantity and range of information should be satisfactory in order to provide a basis for analysis equivalent to that of a statistical standards programme. The operator's organization should have the capability of evaluating the information and summarizing the data to arrive at a meaningful conclusion. Actuarial analysis should be periodically performed to ensure that current process classifications are correct.

7.4.10 Condition-monitored maintenance programmes

7.4.10.1 Other techniques are used which monitor the functional condition of systems or components without disturbing them in their installed environment. These programmes are based on the establishment of acceptable performance as baseline data. Internal and external leakage, functional testing, and unit teardown analysis are the factors used to determine the baseline. The results from these tests and analysis become a part of the aircraft's permanent record. The point to be established is that the tests and analysis accurately and conservatively identify discrepancies before operational reliability is degraded.

7.4.10.2 This type of programme lends itself readily to components. It has also proven very successful in monitoring the functional condition of aircraft systems such as hydraulics, air conditioning and pneumatics (the system primarily utilizing this type of programme is hydraulics). The various tests perform the function of system or subsystem interrogation to determine the presence or absence of component degradation. Internal leakage rates serve as the criteria to evaluate wear and rigging effect on component performance while pressures are used to determine certain component functional responses.

7.4.10.3 During the test, individual parts, components and subsystems are evaluated by selective positioning of the various system controls and isolation points. From the comparison of the response produced by sequential steps to the established tolerance, the general location or the specific location of the faulty unit can be determined.

7.4.10.4 Additional advantages include:

- a) analysis of the data is not required before departure unless functional tests indicate a need for immediate corrective action;

- b) results of the test do not require immediate replacement of units showing deterioration provided the functional tests of the subsystem or component are satisfactory; and
- c) evaluation of these test data can be used to schedule component replacement at a subsequent inspection or check.

7.4.11 Monitoring by age/reliability relationship

7.4.11.1 Some operators may use an actuarial analysis technique as a basic requirement for making technical decisions concerning component reliability in their "on condition" overhaul and monitored maintenance reliability programmes. Components selected for these programmes are those on which a determination of continuing airworthiness may be made by visual inspection, measurements, tests or other means without a teardown inspection or periodic overhaul. Under these programmes, components are allowed to operate in service subject to meeting the established performance standard or the established "on-condition" baseline data.

7.4.11.2 Initially, an actuarial analysis of each component is prepared to determine its reliability versus age characteristics. A component is considered acceptable for inclusion in the programme when the analysis shows that reliability does not deteriorate with increased time in service up to a predetermined point established by the operator. Normally, this cut-off point is considered to be the practical limit based on the amount of data collection and analysis required to qualify the component.

7.4.11.3 When the reliability of a component deteriorates to a value above the established performance standard, another actuarial analysis is made to determine the component's reliability versus age characteristics. Normally, this analysis will also include a determination of the reasons for the deterioration and the corrective action required to bring the condition under control. This reliability analysis is a continuing process and reveals whether a component requires a different maintenance programme or is in need of a design change to improve reliability.

7.4.11.4 An actuarial analysis is also made when the observed performance of a component improves to the point where more components are reaching higher operating times without experiencing premature removal failures. With such an improvement in survival characteristics possible, it is desirable to make a reliability analysis to determine its age-to-reliability characteristics.

7.4.11.5 Premature removal rate and the subsequent analysis of the teardown findings in the shop are monitored. The introduction of the "on-condition" overhaul concept has made it increasingly important to gain more information about the operating performance of the components and to examine the relationship of this performance to the time in service. This need has fostered the development of actuarial analysis techniques.

7.4.11.6 This method of analysis requires, for a specified calendar period, that the following information be available for each component under study:

- a) the operating time on each component at the beginning of the study;
- b) the operating time on each component removed and installed during this period;
- c) the reason for removal and disposition of each component; and
- d) the time on each operating component at the end of the study period.

7.4.11.7 An analysis is made of the performance of each component as its life progresses from one overhaul to another as follows:

- a) a time and failure distribution chart is prepared showing the amount of operating time for each component and the failures experienced in each 100-hour time bracket for the specified study period. In conjunction with this chart, a digest of the causes of failure for each 100-hour time bracket is also prepared;
- b) the next step is to develop failure rate and survival curves versus time since overhaul (TSO). A failure rate curve shows the failure rate per 1 000 hours for each component in each 100-hour time bracket. A survival curve shows the number of units remaining at any given time. The shape of the survival and failure rate curves are valuable when determining the deterioration of reliability. The operating time which can be realized between consecutive overhauls is determined by the area which is under the survival curve and whose boundary is the horizontal and vertical axes;
- c) additional information is available from these data by developing a probability curve. This curve will show the probability of a component reaching a given time and the number of components expected to fail in a given time bracket. The number of components that would probably fail in a given time bracket is obtained by taking the difference of the ordinates at the beginning and end of a given time bracket. This would also be a reflection of the slope of the survival curve at that point. The percentage of components which survive to a given time is also the probability of a single component operating to that time without failing; and
- d) a still better evaluation is possible by developing a conditional probability curve. This curve will show the probability of failure of a component within a given time interval. Data for a conditional probability is obtained by dividing the number (or percentage) of components entering an interval by the number (or percentage) of components removed during an interval. It is considered that this curve best depicts the relationship between reliability and overhaul time.

7.4.11.8 Some advantages of this type of analysis are as follows:

- a) a determination can be made as to whether failures are being prevented by the specification;
- b) an indication is given statistically concerning the current limit and whether or not it has reached an optimum point;
- c) an indication is provided as to what might occur to the overall premature removal rate if the limit were changed;
- d) an indication will be provided of any unusually high rate of premature removals and/or failures that have occurred immediately after a check and repair or overhaul;
- e) in some cases, an indication may be given that scheduled interim maintenance would result in an improvement of the overall premature rate;
- f) other useful conclusions can be made concerning the relationship of the failure to the time in service, time intervals and engineering change accomplishment; and
- g) this technique of in-service component reliability analysis readily lends itself to computer programming.

These advantages emphasize the value of such an analysis in determining a maintenance programme that is best for the component involved.

7.4.12 Control for adjusting time limitations

7.4.12.1 An operator may receive authorization from the CAA in its reliability programme to adjust time limitations without prior approval. Another operator's reliability programmes may require prior notification and approval from the CAA before escalating time limitations for overhauls, inspection intervals and checks. Reliability programmes are unique to each operator and based on the operating environment and history of the operator. When considering the merits of a time extension, there are many different methods which may be used. The programme should identify these methods and the group responsible for the preparation of a substantiation report to justify the requested time extension. The programme should show that such action is approved by at least two separate organizational segments of the operator, one of which exercises inspection or quality control responsibility for the operator and the other organizational segment responsible for the performance of the function. When evaluating a particular programme, the following should be considered:

- a) are the specific parameters used to determine time extensions spelt out (i.e. sampling, functional checks and unscheduled removal)?;
- b) if sampling is used, does it explain the method, number of samples required, when they will be taken, and at what time interval? Time on units or exhibits used as samples should be specified;
- c) does the programme provide for time increase in overhaul times, periodic services, routine and service checks, phase checks and block overhauls?;
- d) are provisions made for changing of items having specified fixed time between overhaul to "on-condition"? If so, what are they, e.g. sampling, actuarial studies, unit performance, maintenance findings and pilot reports;
- e) what substantiating data are provided to justify a time increase for emergency equipment which is not normally operated during routine flight?;
- f) who establishes the increments of time increases, the sampling requirements, and other substantiation for each proposed action?; and
- g) are instructions available relative to manual revision concerning time increases and what will have to be accomplished prior to pursuing a subsequent time increase?

7.4.12.2 It should be ensured that the proposed time between overhauls (TBO) adjustment does not conflict with a corrective action programme established by a previous reliability analysis. A provision in the reliability programme should be made for the CAA to be advised when increases of time limitations of system and/or components controlled by the programme occur. Operators should be encouraged where possible to include a graphic display of major system and/or component (engine/airframe) TBO escalation. Reliability programmes provide an operator with a method of adjusting maintenance, inspection and overhaul intervals without prior CAA approval. However, the CAAs may require prior notification and approval before the operator may increase intervals for overhauls and inspections. It is important that the operator adhere strictly to the approved reliability programme authorizations.

7.4.13 Interval adjustments and changes

The reliability programme should not allow for maintenance interval adjustment of any certification maintenance requirement (CMR) items and ALIs. CMR items and ALI are part of the certification process and should not be escalated through the operator's reliability programme. The operator should not use its reliability programme as a basis for adjusting the repeat interval for its corrosion prevention and control programme. However, the operator may use the reliability programme for recording data for later submission to the CAA to substantiate subsequent repeat interval changes. Further,

maintenance interval adjustments should not interfere with an ongoing corrective action. The reliability programme should include procedures for the classification and assignment of maintenance processes and/or tasks and changing from one process and/or task to another. It may be necessary to contact the aircraft manufacturer in order to reference the relevant MSG-2 methodology used for maintenance processes or MSG-3 methodology used for maintenance tasks. The programme should also include the authority and procedures for changing maintenance specifications and the related documents used to reflect changes to interval adjustments, processes and/or tasks.

7.4.14 Approval of programmes

7.4.14.1 As part of the maintenance programme approval process the operator should submit a reliability programme description that supports the effectiveness of the maintenance programme. The programme should be administered and controlled by the operators and monitored by the AID inspector. The document should contain the essentials of the systems operation and any other instructions required of the particular programme or character of the maintenance organization involved.

7.4.14.2 The operator should submit the reliability programme and appropriate information to the CAA for evaluation and approval. The AID inspector should use all the information necessary in evaluating the reliability programme. Operator personnel should be available to answer questions or provide additional information concerning the reliability programme.

7.4.14.3 The procedures for implementing revisions to the programme should be described in sufficient detail to identify the isolated areas which require CAA approval. The operator should also identify the segment of the organization having overall responsibility for the approval of amendments to the programme. The areas involving reliability programme revision which require CAA approvals may include:

- a) reliability measurement;
- b) changes involving performance standards, including instructions relating to the development of these standards;
- c) data collection;
- d) data analysis methods and application to the total maintenance programme;
- e) process or task changes:
 - i) for statistical alert type programmes, procedures for transferring components or systems from one primary maintenance process to another; and
 - ii) for non-alert type programmes, changing systems or components from one primary maintenance process to another;
- f) procedures for adding or deleting systems, or components;
- g) adding or deleting aircraft types;
- h) procedural and organization changes affecting administration of the programme; and
- i) procedures for transferring systems or components to other programmes.

7.4.14.4 When evaluating programme revision procedures, consideration should also be given to the following:

- a) does the programme provide for periodic review to determine if the established performance standard is still realistic or in need of recalculation?;
- b) what is the distribution circulation given to approved revisions?; and
- c) are the overhaul and inspection periods, work content and rescheduled maintenance activities controlled by reliability methods reflected in the appropriate maintenance manuals?

7.4.14.5 Reliability programme evaluation and approval is one of the most complex duties an AID inspector will perform. Special attention should be given to every aspect of the proposed programme submitted by the operator. Previous experience with the type of equipment the operator proposes to include in the reliability programme is recommended. In States where adequate technical resources are not available the CAA may consider obtaining technical assistance from regional CAAs possessing experience in these areas, or the CAA of the State of Manufacture or State of Design.

7.4.14.6 All conclusions reached by the CAA should be addressed in writing to the operator with a copy kept in the CAA office operator's file. Revisions to the reliability programme requiring formal CAA approval should be subject to the same consideration as initial approval.

7.5 STRUCTURAL INTEGRITY PROGRAMME

7.5.1 Annex 6, in Part I, 11.3.1 b) and Part III, Section II, 9.3.1 b) requires the maintenance programme to contain, when applicable, a continuing structural integrity programme. Annex 8, Part II, 4.2 provides that the State of Design of an aircraft ensures that, in respect of aeroplanes over 5 700 kg MTOM, a continuing structural integrity programme exists to ensure the airworthiness of the aeroplane. The programme should include specific information concerning corrosion prevention and control.

7.5.2. Service experience has indicated a need for knowledge concerning the structural integrity of aircraft, especially as they age. Structural integrity is a concern to manufacturers and operators as fatigue cracking and corrosion are cycle and calendar time dependent, respectively, and knowledge about them can best be assessed on the basis of real-time service experience. Increased operational demand, longer service life and strict safety standards indicated the need for a programme to ensure a high level of structural integrity. Structural integrity programme (SIP) development should be initiated by the type design organization and developed jointly with representatives of air operators and airworthiness authorities and approved by the State of Design of the aircraft.

7.5.3 If the State of the Operator is not the State of Registry, it is recommended to contact the State of Registry to determine if an SIP is applicable for the aircraft it operates. Contact with the manufacturer of the aircraft is also recommended to obtain information and advice on structural integrity programmes for the aircraft being operated.

7.5.4 An SIP should include:

- a) approved damage-tolerance-based inspections and procedures for the aircraft structure susceptible to fatigue cracking that could contribute to a catastrophic failure. The purpose of the inspection programme is to supplement the current inspection programme as necessary to ensure the safe operation of the aircraft type;
- b) a corrosion prevention control programme with the objective of controlling corrosion in the aircraft's primary structure. The corrosion prevention control programme should include periodic inspections to detect and define levels of corrosion. Treatment of the corrosion is critical and limits the material loss and assists in maintaining the airworthiness of the aircraft;

- c) maintenance programme procedures which address the adverse effects of fatigue cracking on critical structure and may include repetitive inspections of these areas to ensure structural integrity. The programme may also include modifications or replacement actions in areas where there is a known history or hazard of fatigue cracking. The modifications or replacement action may reduce or eliminate the need for repetitive inspections to maintain structural integrity. The type design organization may have issued SBs that contain terminating modifications to inspections and contact with the design organization is recommended;
- d) a repair assessment programme to evaluate aircraft repairs. The programme ensures that existing repairs do not deteriorate due to accidental, fatigue or environmental damage beyond the remaining usage life of the aircraft. In order to establish the scope of the repair assessment programme contact with the type design organization of the aircraft may be necessary to determine if the aircraft was evaluated for damage tolerance during initial certification;
- e) provisions for preventing widespread fatigue damage (WFD). Multiple site damage and multiple element cracks are typically too small initially to be reliably detected with normal inspection methods. Without intervention, these cracks can grow, link up and eventually compromise the structural integrity of the aeroplane, in a condition known as WFD. WFD is increasingly likely as the aeroplane ages, and is certain if the aeroplane is operated long enough without any intervention.

7.5.5 The role of the State of Registry in the implementation of the SIP:

- a) develop or adopt requirements to ensure the continuing airworthiness of the aircraft during its service life;
- b) upon receipt of MCAI from the State of Design, adopt the mandatory information directly or assess the information received and take appropriate action; and
- c) approve the structural integrity provisions contained in the maintenance programme.

7.5.6 The SIP developed and updated by the organization responsible for the type design under the responsibility of the State of Design (refer to Part V of this manual) is one important element of continuing airworthiness, and it will include many specific items that are intended to be made mandatory. The programme should include damage tolerance based supplemental inspections, corrosion prevention and control, structural modifications and associated inspections, repair assessment, and WFD assessment as described in 7.5.4 above.

7.5.7 The State of Registry, in approving a maintenance programme, should therefore:

- a) review and assess the latest SIP and all related continuing airworthiness information and, if appropriate, adopt the requirements in national regulations. All requirements made mandatory by the State of Design should also be assessed and made mandatory for all applicable aircraft on the State's Registry unless local operating conditions or operator experience provide a strong basis for deviation;
- b) ensure that all the requirements of the SIP have been incorporated in the operator's maintenance programme before it is approved. Each operator should make an individual determination as to how the data that are in the continuing structural integrity programme should be incorporated in the maintenance programme owing to the differences in the various operators' maintenance programmes, operating environment and fleet modification status;
- c) ensure that the air operator's maintenance programme procedures provide an adequate system for recording and reporting in a timely way to the type design organization (and to the State of Registry), the operational usage, the structural discrepancies experienced in service (including fatigue, wear,

corrosion, accidental damage) and, where available, the results of initial analysis. These data should include a description and the location of the damage, identification of the aircraft, relevant data on its modification status and operating history, time since beginning operations, time since the last maintenance check, the means by which the discrepancy was detected and its probable cause. The operator's existing record-keeping requirements still apply, e.g., aircraft inspection status, and reports of major repairs and modifications, if applicable. A separate report to the State of Registry may be necessary should structural discrepancies that exceed repairable limits established by the type design organization be noted;

- d) ensure that the air operator's MCM contains procedures for review of all recommended or mandatory changes to the SIP and will result in timely revision of the maintenance programme to include these changes;
- e) ensure that the items in the SIP are accomplished on each aircraft for which it has issued a Certificate of Airworthiness within the time limits specified;
- f) ensure that for each aircraft for which it has issued a Certificate of Airworthiness, the operator has good access to the records of all damage and repairs and modifications performed during the lifetime of the aircraft and has incorporated into the maintenance programme any specific structural inspections or life limits issued when the repair or modification was approved or when the damage was assessed; and
- g) if the structural integrity programme issued by the organization responsible for the type design has a limit of validity (LoV) specified for the maintenance programme, the State of Registry needs to ensure that there is a system in the maintenance programme to identify when this validity limit is approaching and to stop flying if the limit is reached. The Certificate of Airworthiness is not valid beyond this LoV unless SIPs have been reviewed and the results justify an extension of the maintenance programme.

7.6 MASS AND BALANCE PROGRAMME

7.6.1 General

7.6.1.1 Annex 6, Part I, Chapter 5 and Part III, Section 2, Chapter 3 require that aeroplanes and helicopters be operated in accordance with a comprehensive and detailed code of performance in compliance with the applicable standards including mass limitations and centre of gravity limitations as specified in the aircraft flight manual. To satisfy this requirement, operators are required to develop and maintain a mass and balance programme.

7.6.1.2 The primary purpose of aircraft mass and balance control is safety. A secondary purpose is to achieve the utmost in efficiency during operation of the aircraft. Improper loading reduces the efficiency of operating an aircraft and can be the cause of a failure to start or complete a flight. The empty mass and corresponding centre of gravity of all civil aircraft is determined at the time of initial certification. The condition of the aircraft at the time of determining empty mass and centre of gravity should be one that is well defined and can be easily repeated.

7.6.1.3 The mass and centre of gravity of aircraft should be determined prior to the initial issuance of the Certificate of Airworthiness. In certain cases, an updated determination of mass and centre of gravity may not be required prior to the issuance of a Certificate of Airworthiness such as newly manufactured aircraft where the determination of mass and centre of gravity has been previously determined by the manufacturer and recorded. Another example where an aircraft may not require re-weighing pending issuance of a Certificate of Airworthiness is the importation of an aircraft where the aircraft has been previously weighed prior to importation with any changes to mass computed and recorded in the mass and balance report. Mass and balance control provides mathematical proof that the aircraft's mass and balance are within limits. Mass and balance information can be obtained from the aircraft specifications, aircraft operation limitations, aircraft

flight manual and mass and balance report. The removal or addition of equipment affects the aircraft's empty mass and centre of gravity limits, and mass calculations are necessary to ensure the changes are within the aircraft's mass and balance limits.

7.6.1.4 The applicant for the issuance or renewal of the Certificate of Airworthiness should be required to provide the current mass and balance report of the aircraft to the State of Registry. The mass and balance report is normally obtained by weighing. If the changes in mass and balance are negligible, computed and recorded, the accurate mass may continue to be obtained by calculation from the previous aircraft weighing. A sample of a mass and balance report is referenced in Attachment A to this chapter. Mass and balance records should be complete, current and maintain a continuous record of changes of empty mass, arm and empty centre of gravity limits for each aircraft. The mass and balance record should contain details of all modifications affecting either the mass or balance of the aircraft.

7.6.2 Periodic determination of mass

7.6.2.1 Over a period of time and use an aircraft will have a tendency to gain mass because of the accumulation of dirt, grease and oil in areas of the aircraft not readily accessible for washing and cleaning. Other reasons include the repainting of aircraft, installation of new equipment and accomplishment of modifications and repairs. The mass gained in any given period of time will depend on the function of the aircraft, its hours in flight, atmospheric conditions, the type of landing fields the aircraft operates from and their operating environment. For this reason, periodic aircraft weighing is desirable and usually required by their national regulations for operators. Operators are subject to standards that require their aircraft to be properly loaded and not to exceed the mass and balance limitations during operations. Therefore, operators normally require mass and balance instructions and periodic determinations of mass and balance to ensure safe and efficient operations. The aircraft should be re-weighed at periods determined by the CAA or as stipulated in the national regulations. Re-weighing of the aircraft is dependent on several factors: the date of last weighing, history of the aircraft or embodiment of modifications. Consultation with the CAA is recommended if clarification is needed on re-weighing based on the history of the aircraft or incorporation of modifications.

7.6.2.2 The common changes that occur during life of the aircraft are caused by repairs and modifications. The air operator is responsible for ensuring the mass and balance records are updated whenever a change occurs to the aircraft mass and balance.

7.6.2.3 Further to the provisions above, if the CAA or the operator is of the opinion that adequate mass control has not been exercised over an aircraft during the modification, the CAA may require that a new empty mass and empty centre of gravity position be determined for the aircraft.

7.6.2.4 For a fleet of the same model and configuration, an average operational fleet mass may be utilized if the operating mass and centre of gravity (CG) position are within established limits acceptable to the CAA.

7.6.2.5 The following fleet weighing method is one of the means to establish an operator's fleet empty mass and CG. The operator should consult with the relevant CAA before establishing how many aircraft should be weighed in each weighing cycle. An air operator's fleet empty mass may be determined by weighing aircraft according to the following criteria:

- a) for aircraft fleets of one to three aircraft, weigh all aircraft;
- b) for fleets of four to nine aircraft, weigh three aircraft plus at least 50 per cent of the number of aircraft greater than three; and
- c) for fleets of more than nine aircraft, weigh six aircraft plus at least 10 per cent of the number of aircraft greater than nine.

The aircraft in the fleet having the longest time since last weighing should be selected. Thereafter a rotation programme should be incorporated to ensure all aircraft in the fleet will be weighed periodically. Reestablishment of the air operator's empty fleet mass or operating fleet mass and CG may be accomplished by calculation based on the current empty mass and CG or weighing of aircraft at periodic intervals as approved by the CAA or established in the national regulations.

7.6.3 Procedures for determining mass

7.6.3.1 Aircraft mass determination should be performed by a person authorized to perform mass and balance calculations on behalf of the air operator or aircraft owner. Aircraft should be prepared for mass determination in accordance with manufacturer's instructions.

7.6.3.2 Two independent determinations should be made, and the aircraft longitudinal datum line should be horizontal. The load should be completely removed from the weighing equipment between determinations. The aircraft gross masses as determined by the two measurements should be consistent. If not, the measurements should be repeated until the gross masses, as determined by two consecutive and independent measurements, are consistent.

7.6.3.3 Prior to the initial issue of a Certificate of Airworthiness for each aircraft, a list of equipment included in the empty mass should be established. If an operating mass is used, a similar list of removable equipment and disposable load included in the operating mass should also be established. Where a change occurs in the items included in either the empty mass or, if applicable, the operating mass of an aircraft, the appropriate list should be amended by the operator.

7.6.3.4 Normal precautions, consistent with good practices in the mass determination procedures, should be taken, such as:

- a) aircraft and equipment should be checked for completeness in accordance with 7.6.3.3;
- b) fluids should be properly accounted for;
- c) mass determination should be carried out in an closed building, to avoid the effect of wind; and
- d) the scales used should be properly calibrated and used in accordance with the manufacturer's instructions.

7.6.3.5 An aircraft mass and balance report should be completed and certified by the person signing the report. Data recorded should be sufficient to enable the empty mass and empty mass centre of gravity position to be accurately determined.

7.6.3.6 The empty mass and empty centre of gravity position should be determined by the person determined in 7.6.3.1 or operator of the aircraft in accordance with the recorded results of the measurements.

7.6.4 Loading data

7.6.4.1 The loading schedule should be kept with the aircraft, forming a part of the aircraft flight manual. It should include instructions on the proper load distribution such as filling of fuel tanks and oil tanks, passenger movement and distribution of cargo. A check should be made to determine if the schedule will allow computation of separate loading conditions when the aircraft is to be loaded in other than the specified conditions shown in the loading schedule.

7.6.4.2 Information on how to base records of mass and balance changes to the aircraft may be obtained from the pertinent aircraft specifications, aircraft flight manual and the aircraft mass and balance report. Operators should maintain records of all known mass and centre of gravity changes which occur after the aircraft mass has been determined.

7.6.4.3 A mass and centre of gravity schedule should be provided for each aircraft. Each schedule should be identified by the aircraft designation, nationality and registration marks. The date of issue of the schedule should be given and the schedule should be signed by an approved representative of the organization or a person suitably qualified or acceptable to the CAA. A statement should be included indicating that the schedule supersedes all earlier issues.

7.6.5 Preparation and approval of loading data

The loading data should be prepared by the air operator and acceptable to the CAA. Where the applicable aircraft flight manual pages are used as the load data sheet and to specify any required loading system, the completed pages should be also submitted to the CAA for approval and incorporation into the aircraft flight manual. The air operator is responsible for preparation of a load data sheet for each aircraft based on the empty mass and empty CG position. Unless otherwise approved by the CAA, the aircraft flight manual page titled "aircraft mass" should be used as the load data sheet in the case of aeroplanes of MTOM not greater than 5 700 kg. The air operator should be responsible for the preparation of a loading system for each aircraft based on the empty mass and empty CG position unless it can be shown that the aircraft cannot be loaded so that its CG falls outside the approved range.

7.6.6 Record of mass and balance

The mass and balance record system should include procedures that allow the air operator to update and maintain a current and continuous record of the mass and CG of the aircraft they operate. The records should reflect changes in mass and balance and list all modifications affecting the mass or balance of the aircraft. Revised empty mass and CG changes should be identified by the date, aircraft make, model and serial number. The revised mass and balance information should be signed by a qualified person. Where mass and balance programme information is generated by a computerized mass and balance control system, the operator should verify the accuracy of the output data. The operator should also ensure that amendments to the input data are validated and incorporated properly into the system. The operator needs to ensure the overall system is operating properly and the software updates are current. Some large aeroplanes have on-board mass weighing systems. When the aeroplane is on the ground the on-board mass system provides the flight crew with a continuous indication of the aircraft total mass and the location of the CG in per cent of the Mean Aerodynamic Chord (MAC). The operator should seek the approval from the CAA if it wishes to use an on-board mass and balance computerized system as a primary source for dispatch.

7.7 MAINTENANCE ARRANGEMENTS

7.7.1 Maintenance organization

7.7.1.1 Annex 6, Part I, 8.1.2 and Part III, Section II, 6.1.2, prohibit operators from operating any of their aircraft unless the maintenance of the aircraft and any associated part of the aircraft is carried out by:

- a) an AMO that is either approved by the State of Registry of the aircraft or is approved by another Contracting State and is acceptable to the State of Registry; or
- b) by a person or organization in accordance with procedures authorized by the State of Registry.

7.7.1.2 When the maintenance is carried out by an organization other than an AMO, the State of Registry's regulation needs to identify and prescribe the requirements for the approval of such organizations.

7.7.1.3 Annex 6, Part I, 11.2 and Part III, 9.2, provide that the air operator's MCM includes a description of the administrative arrangements between the air operator and the AMO.

7.7.1.4 The requirements and procedures for the approval or acceptance of an AMO are found in Part III, Chapter 10 of this manual.

7.7.2 Guidance on contractual arrangements for maintenance

In accepting an operator-contracted maintenance arrangement, the CAA needs to ensure that the following minimum requirements are satisfied:

- a) the operator subject to contractual maintenance arrangements will ensure each aircraft it operates is maintained in an airworthy condition;
- b) the AMO contracted to perform the maintenance should have access to the operator's currently approved maintenance programme that includes the make and model of the aircraft subject to the contract and the operator's MCM;
- c) an AMO performing maintenance for an operator under the terms of its organization certification should be appropriately rated and capable of performing the work contracted for, and that work should be performed in accordance with the air operator's approved MCM;
- d) the AMO should have the facilities and capabilities to perform the work for which it has been contracted;
- e) when an air operator contracts with an appropriately rated AMO, the air operator should have available the names of these organizations and the scope of the work contracted;
- f) the contractor's manual may be used in part or in total for methods, techniques and standards, provided the air operator's MCM describes the applicability and authority of the affected manuals. The same applies to work forms;
- g) the air operator's MCM should also describe the policies and procedures for the evaluation and the air operator's approval of contractual arrangements;
- h) a procedure for maintaining maintenance records and for transmitting related information regarding continuing airworthiness should be established;
- i) the arrangements should clearly describe the operator's and AMO's responsibilities regarding the control, planning and scheduling of the maintenance tasks to be performed.

7.8 AIR OPERATOR'S CONTINUING AIRWORTHINESS RECORDS

7.8.1 Introduction

7.8.1.1 Annex 6, Part I, 8.2 and 11.2, and Part III, 6.2 and 9.2 provide that the State of Registry be responsible for the acceptance of the air operator's MCM. The MCM should include the policies and procedures relating to records of continuing airworthiness for aircraft operated by the air operator. Continuing airworthiness records for an aircraft are defined in Annex 6 as those records which are related to the continuing airworthiness status of an aircraft and its associated

parts. It should be noted that maintenance records for aircraft and associated part of an aircraft are also considered as continuing airworthiness records. This section covers the requirements for continuing airworthiness records, including maintenance records that should be kept by the operator. The State of Registry should verify that all these requirements are satisfied by the procedures in the air operator's MCM.

7.8.1.2 Annex 6, Part I, 8.4.1 and Part III, Section II, 6.4.1 require that an operator ensure that the following records are kept:

- a) the total time in service (hours, calendar time and cycles, as appropriate) of the aeroplane and all life-limited components;
- b) the current status of compliance with all mandatory continuing airworthiness information;
- c) appropriate details of modifications and repairs;
- d) the time in service (hours, calendar time and cycles, as appropriate) since the last overhaul of the aeroplane or its components subject to a mandatory overhaul life;
- e) the current status of the aeroplane's compliance with the maintenance programme; and
- f) the detailed maintenance records to show that all requirements for the signing of a maintenance release have been met.

7.8.1.3 Annex 6, Part I, 8.4.2 and Part III, Section II, 6.4.2 provide that the records of 7.8.1.2 a) to e) above be kept for a minimum period of 90 days after the unit to which they refer has been permanently withdrawn from service, and the records of 7.8.1.2 f) above for a minimum period of one year after the signing of the maintenance release.

7.8.1.4 Annex 6, Part I, 8.4.3 and Part III, Section II, 6.4.3 provide that in the event of a temporary change of operator, the records be made available to the new operator. In the event of any permanent change of operator the records should be transferred to the new operator.

7.8.1.5 Annex 6, Part I, 8.4.4 and Part III, Section II, 6.4.4 provide that continuing airworthiness records be kept in a form and format that ensures readability, security and integrity of the records at all times. The form and format of the records may include, for example, paper records, film records, electronic records or any combination of these.

7.8.2 General

7.8.2.1 The continuing airworthiness records for an aircraft should give an overall picture of the airworthiness status of the aircraft.

7.8.2.2 The form, format and content of the continuing airworthiness records for an aircraft should be acceptable to the State of Registry of the aircraft. Operators should be eligible to implement an electronic continuing airworthiness record system to generate, process, store and archive continuing airworthiness records for their aircraft, subject to acceptance by the State of Registry. The State of Registry should consider the applicable State legislation regarding electronic records generally and the criteria set out in Attachment B to this chapter.

7.8.2.3 Operators need to ensure that all maintenance records associated with the maintenance release issued by AMOs are received so that the required records can be retained..

7.8.2.4 Operators are responsible for the retention and availability of all continuing airworthiness records including maintenance records. When acceptable to the State of Registry, operators may arrange for an AMO or another

organization that carries out maintenance to retain maintenance records on their behalf. Operators should establish procedures to ensure the AMO or the other organization maintains the maintenance records in compliance with the operator's MCM and ensures the maintenance records are returned to the operator upon their request.

7.8.2.5 The operator should include in the MCM detailed procedures for retention of continuing airworthiness records.

7.8.2.6 The operator should include in the AMO's procedures manual guidelines for the completion of maintenance records to show that the requirements for the issuance of a maintenance release have been met. If maintenance is carried out by persons or organizations other than AMOs, the operator needs to ensure that such procedures for the completion of maintenance records are included in the operator's MCM and followed by the persons or organizations.

7.8.2.7 The State of Registry must have access to all continuing airworthiness records including any maintenance records kept by an AMO or another organization on behalf of the operator.

7.8.3 Contents of records

7.8.3.1 The continuing airworthiness records for an aircraft should clearly indicate the status of compliance with the mandatory continuing airworthiness instructions applicable to the aircraft and the status of compliance with the aircraft's, maintenance programme including any life limites applicable to components. Thorough and accurate continuing airworthiness records are necessary to establish the validity of the aircraft's Certificate of Airworthiness.

7.8.3.2 The maintenance record entries should provide enough information to demonstrate that compliance to the airworthiness requirements has been met

7.8.3.3 The air operator needs to ensure that AMOs have detailed procedures in their manual that prescribe the form and content and of maintenance records. If maintenance is carried out by persons or organizations other than AMOs, the operator needs to ensure that the form and content of maintenance records are prescribed in the operator's MCM.

7.8.3.4 The following information, as applicable, should be entered in the maintenance record:

- a) the identification of the aircraft on which maintenance has been carried out, including make, model, registration and serial number;
- b) the identification of the component on which maintenance has been carried out, including the part number and serial number of the component;
- c) description of the work performed and a reference to approved data used;
- d) the aircraft total time in service;
- e) component time since new (TSN), time since overhaul (TSO) and, if applicable, cycles since new and cycles since overhaul;
- f) if a part has been replaced, the part number and serial number of the part;
- g) signature and license or authorization number of the certifying personnel, and;
- h) the date

7.8.3.5 Maintenance release entries should contain a description of the work performed in enough detail to show that the requirements for the issuance of a maintenance release have been met.

7.8.3.6 Appropriately certificated persons in accordance with Annex 1 should accomplish the requirements contained in MCAI and are required to certify compliance in the maintenance record. The air operator needs to ensure that maintenance personnel make appropriate entries in the maintenance records.

7.8.3.7 The continuing airworthiness records showing compliance with MCAI should include:

- a) MCAI information (number and title), including revision or amendment numbers;
- b) where the MCAI is generally applicable to the aircraft or component type but is not applicable to the particular aircraft or component being maintained, this should be identified in the maintenance record accordingly with an authorized signature;
- c) the date when MCAI was accomplished;
- d) for a multi-part instruction, which parts have been accomplished. If the entire MCAI was accomplished reference the entire instruction by title;
- e) the method of accomplishment of the instruction together with the inspection result, accurately described;
- f) if the MCAI requires recurring action, an indication of the next recurring action interval; and
- g) certification by licensed personnel, in accordance with Annex 1, for the accomplishment of the MCAI.

7.8.3.8 Appropriate details of modifications and repairs should include records identifying any modification or repair, along with a reference to the approved data used and a description of the work performed with maintenance release information. Major modification and major repairs should be recorded in a form and manner as prescribed by the CAA.

7.8.3.9 Records about aircraft or component inspection status found during inspections should include information about defects or unairworthy conditions, details of faults and any subsequent rectification, the total time in service as appropriate and the state of maintenance when it enters the AMO's facilities.

7.8.3.10 When operators wish to take advantage of modular design (e.g. modular assembled gas turbines where a specification of a true total time in service is not relevant), the total time in service and maintenance records for each module are to be maintained. The maintenance records as specified are to be kept with the module and should show compliance with any mandatory requirements pertaining to that module.

7.8.4 Record-keeping

7.8.4.1 The continuing airworthiness records required under Annex 6 should be kept in a form and manner acceptable to the State of Registry and the State of the Operator.

7.8.4.2 If a paper system is applied, legible entry should be made, and the record should remain legible throughout the required retention period, irrespective of the medium.

7.8.4.3 If an electronic system is implemented, it should be ensured that all records are generated, processed, used, stored and archived following the guidelines set out in Attachment B to this chapter. The software and hardware used should support specific procedures acceptable to the State of Registry with respect to:

- a) protection of the records by electronic means against loss, destruction or tampering to the equivalent extent of that provided to paper records;
- b) backup of records (e.g. backup system robustness and reliability; timing and frequency of backup completion; segregation from source records; data loss and recovery);
- c) user identification, authentication and authorization to access the records, scope of access, control of access and traceability of all operations concerning any individual record; and
- d) security and integrity of the records

7.8.4.4 If optical or other high-density storage is used for the retention of continuing airworthiness records, the records should be as legible as the original record and remain so over the required retention period.

7.8.4.5 Continued airworthiness records should be kept in such a way that they are protected from hazards such as fire, flood, theft or alteration. Computer backup disks, tapes and other storage mediums should be safely stored in a different location.

7.8.4.6 Records should be structured or stored in such a way as to facilitate auditing.

7.9 MAINTENANCE RELEASE

7.9.1 General

7.9.1.1 Annexes 6 and 8 provide that a maintenance release shall be completed and signed to certify that the maintenance work performed has been completed satisfactorily in accordance with the appropriate airworthiness requirement.

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

7.9.1.3 When maintenance is not carried out by an approved maintenance organization, the maintenance release shall be completed and signed by a person appropriately licensed in accordance with Annex 1.

7.9.1.4 Annex 6 provides that the operator's MCM include a description of the procedures for preparing the maintenance release and the circumstances under which the release is to be signed when maintenance is not carried out by an AMO.

7.9.1.5 Maintenance releases issued in electronic form should be acceptable to the aircraft's State of Registry and should satisfy the criteria set out in Attachment B to this chapter. The electronic maintenance release form should be accessible in "edit mode" only at the location where the maintenance release is being issued. Access to the document from any other location should be "read only".

7.9.2 Requirements of maintenance release

A maintenance release should include the following information:

- a) details of the maintenance carried out including detailed reference to the data used;
- b) the date such maintenance was completed;
- c) when applicable, the identity of the AMO; and
- d) the identity of the person signing the maintenance release including the license or authorization number of the person.

Attachment A to Chapter 7

SAMPLE MASS AND BALANCE REPORT

MASS CONTROL CERTIFICATE

Date issued *Date/time of first flight UTC

** Note: This date/time must be later than the date of issue*

Aircraft mass and centre of gravity determination

No.:

Date:

Aircraft registration:

Aircraft type:

Aircraft serial number:

Name of operator:

Place of determination of mass:

Reason for determination of mass:

Performed by:
Checked by:

Empty mass:
Empty CG from datum line:
Index:

Approved by:

(Authorized personnel)

MASS CONTROL CALCULATION

Empty mass lever arms

Aircraft type: _____

Registration: _____

<i>Reaction (wheel, jack, point, etc.)</i>	<i>Average scale reading (kg)</i>	<i>ARM (cm)</i>	<i>Moment (cm-kg)</i>
Left main gear:			
Right main gear			
Sub-total			
Nose/tail gear			
Total (as measured)			

Items included in empty mass:

1.
2.
3.
4.
5.

Remarks:

MASS CONTROL CALCULATION

Aircraft mass and centre of gravity determination

COLUMN I			
Items included but not part of empty mass	Mass (kg)	ARM (cm)	Moment (cm-kg)
TOTAL			

COLUMN II			
Basic items not included when determining mass	Mass (kg)	ARM (cm)	Moment (cm-kg)
TOTAL			

Aircraft mass record

Description	Net mass (kg)	ARM (cm)	Moment (cm-kg)
Total (as measured)			
Less total mass from Column I			
Plus total mass from Column II			
Net empty mass			

forward cm, from reference line

aft cm, from reference line

Index formula:

INDEX:



Attachment B to Chapter 7

GUIDANCE FOR ACCEPTANCE OF ELECTRONIC AIRCRAFT MAINTENANCE RECORDS (EAMR) AND CONTINUING AIRWORTHINESS RECORDS

1. Purpose and scope

The purpose of this attachment is to provide guidance to civil aviation authorities (CAAs) seeking to establish and develop their national regulations in relation to EAMR and continuing airworthiness records. In proceeding to use the guidance hereby provided, the CAAs should note the following:

1. The term “electronic record” used throughout this attachment should be understood as referring to electronic maintenance records and continuing airworthiness records for aircraft, engines, propellers and associated parts.
2. The Contracting States should develop State regulations and practices that enable and encourage the air operators, design organizations, production organizations and maintenance organizations to use and rely on electronic records in their airworthiness activities.
3. This attachment lists the elements that should be considered by CAAs in setting their regulations for acceptance and usage of electronic records. This list is not intended by any means to be limitative nor should it be considered as exhaustive.
4. In developing their specific regulatory framework per individual State law, the CAAs should strongly consider the common baseline set forth by the following or equivalent reference standards: “ATA Spec 2000 e-business Specification”, “ATA iSpec 2200 Information Standards for Aviation Maintenance”, “ATA Spec 2300 Data Exchange Standard for Flight Operations”, “ATA Spec 2500 Aircraft Transfer Records”, “ATA Spec 42 Aviation Industry Standards for Digital Information Security”, “S1000D International Specification for Technical Publications Using a Common Source Database”, “ARINC-811 Commercial Aircraft Information Security Concepts of Operation and Process Framework”, RTCA/EUROCAE documents DO-355/ED-204 “Information Security Guidance for Continuing Airworthiness”.

2. General

2.1 The information pertaining to aircraft maintenance and continuing airworthiness is often recorded, certified and stored in a paper format. The accepted paper-based practice capabilities are challenged and limited in supporting real time accurate and complete records when faced with the increase of information volume and complexity associated with modern aircraft operation and maintenance. The CAAs should consider the approval and oversight of electronic record-keeping processes and procedures to be implemented by air operators, aircraft manufacturers and maintenance organizations.

2.2 An electronic record-keeping system should be a system of record processing in which records are entered, electronically endorsed, stored, and retrieved electronically by a computer system rather than in the traditional “hard copy” or paper form.

2.3 Any electronic record-keeping system and the record it generates, processes and stores should be described in

the operator's Maintenance Control Manual, be acceptable to the CAA and meet the requirements set forth by the CAA for the operator's maintenance and operational activity. This should include unrestricted CAA access for auditing and the capability of the organization to provide paper copies of records if required by the CAA.

2.4 The electronic record generated, processed and stored per CAA requirements should be considered as original documents. Use of a complete electronic record-keeping system should be acceptable to the CAA. Electronic records signed electronically should be considered equivalent to aircraft maintenance and continuing airworthiness records authenticated with non-electronic signatures. Any printout of an electronic record required by the CAA (see above provision 2.3) should have a watermark displayed on the page background stating "PRINTED FROM ELECTRONIC FILE".

2.5 The exchange of electronic records between aviation organizations, under the same or different CAA oversight responsibility, should be accomplished on a voluntary basis where both the issuer and receiver agree on the electronic transfer of the records.

2.6 Paper-based aircraft maintenance records should continue to be acceptable to the CAA if the air operator, aircraft manufacturer or maintenance organization adopts the traditional paper-based system. Notwithstanding the capability stipulated in provision 2.3 above, the CAA should not require that a dual system be implemented if the organization adopted an electronic record system in agreement with provision 2.4. A combination of electronic and paper-based maintenance record-keeping system should be acceptable to the CAA if the air operator, maintenance organization or aircraft manufacturer adopts the traditional paper-based system as a backup system in case of situations where a full electronic record cannot be created.

2.7 The adoption of the electronic records system should be conditional to providing to all system users the adequate training that includes security awareness and policy and procedures relevant to the system adopted. The assurance of its implementation is, thus, as important to an electronic records system as the architecture itself. The CAA should validate, before acceptance of the electronic records system, not only the technical capabilities of the proposed system but also the organizational readiness to adopt the system.

3. Identification, authentication and authorization

3.1 The basis of any electronic record and its related electronic signature identity management system is trust. Whether it is about identifying an aircraft, a crew member, a mechanic, a component, or a ground station entity, the organization will have to be able to trust that, when the entity presents a digital credential, the respective credential was issued to and is linked with that entity. To facilitate the establishment of this trust, requirements and procedures should be specified enabling and ensuring verification of the identity of the various parties that are involved in the issuance of a credential. The credential should be the basis of establishing the identity of an electronic record system user.

3.2 The electronic record system should perform the user's identity authentication. This should consist of means by which the system validates an authorized user's identity. These means may include, but are not limited to, a password, a Personal Identification Number (PIN), a cryptographic key, or a badge swipe, all in correlation with the implemented solution and processes.

3.3 The level of identity assurance and authentication should be commensurate to the class of activity for which the electronic record system is authorizing the user's access.

3.4 The user's identity assurance should comprise both initial and continuing (i.e. periodic) procedures with which the user has to comply.

3.5 The organization to which the user belongs at the time of interacting with the electronic record should be responsible for the correlation between the management of the user's identity and the user's scope of authorization.

4. Electronic signature

Note.— The use of the wording “electronic signature” is intended here to capture broad and diverse categories of solutions which, although they may be differently identified in the expert field of digital security in accordance with their technological features and capabilities, are all in compliance with provisions 4.3, 4.4 and 4.5. The inaccuracy generated by non-differentiation between categories such as electronic signature, digital signature, advanced electronic signature, secure electronic signature or digital electronic signature is considered irrelevant for these guidelines as long as compliance with 4.3, 4.4 and 4.5 is ensured by the solution adopted. The considerations presented in this section are entirely valid for aviation applications highlighted in other ICAO publications (e.g Doc 10020, Manual on Electronic Flight Bags (EFBs)).

4.1 The handwritten signature is universally accepted because it has certain qualities and attributes that should be preserved in any electronic signature. For an acceptable electronic signature, the purpose is identical to that of a handwritten signature; therefore an electronic signature should possess those qualities and attributes that guarantee a handwritten signature’s authenticity.

4.2 Electronic record-keeping systems may be used to generate aircraft records (e.g. maintenance task cards, aircraft maintenance records, dispatch releases, flight releases, airworthiness releases, and flight test reports) for which there is a need to be able to properly authenticate the user with an electronic signature.

4.3 The electronic signature is the online equivalent of a handwritten signature. It is an electronic sound, symbol, visible mark or process attached to or logically associated with a record and executed or adopted by an individual with the intent to sign the record. It electronically identifies and authenticates an individual entering, verifying, or auditing computer-based records. The electronic signature should provide a secure authentication of the signatory and should be linked to the data for which the signature was created in such a way that any subsequent change of the data is detectable.

4.4 There are several attributes that an electronic signature should possess:

Uniqueness, which is the feature by which the electronic signature should identify a specific individual and only that individual, and should be difficult to duplicate. An acceptable method of proving the uniqueness of a signature is by using an identification and authentication procedure that validates the identity of the signatory. Acceptable means of identification and authentication include the use of separate and unrelated identification and authentication codes. These codes could be encoded onto badges, cards, cryptographic keys, or other objects. Systems using PIN or passwords could also be an acceptable method of ensuring uniqueness. A computer entry used as a signature should have restricted access that is limited by an authentication code that is changed periodically. Additionally, a system could use physical characteristics, such as a fingerprint, handprint, or voice pattern, as a method of identification and authorization.

Significance, which is the feature by which an individual using an electronic signature should take deliberate and recognizable action to affix his or her signature. Acceptable, deliberate actions for creating a digital electronic signature include: badge swipes, signing an electronic document with a stylus, typing specific keystrokes or using a digital signature.

Scope, which is the feature by which the scope of information being affirmed with an electronic signature should be clear to the signatory and to subsequent readers of the record, record entry, or document. The electronic record should accurately reflect the information being affirmed by signatory and the signatory should be fully aware of what he or she is signing.

Security, which is the feature by which an electronic system that produces signatures should restrict other individuals from affixing another individual’s signature to a record, record entry, document, or alter the content without trace. To this effect, a corresponding policy and management structure should support the computer hardware and software that delivers the information. The system should contain restrictions and procedures to

prohibit the use of an individual's electronic signature when the individual leaves or terminates employment. This should be done immediately upon notification of the change in employment status.

Non-repudiation, which is the feature by which an electronic signature should prevent a signatory from denying that he or she affixed a signature to a specific record, record entry, or document.

Traceability, which is the feature by which an electronic signature should provide positive traceability to the individual who signed a record, record entry, or any other document.

4.5 The electronic signature solution adopted should adhere to validated requirements and industry standards regarding: the strength of the user/system identification credential employed in creating signatures, the proof-of-possession algorithm for identification credentials, the cryptographic algorithm for protection of data and alternatives that may provide similar protection if the previously enumerated are deemed impractical.

4.6 The electronic records are essentially linked in most cases to the date and time information regarding the moment in which they were created, modified and signed-off. Such information should be appropriately addressed by the time stamping capability of the electronic record-keeping system.

5. Security and integrity

5.1 A corresponding policy and management structure should support the computer hardware and software that delivers the information. Appropriate physical security and electronic record backup procedures should be established for current, operational, stored and archived records.

5.2 The electronic record system should protect confidential information.

5.3 The electronic record system needs to ensure that the information is not altered by operating any unauthorized changes to the record.

5.4 Procedures should be established allowing the organization to correct documents that were electronically signed in error. The original entry should be superseded anytime a correction related to that entry is made. (The original entry should be voided but remain in place. Reference to a new entry should be made and electronically signed and dated). It should be clearly identified that the original entry has been superseded by another entry.

5.5 Procedures should be established to describe how the operator will ensure that the electronic records are transmitted in accordance with the appropriate regulatory requirements to stakeholders who need access to the records.

5.6 Procedures should be established for reviewing the computerized personal identification codes system to ensure that the system will not permit password duplication.

5.7 Procedures should be established for auditing the computer system periodically to ensure the integrity of the system. A record of the audit should be completed and retained on file as part of the operator's record retention requirements. This audit may be supported by system automatic self-testing.

5.8 Procedures should be established for non-recurring audits of the computer system if the integrity of the system is suspect.

5.9 Audit procedures should be established to ensure the integrity of each computerized workstation. If the workstations are server-based and contain no inherent attributes that enable or disable access, there is no need for each workstation to be audited. The procedures should be applicable to both fixed (e.g. desktop computers) and mobile equipment (e.g. laptops, tablets, PMATs etc.).

5.10 An information security assessment process should be established for the electronic record system to determine how effectively each entity being assessed (e.g. host, network, procedure, person) meets specific security objectives. The effective implementation of such established process should employ password cracking and security penetration testing procedures.

6. Archiving and transferability

6.1 In addition to physical safety of the archives, specific procedures for archiving electronically signed documents should be established. A means of safely archiving electronically signed documents should be part of any electronic signature computer software. This will provide for and adequately support the retention, access and future authentication of electronic records.

6.2 Procedures should be established to ensure that all maintenance and continuing airworthiness records referred to in Chapter 6 of Part IV of this manual are made available at aircraft transfer to support the Export C of A. The electronic record-keeping system should include the necessary protocol to allow for secure transfer of the records to another electronic record-keeping system.

Chapter 8

AIRCRAFT MAINTENANCE — MODIFICATIONS AND REPAIRS

8.1 GENERAL

8.1.1 A type certificate issued in accordance with Annex 8, Part II, 1.4, is evidence of approval of a type design of an aeronautical product in its configuration as of the date of type certificate issuance or approval. After issuance of a type certificate, modifications and repairs can be performed to aircraft for a variety of reasons, whether because of rule changes, mandatory actions, product improvements or incorporation of customer options, or sustained damage.

8.1.2 A Certificate of Airworthiness issued under Annex 8 is based on satisfactory evidence that an aircraft complies with a type design approved or accepted by a State of Registry. For aircraft engaged in international civil aviation, the recognition and acceptance of a Certificate of Airworthiness is facilitated through Article 33 of the Convention. A State of Registry claiming such recognition, however, must ensure that there exists a national requirement for ensuring the continuing airworthiness of an aircraft during its service life. This national requirement involves the aircraft owner or air operator and the CAA ensuring that the aircraft continues to conform to its approved type design after modification, repair, and installation of a replacement part. Annex 8, Part II, Chapter 4, and Chapter 9 provide the requirements on continuing validity of the Certificate of Airworthiness.

8.1.3 The State of Registry has an obligation under Annex 8 to approve the modification and repair design, as a way of ensuring that the aircraft will continue to comply with the design aspects of the airworthiness standards used for the type certification of that aircraft. An unapproved modification or repair design renders a Certificate of Airworthiness invalid. The relationship between repair to an approved type design/modification and the Certificate of Airworthiness is explained further by the following three requirements that form part of several general provisions on maintenance in Annex 6:

- a) an operator must ensure that the certificates of airworthiness of the aircraft it operates remain valid;
- b) an operator must keep records of appropriate details of modifications and repairs incorporated on aircraft; and
- c) modifications and repairs should comply with airworthiness requirements of, or acceptable to, the State of Registry, and procedures should be established to ensure that the substantiating data supporting compliance with the airworthiness requirements are retained.

8.2 MODIFICATIONS

8.2.1 After issuance of an initial or original type certificate, there are many activities that can be performed or required by the type certificate holder, the State of Design, the State of Registry, air operators and other design

organizations that will result in the modification of an aeronautical product. For example, the type certificate holder may want to develop a model derivative of the same aeronautical product, or an aircraft owner or air operator may want to replace an aircraft's existing navigation systems with state-of-the-art technology.

8.2.2 Modifications are intended to change a function, operation, limitation, performance, and/or characteristic of the physical or functional element(s) of an existing aircraft, engine and/or propeller for the purpose of achieving a desired feature, role or capability for the affected aeronautical product. Modifications will vary in design philosophy, application technology, complexity and magnitude.

8.3 REPAIRS

8.3.1 An aircraft may experience accidental damage, wear and tear, environmental deterioration, fatigue, malfunction, and failure during its operational life. A repair is a corrective action intended to restore an aeronautical product to an airworthy condition as defined by the appropriate airworthiness requirements and is regarded primarily as a maintenance function. An unapproved repair design could render a Certificate of Airworthiness invalid.

8.3.2 Accomplishing a repair on an aircraft may involve such actions as performing maintenance or servicing procedures, replacing a defective part with a like serviceable unit or with an approved substitute part, or designing and incorporating a repair scheme. Generally, the documents encompassing the ICA such as, but not limited to, maintenance manuals, servicing instructions, overhaul manuals and repair manuals contain adequate maintenance procedures that are recognized by Contracting States as either approved or acceptable for purposes of accomplishing repairs to aircraft. For example, a structural repair manual (SRM) contains several State of Design approved repair schemes for typical damages or structural failures that can be readily applied by an operator, without the need to obtain prior approval of the CAA. However, where the repair action specifically requires designing a repair scheme, the repair design must be approved by the CAA. All changes to limited life components limits must be incorporated in the maintenance programme following the design repair approval.

8.4 CATEGORIES OF MODIFICATIONS AND REPAIRS (MAJOR/MINOR)

8.4.1 General

8.4.1.1 The maintenance provisions of Annex 6 and the type certificate and continuing airworthiness requirements of Annex 8 specify that modifications and repairs must be approved by the State of Registry. Depending on the civil aviation activities within a State, approving all modifications and repair designs could overwhelm a CAA and may require extensive technical resources to execute the approval process in a timely manner. For this reason, States should introduce a system for categorizing design changes as either a major or minor modification/repair.

8.4.1.2 The general intent behind the categories is to optimize the CAAs' resources by identifying those modifications and repair designs that require their direct participation in the approval process, determining the kind of data needed to substantiate the modification or repair, and establishing the type and form of approval. Some States may require their involvement in and approval of both major and minor modifications/repairs, while other States may only require approval of major modifications or repairs. Also, the threshold or level that distinguishes a major from a minor modification/repair may vary with States. It is up to each State to establish its national policy on approval of modifications and repairs.

8.4.1.3 An applicant seeking foreign approval of its modification or repair design should coordinate its request with the local CAA during consultation with foreign CAAs to clarify potential differences in the modification or repair category, and consequently their approval requirements.

8.4.2 Major modification

8.4.2.1 By definition, a major modification has an appreciable, or other than negligible, effect on the airworthiness of an aeronautical product. The CAA should evaluate the technical merit of each modification proposal and establish a clear understanding of the intended and/or consequential effect on the affected aeronautical product. A major modification should not be confused as equivalent to, or treated like, a minor change. The effect of a major modification is usually confined to a single area, system or component of an aircraft, engine or propeller. Some examples of modifications that are generally regarded as major modifications are:

- a) in the case of aircraft, the modification includes general avionics upgrade, relocation of galley, installation of non-essential auxiliary power unit, substitution of one structural bonding method for another, installation of wheel skis, installation of quieter exhaust system, increase in fuel tank capacity, installation of new type passenger seats, or mass increase of less than five per cent;
- b) in the case of an aircraft engine, the modification includes change in oil tank design, fan blade re-design, software changes, bearing change, change in limits on exhaust gas temperature, changes to the engine by replacing aircraft engine structural parts with parts not supplied by the original manufacturer or parts not specifically approved by the CAA, change from one hydro-mechanical control to another hydro-mechanical control, change in crankshaft, redesigned cylinder head, valves or pistons or conversions of any sort for the purpose of using fuel of a rating or grade other than that listed; and
- c) in the case of propellers, the modification includes changes in blade design, changes in hub design or changes to a component in the control system.

8.4.2.2 A major modification to an aircraft should be accomplished in accordance with design data approved by the State of Registry or an authorized person or organization. The modification accomplished should also conform to all other applicable standards of airworthiness.

8.4.3 Minor modification

By definition, a minor modification is a design change that has a negligible, or no appreciable, effect on the mass, balance, structural strength, reliability, operational characteristics or other characteristics affecting the airworthiness of the aeronautical product. The accomplishment of minor modifications normally involves use of standard or generally accepted practices.

8.4.4 Major repair

8.4.4.1 A major repair is usually considered a repair that might appreciably affect mass, balance, structural strength, performance, engine operation, flight characteristics or other qualities affecting airworthiness. A repair in this category normally requires some form of engineering analysis or assessment. The CAA should evaluate the technical merit of a repair design proposal and establish a clear understanding of the intended or consequential effect on the affected aeronautical product. For example, it may not be appropriate to approve a repair that is purposely designed to be much stronger than the structure being repaired because the effect may be an undesirable change in the original structural load distribution. The threshold or level that distinguishes a major from a minor repair may vary from State to State. For the purpose of illustration, the following examples can be used to categorize a major repair:

- a) repairs involving a principal component of the aircraft structure, such as a frame, stringer, rib, spar or stressed skin;
- b) repairs to structural elements that were approved using damage tolerance or fail-safe evaluation;

- c) repairs to pressurized areas;
- d) repairs involving the installation of an item of mass necessitating structural re-evaluation;
- e) repairs to structural attach points intended for the stowage or retention of significant mass;
- f) repairs to load-bearing structure of aircraft seats, harnesses, or to occupant restraint equipment;
- g) repairs involving substitution of materials, or use of a different repair process or technique; and
- h) repairs to components, parts, appliances where form, fit, and function may be affected.

8.4.4.2 A major repair to an aircraft should be accomplished in accordance with design data approved by the State of Registry or an authorized person or organization, such that the repair conforms to applicable standards of airworthiness.

8.4.5 Minor repair

A minor repair involves any repair that does not fall under the major repair category, meaning the repair has a negligible effect on the airworthiness of the affected aeronautical product. The accomplishment of minor repairs normally involves use of standard or generally accepted practices (see 8.3.2 above).

8.5 REPAIR AND MODIFICATION APPROVAL

Note.— Reference is made throughout this section to the requirements of the State of Registry. When the State of the Operator is not the same as the State of Registry, it may be necessary to consider any additional requirements of the State of the Operator.

8.5.1 The approval of a modification can be processed in many ways, depending on the scope and complexity of the proposed design change and the regulatory system in place for each Contracting State. But the general process of approving the design change remains fundamentally the same as that of a type certification process (see Part V, Chapter 2 of this manual — Type certification). Annex 8, Part II, 1.3.4, obliges all Contracting States to ensure their approval of a design of a modification is based on satisfactory evidence that the aircraft continues to comply with the design aspects of the appropriate airworthiness requirements used for the type certification of that aircraft. Satisfactory evidence of approval of a modification is most commonly recorded as either an amendment or supplement to the type certificate or other CAA airworthiness compliance and conformity approval.

8.5.2 The approval of a repair can be processed in many ways, depending on the scope and complexity of the proposed repair and the regulatory system in place for each Contracting State. The approval of repairs may be a function delegated by a Contracting State to authorized persons or organizations, while other Contracting States exercise it as their exclusive function. Some repair approvals are limited to the approval of the design data only, whereas other approvals may also constitute installation approval. Regardless, the approval process is intended to verify that the repair design complies with the airworthiness requirements of the State of Registry for the purpose of maintaining validity of a Certificate of Airworthiness issued under Annex 8. Approval of a repair design is most commonly recorded as a repair design approval. Responsibility for approval remains with the State of Registry.

8.5.3 Many States do not have the capabilities to approve a major modification or repair on their own. They may rely on the State of Design (or designees from the State of Design) to recommend approval of engineering data in support of the major modification or repair. The State of Registry then accepts the recommendation. All Contracting States,

regardless of their technical capability to approve major modifications or repairs, are encouraged to give recognition to the modification and repairs approvals granted by the State of Design or another Contracting State with a demonstrated technical capability, and avoid duplicate or redundant testing where practical, and without prejudice to their own unique national requirements. Many airworthiness standards currently used by States with aviation manufacturing industries are already harmonized, and the remaining differences are either with the unique technical requirements, due to operational or environmental constraints, and/or interpretation of the same requirements. Although full harmonization of all airworthiness requirements is yet to come, the overall objective is that all States should work towards reducing the amount of work needed to accomplish the approval of an aircraft modification and repair.

8.5.4 The Contracting State granting approval to a modification design is designated as the State of Design for the modification design, and by definition should have jurisdiction over the individual or organization responsible for the design of the modification. A clearly identified State of Design is necessary to allow for the implementation of the responsibilities on continuing airworthiness of aircraft under Annex 8, Part II, Chapter 4.

8.6 REPAIR APPROVAL PROCESS

8.6.1 Application for approval of repair design

8.6.1.1 Any person or organization may apply for approval of a repair design to an aircraft. This could include the aircraft owner or air operator of an aircraft, a type certificate holder, a maintenance, repair and overhaul facility, a specialized engineering organization, an engineering consultant, or, where allowed by a State, their representatives. The approval will be granted to the organization or individual that has responsibility for the repair design. Annex 8, Part II, 1.3.4, states that a Contracting State issuing an approval for the design of a modification, of a repair or of a replacement part does 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. Annex 6, Part 1, 8.6, further provides that all modifications and repairs comply with airworthiness requirements acceptable to the State of Registry. The State of Registry needs to ensure that the applicant has:

- a) comprehensive knowledge, experience and capabilities in the applicable technologies, such that in-depth analyses can be performed where required;
- b) information on prior repairs in the area where approval is sought; and
- c) sufficient information on the type design of the aircraft involved.

If necessary, it is recommended that the State having jurisdiction over the individual or organization responsible for the design of the repair be consulted.

8.6.1.2 The State of Registry should establish, within its regulations, the requirements for application for approval of repair design. An application for the approval of a repair design should be submitted in a form and manner prescribed, or agreed to, by the CAA. Information to be submitted on the proposed repair should include, at a minimum, the following:

- a) the name and address of the applicant;
- b) the make and model of the affected aeronautical product (registration and/or serial number) and its type certificate number (or approval reference);
- c) the title, detailed description and purpose of the repair design;

- d) the proposed airworthiness standards to which the proposed repair is intended to show compliance, including the identification of any impact on approved airworthiness limitations contained in the ICA for the affected aeronautical product;
- e) documentation and/or substantiating data of the repair design; and
- f) when required by a State of Registry for a foreign applicant, evidence of prior approval by the State that has jurisdiction over the individual or organization responsible for the repair design.

8.6.2 Approval activities

The main objective of the approval process is for the State of Registry to determine compliance of a proposed repair design with its applicable airworthiness requirements, such that the affected aeronautical product is restored to its approved type design. There are four key activities in the approval of a repair design, namely:

- a) establishing an approval basis;
- b) establishing the means or methods of compliance;
- c) demonstrating compliance and findings; and
- d) approving the repair design.

8.6.3 Establishing an approval basis

8.6.3.1 Annex 8, Part II, 1.3.4 states that a Contracting State issuing an approval for the design of a modification, of a repair or of a replacement part should 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. The following should be the basic policy for repairs, unless established otherwise by a State of Registry:

- a) for an aircraft, the approval basis is the aircraft design standards recorded in the type certificate data sheet accepted and/or validated by the State of Registry; and
- b) for an engine or propeller, the approval basis is the engine or propeller design standards recorded in the type certificate data sheet accepted and/or validated by the State of Registry.

8.6.3.2 The approval basis for a repair design should not include any proposal for an exemption or a finding of equivalent level of safety because a repair is a restoration to an approved type design. The intent of the repair is to maintain the same level of safety that the aeronautical product was certified to.

8.6.3.3 The approval basis could also be affected by additional requirements that are not related to the original approval or type certification of the aeronautical product. For example, a supplemental SIP or a repair assessment programme for ageing aircraft may influence repair designs to be held to higher design standards or evaluation techniques. In establishing the approval basis, the State of Registry should also account for other factors, such as maintenance or operating rules, which may affect the actual installation of the repair.

8.6.4 Establishing the means of compliance

The means of compliance is usually dictated by the design standard(s) in the approval basis for which compliance will be demonstrated, and generally falls into one or any combination of the following:

- a) *Test* – is performed when the requirement explicitly calls for a demonstration by test (physical, actual or simulation). Examples of test are fatigue test, simulation, functional or operational test, fire or flammability test, and environmental test (e.g. salt spray);
- b) *Analysis* – is performed when the requirement explicitly calls for a demonstration by analysis (qualitative, quantitative, or comparative). Examples of analysis are failure modes and effects analysis, static strength or damage tolerance analysis, and structural loads analysis;
- c) *Inspection or evaluation* – is performed against an item that does not require test or analysis, but relies on observation, judgment, verification, evaluation or a statement of attestation from the applicant or its vendors/contractors; and
- d) *By derivation or similarity* – is performed when a new repair design can be developed or derived from a previously approved repair and the two repair designs can be considered similar.

8.6.5 Demonstration of compliance

8.6.5.1 The demonstration of compliance requires that the applicant submit substantiating data (design data, reports, analysis, drawings, processes, material specifications and ICA). The data should be complete and in a logical format for review by the CAA. Where the demonstration of compliance involves a test, a test plan should be developed and approved prior to any actual test being performed. Official certification tests should be witnessed by AED personnel or by an AED delegate, when authorized.

8.6.5.2 The applicant should give the AED access to the aeronautical product being repaired in order to make any inspections, test, and engineering assessment that may be necessary to determine compliance with the approval basis of the repair. However, the applicant should perform its own inspection and test necessary to demonstrate compliance, prior to presenting the repaired aeronautical product to the AED for testing or evaluation.

8.6.6 Finding of compliance

The CAA makes a finding of compliance with the approval basis. The finding of compliance can be made by the AED, AID, or by its authorized delegate, depending on the predefined levels of involvement in the repair approval process. Following a successful demonstration of compliance by the applicant, the AED, AID or authorized delegate should make a finding of compliance and conclude the approval process. The findings are usually accomplished through one or any combination of the following actions:

- a) *acceptance of substantiating data* – Reports, analysis, drawings or similar documents are usually produced against each item in the approval basis and should be reviewed and accepted. Specific attention should be paid to the methodology and assumptions, rather than the detailed calculations or analysis;
- b) *witnessing of test* – Tests are performed in accordance with an approved test plan and witnessed by the AED, AID or authorized delegate. The test should be conducted only after conformity with the test plan has been established for the test articles, test environment and test facilities. The AED, AID or authorized delegate does not perform the actual test and should remain impartial and concentrated on the test objective;

- c) *engineering inspection* – Any aspect of the repair design for which compliance with the approval basis cannot be determined through review of drawings or reports, should receive an engineering compliance inspection. An engineering compliance inspection is to assure that an installation, and its relationship to other installations on an aeronautical product, complies with the airworthiness requirements;
- d) *conformity inspection* – Where required, conformity inspection should be performed by the AED, AID or authorized delegate to verify conformity of the repaired aeronautical product with drawings, specifications and special processes. An engineering inspection should not be confused with a conformity inspection. A conformity inspection is done to determine conformity to the engineering data, while an engineering inspection is done to determine compliance with the approval requirement.

8.6.7 Approving the repair design

8.6.7.1 The CAA approval of the repair design should be documented and a physical record retained by the air operator, as required by the maintenance record-keeping requirement of Annex 6. A statement of “no technical objection” should be avoided; such an expression does not mean an approval, acceptance or rejection. The CAA should consider documenting its clear approval through one of the following means:

- a) issuance of an approval letter signed by the CAA;
- b) issuance of an approval using a standard form established by the CAA;
- c) by signature or marking (stamp or seal) the repair approval document as submitted by the applicant; or
- d) in the case of recognizing foreign approvals, a statement of endorsement that such foreign approval is considered approved by the State of Registry.

8.6.7.2 The repair design should not be approved if there is a known or suspected design feature that could make the repaired aeronautical product unsafe after installation. An example would be the use of an inappropriate type of blind fasteners (multi-piece) to install a structural repair patch in an area subject to repeated vibration.

8.6.7.3 The CAA should stipulate limitations, if any, associated with its approval of the repair design. The limitations should include time limits (in the case of temporary repairs, or life-limited repairs), follow-up or repeat inspection requirement, installation considerations, specific applicability (or repeatability of application) to aeronautical product(s), permitted deviations or substitutions from the repair design. The limitations should also identify approved changes or revisions to the approved airworthiness limitations contained in the ICA for the affected aeronautical product.

8.6.8 Post-approval activities

8.6.8.1 The activities following approval of a repair design involve accomplishing the repair on the aeronautical product, documenting the repair accomplished, and issuing the maintenance release of the affected aeronautical product. Where necessary, the relevant maintenance manuals should also be updated.

8.6.8.2 The CAA should keep a record of approvals granted for repair designs. This should include the supporting documents submitted with the application.

8.7 MODIFICATION APPROVAL PROCESS

8.7.1 Application for approval of a modification

8.7.1.1 Any person or organization may apply for approval of a proposed modification to an aircraft. This could include the aircraft owner or air operator, a type certificate holder, a maintenance, repair and overhaul facility, a specialized engineering organization, an engineering consultant, or, where allowed by a State, their representatives. The applicant must be the organization or individual that has responsibility for the proposed modification and in whose name the approval will be granted. In cases of complex design changes involving multinational agreements, joint ventures, partnerships or similar collaboration, the applicant remains responsible for integrating all design data from its various sources, and submitting it to the airworthiness organization of the Contracting State as a complete and detailed proposal for the modification of an aircraft, engine or propeller.

8.7.1.2 A State that has first taken responsibility for approval of a modification is designated as the State of Design for the modification and, by definition, must have jurisdiction over the individual or organization responsible for the modification. A clearly identified State of Design is necessary to allow for the implementation of the responsibilities on continuing airworthiness of aircraft under Annex 8, Part II, Chapter 4.

8.7.1.3 The State of Registry, in approving a modification, needs to ensure that the applicant has:

- a) comprehensive knowledge, experience and capabilities in the applicable technologies, such that in-depth analyses can be performed where required; and
- b) sufficient information on the type design of the aircraft involved. If necessary it is suggested that the State of Design be consulted.

8.7.1.4 The State of Registry should establish, within its regulations, the requirements for application for approval of modifications. An application for the approval of a modification should be submitted in a form and manner prescribed, or agreed to, by the CAA. Information on the proposed modification should include, at a minimum, the following:

- a) the name and address of the applicant to which the approval will be issued;
- b) the make and model of the affected aeronautical product (registration and/or serial number) and its type certificate number (or approval reference);
- c) the title, detailed description, and purpose of the proposed modification, including any changes affecting the noise and emissions level of the aircraft or engine;
- d) the type of approval requested (see guidance in "Issuance of Approval", paragraph 8.7.9 of this chapter.);
- e) the proposed airworthiness standards, including environmental standards if applicable, to which the proposed modification is designed and with which it is intended to comply;
- f) documentation and/or substantiating data of the design change;
- g) for a local applicant, an indication on the need for a concurrent or subsequent approval by another State; and
- h) for a foreign applicant, evidence of prior approval by the State that has jurisdiction over the individual or organization responsible for the modification.

Note.— Some States of Registry require a foreign applicant to submit its application through its CAA, who then makes an application on its behalf. This procedure ensures that the State of Design is aware of the application and its corresponding responsibilities on continuing airworthiness under Annex 8 if the modification is eventually approved by the State of Registry.

8.7.1.5 The applicant should identify and describe the proposed modification to the aeronautical product. The application for approval could involve a single modification or a collection of modifications. Changes to an aeronautical product can include physical design changes, changes to an operating envelope, and/or performance changes. An applicant for a change to a type design should consider all previously installed modifications to the affected aeronautical product that are relevant to the proposed modification. It is important that the effects of the proposed modification on other systems, components, equipment or appliances of the affected aeronautical product be properly identified. The intent is to encompass all aspects where there is a need for re-evaluation, that is, where the substantiation presented for the aeronautical product being modified should be reviewed, updated or rewritten.

8.7.2 Approval activities

The main objective of the approval process is for a State to determine for itself the overall compliance of a proposed modification with its applicable airworthiness and environmental standards (when applicable), such that the affected aeronautical product, when modified, will continue to have a valid and approved type design. The State of Registry has the responsibility to establish satisfactory evidence of approval of modification of an aircraft that has been issued a type certificate and/or a Certificate of Airworthiness under Annex 8. There are five key activities associated with a modification, namely:

- a) establishing a certification basis;
- b) establishing the means or methods of compliance;
- c) demonstrating compliance and findings;
- d) approving the modification; and
- e) undertaking post-approval activities.

8.7.3 Establishing a certification basis

8.7.3.1 The type certificate data sheet of an aircraft, engine or propeller identifies the detailed certification basis by which the type design of that aeronautical product was approved. The major components of a certification basis are the airworthiness and environmental standards, including if any, special conditions of airworthiness, findings of equivalent level of safety, and exemptions. For most States, the approval procedure remains at ensuring that a modified aircraft, engine or propeller continues to comply with the certification basis recorded in the type certificate data sheet. However, ICAO encourages States to undertake activities for enhancing safety in civil aviation and, among other things, promoting an airworthiness policy of approving modifications to a level of safety higher than that intended by its original certification basis. This policy requires that modifications demonstrate compliance with design standards that are in effect on the date of application, or with later amendments to the design standards recorded on the type certificate data sheet.

8.7.3.2 In the application for a modification approval, the applicant proposes the airworthiness and applicable environmental standards to which it intends to demonstrate compliance. Depending on the modification, additional airworthiness or operational requirements may be imposed by a State, or an applicant may be required to show that the aeronautical product meets additional standards in order to receive approval in another State, due to differences in requirements. All these requirements are established collectively to become the certification basis for the modification.

The applicant should participate in any AED discussion concerning the proposed certification basis, but it remains the ultimate responsibility of the CAA to evaluate and ensure that the certification basis is appropriate for the proposed modification.

8.7.4 Environmental Standards

The applicable environmental Standards for a modification of an aircraft or engine are described in Annex 16 — *Environmental Protection*. States that have not adopted or accepted Annex 16 as their environmental standards may use other standards provided they are at least equal to the Standards of Annex 16.

Note.— Some States assign the responsibilities for establishing, and finding compliance with, the environmental standards to another government organization, and not necessarily to their CAA. States need to ensure that both the environmental and airworthiness certifications are addressed at the conclusion of the modification approval process.

8.7.5 Establishing the means of compliance

8.7.5.1 General

It is the responsibility of the applicant to demonstrate compliance of the proposed modification with the certification basis of the aircraft, in accordance with the means or methods accepted or agreed to by the CAA. In order to manage this aspect during the modification approval process, it is necessary to agree on a certification compliance plan that clearly identifies the types of action to be applied against each item of the certification basis. The majority of States find it necessary to have a compliance plan. The certification compliance plan can be an effective tool in managing the certification programme by providing an early understanding of what is required to achieve approval and assisting in the identification of approval problems early in the programme.

8.7.5.2 Means of compliance

The means of compliance is usually dictated by the specific item of the certification basis, and generally fall into one or any combination of the following:

- a) *Test* – is performed when the requirement explicitly calls for a demonstration by test (physical, actual or simulation). Examples of test are flight test, ground test, fatigue test, simulation, fire or flammability test, environmental test (e.g. salt spray), functional test, bird strike test, and engine ingestion test;
- b) *Analysis* – is performed when the requirement explicitly calls for a demonstration by analysis (qualitative, quantitative or comparative), or when the applicant can demonstrate, based on previously accepted test results, the validity of using analysis in lieu of testing. Examples of analysis are failure modes and effects analysis, flight performance data reduction and expansion, structural loads analysis, and software evaluation; and
- c) *Inspection or evaluation* – is performed against an item that does not require test or analysis, but relies on observation, judgment, verification, evaluation or a statement of attestation from the applicant or its vendors/contractors.

8.7.5.3 **Certification compliance plan**

8.7.5.3.1 The certification compliance plan is the primary document in the modification approval process that serves both as a checklist and official record of compliance. The applicant should prepare a certification compliance plan and establish its contents with the agreement of the CAA. The certification compliance plan should, at a minimum, contain the following information:

- a) itemized breakdown of the certification basis;
- b) proposed means of compliance for each item (test, analysis, inspection, or combination of these, or finding of equivalent level of safety);
- c) lists of tests to be conducted;
- d) identification of substantiation reports to be submitted (as proof of compliance);
- e) identification of persons responsible for making findings of compliance;
- f) the level of involvement of the CAA, the applicant, or a delegate of the CAA in the findings of compliance or witnessing of tests; and
- g) modification project schedule, including the established milestones and when final approval is expected.

8.7.5.3.2 The activities involving demonstration of compliance should not begin until after a certification compliance plan has been agreed to between the applicant and the CAA. The original (or master) copy of the certification compliance plan is retained by the CAA until completion of the modification approval activity. Upon completion of the programme, the plan can be the official certification compliance record for the modified aeronautical product.

8.7.5.4 **Level of involvement**

Some States have regulations that allow delegation of some or all of their functions, duties or powers to qualified individuals or organizations. The responsibilities assigned by the regulations to a State, however, cannot be delegated and always remain with the State. Under a delegation system, appropriately qualified individuals or organizations may be granted the authority to make a finding of compliance on behalf of their State. A finding of compliance by a delegate is a finding of compliance by the State. As such, an administrative procedure should exist for the recording of the finding of compliance by the delegated individual or organization. Some findings of compliance, however, may be the exclusive responsibility of the CAA and cannot be delegated, or that the CAA may limit a delegate to making recommendations only instead of making a finding of compliance. If the applicant proposes to utilize delegated persons or organizations in the modification approval programme, the exact role of these delegates should be clearly identified in the certification compliance plan and agreed to by the CAA. The levels of involvement of the CAA, applicant and delegates will be defined by the State's delegation system, taking into account such factors as limitations of the delegates, complexity of the modification, availability of technical resources, and time constraints of the modification approval project.

8.7.6 **Demonstration and finding of compliance**

8.7.6.1 **General**

Annex 8, Part II, 1.3.1 and 1.3.2 specify that proof of compliance with the design aspects of the airworthiness requirements be established through the approval of the modification and the performance of necessary inspections and ground and

flight tests. In the certification compliance plan, the means of demonstrating compliance (test, analysis or inspection/evaluation) and the levels of involvement (applicant and CAA) are already specified for each item of the certification basis. The applicant is responsible for demonstrating compliance through the agreed means, while the CAA is responsible for making a finding of compliance on the means demonstrated. Both demonstration and finding of compliance should be recorded against each item in the plan, as evidence of a successful completion. The implementation of the plan is the joint responsibility of the applicant and the CAA, and the modification approval schedule contained in the certification plan is to be tracked.

8.7.6.2 **Demonstration of compliance**

8.7.6.2.1 The demonstration of compliance requires that the applicant submit substantiating data (design data, reports, analysis, drawings, processes, material specifications, operations limitations, aircraft flight manuals, and ICA). The data should be complete and in a logical format for review by the CAA. Where the demonstration of compliance involves a test, a test plan should be developed and approved prior to any actual test being performed. Official certification tests are witnessed by CAA personnel or by an CAA delegate, when authorized.

8.7.6.2.2 The applicant should give the CAA access to the aeronautical product being modified in order to make any inspections, test, and engineering assessment or conduct any flight or ground test that is necessary to determine compliance with the certification item. However, the applicant should perform its own inspection and test necessary to demonstrate compliance prior to presenting the modified aeronautical product to the AED for testing or evaluation.

8.7.7 **Finding of compliance**

Findings of compliance are made against airworthiness and environmental standards. The finding of compliance can be made by the CAA, or by its authorized delegate, depending on the predefined levels of involvement in the certification plan. Following a successful demonstration of compliance by the applicant on a certification item, the CAA should make a finding of compliance and subsequently sign-off on the item in the certification plan. The findings are usually accomplished by the CAA through one or any combination of the following actions:

- a) *Acceptance of substantiating data.* Reports, analysis, drawings or similar documents are usually produced against each certification item and should be reviewed and accepted;
- b) *Witnessing of Test.* Tests are performed, and witnessed by the CAA where required or agreed to, in accordance with an approved test plan. The test should be conducted only after conformity with the test plan has been established for the test articles, test environment and test facilities. The CAA does not perform the non-flight test and should remain impartial and concentrated on the test objective. For flight testing, the CAA or its delegate may perform the flight testing;
- c) *Engineering inspection.* Any aspect of the modification, for which compliance with the certification item cannot be determined through review of drawings or reports, should receive an engineering compliance inspection. An engineering compliance inspection is to assure that an installation and its relationship to other installations on an aeronautical product comply with the design requirements;
- d) *Conformity inspection.* Where required, conformity inspection should be performed by the CAA to verify conformity of the modified aeronautical product with drawings, specifications and special processes. An engineering inspection should not be confused with a conformity inspection. A conformity inspection is done to determine conformity to the engineering data, while an engineering inspection is done to determine compliance with the certification requirement; and
- e) *Flight Test.* Where required, for aircraft, an actual demonstration of flight capabilities and characteristics in accordance with an approved flight test plan.

8.7.8 Approving the modification

All findings of compliance made by the CAA, or its delegate, should be recorded or annotated in the certification compliance plan. When the applicant has demonstrated compliance, and the CAA has found full compliance on all items of the certification basis, including the resolution of outstanding items, the plan is signed off and becomes the official compliance record for the modification project. The certification compliance record serves as the satisfactory evidence specified under Annex 8, Part II, 1.3.4, for the approval of the modification. The approval of the modification means that:

- a) the airworthiness requirements affected by the modification meet all the relevant requirements specified in the certification basis, including special conditions of airworthiness issued by the CAA;
- b) all engineering and conformity inspections have been completed and the modified aeronautical product has been found to meet all pertinent requirements; and
- c) in the case of aircraft, the modified aircraft has been test flown, as required, and found to comply with all the performance requirements of the pertinent airworthiness standards.

8.7.9 Issuance of approval

8.7.9.1 Most Contracting States will grant approval of a major modification using one of the three forms of approval below, provided the proposed modification is not so extensive as to require a new type certificate. Depending on the applicant's eligibility, the form of approval for the proposed modification is usually indicated by the applicant at the time of application (see paragraph 8.7.1 above). Annex 8 does not specify the exact form for recording an approval of a modification. Some States of Registry may only accept or recognize, for their purpose, a foreign modification that was approved using an amended type certificate or STC. Some examples of recording the approval of a modification include:

- a) *Amendment of a type certificate.* The holder of a type certificate can make an application to amend a type certificate. The holder retains the overall responsibility for the type design of an aircraft, engine or propeller. Common examples of design changes leading to an amendment of a type certificate may be the addition of a new model designation or derivative of an aircraft, engine or propeller, the revision of operating conditions or limitations listed in the type certificate data sheet, or changes to aircraft passenger or cabin configuration;
- b) *Supplemental type certificate (STC).* An STC is an approval of a major modification covering those areas or aspects of an aeronautical product that were modified. It should be noted that an aeronautical product that does not have a type certificate cannot be issued a modification approval under an STC (e.g. appliances, parts, components, instruments). Further, an STC should not be issued for approval of minor modifications, or approval of replacement parts or repair, unless its installation represents a modification. Attachment A to this chapter provides an example of an STC; and
- c) *Other approvals.* For modifications that do not warrant the detailed approval process of an amended type certificate or STCs, States may consider other means of granting approval. Such means of approval may be administered by delegated individuals or organizations with demonstrated technical competence, and reported to the CAA under an administrative reporting system for purposes of regulatory oversight. Modifications that are candidates for this approval category typically involve on-demand design changes by air operators, maintenance and/or design organizations, and manufacturers to support varying maintenance and operational needs under time constraints. Examples of modifications that can be approved under this category are: product improvements by manufacturers (introduced through SBs), airline type modifications relating to operational reliability or passenger configuration changes, repair design, field-type modifications that do not involve extensive or

multidiscipline engineering analysis. The types of design changes that can be approved using this other means should be decided by each State according to its resources, delegation policy, and the level of modification activity within its civil aviation industry.

8.7.9.2 The person or organization (holder) to which the modification approval was granted has responsibility for the approved design change. If multiple participants (e.g. joint design ventures, partnerships, sub-contracting or similar arrangements) are involved in the modification, the CAA will require one person or organization to be responsible for the overall design change, and to whom the approval will be issued.

8.7.9.3 An approval granted for a modification (amended type certificate, STC or other approval) should remain valid until otherwise specified or notified by the issuing CAA.

8.7.10 Documents necessary for operation of a modified aircraft

Other information necessary for the safe operation of the aircraft under Annex 6 were developed concurrently with type certification of the aeronautical product. If the approved modification changes any of the information identified in this manual under Part V, Chapter 2 (Type Certification), the applicant should prepare the appropriate revision to this information and submit it to the CAA for approval or acceptance. Following approval or acceptance by the CAA, the revised information should be published in a form and manner prescribed by the CAA and subsequently provided as part of the modification approval documentation.

8.8 POST-APPROVAL ACTIVITIES

8.8.1 General

The State of Design of a modification (i.e. State that first gave the initial approval) has responsibilities under Annex 8 to provide continuing airworthiness support to the State of Registry (i.e. a State that incorporated the modification on its aeronautical products). The CAAs of both States and the holder of the modification approval fulfill this responsibility through a system of receiving and exchanging information, surveillance, assessment of service difficulty experiences, and development of the necessary airworthiness actions. Annex 6 provides the requirement for detailed record-keeping of modifications and evidence of compliance with the appropriate airworthiness requirements. (Also see Chapter 9 of this Part.)

8.8.2 Retention of design change data

8.8.2.1 The data constituting the design change are contained in records, reports, drawings and other documents that describe collectively the exact configuration of the design change when it was approved. The design change data must be maintained by the CAA or the holder of the modification approval, or both. The CAA should determine the eligibility and type of data to be maintained by the modification approval holder. In either case, it should be recognized that the design change records are permanent and may not be destroyed. Data maintained by the modification approval holder must be made available to the CAA for such routine activities as production inspection, surveillance, design change reviews, development of corrective actions, or for any other reasons deemed necessary by the CAA. The record-keeping should consist of at least the following:

- a) the drawings and specifications, and a listing of those drawings and specifications necessary to define the configuration and design features of the modification as it was shown to comply with the requirements applicable to the aeronautical product;

- b) reports on analysis and tests undertaken to substantiate compliance with the applicable requirements;
- c) information, materials and processes used in the construction of the modification of the aircraft, engine or propeller;
- d) an approved aircraft flight manual supplement or its equivalent (type-related document), including revisions to the master minimum equipment list and configuration deviation list, if applicable;
- e) approved revisions or recommendations to the maintenance programme or equivalent document, and aircraft maintenance manual with details of revisions to the manufacturer's recommended and CAA accepted scheduled maintenance plan and procedures guidelines; and
- f) any other data necessary to allow, by comparison, the determination of airworthiness and noise characteristics (where applicable) of modified aeronautical products of the same type.

8.8.3 Responsibility of holder of modification approval

The holder of the modification approval remains responsible for the continued integrity of the design change to approved type design and it or its representative must continue to be the CAA's contact point for resolving issues that may require corrective action. To fulfill this responsibility, the holder should have the continued capability, or access to a capability, of providing appropriate technical solutions for service difficulties when service experience warrants it, or when the CAA requires mandatory corrective action. If the holder is no longer capable, the CAA must take action in accordance with Chapter 9 of this Part. If the approval is transferred to another holder, the CAA should determine that the new holder is capable of fulfilling the minimum responsibilities described herein.

8.8.4 Continuing airworthiness

Annex 8, Part II, Chapter 4, prescribes the activities and corresponding responsibilities of a State of Design, the States of Registry, and the modification approval holder in ensuring the continuing airworthiness of an aircraft during its entire operational or service life. Service experiences involving faults, malfunctions, defects and other occurrences that may affect the continuing airworthiness of the aircraft are required to be recorded, reported and assessed under Annex 8, Part II, 4.2. This information is used to determine if an unsafe or potentially unsafe condition exists in an aircraft. The State of Design, States of Registry, and the modification approval holder all play important roles in deciding if and when airworthiness action is needed to either correct an unsafe, or avoid a potentially unsafe, condition (see guidance in Chapter 9 of this Part).

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Attachment A to Chapter 8

EXAMPLE OF A SUPPLEMENTAL TYPE CERTIFICATE

***Contracting State
Civil Aviation Authority***

Supplemental Type Certificate No. _____

Pursuant to Civil Aviation Regulations Number _____ of Contracting State,
this Supplemental Type Certificate is issued to:

Name of Holder
Complete Address of Holder

For the following description of design change:

Affected Type Certificate Number: _____
Product make and model: _____

Limitations and conditions of approval (See Continuation Sheet):

Date of application:



Conditions: This approval is applicable only to the type/model of aeronautical product specified therein. Prior to incorporating this modification, the installer shall establish that the interrelationship between this change and any other modification(s) incorporated will not adversely affect the airworthiness of the modified aeronautical product.

Authorized Person – Civil Aviation Authority

Date of Issue

Contracting State Civil Aviation Authority

Supplemental Type Certificate No. _____ (Continuation Sheet)

Certification Basis:

Based on Part XX, and the Contracting State policy for major design changes, the certification basis for the Aircraft Model _____, as modified is as follows:

- a) *The type certification basis for Aircraft Model _____ series aeroplane is shown on Type Certificate data sheet _____ for parts or areas not affected or changed by the modification.*
- b) *The certification basis for parts affected or changed by the modification since the date of application (mm/dd/yy) is based upon Part XX, as amended by Amendment XX-98. The certification basis for this modification was determined to be:*

*Regulations at the latest amendment XX-0 through XX-98
XX.1 – XX.31, XX.301-XX.307, XX.561-XX.563, XX.601-XX.625*

Regulations at an intermediate amendment
 XX.574 Amendment XX-54
 XX.629 Amendment XX-26
 Appendix X Amendment XX-58

*Regulations at the amendment level in TCDS _____
 XX.25, XX.321-XX.373, XX.471-XX.519*

----- END -----

Chapter 9

CONTINUING AIRWORTHINESS OF AIRCRAFT

Note.— Information on the codes of airworthiness used by different States, methods of handling and exchange of information on airworthiness directives (or their equivalent), details of systems used in States for reporting of information on faults, defects and malfunctions and list of the design organizations responsible for the type design and continuing airworthiness of aircraft is published in ICAO Circular 95. The Online Airworthiness Information Network launched in October 2014 replaces and expands on Circular 95.

9.1 INTRODUCTION TO THE CONCEPT OF CONTINUING AIRWORTHINESS

9.1.1 Continuing airworthiness covers the processes that require all aircraft to comply with the airworthiness requirements in their type certification basis or are imposed as part of the State of Registry's requirements and to be in a condition for safe operation, at any time during the operating life of the aircraft or components thereof.

9.1.2 Under the control of the respective CAAs of the State of Design, the State of Registry and, when appropriate, the State of the Operator, continuing airworthiness includes the following:

- a) design criteria including instructions for continuing airworthiness which provide the necessary accessibility for inspection and permit the use of established processes and practices for the accomplishment of maintenance;
- b) information that identifies the specifications, methods and procedures necessary to perform the continuing airworthiness tasks identified for the aircraft and the tasks necessary to maintain the aircraft, as developed, by the type design organization; and publication of this information in a format that can be readily adapted for use by an operator;
- c) adoption by the operator into its maintenance programme of the specifications, methods and procedures necessary to perform the continuing airworthiness tasks identified for the aircraft and the tasks necessary to maintain the aircraft, using the information provided by the type design organization;
- d) the reporting of faults, malfunctions and defects and other significant maintenance and operational information by the operator to the type design organization in accordance with the requirements of the State of Registry and the State of the Operator;
- e) the reporting of faults, malfunctions and defects and other significant maintenance information by the maintenance organization to the type design organization in accordance with the requirements of the State having jurisdiction over the maintenance organization;
- f) the analysis of faults, malfunctions, defects, accidents and other significant maintenance and operational information by the type design organization, the State of Design and the State of Registry and the initiation and transmission of information and recommended or mandatory action to be taken in response to that analysis;

- g) consideration of the information provided by the type design organization and action on the information as deemed appropriate by the operator or the State of Registry;
- h) accomplishment by the operator of all mandatory requirements with particular emphasis on fatigue life limits and any special tests or inspections required by the airworthiness requirements of the type design of the aircraft or subsequently found necessary to ensure structural integrity;
- i) adoption by the operator into its maintenance programme of supplemental structural inspection programmes and subsequent SIP requirements, taking into consideration the SIP for aeroplanes recommended by the type design organization; and
- j) compliance with SIPs for aircraft.

9.1.3 The SIP for aeroplanes may include the following, dependent on the structural design criteria:

- a) supplementary SIP;
- b) corrosion prevention and control programme;
- c) SB review and mandatory modification programme;
- d) repairs review for damage tolerance; and/or
- e) widespread fatigue damage (WFD) review.

9.2 EXCHANGE AND USE OF CONTINUING AIRWORTHINESS INFORMATION

9.2.1 Introduction

9.2.1.1 Aircraft are designed and certificated to airworthiness standards. In service, however, faults, malfunctions, defects and other occurrences (service difficulties) may be experienced. To satisfy its responsibilities under the Convention on International Civil Aviation, it is essential that the State of Registry be kept informed of service difficulties by its operators and maintenance organizations.

9.2.1.2 Furthermore, it is also essential that the type design organization and the State of Design be kept informed of service difficulties. The type design organization, receiving this kind of information from all operators of the type of aircraft, is in the best position to develop recommendations to solve the problems of the aircraft in service. The State of Design, being the certificating authority of the type of aircraft, will, if necessary, make these recommendations mandatory and initiate changes to the airworthiness requirements, if appropriate.

9.2.1.3 The information issued by the type design organization and the information made mandatory by the State of Design should be transmitted to all operators and their authorities.

9.2.1.4 Because it is clear that a proper exchange and use of continuing airworthiness information is essential for the continuing airworthiness of aircraft, relevant requirements are incorporated in Annexes 6 and 8.

9.2.1.5 This Part of the manual provides guidance material on these requirements for the State of Registry.

9.2.2 Responsibilities of the State of Registry

In accordance with Annex 8 the responsibilities of the State of Registry are as follows:

- 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 Annex 8, Part II, 3.2 it advises the State of Design that it has entered such an aircraft on its register (Annex 8, Part II, 4.2.3 a));
- b) upon receipt of MCAI from the State of Design, adopt the mandatory information directly or assess the information received and take appropriate action (Annex 8, Part II, 4.2.3 d));
- c) ensure the transmission to the State of Design of all MCAI which it, as the State of Registry, originated in respect of that aircraft (Annex 8, Part II, 4.2.3 e));
- d) ensure that, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM, 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 organization responsible for the type design of that aircraft (Annex 8, Part II, 4.2.3 f)); and
- e) as a Contracting State, the State of Registry should establish, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM, the type of service information that is to be reported to its airworthiness authority by air operators, organizations responsible for type design and maintenance organizations. Procedures for reporting this information should also be established (Annex 8, Part II, 4.2.4).

9.3 NOTIFICATION TO THE STATE OF DESIGN

9.3.1 In order to receive all MCAI the State of Registry should advise the State of Design when it enters on its registry for the first time an aircraft type including engine and propeller.

9.3.2 A State with maintenance organizations approved for aircraft types not registered or not operated in that State, or approved for parts or equipment not used in that State, should request the State of Design to provide all MCAI on those types and parts.

9.4 ACTION BY THE STATE OF REGISTRY UPON RECEIPT OF MANDATORY CONTINUING AIRWORTHINESS INFORMATION

9.4.1 From the legal point of view, the implementation of MCAI could be limited to the State that issues that information. It is essential, however, that appropriate action be taken on all affected aircraft and parts of all States concerned. States should therefore carefully assess the MCAI issued by the State of Design. The State of Design and the type design organization are primarily responsible for issuing this airworthiness information and are best suited for being informed about accidents, incidents and service experience concerning the continuing airworthiness of aircraft.

9.4.2 A State of Registry may adopt by reference the MCAI issued by the State of Design of the aircraft, engine, propeller and appliances/accessories. Therefore, aircraft MCAI could be issued from a different State than the engine, propeller and appliances/accessories MCAI. The State needs to ensure that its operators have access to relevant MCAI and implement the required actions within the compliance time limit.

9.4.3 When States of Registry assess MCAI issued by the States of Design and subsequently issue their own mandatory information, such States should have the necessary expertise and human resources to do so. States of Registry should verify whether or not the MCAI is applicable to the aircraft on their aircraft register and can be accomplished as intended. For instance, in some cases the aircraft may have been modified or had equipment installed without the type design organization or the State of Design directly involved in that modification or installation approval.

9.4.4 Operators and States of Registry should be aware that some States of Design do not issue their MCAI in the form of ADs, and may instead give mandatory status to notices such as SBs or by requesting the type design organization to include a statement in the SB that the information has mandatory status for aircraft registered in the State of Design. Some States of Design publish summary lists of SBs which are classified as mandatory.

9.4.5 Any service information made mandatory by the State of Design should be clearly distinguished from service information that might be declared mandatory by the organization responsible for the type design. The type design organization may have classified the information as mandatory for the purpose of improving maintainability, inspectability, the part's life-limit or for liability reasons.

9.4.6 The operator should accomplish all actions made mandatory by its CAA in order to keep the aircraft airworthy. All relevant MCAI should be recorded in the maintenance records and all the related maintenance records should be kept so that they could be presented to the CAA upon request. Proper documentation of mandatory actions will also enable a smoother transfer of aircraft between States.

9.4.7 If an operator wishes to comply with the MCAI in an alternative way or have an extension of its compliance limit, a written request should be submitted for approval to the CAA of the State of Registry and a written reply sent to the operator. In particular, in the case of the mandatory information issued by the State of Design and adopted by the State of Registry, the latter may not be able to make such a decision due to lack of relevant information or expertise. In such a case, the State of Registry may consult the CAA of the State of Design or accept advice from the type design organization.

9.4.8 Where the compliance with MCAI is given at very short notice, operators should have a means to receive this information at any time (by fax, e-mail or other acceptable means) and to take the necessary action.

9.5 TRANSMISSION TO THE STATE OF DESIGN OF MANDATORY CONTINUING AIRWORTHINESS INFORMATION ISSUED BY STATE OF REGISTRY

In addition to the MCAI issued by the State of Design, the State of Registry may issue MCAI for an aircraft on its register. States should only make mandatory requirements additional to those of the State of Design when there are urgent safety-related reasons or when the State of Registry has modified an aircraft because of unique airworthiness requirements. When possible, such action should entail prior consultation with the State of Design, but in all cases the State of Design should be notified as soon as practicable.

9.6 TRANSMISSION OF INFORMATION ON FAULTS, MALFUNCTIONS AND DEFECTS AND OTHER OCCURRENCES TO THE ORGANIZATION RESPONSIBLE FOR THE TYPE DESIGN

9.6.1 The State of Registry should have a system to ensure that information on service difficulties is transmitted to the organization responsible for the type design of the aircraft.

9.6.2 When the State of Design of the engine or propeller is different from the State of Design of the aircraft, the State of Design of the aircraft should have a system to transmit information on service difficulties to the State of Design for the engine or propeller. The State of Registry may also elect to transmit the information to the State of Design of the engine or propeller.

9.6.3 It is essential that information on airworthiness deficiencies be transmitted without any delay to the type design organization of the aircraft affected, so that corrective action may be developed by that organization and communicated to all operators of the aircraft type.

9.6.4 Some States may elect to enact regulations requiring operators of aircraft registered in the State to report airworthiness deficiencies to the type design organization of the aircraft affected. Alternatively, a State may choose to require reporting to its own airworthiness authority, which should then pass the information on to the type design organization of the aircraft affected.

9.6.5 If the performance of maintenance is either partially or wholly assigned to a maintenance organization, service experience on faults, malfunctions, defects, and findings in inaccuracy of maintenance data of both the operator and the maintenance organization should be transmitted to the type design organization. The information from the operator should pertain to the operational and maintenance experience of its fleet. The information from the maintenance organization should pertain to its maintenance experience of all aircraft designed by the type design organization.

9.6.6 ICAO Circular 95 provides details of systems used in States for reporting of information on faults, defects and malfunctions. The Online Airworthiness Information Network launched in October 2014 replaces and expands on Circular 95.

9.7 INFORMATION TO BE REPORTED TO THE CIVIL AVIATION AUTHORITY

9.7.1 Air operators, organizations responsible for type design and maintenance organizations should report to their airworthiness authority, all faults, malfunctions, defects and other occurrences which cause or might cause adverse effects on the continuing airworthiness of the aircraft. The State should establish a system to collect this information with a detailed procedure describing the reporting process by the organizations.

9.7.2 Some States have established a service difficulty reporting system. Organizations in these States should report information on faults, malfunctions, defects and other occurrences that cause or might cause adverse effects on the continuing airworthiness of that aircraft through this system. (Section 9.8 of this chapter provides information on such systems.)

9.8 SERVICE DIFFICULTY REPORTING SYSTEM

9.8.1 General

9.8.1.1 The Service Difficulty Reporting System (SDR) is established to support the CAA in its mandate to foster an acceptable level of safety by:

- a) promoting product safety improvement;
- b) detecting trends (as opposed to isolated cases); and
- c) giving the CAA the necessary tools to discharge the State of Registry's obligations with regard to continuing airworthiness information, as set forth in Annex 8, Part II, 4.2.3 f) and 4.2.4.

9.8.1.2 The current aircraft population is too large to achieve full knowledge of all potential safety problems solely through inspection. The SDR assists in effective decision making, manpower utilization and enhancement of safety. A properly implemented SDR provides the intelligence needed to assess defects, institute early corrective action and thus assist in accident prevention.

9.8.1.3 The SDR is a feedback system which provides a most effective resource for decision making on matters of reliability and airworthiness. The level of sophistication of the SDR can range from the use of advanced computers with immediate readout capabilities, to manual programmes which utilize a reporting form that is completed by the operator and manually processed by the regulatory agencies.

9.8.2 Sources of information for the service difficulty report

SDRs should be received from certificate holders such as air operators, AMOs, organizations responsible for type design, and from any source having access to aviation safety information, such as air traffic control. Significant malfunctions, failures, or conditions brought to the attention of or noted by the AID inspector during surveillance of aviation industry activities should also be reported.

9.8.3 Guidelines for reporting

9.8.3.1 CAA regulations should require certificate holders to submit specified information to the AID. The reports should be submitted on a common form. The regulations should require a report for each malfunction, failure or defect that occurs under the reportable categories. Similar failures that continue to occur should be reported so that the manufacturer and the State of Manufacture are aware of trends that may be developing. In addition, each operator should report any other failure, malfunction or defect in an aircraft that occurs or is detected at any time, if in the holder's opinion that failure, malfunction or defect has endangered or may endanger the safe operation of an aircraft.

Note.— Examples of forms and methods used for handling SDRs by Contracting States may be found in the Online Airworthiness Information Network located within ICAO's Integrated Safety Trend Analysis and Reporting System which was launched in October 2014 to replace and expand on Circular 95..

9.8.3.2 Each operator should report the occurrence or detection of each failure, malfunction or defect concerning at least the following:

- a) fires during flight and whether or not a fire warning system was installed and functioned properly;
- b) false fire warning during flight;
- c) an engine exhaust system that causes damage during flight to the engine, adjacent structure, equipment or components;
- d) an aircraft component that causes accumulation or circulation of smoke, vapour, or toxic or noxious fumes in the crew compartment or passenger cabin during flight;
- e) engine shutdown during flight because of flameout;
- f) engine shutdown during flight when external damage to the engine or aircraft structure occurs;
- g) engine shutdown during flight due to foreign object ingestion or icing;
- h) shutdown during flight of more than one engine;
- i) a propeller feathering system or ability of the system to control over-speed during flight;
- j) a fuel or fuel dumping system that affects fuel flow or causes hazardous leakage during flight;

- k) a landing gear extension or retraction, or opening or closing of landing gear doors during flight;
- l) brake system components that result in loss of brake actuating force when the aircraft is in motion on the ground;
- m) aircraft structure that requires significant repair;
- n) cracks, permanent deformation, or corrosion of aircraft structure, if more than the maximum acceptable to the manufacturer or the CAA;
- o) aircraft components or systems that result in taking emergency actions during flight (except action to shut down an engine);
- p) each interruption to a flight, unscheduled change of aircraft en route, or unscheduled stop or diversion from a route, caused by known or suspected mechanical difficulties or malfunctions;
- q) the number of engines removed prematurely because of malfunction, failure or defect, listed by make and model and the aircraft type in which it was installed; and
- r) the number of propeller featherings in flight, listed by type of propeller and engine and aircraft on which it was installed.

9.8.3.3 In addition to the reports required above, each operator should report any other failure, malfunction or defect in an aircraft that occurs or is detected at any time, if in its opinion, the failure, malfunction or defect has endangered or may endanger the safe operation of the aircraft.

9.8.3.4 The reports required of the operator should be submitted in writing to the State's organization and in the timeframe identified in the approved air carrier operations specifications.

9.8.4 Significant reports

9.8.4.1 The following significant reports warrant immediate notification of the appropriate State organization by telephone or report:

- a) primary structure failure;
- b) control system failure;
- c) fire in the aircraft;
- d) engine structural failure; or
- e) any other condition considered an imminent hazard to safety.

9.8.4.2 The telephone or report should follow the format of the SDR and, being of an alert nature, should contain the following information when available and relevant:

- a) aircraft owner's name and address;
- b) whether accident or incident;

- c) related SBs, service letters, ADs; and
- d) disposition of the defective parts.

9.8.4.3 The information contained in the telephone call or report should be entered on the SDR form and submitted in the normal manner to the AID as soon as possible after the telephone call or report submission.

9.9 MANDATORY CONTINUING AIRWORTHINESS INFORMATION (MCAI)

9.9.1 General

9.9.1.1 A primary safety function of the airworthiness organization within the CAA is to require correction of unsafe conditions found in an aircraft, aircraft engine, propeller, equipment or instrument or when such conditions develop in other aeronautical products of the same design. The unsafe conditions may be due to design deficiencies, manufacturing defects, maintenance programme deficiencies, or other causes. MCAI are the means used to notify aircraft owners and other interested persons of unsafe conditions and to prescribe the conditions under which the aeronautical product may continue to be operated. One of the most commonly used types of MCAI issued by States is an Airworthiness Directive (AD). Some States may also consider as MCAI any mandatory and alert service bulletins issued by the organization responsible for the type design.

9.9.1.2 ADs are generally divided into two categories:

- a) those of an urgent nature requiring immediate compliance upon receipt; and
- b) those of a less urgent nature requiring compliance within a relatively longer period.

9.9.1.3 The contents of ADs include the aircraft, engine, propeller, equipment or instrument type, model and serial numbers affected. Also included are the compliance time or period, a description of the difficulty experienced, and the necessary corrective action.

9.9.1.4 A large number of States operate aircraft that have been manufactured or certificated in another State. In order to continue to maintain such aircraft at a level of airworthiness equivalent to that achieved at type certification, the State in which such aircraft are currently registered needs to regularly obtain all information, particularly MCAI issued by the State of Design, by the type design organization or, on rare occasions, by the airworthiness authority of any other State in which the same type of aircraft are registered, particularly where such information pertains to the continuing airworthiness and the prevention of recurring defects in an aircraft and its components and equipment. It is therefore necessary that each State receive all continuing airworthiness information relating to aircraft on the aircraft register, no matter what State originates the information. It is equally necessary to facilitate coordinated corrective measures, for the State of Design to receive continuing airworthiness information originated in any other State relating to aircraft it has certificated. Some States, together with commercial organizations, provide information regarding MCAI via the internet.

9.9.2 Responsibility for MCAI

9.9.2.1 *Responsibilities of the air operator*

9.9.2.1.1 The manner in which the operator complies with MCAI issued by the State of Registry depends upon the arrangements under which the operator had leased, chartered or otherwise acquired control of an aircraft. The operator may arrange with the aircraft owner for the latter to carry out all actions arising out of MCAI, or the operator may carry out these actions.

9.9.2.1.2 The operator will determine by which means it will be kept informed on MCAI. However, the operator must ensure that the MCAI have been implemented in the manner prescribed and refrain from engaging in flight operations contrary to the provisions of the applicable MCAI.

9.9.2.2 **The aircraft owner's role**

9.9.2.2.1 The owner should not use its aircraft, or knowingly allow it to be used by others, except in compliance with MCAI issued up to date. If the owner leases the aircraft or allows another entity to maintain it, the owner should take effective steps to assure compliance with MCAI. The owner cannot assume that others will take over the responsibilities of maintenance automatically. The situation may call for a written agreement, or a verbal one, depending on circumstances. But there should be no doubt as to who will take the necessary responsive action to MCAI.

9.9.2.2.2 In some cases, the owner may elect to also comply with MCAI issued by other than the State of Registry in order to facilitate transfer of registration at the end of a lease.

9.9.2.3 **The role of aircraft maintenance engineers or maintenance organizations**

The responsibility of the aircraft maintenance engineer (AME) or AMO with regards to AD compliance should also be clearly understood. The AMO or AME is responsible for the work that has been contracted to him or requested of him. The responsibility for compliance with MCAI rests with the air operator.

9.10 AUTHENTICITY AND SERVICEABILITY OF AIRCRAFT PARTS

9.10.1 Introduction

9.10.1.1 The need to ensure that parts installed on an aircraft meet the design specification and are serviceable is self-evident. The installation of any part failing to meet the intended design requirements degrades those requirements, leading to a degradation of airworthiness.

9.10.1.2 It is essential that for the purposes of continuing airworthiness a system of control exists which ensures that only parts meeting the approved design data applicable to a particular aircraft are installed on that aircraft. This chapter provides guidance on the establishment of such a system.

9.10.2 Approved parts

9.10.2.1 An approved part is one whose design has been found to be acceptable to the State of Design, whose proper manufacture has been approved by the State of Manufacture, and that has been found to be in a condition for safe operation by the State of Registry.

Note.— Parts approved pursuant to 9.10.2.1 are eligible for installation on a specific aircraft if, and only if, they also meet the approved design data applicable to the particular aircraft on which they are to be installed. For example, a seat designed and approved for 9 g forward loads is not eligible for installation on an aircraft which is required to have a seat that is dynamically tested for 16 g.

9.10.2.2 Standard parts such as fasteners are considered as approved parts when they are in compliance with a national- or industry-accepted standard and when referenced in the type design of the particular aircraft.

9.10.3 Unapproved parts

Parts not meeting the criteria described in 9.10.2.1 and 9.10.2.2 are considered to be unapproved. Any part not supported by the required documentation (see 9.10.4) would also be considered to be unapproved. Unapproved parts also include those parts improperly returned to service, for example:

- a) parts supplied directly to the end user by a contractor without direct ship authority from the design approval holder and the State of Manufacture to do so;
- b) parts maintained or approved for return to service by a person or organization not approved to do so;
- c) parts not maintained in accordance with the requirements of the applicable approved data; and
- d) parts having reaching their life limit, including, if applicable, any shelf-life limit.

9.10.4 Supporting documentation

9.10.4.1 A documentation process providing written evidence of the acceptability of a part is an essential element of any system designed to ensure that only approved parts are installed on an aircraft. Such a process is intended to provide all relevant information concerning the part to which it refers sufficient to enable a potential installer to readily ascertain its status.

9.10.4.2 Such documents will contain information relating to:

- a) the authority under which it is issued;
- b) reference identification for the purposes of traceability;
- c) name, address and approval reference of the issuing organization;
- d) work order, contract or invoice number;
- e) quantity, description, part number and, if applicable, serial number of the part;
- f) relevant information concerning any life limitations, including in-service history records;
- g) the signature and approval reference of the person issuing the document; and
- h) whether the part is new or used.

9.10.5 Precautions to prevent the inadvertent acceptance of unapproved parts

9.10.5.1 Documentary evidence of compliance with an approved process will not in itself provide a guarantee against the installation of unapproved parts if the original supplier of such parts knowingly provides false information or otherwise sets out to deceive.

9.10.5.2 It is always necessary to have secondary defences in place designed to give early warning of unapproved parts prior to their release for installation. The primary defence in such cases is a strong, well-informed and alert parts ordering and receiving system which, through auditing and reports, establishes a satisfactory level of confidence in its parts suppliers and which:

- a) ensures a continual correlation between parts ordered and parts received;
- b) is alert to any unauthorized alterations to supporting documentation and to any inability of the supplier to supply the required documentation;
- c) is aware if a quoted price for the part is significantly lower than that quoted by other suppliers;
- d) is aware that delivery times are significantly shorter than those quoted by other suppliers; and
- e) is aware of parts packaging methods used by approved parts manufacturers, maintenance organizations and distributors, and can detect deviations from these methods.

9.10.5.3 Organizations, particularly approved maintenance organizations and operators, should establish procedures to ensure that all those staff who have routine contact with parts, especially including buyers, stores staff, mechanics and certifying staff, are fully aware of the dangers posed by unapproved parts and also the likely sources. Ample warnings should be given to such staff about accessing any unapproved parts database. Approved maintenance organizations and operators will also need to ensure that their parts suppliers are fully integrated into the reporting network, and audits will be necessary among staff at intervals to ensure that all remain vigilant to the problem.

9.10.6 Unapproved parts reporting

9.10.6.1 Systems used by end users to report to type certificate holders and regulatory agencies are intended to provide widespread warning of the detection of unapproved parts so that operators of similar equipment can be made aware as soon as possible. In view of the likely random appearance of unapproved parts, access to a reporting system should be easy and available at all reasonable times. It follows that publicity for the reporting system (and the programmes generally) should be widespread.

9.10.6.2 In order to obtain as much information as possible from a report of a suspected unapproved part, it is necessary to have a standardized reporting format. Information required will include the description of the part and from where it was received; part numbers and, if applicable, serial numbers; particular colours, markings, dimensions and features common to the unapproved part which distinguish it from the genuine item; and the nature of any accompanying documentation.

9.10.6.3 At any time a part is deemed to be suspect, it and any accompanying documentation should be quarantined immediately and held until the body responsible for processing the reports is satisfied that the evidence is no longer required or until the authenticity of the part has been established.

9.10.6.4 Some reports of suspected unapproved parts will eventually turn out to be false as further information becomes available in the form of supporting documentation. A successful reporting system should accept such false alarms and the wasted effort they generate in the knowledge that to discourage such reports might eventually lead to the suppression of a genuine report.

9.10.6.5 A relatively simple database, preferably computer driven, will be required to maintain a record and allow easy processing of reports of suspected unapproved parts. The database should be capable of interrogation such that any common thread within the reports received is readily identified by keyword access. The database itself can be a dedicated system or part of a much larger general occurrence reporting system.

9.10.6.6 In view of the international nature of the aviation industry and in particular the known international nature of the generation and distribution of unapproved parts, the ability to link national databases is obviously advantageous, the unimpeded cross-flow of information being essential in successfully combating the problem.

9.10.7 Parts stockists and distributors

9.10.7.1 It is recognized that parts stockists and distributors have a significant influence over preventing the use of unapproved parts. Such organizations have an established commercial role of stocking or obtaining parts, often at short notice. Some States approve stockists and distributors but others do not.

9.10.7.2 In airworthiness terms, the parts supplier's role is simply that of a holder of a part and its supporting data for a limited period, the part and data being passed in their entirety to the purchaser. The most effective control is exercised by the purchaser of the parts by ensuring that the part is correct and that the documentation truly reflects the status of the part. Further assurance is provided by the installer purchasing only from those suppliers having a known satisfactory record.

9.10.7.3 Parts distributors may also break down large orders of identical parts into smaller lots for shipment to end users. In this case they should provide documentation that the parts came from the original large order and either issue a second set of airworthiness documentation, if authorized by their State regulatory authority to do so, or attach a copy of the original airworthiness documentation.

9.10.8 Parts removed from an aircraft no longer in service

9.10.8.1 Aircraft withdrawn from service are often used as a source of spare parts, a process sometimes described as "parting out". These parts, although serviceable at the time the aircraft was placed in storage, may have been affected adversely by storage conditions, including especially environmental factors, or by the length of storage.

9.10.8.2 The records for the aircraft and its parts prior to the aircraft being placed into storage will need to be researched in order to ascertain the previous maintenance history, and MCAI, modification and repair status of the parts being removed. Any unusual events immediately prior to storage, e.g. heavy landings or lightning strikes, will also have to be considered when deciding on the serviceability of the parts being removed.

9.10.8.3 It is important that the part removal process be planned and controlled in a manner as close as possible to that adopted for routine maintenance tasks on in-service aircraft. The following points in particular should be considered:

- a) the means by which the part is removed should be in accordance with the normal maintenance data (e.g. maintenance manuals), using the tooling specified;
- b) adequate access equipment should be provided;
- c) if conducted in the open, disassembly should cease during inclement weather;
- d) all work should be carried out by appropriately qualified maintenance personnel;
- e) all open connections should be blanked;
- f) a protected and enclosed quarantine storage area for the parts being removed should be provided in the immediate vicinity of the work area; and
- h) normal maintenance documentary controls should be used, e.g. the use of work sheets or cards to record component removals, and label identification to show serviceability status.

9.10.8.4 An assessment for condition and eventual return to service of each removed part will need to be conducted by a suitably approved organization. The extent of the work necessary before the part is returned to service may, depending on the factors noted in 8.1, range from a simple external visual inspection to a complete overhaul.

9.10.9 Parts recovered from aircraft involved in accidents

9.10.9.1 When an aircraft has been involved in an accident, the title to the salvage may pass from the insured aircraft owner to other persons (e.g. aircraft insurers); this salvage may be offered for sale either complete or as separate aircraft items in an “as is, where is” condition. While some items may be totally unaffected by the accident or incident which caused the aircraft to be declared as salvage, it is essential to obtain clear evidence that this is the case. If such evidence cannot be obtained, the item may not be returned to service.

9.10.9.2 Before overhaul and reinstallation can be considered, all such items must therefore be subject to airworthiness assessment and inspection in the light of adequate knowledge of the circumstances of the accident, subsequent storage and transport conditions, and with evidence of previous operational history obtained from valid airworthiness records. Confirmation of this assessment in the form of an airworthiness release is essential.

9.10.9.3 In particular, if a crash load is sufficient to take any part above its proof strength, residual strains may remain which could reduce the effective strength of the item or otherwise impair its functions. Loads higher than this may of course crack the item, with an even more dangerous potential. Further, a reduction in strength may be caused by virtue of the change of a material’s characteristics following overheating from a fire. It is therefore of the utmost importance to establish that the item is not cracked, distorted or overheated. The degree of distortion may be difficult to assess if the precise original dimensions are not known, in which case there is no option but to reject the item. Any suggestion of overheating would be cause for a laboratory investigation into significant change of material properties.

9.10.10 Disposal of scrapped parts

9.10.10.1 Those responsible for the disposal of scrapped aircraft parts and materials should consider the possibility of such parts and materials being misrepresented and sold as serviceable at a later date. Caution should be exercised to ensure that the following types of parts and materials are disposed of in a controlled manner that does not allow them to be returned to service:

- a) parts with non-repairable defects, whether visible or not to the naked eye;
- b) parts that are not within the specifications set forth by the approved design and cannot be brought into conformity with applicable specifications;
- c) parts and materials for which further processing or rework cannot make them eligible for certification under an approved system;
- d) parts subjected to unacceptable modifications or rework that is irreversible;
- e) life-limited parts that have reached or exceeded their life limits, or have permanently missing or incomplete records;
- f) parts that cannot be returned to an airworthy condition due to exposure to extreme forces or heat (see 9.10.8); and
- g) principal structural elements removed from a high-cycle aircraft for which conformity cannot be accomplished by complying with the mandatory requirements applicable to ageing aircraft.

9.10.10.2 Scrapping of parts and materials may not be appropriate in certain cases when there is an ongoing evaluation process to determine whether a part or material may be restored to an airworthy condition. Examples of these cases include the extension of life limits, the re-establishment of in-service history records, or the approval of new repair methods and technologies. In these cases, such parts should be segregated from serviceable parts until the decision has been made as to whether these parts can be restored to an airworthy condition, or be scrapped.

9.10.10.3 Scrapped parts should always be segregated from serviceable parts and when eventually disposed of should be mutilated or clearly and permanently marked. This should be accomplished in such a manner that the parts become unusable for their original intended use and unable to be reworked or camouflaged to provide the appearance of being serviceable.

9.10.10.4 When scrapped parts are disposed of for legitimate non-flight uses, such as training and education aids, research and development, or for non-aviation applications, mutilation is often not appropriate. In such cases the parts should be permanently marked indicating that they are not serviceable; alternatively, the original part number or data plate information can be removed or a record kept of the disposition of the parts.

Chapter 10

APPROVAL OF THE MAINTENANCE ORGANIZATION

10.1 GENERAL

10.1.1 Annex 6, Part I, 8.1.2 and Part III, Section II, 6.1.2, prohibit operators from operating any of their aircraft unless maintenance on the aircraft and any associated part of the aircraft is carried out by:

- a) an AMO that is either approved in accordance with Annex 8, Part II, Chapter 6, by the State of Registry of the aircraft or another Contracting State and is acceptable to the State of Registry; or
- b) by persons or organizations in accordance with procedures authorized by the State of Registry.

10.1.2 Annex 8, Part II, Chapter 6 contains the Standards which are applicable to the approval of organizations involved in the maintenance of aircraft and associated parts of aircraft. These include Standards for:

- ;
- a) a procedures manual;
- b) safety management system;
- c) maintenance procedures and quality assurance system;
- d) facilities;
- e) personnel;
- f) completion and retention of records; and
- g) issuance of maintenance release.

10.2 STATE OF REGISTRY'S OBLIGATION FOR APPROVAL OF MAINTENANCE ORGANIZATION

10.2.1 Annex 8, Part II, Chapter 4, requires the State of Registry for an aircraft to establish requirements to ensure the continuing airworthiness of the aircraft during its service life, including requirements to ensure that the aircraft is maintained in an airworthy condition. The State of Registry therefore has an obligation to either approve maintenance organizations or accept approval of maintenance organizations that have been approved by a foreign State to facilitate the ongoing maintenance of the aircraft and associated parts of the aircraft.

10.2.2 It is now a common practice for aircraft operators to contract maintenance to a number of independent AMOs, including AMOs located in and operating under the jurisdiction of a foreign State. Due to a lack of automatic acceptance of foreign AMOs by the State of Registry, these AMOs are required to hold more than one State approval to maintain

aircraft registered in different States. When a State approves a maintenance organization that already holds approval from another State, it should coordinate with the CAA of the other State to explore the possibility of sharing information about the capability, scope of approval and the compliance status of the AMO. This may reduce the burden of initial assessment and ongoing oversight of the CAA and the compliance burden of the AMOs.

10.2.3 For the purpose of reducing the compliance burden linked to multiple approvals, States should encourage AMOs to use globally-recognized industry standards when qualifying their personnel for certain maintenance activities, as well as when showing compliance with other requirements. Examples of globally-recognized industry standards may apply to areas such as, but not limited to:

- a) quality system;
- b) safety management system;
- d) qualifications of personnel performing non-destructive testing;
- c) calibration of tools; and
- d) technical records.

10.3 APPROVAL CERTIFICATE AND SCOPE OF APPROVAL

10.3.1 Contracting States approving a maintenance organization shall issue an approval certificate to the AMO that includes the following information as set out in Annex 8, Part II, 6.2.3:

- a) the issuing authority and the name, title and signature of the person issuing the certificate;
- b) the maintenance organization 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 certificate.

10.3.2 Annex 8, Part II, 6.2.3.1 recommends that AMOs are issued with a standardized approval certificate as included in Annex 8, Part II, Appendix 1 which uses a comprehensive class and rating system to define the AMO's scope of approval. Once adopted by Contracting States, the standardized certificate along with its class and rating system would facilitate harmonization of AMO approvals internationally and help Contracting States in the recognition of approved AMOs.

10.3.3 Attachment E to this chapter includes the template of the approval certificate recommended in Annex 8, Part II, Chapter 6.

10.3.4 The scope of maintenance that an AMO is approved to carry should be classified into the following classes:

- a) aircraft maintenance;
- b) engine maintenance;
- c) component maintenance; and
- d) specialized maintenance.

10.3.5 An approval in aircraft maintenance class should allow an AMO to perform maintenance on an aircraft and any component of the aircraft while such component is installed in the aircraft. However, maintenance performed on a component that has been temporarily removed from an aircraft to facilitate the performance of maintenance (for example, to improve access to the component) should be considered aircraft maintenance provided the relevant maintenance data requires the removal of the component. The following ratings should be used to define the scope for aircraft maintenance:

- a) Large aeroplane — aeroplanes with maximum take-off mass over 12 500 lbs/5 700 kg;
- b) Small aeroplane — aeroplanes with maximum take-off mass up to 12 500 lbs/5 700 kg, except light sport aeroplanes;
- c) Helicopter — for all kinds of helicopters; and
- d) Other kind of aircraft — all aircraft other than aeroplanes and helicopters (such as glider, balloon, airship, light sport aircraft etc.).

Each of the above ratings should be further limited by referring to a particular type, model or series of aircraft on which the AMO is approved to perform maintenance and by the level of maintenance such as line or base maintenance.

10.3.6 An approval in engine maintenance class should allow an AMO to perform maintenance on uninstalled engines that are intended for installation on an aircraft. The following ratings should be used to further define the scope for engine maintenance:

- a) turbine engine;
- b) reciprocating engine; and
- c) electrical engine.

Each of the above ratings should be further limited by referring to a particular type or model of engine on which the AMO is approved to perform maintenance and by the level of maintenance such as line or base maintenance.

10.3.7 An approval in component maintenance class should allow an AMO to perform maintenance on uninstalled components that are intended for installation on an aircraft. The scope of component maintenance should be defined by referring to the standard numbering system (SNS) code designated for the aircraft system to which the component belongs under the ASD/ATA S1000D specification. Refer to Attachment F to this chapter for the component maintenance ratings that should be used to define the scope of component maintenance. These ratings are based on the SNS code for the system to which the component belongs. Each of the component ratings should be further limited by referring to the particular kinds of component (within a system) on which the AMO is approved to perform maintenance.

10.3.8 An approval in specialized maintenance class should allow an AMO to perform limited maintenance on an aircraft and on an uninstalled component where the maintenance mainly involves application or use of standardized

methods or techniques. An approval in specialized maintenance class is not necessarily related to a specific aircraft or component as the method and techniques involved in the maintenance are meant to be generic and standardized in nature. An AMO with an approval in aircraft maintenance or component maintenance class may carry out the maintenance covered by the specialized maintenance class without holding a specialized maintenance approval, provided the AMO has the capability and has established processes and procedures for performing the maintenance. The following ratings which are based on specific methods or techniques should be used to further define the scope for specialized maintenance:

- a) composite material maintenance;
- b) surface treatment such as peening, plating or painting;
- c) non-destructive testing;
- d) welding; and
- e) other — unique methods and techniques approved or accepted by the State granting the approval.

10.4 ACCEPTANCE OF MAINTENANCE ORGANIZATION APPROVAL ISSUED BY ANOTHER STATE

10.4.1 General

10.4.1.1 Where a Contracting State accepts an AMO approval issued by another Contracting State, Annex 8, Part II, 6.2.6 requires the State accepting the approval to develop a process for such acceptance. The State's process should describe how the requirements under which the approval has been issued are equivalent to its own requirements and are in accordance with the Standards of Annex 8, Part II, Chapter 6. The process may be established on the basis of a bilateral/multilateral aviation safety agreement between the States or as a unilateral acceptance in whole or in part of the other State's AMO approval.

10.4.2 Unilateral acceptance of other State's approval

10.4.2.1 Unilateral acceptance means that the State of Registry (SoR) accepts the AMO approvals issued by another Contracting State. Before the acceptance of another State's approval, the SoR should perform an assessment of the other State's legislation and surveillance system. The assessment of the other State's legislation should show that the requirements under which the approval has been issued are equivalent to the national requirements established by the SoR. The SoR should not expect a one-to-one equivalence, but it should ensure that the same safety objectives are achieved. Based on the outcome of the assessment, the SoR may either accept the whole or part of the approval issued to the AMO. For example, an AMO may hold approval in both aircraft and component maintenance, but the SoR may accept only the component maintenance approval and not the aircraft maintenance approval.

10.4.2.2 The SoR should assess the scope of approval system to ensure that this is consistent with its own system or at least adequate for its purpose. The use of a standardized certificate with a common approval and ratings system as described in section 10.2 of this chapter would help the assessment process. The SoR should take into account that AMOs approved by another State may have a larger scope of approval than what may be obtained in the SoR. In those cases, the SoR may consider issuing an approval certificate limiting the classes and/or ratings in the scope of approval.

10.4.2.3 During this assessment process, the SoR may find out that there are certain national requirements for which there are no equivalent requirements in the other State's legislations. The SoR should identify these requirements and establish the additional procedures that AMOs would need to comply with in order to obtain acceptance of their approval. For example, such procedures could be contained in a supplement to the AMO's existing procedures manual.

10.4.2.4 In the case of unilateral acceptance, the SoR should continuously monitor the validity of the AMO approval issued by the other State and whether any limitations may have been added. This is deemed necessary as the State who originally issued the approval has no direct reporting obligation to the SoR, which unilaterally accepts the approval.

10.4.3 Bilateral or multilateral acceptance of approval

10.4.3.1 States may establish agreements for the acceptance of each other's regulatory systems that include AMO approvals. The relevance of bilateral or multilateral aviation safety agreements resides in the fact that States agree to cooperate in the area of aviation safety.

10.4.3.2 The establishment of a bilateral or multilateral aviation safety agreement is a complex process which should require the involvement of technical and legal experts from each State. It is advisable that a project team with sufficient expertise from the participating States is formed and that a project plan is agreed. Some of the key considerations before initiating the process for a bilateral or multilateral aviation safety agreement are the following:

- a) States should have a mature and stable aviation safety regulatory system;
- b) regulations regarding AMO approvals should be similar between all States. A one-to-one comparison must be accomplished to ensure these regulations meet the requirements of each State involved in the agreement. Developing additional procedures to bridge any identified gap(s) may be necessary; and
- c) the CAA organizations' functions and responsibilities should follow similar principles, in particular, the qualification system of staff and the oversight system implemented for monitoring compliance of the AMOs.

10.4.3.3 The bilateral or multilateral acceptance project should include the following phases:

- a) Memorandum of Cooperation at the political level. The States should agree on a roadmap to develop and sign an aviation safety agreement. This agreement establishes the legal basis for the acceptance of each other's approval system;
- b) Technical assessment. This phase consists of a series of on-site activities where the inspectors of the States would receive training on each other's regulatory systems, the provisions and application of the bilateral/multilateral aviation safety agreement, and administrative procedures linked with the agreement. Furthermore, the inspectors involved should participate in certification and oversight inspections on maintenance organizations of the partner States;
- c) Drafting of agreement and annexes for the specific technical domains. The implementation procedures should be described in the annex to the agreement. These procedures contain the technical provisions and the processes to implement the agreement in the different aviation domains, for example: maintenance, certification, operations. The implementation procedures should describe the process for the issuance, surveillance, as well as revocation or suspension of an approval between the States;
- d) Signing and ratification of the agreement. This phase normally contains two elements, the signature of the agreement by the appropriate State representatives and the ratification within the legal framework of the States; and
- e) Continuous monitoring of the implementation. This is a continuous phase in which each State participates in the other State's oversight activities. This will maintain the level of confidence and communication which was established at the forefront of the agreement. In addition, this phase should

include regular formal consultation between the States' authorities in order to ensure consistent interpretation and implementation of the agreement. This phase may result in revisions to the implementation procedures, if required.

10.5 PROCESS FOR APPROVAL OF A MAINTENANCE ORGANIZATION

10.5.1 General

10.5.1.1 Annex 8, Part II, 6.2 requires a Contracting State to define appropriate requirements for the approval of a maintenance organization in accordance with the Standards set out in Annex 8, Chapter 6. The issuance of a maintenance organization approval by a Contracting State should be dependent upon the applicant demonstrating compliance with these requirements. States should implement a comprehensive process for proper assessment of an applicant for an AMO approval and the subsequent issuance of the approval. The process should ideally comprise the following phases:

- a) pre-application phase;
- b) formal application phase;
- c) document evaluation phase;
- d) demonstration and inspection phase; and
- e) certification phase.

10.5.1.2 Each of these phases is briefly introduced below and is described in detail in Attachment D to this chapter. The assessment involved in each phase should be carried out by qualified inspectors either belonging to the CAA or delegated by the CAA to act on their behalf.

10.5.2 Pre-application phase

10.5.2.1 The main purpose of this phase is to provide the applicant with information on the certification process and the regulatory requirements. States are responsible for publishing and maintaining their AMO application procedures. It should be noted that it is the applicant's responsibility to be aware of the content and eligibility of these procedures prior to initiating an application.

10.5.2.2 It is important to conduct a thorough and careful preliminary assessment of the application. The more thoroughly the applicant's competence is established at this stage, the less likelihood of serious problems in the document evaluation and the demonstration and inspection phases preceding certification or during the course of subsequent operations.

10.5.2.3 It may be necessary to identify the focal person(s) who would be working with the CAA on the application process. This would facilitate the application process.

10.5.3 Formal application phase

10.5.3.1 The formal application for an AMO approval should be submitted in the manner prescribed by the CAA and the application should be accompanied by the required documentation. Guidance on application documentation is provided in Attachment D to this chapter.

10.5.3.2 Submission of a formal application is interpreted by the CAA to mean that the applicant is aware of the regulations and rules applicable to the proposed operation, is prepared to show the method of compliance and is prepared for in-depth evaluation of the organization.

10.5.3.3 Upon receipt of an application, the CAA should designate a project manager to manage the application and assign a group of inspectors to support the approval process.

10.5.4 Document evaluation phase

10.5.4.1 The document evaluation phase involves the detailed examination of all documentation and manuals provided by the applicant to establish that every aspect required by the regulations is included and adequately covered. In order to facilitate this phase of the certification process, the applicant should have coordinated all aspects of the development of the required documentation with the CAA project manager prior to the submission of the formal application.

10.5.5 Demonstration and inspection phase

10.5.5.1 Inspections in this phase will include maintenance organization facility inspections and inspection of maintenance control and planning systems to ensure that the applicant's proposed procedures are effective and that the facilities and equipment are actually in place and meet regulatory requirements. This may also include interviews with personnel to ensure that the procedures are transmitted and understood, particularly as relevant to management staff, their responsibilities and to the Quality Management System in place as per paragraph 10.8.2.

10.5.5.2 The project manager should identify those activities where demonstration will be required.

10.5.6 Certification phase

10.5.6.1 The certification phase commences after the CAA project manager determines that all assessment processes have been completed in a satisfactory manner and that the applicant has demonstrated compliance with the applicable requirements and is capable of fulfilling its responsibilities and of conducting a safe operation.

10.5.6.2 The CAA project manager should prepare and retain a written report recommending the issue of the AMO approval. Subsequent to issuing the AMO approval, the CAA will be responsible for continued surveillance and for conducting periodic inspections to ensure the AMO's continued compliance with CAA regulations, authorizations, limitations and provisions of its AMO approval and scope of approval.

10.6 MAINTENANCE ORGANIZATION'S PROCEDURES MANUAL

10.6.1 The maintenance organization's procedures manual (MOPM) is a document which provides information about the organizational structure, management responsibilities, type of work performed, maintenance procedures and the quality assurance or inspection systems to be followed by the maintenance organization.

10.6.2 The MOPM specified in Annex 6, Part I, Chapter 8, should provide clear guidance to personnel on how the work is to be performed under the approval issued by the CAA. The MOPM should also explain how personnel are managed, and describe personnel responsibilities and how compliance with the relevant continuing airworthiness requirements is achieved. The manual should also include a statement of the organization's policies and objectives.

10.6.3 Both the CAA and maintenance organization should consider the MOPM as an integral part of the approval process of the organization. The MOPM should be carefully reviewed against the relevant requirements of the State national requirements. Subsequent amendments to the MOPM are required to be sent to organizations and persons the manual has been issued to, including the CAA. The CAA should review the amendments and resolve any concerns with the maintenance organization at the earliest opportunity.

10.6.4 If the maintenance organization is also the operator, the maintenance organization's procedures manual and the air operator's MCM may be combined.

10.6.5 In the case of large organizations, it may be advantageous for the manual to be available to users electronically via computer. If this method is chosen, revision and control procedures are necessary to ensure printed copies are updated. A computer security system with authorized access to certain individuals is necessary to ensure manual information is updated properly and manuals are not erroneously edited or revised. The information made electronically available to users should be in the read-only format.

10.6.6 Another option for large organizations is for the manual to be divided into two or more volumes. The first volume would contain the essential requirements for management of the approval and compliance with the appropriate airworthiness requirements, including the control of the contents of the other volumes.

Note.— Further guidance on the contents of a maintenance organization's procedures manual is provided in Attachment A to this chapter.

10.7 SAFETY MANAGEMENT SYSTEM

Annex 19, Chapter 3, requires States, as part of their State safety programme, to ensure that a maintenance organization implements a safety management system acceptable to the State. Annex 19, Appendix 2, provides the framework for a safety management system of an AMO. The framework should include: safety policy and objectives, safety risk management, safety assurance and safety promotion.

Note.— Guidance on both the safety programme applicable to States and the safety management system applicable to the maintenance organization is contained in the Safety Management Manual (Doc 9859).

10.8 MAINTENANCE PROCEDURES AND QUALITY ASSURANCE SYSTEM

10.8.1 General

10.8.1.1 Annex 8, Part II, 6.4 requires an AMO to establish procedures, acceptable to the State granting the approval, which ensure good maintenance practices and compliance with all relevant requirements. These procedures are listed in Attachment A to this chapter and may vary according to State regulations.

10.8.1.2 Annex 8, Part II, 6.8 also requires that a maintenance release be completed and signed to certify that the maintenance work performed has been completed satisfactorily and in accordance with the appropriate airworthiness requirement and the procedures described in the maintenance organization's procedure manual. There are three generally accepted methods of meeting this requirement:

- a) personnel licensed, in accordance with Annex 1, either complete the maintenance task or supervise its completion by unlicensed personnel, and issue the necessary certification for completion of the tasks;

- b) unlicensed personnel of a production department complete the maintenance task, and personnel from a separate inspection department inspect for proper completion of the task and issue necessary certification for completion of the task; or
- c) the licensed personnel of the AMO's production department complete the maintenance task to approved quality control standards and also issue the necessary certification for completion of the task, while personnel from a separate quality assurance department perform sample audits to determine that the approved procedures are being adhered to and that the final aeronautical product is satisfactory.

Note.— It is common to find various combinations of a), b) and c) in organizations.

10.8.1.3 Of the three methods described above, c) is considered the optimum for maintaining large transport aircraft. Before considering this topic further, it is necessary for the purposes of this chapter, to provide definitions of quality, quality control and quality assurance:

- a) the quality of an aeronautical product or service is the degree to which it meets the requirements of the customer, including the relevant airworthiness requirements;
- b) quality control is a management system for implementing, programming and coordinating the ongoing quality and improvement efforts of the various groups in an organization to permit the completion of aircraft maintenance in accordance with the requirements of the MOPM, OEM, CAA and the customer; and
- c) quality assurance is the overall authority for the supervision of quality standards to verify that the standards are appropriately complied with and, if necessary, to initiate corrective and preventive actions for improvement of the functioning of the system.

10.8.1.4 In practical terms, it is very difficult to control quality in circumstances where completion of a task and determination of compliance with the associated quality requirements are responsibilities of separate persons. The quality of maintenance is very much dependent on the competence of the personnel who complete the tasks; it is not something that can be "inspected-in". Thus, responsibility for quality control is best vested in a competent production personnel who complete the tasks and are qualified to accept responsibility for their certification, in accordance with prescribed procedures. In this context the method described in 10.8.1.2 c) above is considered the most effective way of controlling the quality of maintenance, especially where the volume of work is large and inspection of individual tasks is not practical.

10.8.2 Quality management

10.8.2.1 Annex 8, Part II, 6.4, requires an AMO to establish procedures, acceptable to the State granting the approval, which ensure good maintenance practices and compliance with all relevant requirements. It also provides that the AMO ensures compliance with its procedures by either establishing an independent quality assurance system, or by providing a system of inspection to ensure that all maintenance is properly performed.

10.8.2.2 To function effectively, it is essential for the manager of the quality department to have direct access to the accountable executive on quality issues.

10.8.2.3 No system of quality management is complete without an element of quality assurance. This provides, through an independent audit system, the necessary feedback to the management of the AMO to ensure that:

- a) through product sampling, the requirements of the customer, including those related to airworthiness, are being satisfied;

- b) the procedures of the organization are being complied with and that they remain appropriate for the undertakings of the organization; and
- c) the organization remains in compliance with the requirements and conditions of the approval granted by the CAA.

Note.— It is therefore important for the manager of the quality department to have direct access to the accountable executive on quality issues.

10.8.2.4 The AMO's quality system should be applied to all of the facilities and procedures that are used to maintain and release aircraft and aeronautical products, and to all suppliers and contractors.

10.8.2.5 The AMO's quality system should also be applied to the receipt and usage of materials and parts, and the contracting of maintenance services. This is to ensure that materials, parts, and contracted maintenance comply with national airworthiness requirements and the MOPM.

10.8.2.6 An independent quality audit programme should be implemented to ensure that the quality system is being properly applied and that satisfactory results are achieved.

10.8.2.7 In order to ensure proper analysis of deficiencies discovered during audits, the AMO's quality system should include a system for recording of audit results, corrective actions taken and root cause analysis of the deficiencies that is aimed at preventing reoccurrence of the deficiencies.

10.8.2.8 All audit findings should be forwarded to the accountable executive of the organization, as well as the person responsible for the particular facility or procedure for corrective action. There should be a feedback system for confirming to the quality assurance personnel that corrective and preventive action has been taken in a timely manner. All persons concerned with any audit deficiency should be made aware of the deficiency, the corrective actions and the preventive actions.

10.8.2.9 The AMO's quality control policies and procedures should be described in the MOAP, together with the quality assurance audit programme in respect of product, facility and procedures. Emphasis should be placed on the systems employed by the AMO to achieve and ensure airworthiness of products, and on the adequacy and effectiveness of such systems.

10.8.3 Quality system personnel qualifications

10.8.3.1 Personnel assigned to quality control and assurance duties should be:

- a) sufficiently experienced in the AMO's systems and procedures and should have technical knowledge of the aircraft being maintained so as to enable them to perform their duties satisfactorily;
- b) experienced in the techniques of quality control and assurance or be appropriately trained before taking up their duties;
- c) given clearly defined terms of reference and responsibility within the organization; and
- d) licensed in accordance with Annex 1, if they are required to sign for proper completion of maintenance tasks under the system mentioned in 10.8.1.2 b).

10.8.3.2 The department responsible for quality control and assurance should establish procedures to ensure that personnel performing quality audit in accordance with the audit programme are not involved in the performance of the tasks or activities to be audited.

10.9 FACILITIES

10.9.1 Facility requirements

10.9.1.1 Facilities should be available and appropriate to the scope of work performed as stated on the AMO approval certificate. These should be adequately lighted, provide protection from adverse weather conditions and capable of enclosing the largest aircraft which the AMO is rated for. Specialized workshops should be segregated to ensure that environmental or work area contamination is unlikely to occur. Because aircraft maintenance is document-intensive, adequate office facilities should be available for personnel and particularly those engaged in the management of quality, planning and technical records.

10.9.1.2 Storage facilities should be provided for parts, equipment, tools and material. Storage conditions should be such that unauthorized access to serviceable parts is prevented and that there is complete segregation of serviceable and unserviceable parts. The facilities should provide security, and the storage arrangements and/or special facilities should be provided in order to prevent deterioration and damage to stored items.

10.9.1.3 Facilities do not have to be the property of the AMO, they could be available by contract arrangements but the certificate holder has to demonstrate that he has necessary access via contractual agreement.

10.9.2 Equipment, tools, material and technical data

10.9.2.1 Equipment, tools, material and technical data should be available for completion of the scope of activities included in the approval granted by the CAA. Technical data should include aircraft, engine, propeller and components manuals, regulatory documents, operator MCM and maintenance schedule. For maintenance organizations that are not also air operators, it is common to expect some specialized equipment, tools and data in respect of a particular variant of an aircraft type to be provided by the operator. When the CAA accepts an arrangement of this nature, it needs to ensure that the activity is controlled by a contractual arrangement between the maintenance organization and the operator. It is recommended that the State of Registry have access to the relevant contracts during the review process leading to acceptance of the maintenance organization that will perform maintenance on the aircraft on their aircraft register. The AMO should show that all tools, equipment and maintenance data as specified in the approved data can be made available when needed.

10.9.2.2 Much of the tooling and equipment used in aircraft maintenance is subject to periodic calibration. The system for calibration should be acceptable to the CAA and the actual standards themselves traceable to international standards acceptable to the State concerned.

10.9.2.3 All tools and equipment that are required to be controlled in terms of servicing or calibration should be clearly identified and listed in a control register including any personal tools and equipment that the organization agrees can be used. Where the manufacturer of aircraft or its parts specifies a particular tool and equipment, then that tool or equipment should be used, unless otherwise agreed by the CAA in a particular case via a procedure specified in the AMO's procedures manual.

10.9.2.4 The control of these tools and equipment requires that the AMO has a procedure to inspect/maintain and, where appropriate, calibrate such items on a regular basis and indicate to users that the item is within any inspection service or calibration time-limit.

10.9.2.5 A clear system of labelling all tooling, equipment and test equipment is therefore necessary giving information on when the next inspection or service or calibration is due and if the item is unserviceable for any other reason where it may not be obvious. A register should be maintained for all precision tools and equipment together with a record of calibrations and standards used.

10.9.2.6 Inspection, maintenance and calibration on a regular basis should be in accordance with the equipment manufacturer's instructions except as otherwise accepted by the CAA.

10.9.2.7 The organization should establish procedures to ensure that it either holds or has access to adequate up-to-date technical data such as specifications, drawings, technical handbooks, overhaul/repair and maintenance manuals, schedule of fits and clearance, MCAI, and manufacturers' SBs.

10.9.2.8 The control, calibration/inspection procedures, intervals, labelling and tracking of tools, equipment and technical data should be described in the MOPM.

10.10 PERSONNEL

10.10.1 Accountable executive and nominated personnel

10.10.1.1 Annex 8, Part II, Chapter 6, 6.6.1 requires an AMO to nominate an accountable executive who is accountable to the CAA on behalf of the organization. The accountable executive should have the final responsibility for the effective and efficient performance of the organization. Depending on the size and complexity of the organization, the accountable executive may be:

- a) the chief executive officer;
- b) the chairperson of the board of directors;
- c) a partner; or
- d) the proprietor.

10.10.1.2 The accountable executive's authorities and responsibilities include, but are not limited to:

- a) full authority for human resources issues;
- b) authority for major financial issues;
- c) direct responsibility for the conduct of the organization's affairs;
- d) final authority over operations under certificate; and
- e) final responsibility for all safety issues.

10.10.1.3 The accountable executive should be responsible to the CAA of the State that issued the AMO approval for ensuring compliance with the terms and conditions of the approval. This approach provides a guarantee to the CAA that responsibility for the corrective action for any deficiencies identified by the CAA is vested at the highest level in the organization's management structure, thus ensuring that the executive authority including finance, if necessary, will be available. This might not be the case, for example, if the responsibility for compliance with the terms and conditions of the approval is vested in the inspection department of the AMO.

10.10.1.4 Annex 8, Part II, Chapter 6, 6.6.1 requires the accountable executive to nominate a person or group of persons whose responsibilities include ensuring that the AMO is in compliance with the requirements of the State that granted the approval. These personnel should be appropriately qualified and experienced to manage the various functions and responsibilities of the AMO covered by the approval.

10.10.2 Maintenance and other personnel

10.10.2.1 Annex 8, Part II, 6.6.3 requires AMOs to employ sufficient qualified personnel to plan, perform, supervise and inspect the activities included in the approval. Because AMOs engaged in maintenance for commercial reasons are under constant pressure to achieve maximum work throughput, it is important to determine that such organizations have the necessary personnel to match the anticipated workload without any reduction in the standards accepted by the CAA.

10.10.2.2 Annex 8, Part II, 6.6.4 requires the AMO to establish the competence of maintenance personnel in accordance with procedures and to a level acceptable to the Contracting State granting the approval. It also states that if the person signing a maintenance release is not licensed, the person shall meet the qualification requirements specified in Annex 1. Annex 1, 4.2.2.4, allows a Contracting State to authorize an AMO to appoint non-licensed personnel to sign a maintenance release provided that person meets the licensing requirements in Annex 1, 4.2.1 relating to:

- a) age;
- b) knowledge;
- c) experience;
- d) training; and
- e) skill.

10.10.2.3 It is important to understand that aircraft maintenance is an integrated activity, involving technical records, planning, supervision, quality control or quality assurance personnel, mechanics and specialist technicians such as non-destructive test personnel. Procedures should exist to ensure that these persons are assessed for competence in relation to their particular role within the AMO.

10.10.2.4 The AMO should establish the minimum requirements regarding the qualifications, training and competence of personnel for the grant of an authorization to sign a maintenance release. These personnel should be assessed against the requirements before they are granted authorization. The AMO should also maintain a register of all maintenance personnel who are granted such authorization together with a list of their privileges.

10.10.3 Training policy

10.10.3.1 Annex 8, Part II, 6.6.5 requires an AMO to ensure that all maintenance personnel receive initial and continuation training appropriate to their assigned tasks and responsibilities. Training provided to personnel engaged in aircraft maintenance needs to keep track with the constant state of change of processes and technology in the industry.

10.10.3.2 It is strongly recommended that policies for initial and refresher training be considered in the assessment for approval by the CAA. Consideration should be given to the needs of mechanics, quality control and quality assurance personnel, supervisors, planners and technical records personnel as well as of those persons signing a maintenance release.

10.10.3.3 It is important to note that training should not be limited to providing knowledge of the aeronautical products which are maintained by the organization. There is a need to ensure that all personnel are given training on the company procedures associated with the approval. Where the organization utilizes specialized techniques such as non-destructive inspection, welding or novel methods of repair, appropriate training should be provided.

10.10.3.4 One component of an SMS framework is safety promotion, an element of which is training and education. The organization should provide current information and training related to safety issues relevant to the specific operations and operational units of the organization. The safety training should consist of:

- a) initial job-specific training including general safety;
- b) indoctrination/initial training incorporating SMS, including human and organizational factors; and
- c) recurrent training.

Note.— Guidance material relating to SMS may be found in Doc 9859.

10.10.3.5 It is recommended that the AMO develop a formal training programme for all maintenance personnel appropriate to their assigned tasks and responsibilities. All records of training should be kept on file by the AMO.

10.11 RECORDS

10.11.1 Annex 8, Part II, 6.7.1, provides that the maintenance organization retains detailed maintenance records to show that all requirements for the signing of a maintenance release have been met, and these records should be kept for a minimum period of one year after the signing of the maintenance release.

10.11.2 The records required by Annex 8, Part II, 6.7.1, should include:

- a) aircraft inspection records containing the maintenance release certifications;
- b) records of any corrective actions raised during scheduled maintenance;
- c) work records in respect of engines, propellers, appliances and components repairs and overhaul;
- d) ground and flight test records; and
- e) copies of the pertinent aircraft technical records indicating:
 - i) work in respect of MCAI and any other instructions for continuing airworthiness; and
 - ii) maintenance releases applicable to the work performed.

Note.— Given that records in 10.11.2 e) must be handed over to the aircraft owner following completion of the maintenance, the provisions of 10.11 are needed to maintain traceability within the AMO in respect of its quality assurance programme and its MOPM requirements.

10.11.3 The maintenance records should be kept in a form and manner acceptable to the State of Registry and the State of the Operator.

10.11.4 If a paper system is applied, legible entry should be made, and the record should remain legible throughout the required retention period, irrespective of the medium.

10.11.5 If an electronic system is implemented, it should ensure that all records are generated, processed, used, stored and archived following the guidelines set out in Part III, Attachment B to Chapter 7. The software and hardware used should support specific procedures acceptable to the CAA with respect to:

- a) protection of the records by electronic means against loss, destruction or tampering equivalent to that provided for paper records;
- b) backup of records (e.g. backup system robustness and reliability; timing and frequency of backup completion; segregation from source records; data loss and recovery);
- c) user identification, authentication and authorization to access the records, scope of access, control of access and traceability of all operations concerning any individual record; and
- d) security and integrity of the records.

10.11.6 If optical or other high-density storage of maintenance records is used, the records should be as legible as the original record and remain so over the required retention period.

10.11.7 Maintenance records should be kept in such a way that they are protected from hazards such as fire, flood, theft or alteration. Computer backup disks, tapes and other storage mediums should be safely stored in a different location.

10.11.8 Records should be structured or stored in such a way as to facilitate auditing.

10.12 MAINTENANCE RELEASE

10.12.1 General

10.12.1.1 Annex 8, Part II, 6.8 states that a maintenance release be completed and signed to certify that the maintenance work performed has been completed satisfactorily in accordance with appropriate airworthiness requirements.

10.12.1.2 Generally, a maintenance release should include the following:

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

Note.— An example of a release certificate used to release assemblies/items/components/parts is in Attachment G to this chapter.

10.12.1.3 A maintenance release which certifies that the maintenance work has been completed in a satisfactory manner is necessary before flight at the completion of any maintenance or package of maintenance specified by the customer in accordance with such customer's responsibility. The maintenance may include any one or a combination of the following:

- a) a check or inspection from the operator's aircraft maintenance programme; and
- b) implementation of MCAI, component overhauls, repairs, modifications, engine/propeller changes, aircraft component replacements and defects rectification.

10.12.1.4 In all the cases, the maintenance release (for the aircraft, engine, propeller or for the component) means that only the maintenance work performed has been completed satisfactorily and in accordance with approved data and the procedures described in the maintenance organization's procedures manual.

10.12.1.5 Maintenance can only be deferred in accordance with the operator's MCM procedures.

10.12.2 Qualification of persons signing a maintenance release

10.12.2.1 Annex 1, Chapter 4, provides requirements for the licensing of a person signing the maintenance release. In addition when a Contracting State authorizes an AMO to appoint non-licensed personnel as certifying personnel employed by the organization, they should meet the requirements of Annex 1, 4.2.1, relating to:

- a) age;
- b) knowledge;
- c) experience;
- d) training; and
- e) skill.

The CAA should give particular attention to this point in its national requirements for approval of maintenance organizations.

10.12.2.2 Any CAA that renders valid a license issued by another State as an alternative to the issuance of its own license should establish validity by suitable authorization to be carried with the former's license accepting it as the equivalent or limited to specific privileges. The AMO should limit the privileges of its certifying personnel as stipulated in the CAA authorization.

10.12.2.3 All certifying personnel signing a maintenance release should be familiar with the relevant company systems and procedures, and have appropriate knowledge of the aircraft or component being maintained. It is important that compliance with this requirement is determined before a certifying authorization is granted.

10.13 INSPECTION AND ACCEPTANCE OF AIRCRAFT COMPONENTS AND MATERIAL FROM EXTERNAL SUPPLIERS AND CONTRACTORS

10.13.1 This paragraph describes the procedures for the reception, inspection and the acceptance of equipment, components, parts, standard parts and materials from external sources of suppliers and contractors.

10.13.2 The AMO may obtain equipment, components, parts, standard parts and materials from various sources including:

- a) suppliers or distributors (e.g. new or used/maintained equipment, components, parts, standard parts and materials);
- b) other AMOs (e.g. maintained equipment, components, parts, standard parts and materials);
- c) unapproved workshops but under cover of its own quality system (maintained equipment, components, parts);

- d) maintenance workshops of the approved maintenance organization (internally maintained equipment, components, parts); or
- e) the operator.

10.13.3 In all these cases, the AMO should define and implement reception procedures for new and used/maintained equipment, components, parts, and new standard parts and materials. The reception procedures should, at a minimum, include the following:

- a) authorization procedure for reception, inspection and acceptance;
- b) process of administrative control of the components and materials and their related documentation;
- c) identification of the type of acceptable documents depending on the situation (e.g. new/used equipment, components, parts, standard parts and materials, approved contracting, non-approved contracting under cover of the organization, standard exchange, maintenance by a workshop of the organization, serviceable removed component);
- d) procedures of physical inspection;
- e) procedures of acceptance (e.g. identification of the material, marking, tagging, register, taking into account the storage limits, the life limits, the storage specificity, record of the acceptance); and
- f) procedures for treatment of suspected unapproved parts (quarantine, record, and notification to the CAA).

10.14 CONTRACTING OF MAINTENANCE BY AN APPROVED MAINTENANCE ORGANIZATION

It is a widely accepted practice for operators to contract their maintenance to AMOs. In some States, it is accepted practice to allow AMOs to contract activities to other organizations which are not approved by the CAA or do not require an approval for the activities under consideration (e.g. plating and machining). In the acceptance of such practice, consideration should be given to the following points (see details in 10.15 below):

- a) the approved organization should have its approval extended to include the contracted work so that it could assess the competence of the contractor;
- b) the approved organization should retain responsibility for quality control and release of contracted activities, according to the appropriate airworthiness requirements; and
- c) necessary procedures should be in place for the control of contracted activities, together with terms of reference for the personnel responsible for their management.

10.15 SUPPLIER'S EVALUATION AND CONTRACTOR'S CONTROL PROCEDURE BY THE APPROVED MAINTENANCE ORGANIZATION

10.15.1 General

The AMO should evaluate its suppliers and contractors and the control exercised by it on its approved or non-approved contractors. The AMO must ensure that:

- a) the received equipment, components, parts, standard parts and materials from its supplier are airworthy; and/or
- b) the contracted maintenance work has been performed according to its own standards.

The equipment, components, parts, standard parts and materials may come from a supplier (without any maintenance work contracted) or from a contractor (approved or not approved). The latter case generally involves a maintenance task.

10.15.2 Assessment of the suppliers (no maintenance services are provided)

The AMO should assess its suppliers (e.g. a questionnaire or an audit), implement procedures in order to retain/withdraw the authorization to use such suppliers, and establish special instructions concerning the expected component/part release document (airworthiness tag, conformity statement). These documents may depend on the supplier origin (manufacturer, retailer, airline, distributor or maintenance workshop).

10.15.3 Assessment of the approved contractors (maintenance services are provided by these AMOs also called approved workshops)

Before using approved contractors, the maintenance organization should describe how the following items are satisfactorily dealt with (not an exhaustive list of items):

- a) the approved workshops reference list (only those included in this list can be contracted to work);
- b) the control of the scope of activity of the approved workshops towards the maintenance services sought by the AMO; and
- c) the means internally implemented so that only those approved workshops could be used as workshops (checking the list of the approved workshops chosen from lists issued by the CAA).

10.15.4 Assessment of unapproved contractors (maintenance services are provided by these unapproved maintenance organizations)

The quality assurance system of the AMO should include all the subcontracted activities. All human resources, the means and the procedures used by the contractor should have been treated (and controlled) in the same way as the ones coming from the AMO. Special attention should be paid to the release of the work procedure. The maintenance release is finally signed under the approval of the AMO. The internal control activity of the subcontracting activities should be audited by the AMO.

Attachment A to Chapter 10

CONTENT OF A MAINTENANCE ORGANIZATION'S PROCEDURES MANUAL

Annex 8, Part II, 6.3, provides that the following information be included in the manual:

- 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 Annex 8, Part II, 6.4;
- c) a general description of the organization's facilities;
- d) names and duties of the person or persons required by Annex 8, Part II, 6.6.1 and 6.6.2;
- e) a description of the procedures used to establish the competence of maintenance personnel as required by Annex 8, Part II, 6.6.2;
- f) a description of the method used for the completion and retention of the maintenance records required by Annex 8, Part II, 6.7.1;
- g) a description of the procedure 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 subcontracted 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 service information reporting requirements of Annex 8, Part II, 4.2.3 f) and 4.2.4;
- l) a description of the procedure for receiving, assessing, amending and distributing within the AMO all necessary continuing airworthiness information from the type certificate holder or type design organization; and
- m) a description of the procedures for implementing changes that affect the approval of the AMO.

Notwithstanding the above requirements, consideration should be given to including the following in the procedures manual:

- a) Management

- i) a statement signed by the accountable executive confirming that the manual defines the organization's procedures and associated personnel responsibilities and will be complied with at all times;
 - ii) an organization chart showing the associated chains of responsibility of the persons nominated in accordance with d) above;
 - iii) notification procedures to the CAA regarding changes to the organization's activities, approval, location and personnel;
 - iv) liaison or contractual arrangements with other organizations which provide services associated with the approval; and
 - v) amendment procedures for the manual.
- b) Maintenance procedures
- i) supplier evaluation procedure;
 - ii) acceptance/inspection of aircraft components and material from outside contractors;
 - iii) storage, labelling/tagging and release of aircraft components and material to aircraft maintenance;
 - iv) acceptance of tools and equipment;
 - v) calibration of tools and equipment;
 - vi) use of tools and equipment by personnel (including alternate tools);
 - vii) cleanliness standards of maintenance facilities;
 - viii) updating of maintenance instructions in response to aircraft component manufacturers' service information;
 - ix) repair procedure;
 - x) procedures for compliance with an operator's aircraft maintenance programme;
 - xi) MCAI handling procedure;
 - xii) optional modification procedure;
 - xiii) maintenance documentation in use and completion of same;
 - xiv) technical record control;
 - xv) procedures for handling of defects arising during maintenance;
 - xvi) issue of the maintenance release required by Annex 8, Part II, 6.8;
 - xvii) records for the operator (if the organization is not an operator itself);

- xviii) reporting of defects and other occurrences as required by the CAA;
 - xix) return of defective aircraft components to store;
 - xx) control of defective components sent to contractors;
 - xxi) control of computer maintenance record systems;
 - xxii) reference to specific maintenance procedures such as engine running procedures, aircraft pressure run procedures, aircraft towing procedures and aircraft taxiing procedures;
 - xxiii) contracting procedures;
 - xxiv) human factors; and
 - xxv) manpower resources.
- c) Line maintenance procedures (when applicable)
- i) line maintenance control of aircraft components, tools, equipment, etc.;
 - ii) line maintenance procedures related to servicing/fuelling/de-icing, etc.;
 - iii) line maintenance control of defects and repetitive defects;
 - iv) line procedure for pooled parts and loan parts; and
 - v) line procedure for handling of defective parts removed from aircraft.
- d) Quality system procedures
- i) quality audit of organization procedures;
 - ii) quality audit of aircraft;
 - iii) quality audit findings remedial action procedure;
 - iv) the qualification and training procedures for certifying personnel issuing a maintenance release;
 - v) records of certifying personnel;
 - vi) the qualification and training procedures for quality audit personnel;
 - vii) the qualification and training procedures for mechanics;
 - viii) exemption process control;
 - ix) concession control for deviation from organization's procedures;
 - x) qualification procedure for specialized activities, such as non-destructive testing (NDT), welding, etc.;
 - xi) when required, control of manufacturer's working teams based at the premises of the organization, engaged in tasks which interface with activities included in the approval; and

- xii) quality audit of sub-contractors (or acceptance of accreditation by third parties, e.g. use of NDT organizations approved by a State regulatory body other than the CAA).
- e) Examples of standard documents. Examples of standard documents used by the organization which are associated with activities undertaken under the terms and conditions of the approval, such as:
 - i) technical record control; or
 - ii) rectification of defects.

Attachment B to Chapter 10

APPROVED MAINTENANCE ORGANIZATION'S QUALITY ASSURANCE AUDIT PROCEDURES

The lists which follow are not exhaustive, but include the principal audit areas which need to be considered.

1. Checks on aircraft, while undergoing scheduled maintenance, for:
 - a) ensuring that only work instructions reflecting the latest amendment standards are used;
 - b) completion of work instructions including the transfer of defects to additional worksheets, their control, and final collation. Action taken in respect of items carried forward, not completed during the particular inspection or maintenance task;
 - c) compliance with manufacturers' and the organization's standard specifications and procedures;
 - d) standards of inspection and workmanship;
 - e) condition of corrosion prevention and control treatments and other protective processes;
 - f) procedures adopted during shift changeover of personnel to ensure continuity of inspection and responses; and
 - g) precautions taken to ensure that, on completion of any work or maintenance, all aircraft are checked for loose tools and miscellaneous small items such as split pins, wire, rivets, nuts, bolts and other debris, and for general cleanliness and housekeeping.

2. Checks on airworthiness data for:
 - a) adequacy of continuing airworthiness information including maintenance manuals and other technical publications appropriate to each aircraft type and component maintained by the AMO and the regular receipt of amendments;
 - b) assessment of manufacturer's service information, appropriate to each aircraft type and component maintained by the AMO and implementation of any subsequent action that applies to the AMO;
 - c) maintenance of a register of manuals and technical publications held within the organization, their locations and current amendment status; and
 - d) assurance that all the organization's manuals and documents, both technical and procedural, are kept up to date.

3. Checks on stores and storage procedures for:

- a) the adequacy of stores and storage conditions for rotatable components, small parts, perishable items, flammable fluids, engines and bulky assemblies in accordance with the specifications adopted by the organization;
 - b) the procedure for examining incoming components, materials and items for conformity with order, release documentation and procurement from sources approved by the organization;
 - c) the “batch recording” of goods received and identification of raw materials, the acceptance of part life items into stores, requisition procedures for issue of items from stores;
 - d) labelling procedures, including the use of serviceable/unserviceable/repairable labels and their certification and final disposal after installation, and labelling procedures for components which are serviceable but “part life” only;
 - e) the internal release procedure to be used when components are to be forwarded to other locations within the organization;
 - f) the procedure to be adopted for the release of goods or overhauled items to other organizations (this procedure should also cover items being sent away for rectification or calibration);
 - g) the procedure for the requisitioning of tools together with the system for ensuring that the location of tools, and their calibration and maintenance status, is known at all times; and
 - h) control of shelf life and storage conditions in the stores; control of the free-issue dispensing of standard parts, identification and segregation.
4. Checks on maintenance facilities for:
- a) cleanliness, state of repair and correct functioning of hangars, hangar facilities and special equipment and the maintenance of mobile equipment;
 - b) adequacy and functioning of special services and techniques including welding, non-destructive inspection (NDI), weighing, painting;
 - c) equipment provided for use to access ICA (e.g. maintenance and structural manuals) ensuring that regular maintenance takes place and an acceptable standard of screen reproduction and printed copy is achieved;
 - d) the adequacy of special tools and equipment appropriate to each type of aircraft, including engines, propellers and other equipment;
 - e) the calibration and maintenance of tools and measuring equipment; and
 - f) environmental controls.
5. Checks on the organization’s general airworthiness control procedures for:
- a) implementing the requirements of MCAI or any other special actions in response to service difficulties, etc.;
 - b) monitoring the practices of the organization in respect of scheduling or pre-planning maintenance tasks to be carried out in the open air and adequacy of the facilities provided;

- c) operation of the system for service difficulty reporting required by the CAA;
- d) authorization of personnel to issue maintenance releases in respect of inspections and maintenance tasks; the effectiveness and adequacy of training, including continuation training and the recording of personnel experience, training and qualifications for grant of authorization;
- e) the effectiveness of technical instructions issued to maintenance personnel;
- f) the adequacy of personnel in terms of qualifications, numbers and ability in all areas required to support the activities included in the approval granted by the CAA;
- g) the effectiveness and completeness of the quality audit programme;
- h) ensuring detailed maintenance records are kept showing that all requirements for the signing of a maintenance release have been met;
- i) ensuring that major and minor repairs are carried out in accordance with approved repair schemes and practices only;
- j) control of contractors; and
- k) control of activities contracted to it by an operator, such as management of the operator's maintenance programme.

Attachment C to Chapter 10

CONTENT OF AN APPLICATION FORM FOR A MAINTENANCE ORGANIZATION APPROVAL

The application for a maintenance organization approval should include the following information:

1. Full name and address of organization (submit document of incorporation of organization);
2. Contact information:
 - a) name and contact details of person in charge of the quality system; and
 - b) name and contact details of the Accountable Manager;
3. Class(es) and rating(s) applied for;
4. Address of facility;
5. Declaration by person making the application;
 - a) "I declare that the above particulars and documents submitted with this application are true in every respect."
 - b) Name, designation and signature of applicant and date.

Note.— This application must be accompanied by all necessary supporting documents.

Attachment: Checklist of documents to be submitted

<i>Document</i>	<i>Document reference</i>	<i>Remarks</i>
Compliance checklist		
Maintenance organization's procedure manual		
Quality Management Manual		
Safety Management Manual		
List of qualified/authorized personnel		
List of approvals currently held		
Others, as required (please specify)		

Attachment D to Chapter 10

PROCESS FOR APPROVAL OF A MAINTENANCE ORGANIZATION

The process for the issue of a maintenance organization approval consists of the following phases:

1. Pre-application phase

- 1.1 The pre-application phase starts with the applicant making an initial inquiry by letter, telephone call or personal visit to the CAA.
- 1.2 The CAA should advise the applicant, in a pre-application meeting, to thoroughly review the CAA regulations, directives and advisory materials and provide guidance concerning personnel, facilities, equipment and technical data requirements and an explanation of the certification process, in a standard information package for applicants for an AMO approval.
- 1.3 The standard information package should include a form for the prospective AMO's pre-assessment statement to be completed by the applicant, and an advisory pamphlet containing:
 - a) a description of the process for applying for and obtaining an AMO approval;
 - b) an introduction to the specific CAA regulations;
 - c) guidance on the evaluation of an applicant for certification;
 - d) guidance on the issuance of an AMO approval and ratings;
 - e) instructions for completing the pre-assessment statement form already discussed;
 - f) a list of the documents that should be provided with the formal application;
 - g) a schedule of events in the certification process; and
 - h) any other CAA directive or advisory material necessary for the certification process should also be provided.
- 1.4 The purpose of the prospective AMO pre-assessment statement is to establish the intent of the applicant to continue with the process for certification and to thus enable the CAA to commit resources and plan the certification process.
- 1.5 On receipt of a completed prospective AMO pre-assessment statement, the CAA will appoint a project manager and a certification team consisting of appropriately qualified inspectors.

2. Formal application phase

2.1 Formal application package

The formal application package includes an application form or letter accompanied by the required documentation in a manner prescribed by the CAA. The development of the formal application package should have been coordinated with the CAA certification team, subsequent to the pre-application meeting. Such coordination, between the personnel of the applicant and the CAA certification team, will ensure the quality of the application package and later on facilitate the document evaluation process.

Note.— Guidance on the content of the application form is in Attachment C to this chapter.

2.2 Schedule of events

The schedule of events is a key document that lists items, activities, programmes, aircraft and facility acquisitions that will be made ready for inspection by the CAA before certification. The schedule should include dates when:

- a) maintenance personnel will commence training;
- b) maintenance facilities will be ready for inspection; and
- c) each of the required manuals will be ready for evaluation.

The dates should be logical in sequence and provide time for CAA review, inspection and approval of each item. The overall plan is to be kept under constant review to maintain control of the certification process.

2.3 Initial statement of compliance

The initial statement of compliance should be a complete list of all CAA regulations applicable to the proposed operation. Each regulation, or subpart, should be accompanied by a brief description or reference to a manual or other document. The description or reference should describe the method of compliance in each case. The method of compliance may not be finalized at the time of the formal application, in which case a date should be given by which the information will be provided. The purpose of the statement of compliance is to ensure that the applicant has addressed all regulatory requirements. It aids the CAA certification team to assess where the regulatory requirements have been addressed in the applicant's manuals, programmes and procedures.

2.4 Management structure and key staff members

The CAA regulations should establish basic management positions and the qualifications for these positions, with some variation in the requirement dependent upon the complexity of the proposed AMO. The requirements should cover the following positions: accountable executive (Manager); operations manager; training manager; maintenance manager; supervisor, inspector and quality manager. The list should include the management positions, the names of the individuals involved, their qualifications, relevant management experience and, where appropriate, their licences, ratings and aviation experience.

2.5 Documents to review and approve/accept, which include:

- a) Maintenance procedure manual (MPM):
Ensure the MPM as a minimum contains the information required in Annex 8, Part II, 6.3;

- b) Quality management manual, if not included in the procedure manual:
Guidance to procedures to be included in the quality management manual can be found in Attachment B;
- c) Authorization manual, if available;
- d) Safety management manual, if not included in the MPM:
Guidance to meeting the requirements of a SMS can be found in Doc 9859 and Annex 19;

2.6 Cursory review of the formal application package

The CAA certification team will make a cursory review of the formal application package to check that the required attachments have been presented, that these attachments address required information and that the documentation is complete and is of an appropriate quality.

2.7 Acceptability of the formal application

- a) If the formal application package is incomplete or otherwise unacceptable, the CAA should inform the applicant, providing details of the deficiencies and advice on the resubmission of the formal application.
- b) If the information in the formal application package is considered acceptable by the certification team, the project manager will schedule a formal application meeting with the applicant.

2.8 Formal application meeting

A formal application meeting should be conducted between the CAA project manager, the certification team and all the key management personnel of the applicant, with the objective of resolving any questions on the part of either the CAA or the applicant to establish a common understanding on the future procedure for the application process.

3 Document evaluation phase

3.1 After the formal application has been accepted, the CAA certification team will commence a thorough evaluation of all the documents and manuals that are required by the regulations to be submitted to the CAA. The CAA should endeavour to complete these evaluations in accordance with the schedule of events prepared by the applicant and agreed upon at the formal application meeting. If a document or manual is incomplete or deficient or if non-compliance with regulations or safe operating practices is detected, the document or manual should be returned to the applicant for corrective action.

3.2 Documents/manuals that are satisfactory will be approved or accepted, as required by the regulations. Approval should be indicated by a signed document or certificate.

3.3 The complexity of the information that needs to be addressed in the applicant's documents and manuals depends upon the complexity of the scope of approval.

3.4 All manuals are to be provided with procedures for their development, control and distribution, the means to keep them up to date and the means for the publication and distribution of amendments.

3.5 Manuals will require appropriate revision and amendment when new requirements, procedures, personnel or facilities are introduced.

3.6 Quality assurance system

- a) An AMO should establish a quality assurance system as part of the management system to ensure its aircraft/aircraft components are maintained in an airworthy condition and in accordance with the maintenance programme. A quality manager should be designated to monitor the compliance and adequacy of the procedures required to ensure safe maintenance practices and airworthy aircraft/aircraft components.
- b) The quality system should include a quality assurance programme which contains procedures designed to verify that all tasks are being conducted in accordance with all applicable requirements, standards and procedures. The quality assurance system should be approved by the accountable executive, should be acceptable to the CAA and should be described in relevant documentation.

3.7 Training manual for maintenance personnel

- a) Training programmes are required for all operational, maintenance and ground personnel and could be described in separate manuals. These should cover all aspects of initial and recurrent training and conversion and upgrading training.
- b) The CAA inspector should ensure that the programme described meets the minimum requirements of the State regulation.

3.8 Safety management manual

- a) A safety management manual is required which documents all aspects of the safety management system, including: the statement of safety policy and objectives, which clearly describes the safety accountabilities and emergency response planning; the non-punitive reporting system; the safety risk management, which includes hazard identification, risk assessment and mitigation processes; the safety assurance, including safety performance monitoring with an investigation capability; and safety promotion and training.
- b) The safety management manual may be combined with other manuals required in order to obtain the maintenance organization approval.

Note.— Guidance on SMS is provided in the Safety Management Manual (Doc 9859).

4. Demonstration and inspection phase

4.1 General

- a) The applicant is required to demonstrate that an organization, with the necessary qualified staff, equipment and facilities, is set up and responsible for ensuring that the aircraft/aircraft components are maintained in an airworthy condition.
- b) These demonstrations will include actual performance of activities and/or operations while being observed by inspectors of the certification team. During these demonstrations and inspections, the CAA evaluates the effectiveness of the policies, methods, procedures and instructions as described in the manuals and other documents developed by the applicant. During this phase, emphasis should be placed on the applicant's management effectiveness. Deficiencies should be brought to the attention of the applicant in writing and corrective action taken before an AMO approval can be issued.

4.2 Facilities

The inspection should be designed to determine if the buildings to be utilized by the applicant are: properly protected from weather, properly equipped for standard maintenance practices; provided with the necessary communication equipment, equipped with security and emergency controls and warnings; and adequate for the operation to be conducted. Such an inspection would include the inspection of hangars, additional fixed locations, tooling, aircraft parts storage, maintenance records storage, technical reference centre, administrative staff and maintenance personnel offices to ensure compliance with the Maintenance Procedures Manual.

5. Certification phase

5.1 Final preparation for the issuance of an AMO approval

- a) The CAA project manager will have to notify the applicant of all discrepancies that need to be resolved before an AMO approval can be issued.
- b) Following the satisfactory completion of the inspections described in this chapter and the required correction of any deficiencies by the applicant, CAA inspectors should submit their recommendations as to the applicant's ability to safely carry out the proposed maintenance. These recommendations should of course be accompanied by inspection reports and other documentation to substantiate the recommendation.
- c) The project manager will provide appropriate recommendations on the issuance or denial of an AMO approval to the CAA.

Attachment E to Chapter 10

MAINTENANCE ORGANIZATION'S APPROVAL CERTIFICATE

(Adapted from the Appendix in Annex 8)

APPROVED MAINTENANCE ORGANIZATION CERTIFICATE		
ISSUING AUTHORITY¹:		
Approval Reference No²:	Organization Name³: Registered Address: Telephone: E-mail:	Expiration Date (if applicable)⁴:
CLASS(ES) AND RATING(S) AUTHORIZED		
CLASS⁵	RATING⁶	LIMITATIONS⁷
Aircraft maintenance		
Engine maintenance		
Component maintenance		
Specialized maintenance		
Terms of Approval		
<p>This certificate certifies that ⁸_____ is authorized to engage in activities specified in the Terms of Approval annexed hereto, subject to the compliance with the ⁹_____ and the latest maintenance organization's procedures manual (MOPM).</p> <p>Locations of maintenance facilities: As per¹⁰_____ of the latest MOPM.</p> <p>This certificate shall remain valid during the period of validity specified above unless it is surrendered, superseded, suspended or revoked.</p>		
Name ¹¹ : _____	Date of original issue ¹² : _____	
Title ¹³ : _____		
Signature ¹⁴ : _____	Date of current issue ¹⁵ : _____	

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.
 - 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.
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 the 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 item 8 as follows:

“This certificate certifies that ⁸_____ is authorized to engage in activities listed in this certificate, subject to compliance with the ⁹_____ 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, insert 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).

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Attachment F to Chapter 10

RATING FOR COMPONENT MAINTENANCE

AIRCRAFT SYSTEM TO WHICH THE COMPONENT BELONGS	RATING (SNS CODE)	LIMITATIONS
Vibration and noise analysis and attenuation	18	
Standard practices - Airframe systems	20	
Environmental control	21	
Auto flight	22	
Communications	23	
Electrical power	24	
Equipment/furnishings	25	
Fire protection	26	
Flight controls	27	
Fuel	28	
Hydraulic power	29	
Ice and rain protection	30	
Indicating/recording systems	31	
Landing gear	32	
Lights	33	
Navigation	34	
Oxygen	35	
Pneumatic	36	
Vacuum	37	
Water/waste	38	
Water ballast	41	
Integrated modular avionics	42	

AIRCRAFT SYSTEM TO WHICH THE COMPONENT BELONGS	RATING (SNS CODE)	LIMITATIONS
Cabin systems	44	
Central maintenance system (CMS)	45	
Information system	46	
Liquid nitrogen/Inert gas system	47	
Airborne auxiliary power	49	
Cargo and accessory compartment	50	
Standard practices - Structures	51	
Doors	52	
Fuselage	53	
Nacelles/pylons	54	
Stabilizers	55	
Windows and canopies	56	
Wings	57	
Standard practices, Propeller/rotor	60	
Propellers/propulsors	61	
Main rotors	62	
Main rotor drives	63	
Tail rotor	64	
Tail rotor drive	65	
Folding blades/pylon	66	
Rotors flight control	67	
Standard practices, Engine	70	
Power plant	71	
Engine turbine/turboprop, Ducted fan/inducted fan	72	
Engine reciprocating	72	

AIRCRAFT SYSTEM TO WHICH THE COMPONENT BELONGS	RATING (SNS CODE)	LIMITATIONS
Engine fuel and control	73	
Ignition	74	
Air	75	
Engine controls	76	
Engine indicating	77	
Exhaust	78	
Oil	79	
Starting	80	
Turbines	81	
Water injection	82	
Accessory gearboxes	83	
Propulsion augmentation	84	
Fuel cell system	85	
Lift system	86	
Recovery	90	
Air vehicle wiring	91	
Radar	92	
Crew escape and safety	95	
Defined by organization (A customized unique rating that is not adequately described in the above codes)	100	

Attachment G to Chapter 10

EXAMPLE OF A RELEASE CERTIFICATE

1. Approving National Aviation Authority/Country		AUTHORIZED RELEASE CERTIFICATE				3. Form Tracking Number	
4. Organization, Name and Address					5. Work Order/Contract/Invoice number		
6. Item	7. Description	8. Part number	9. Quantity	10. Serial Number	11. Status/Work		
12. Remarks							
13. Certifies that the items identified above were manufactured in conformity to: <input type="checkbox"/> Approved data and in condition for safe flight <input type="checkbox"/> Non-approved data as specified in block 12				18. <input type="checkbox"/> Return to service as per National Regulations <input type="checkbox"/> Other Regulations as specified in block 12 <i>Certifies that, unless specified in block 12, the work identified in block 11 and described in block 12, was accomplished in accordance with the National Regulations, and in respect to that work, the items are approved for return to service.</i>			
14. Authorized Signature		15. Approval/Authorization number		19. Authorized Signature		20. Approval Certificate number	
16. Name		17. Date (format)		21. Name		22. Date (format)	

CAA Form No.



PART IV
STATE OF THE OPERATOR

Chapter 1

STATE AIRWORTHINESS LEGISLATION SYSTEM AND ORGANIZATION STRUCTURE

1.1 GENERAL

1.1.1 In order for a State of the Operator to effectively perform its duties and responsibilities, an effective organization and regulatory system should be firmly in place. The foundation of a solid safety oversight system by which a State of the Operator can exercise its certification and surveillance responsibilities is to have primary legislation that establishes the framework for the creation of a CAA, with the authority to develop and amend regulations to ensure the airworthiness of aircraft that are designed, manufactured, maintained and operated in the State. The primary legislation or law should ensure that the regulations are uniform to the greatest extent possible with those required by Article 12 of the Convention. The CAA needs to ensure that it is appropriately organized, funded, staffed and empowered to carry out its duties and responsibilities. Further, the State of the Operator should assess its aviation industry and ensure that sufficient qualified technical personnel are available to fulfil the needs of the industry. The State may consider reviewing Annexes 6 and 8 and assessing its aviation industry and anticipated growth in determining the organizational structure needed for the State. For all States of the Operator, it will be necessary to establish a certification and surveillance group/division within the CAA. Included in the CAA should be a group to monitor the necessity to amend the regulations with regard to the continuing airworthiness of aircraft.

1.1.2 The State of the Operator should also establish a State Safety Programme (SSP) as required by Annex 6, Part I, Chapter 3 and Part III, Section II, Chapter 1. Additional State of the Operator responsibilities can be found in Annex 6, Parts I, II and III.

1.2 STATE OF THE OPERATOR RESPONSIBILITIES

The following lists the responsibilities normally associated with the State of the Operator. There may be additional responsibilities based on the complexity of the State aviation industry:

- a) Ensure the development and promulgation of regulations and national requirements regarding the airworthiness of aircraft, continuing airworthiness of aircraft and the operation of aircraft, domestic and foreign, including leasing of aircraft;
- b) Notify ICAO of differences between ICAO Standards, and national regulations and practices;
- c) Establish, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM, the type of service information to be reported to the State of Registry by air operators and maintenance organizations;
- d) Evaluate and accept air operators' MCMs;
- e) Perform airworthiness certification inspections of air operator airworthiness;

- f) Determine the continuing airworthiness of aircraft in relation to the appropriate airworthiness requirements for the operation under an AOC;
 - g) Issue AOCs and operations specifications;
 - h) Maintain records of AOC holders;
 - i) Develop annual surveillance work plans that will be commensurate with the aviation activities of the State. The *Safety Oversight Manual (Doc 9734)*, Part A — *The Establishment and Management of a State Safety Oversight System* provides guidance regarding surveillance obligations of a State (Critical Element No. 7); it is recommended that this be considered during the development of surveillance work programmes;
 - j) Perform oversight of its certificated operators;
 - k) Perform ramp inspection on domestic and foreign air operators; and
 - l) Ensure timely corrective action on deficiencies noted during oversight of certificated operators.
-

Chapter 2

AIR OPERATOR CERTIFICATE — AIRWORTHINESS ASPECTS

Note.— This chapter is intended to address the airworthiness aspects involved in the application, inspection and certification of an air operator. Guidance on the certification and continued surveillance of the operator is also given in the Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335).

2.1 GENERAL

2.1.1 The State of the Operator should exercise the necessary control of its air operators through the issuance of an AOC. The award of an AOC constitutes certification by the State of the Operator that specified operations are authorized in compliance with applicable regulations and rules. Through the issuance of an AOC, the State of the Operator can ensure the protection of the public interest and exercise indirect influence and control upon the major aspects of the operation without encroaching upon the operator's direct responsibility for its safety. Detailed guidance on the establishment of a State system for the initial certification of operators and the subsequent surveillance of operations is contained in Doc 8335. The materials contained in this chapter and in Part III, Chapter 10, are to be used in conjunction with Doc 8335 in order to amplify the airworthiness aspects of operator certification and surveillance procedures. In some instances, certain material contained in Doc 8335 has been repeated herein for the sake of clarity.

2.1.2 Annex 6, Part I, 4.2.1.3, and Part III, Section II, 2.2.1.3 state:

“The issue of an air operator certificate by the State of the Operator shall be dependent upon the operator demonstrating an adequate organization, method of control and supervision of flight operations, training programme as well as ground handling and maintenance arrangements consistent with the nature and extent of the operations specified.”

In making the “maintenance arrangements” referred to above, operators are required to ensure that the aircraft they operate are maintained in an airworthy condition. Annex 6, Part I, 8.1.2 and Part III, Section II, 6.1.2 require that an aircraft should not be operated unless it is maintained and released to service by an AMO or under an equivalent system either of which should be acceptable to the State of Registry.

2.1.3 Operators may have an AMO as part of their organization or the maintenance may be contracted to one or more maintenance organizations approved for the purpose. The approval of the maintenance organization should be acceptable to the State of Registry of the operator's aircraft. In issuing the AOC, the State of the Operator will have to be satisfied as to the actions of the State of Registry in granting the approval of the maintenance organization, maintenance programme and setting the standards for the continuing airworthiness of the operator's aircraft. For States which have ratified Article 83 *bis*, the State of Registry may transfer some or all of its responsibilities for the airworthiness aspects.

Note.— See Part V of Doc 8335 and Part IV, Chapter 6, of this manual for information on lease, charter and interchange.

2.1.4 A major factor in the certification process is the determination of the capability of applicants to adequately maintain their aircraft in an airworthy condition. This will require a detailed evaluation and inspection of the applicant's maintenance organization, staffing, facilities, maintenance programme, air operator's MCM, maintenance records process,

training and ability to carry out day-to-day operations. The maintenance inspections and evaluations should be carried out by qualified inspectors of the AID under the overall coordination of an inspector in charge of the certification team of the air operator.

2.1.5 When first assigned to a CAA certification team, the AID inspector should make certain that he or she fully understands the interrelationship of the various duties and responsibilities of the individual inspectors. This understanding is essential in order to prevent duplication of effort, contradictory instructions to the applicant and conflicting inspection schedules. It is also incumbent upon the AID inspector to develop, at a very preliminary stage of the certification, an overall appreciation of the exact nature of the proposed operation.

2.1.6 The procedure for application and the granting of an AOC is best organized in phases and will normally take the following sequence:

- a) pre-application phase;
- b) formal application phase;
- c) document evaluation phase;
- d) demonstration and inspection phase; and
- e) certification phase.

Each of these phases is briefly introduced below, and each will be dealt with in greater detail in the succeeding chapters of this Part.

2.1.6.1 **Pre-application phase**

2.1.6.1.1 A prospective operator who intends to apply for an AOC should enter into preliminary discussions with the CAA and should be provided with complete information concerning the type of operations which may be authorized, the data to be provided by the applicant and the procedures which will be followed in the processing of the application. It is essential that the applicant has, in this pre-application phase, a clear understanding of the form, content and documents required for the formal application. A standard information package should be developed to provide information to applicants.

2.1.6.1.2 The CAA should advise the prospective operator on the approximate period of time that will be required to conduct the certification process, subsequent to the receipt of a complete and properly executed application. This advice is of particular importance in the case of new operators so that such applicants may avoid undue financial outlays during the certification period.

2.1.6.1.3 It is important to conduct a thorough and careful preliminary assessment of the application. The more thoroughly the applicant's competence is established at this stage, the less likelihood there will be of having serious problems in the document evaluation and the demonstration and inspection phases preceding certification or during the course of subsequent operations. Analysis of the application as detailed in this chapter will indicate either that it is acceptable on a preliminary basis or that it is unacceptable. If in the latter case the deficiencies are such that they can be rectified, the applicant should be given a reasonable opportunity to resubmit the application. Such an assessment is essential at an early stage to reveal any critical deficiencies in the proposals and will enable the applicant to prepare alternative proposals addressing the identified deficiencies.

2.1.6.1.4 If the application is acceptable to the CAA on the basis of the preliminary assessment, the applicant should be encouraged to proceed with preparations for the commencement of operations, on the basis that an AOC will be issued subject to satisfactory completion of the remainder of the certification procedure.

2.1.6.1.5 It may be necessary to identify the focal point(s) who would be working with the CAA on the application process. This is to help ensure smooth facilitation of the application process.

2.1.6.2 **Formal application phase**

2.1.6.2.1 The formal application for an AOC should be submitted in the manner prescribed by the CAA, and the application should be accompanied by the required documentation.

2.1.6.2.2 The submission of a formal application is interpreted by the CAA to mean that the applicant is aware of the regulations and rules applicable to the proposed operation, is prepared to show the method of compliance and is prepared for in-depth evaluation, demonstration and inspection related to the required manuals, training programmes, operational and maintenance facilities, aircraft, support equipment, record-keeping, dangerous goods programme, security programme, flight crew and key management personnel, including the functioning of the administrative and operational organization.

2.1.6.3 **Document evaluation phase**

2.1.6.3.1 The document evaluation phase involves the detailed examination of all documentation and manuals provided by the applicant, to establish that every aspect required by the regulations is included and adequately covered.

2.1.6.3.2 In order to facilitate this phase of the certification process, the applicant should have coordinated all aspects of the development of the required documentation with the CAA certification team, prior to the submission of the formal application.

2.1.6.4 **Demonstration and inspection phase**

Inspections in this phase will involve base and station facility inspections, inspection of aircraft and inspection of maintenance control and planning systems. This could also include interviews with personnel to ensure that the procedures are transmitted and understood.

2.1.6.5 **Certification phase**

2.1.6.5.1 The certification phase is the conclusion of the certification process when the CAA project manager has determined that all certification requirements have been completed in a satisfactory manner and that the operator will comply with the applicable regulations and is fully capable of fulfilling its responsibilities and of conducting a safe and efficient operation. The CAA project manager should submit a written report to the DGCA to recommend the issue of the AOC.

2.1.6.5.2 The culmination of this phase is the issuance of the AOC and the associated operations specifications under the authority of which the operation will be conducted.

2.1.6.5.3 Subsequent to issuing an AOC the CAA will be responsible for continued surveillance and for conducting periodic inspections to ensure the operator's continued compliance with CAA regulations, authorizations, limitations and provisions of its AOC and operations specifications. These periodic inspections are components of a continuing safety oversight programme.

2.2 PRE-APPLICATION PHASE

2.2.1 Initial inquiry and CAA response

2.2.1.1 The pre-application phase commences with the applicant making an initial inquiry by letter, telephone call or personal visit to the CAA.

2.2.1.2 The CAA should advise the applicant to thoroughly review the CAA regulations, directives and advisory materials and provide guidance concerning personnel, facilities, equipment and technical data requirements and an explanation of the certification process, in a standard information package for applicants for an AOC.

2.2.1.3 The standard information package should include a form for the prospective operator's pre-assessment statement, to be completed by the applicant, and an advisory pamphlet containing:

- a) a description of the process for applying for and obtaining an AOC;
- b) an introduction to the specific CAA regulations;
- c) guidance on the evaluation of an applicant for certification;
- d) guidance on the issuance of an AOC and associated operations specifications;
- e) instructions for completing the pre-assessment statement form already discussed;
- f) a list of the documents that should accompany the formal application;
- g) a schedule of events in the certification process; and
- h) any other CAA directive or advisory material necessary for the certification process should also be provided.

2.2.1.4 The purpose of the prospective operator's pre-assessment statement is to establish the intent of the applicant to continue with the process for certification and to thus enable the CAA to commit resources and plan the certification process.

2.2.1.5 On receipt of a completed prospective operator's pre-assessment statement the CAA will appoint a project manager and a certification team consisting of appropriately qualified operations and AID inspectors.

2.2.1.6 Further information on the pre-application phase is contained in Doc 8335, Part III, Chapter 2.

2.3 FORMAL APPLICATION PHASE

2.3.1 Formal application package

2.3.1.1 The formal application for certification should be an application form or letter with attachments containing the information required by the CAA, comprising a formal application package. The development of the application and the attached documents should have been coordinated with the CAA certification team, subsequent to the pre-application meeting. Such coordination between the personnel of the applicant and the CAA certification team will ensure the quality of the application package and facilitate the later document evaluation process.

2.3.1.2 The application should be signed by the applicant's accountable executive and should contain at least the following information:

- a) a statement that the application serves as a formal application for an AOC;
- b) the name and address of the applicant;
- c) the location and address of the applicant's principal place of business and the main maintenance base or AMO name and location;
- d) a description of the applicant's business organization and corporate structure, as well as names and addresses of those entities and individuals having a major financial interest;
- e) the name and address of the applicant's legal representative;
- f) the identity of key management personnel, i.e. accountable executive, operations manager, chief pilot, fleet manager(s), cabin crew manager, safety manager, training manager, maintenance manager, ground services manager, security manager and quality manager;
- g) the nature of the proposed operations, i.e. passenger/cargo/mail, day or night, VFR or IFR, whether or not dangerous goods are to be transported;
- h) the extent of the maintenance arrangements or organization's maintenance capabilities or forecast capabilities;
- i) the desired date for the operation to commence; and
- j) if the State legislation requires a fee for the issuance of the AOC, it should be paid at this time to support the applicant's commitment before the State commits any resources to the project.

2.3.1.3 The formal application should be accompanied by the attachments listed in Doc 8335, including the following airworthiness-related documentation:

- a) the MCM;
- b) a maintenance programme, approved by the State of Registry, for each aircraft type operated;
- c) a reliability programme as required;
- d) a quality assurance system or its alternative system;
- e) a list of aircraft to be operated with lease agreement for foreign registered aircraft;
- f) maintenance arrangements with an AMO or evidence of application for the approval of an AMO; and
- g) a Safety Management System.

2.3.2 Attachments to the formal application

2.3.2.1 Schedule of events

The schedule of events is a key document that lists items, activities, programmes, aircraft and facility acquisitions that will be made ready for inspection by the CAA before certification. The schedule should include dates:

- a) when maintenance personnel will commence training;
- b) when maintenance facilities will be ready for inspection;
- c) when each of the required manuals will be ready for evaluation;
- d) when aircraft will be ready for inspection;
- e) if and when demonstration flights are planned; and
- f) of proposed assessments of training staff and other persons subject to CAA approval.

The dates should be logical, in sequence and provide time for CAA review, inspection and approval of each item. The overall plan is to be kept under constant review to maintain control of the certification process.

2.3.2.2 Initial statement of compliance

The initial statement of compliance should be a complete list of all CAA regulations applicable to the proposed operation. Each regulation, or sub-part, should be accompanied by a brief description or a reference to a manual or other document. The description or reference should describe the method of compliance in each case. The method of compliance may not be finalized at the time of the formal application, in which case a date should be given by which the information will be provided. The purpose of the statement of compliance is to ensure that the applicant has addressed all regulatory requirements. It aids the CAA certification team assess where the regulatory requirements have been addressed in the applicant's manuals, programmes and procedures.

2.3.2.3 Management structure and key staff members

The CAA regulations should establish basic management positions and the qualifications for these positions, with some variation in the requirement dependent upon the complexity of the proposed operation. The requirements should cover the following positions: accountable executive; operations manager; chief pilot; fleet manager(s); cabin crew manager; safety manager; training manager; maintenance manager; ground services manager; security manager; and quality manager. The list should include the management positions, the names of the individuals involved and their qualifications and relevant management experience and, where appropriate, their licences, ratings and aviation experience.

2.3.2.4 Aircraft to be operated

A list of the aircraft to be operated should be provided, with the make, model, series and the nationality and registration marks for each aircraft and details of the origin and source for each aircraft, if these details are known. It is possible that the details for individual aircraft may not yet be available, in which case, evidence should be provided as described in

2.3.2.5 **Maintenance contract**

2.3.2.5.1 The organization should provide a maintenance contract with an AMO for all levels of maintenance or if it seeks an AMO approval at the same time of the AOC evidence of application. Where the maintenance organization is part of the operator's own organization, it should be subjected to the same approval procedure as for independent organizations (See Part III, Chapter 10, of this manual).

2.3.2.5.2 Where maintenance is contracted out, a written contract should be agreed between the operator and the maintenance organization detailing the responsibilities of both parties. The technical aspects of the contract should be accepted by the CAA.

2.3.2.5.3 If formal contracts are not completed, letters or other documents showing preliminary agreements or intent should be provided as described in 2.3.2.6.

2.3.2.6 **Documents of purchase, leases, contracts or letters of intent**

Documents of purchase, leases, contracts or letters of intent should provide evidence that the applicant is actively procuring aircraft, facilities and services appropriate to the operation proposed. If formal contracts are not completed, letters or other documents showing preliminary agreements or intent should be provided. These documents should relate to: aircraft; station facilities and services; aircraft maintenance; and outsourced training and training facilities.

2.3.2.7 **Maintenance control manual**

Annex 6, Part I, Chapters 8 and 11 and Part III, Section II, Chapters 6 and 9 require operators to ensure that an MCM, acceptable to the State of Registry, is provided for use and guidance for maintenance and operational personnel as applicable. The operator is accountable for the manual and is also required to ensure that the manual is amended and revised as necessary by means of establishing an appropriate revision control system and that copies of changes are distributed to holders of the manual. The MCM should describe the administrative arrangements between the applicant and the AMO. It should also define the procedures to be used, the duties and responsibilities of operations and maintenance personnel, and the instructions and information to permit maintenance and operational personnel involved to perform their duties with a high degree of safety. Details on the requirements and content of the MCM are described in Part III, Chapter 7, 7.2, of this manual.

2.3.2.8 **Maintenance programme**

Annex 6, Part I, 8.3 and Part III, Section II, 6.3 require operators to provide a maintenance programme approved by the State of Registry for the use and guidance of maintenance and operational personnel. The maintenance programme, including a maintenance schedule, will detail the maintenance requirements for each aircraft type. A description of the requirements and content of a maintenance programme are contained in Part III, Chapter 7, 7.3, of this manual.

2.3.2.9 **Reliability programme**

Annex 6, Part I, Chapter 11 and Part III, Section II, Chapter 9, provide that a reliability programme, when applicable, should be part of the maintenance programme. Details on the requirements and content are detailed in Part III, Chapter 7, 7.4 of this manual.

2.3.2.10 **Quality assurance system**

Annex 6, Part I, 8.1 requires operators to ensure that each aeroplane is maintained in an airworthy condition. The operator should also ensure that the maintenance of its aeroplanes is performed in accordance with the maintenance programme. This could be done through establishing a quality assurance system or equivalent. Such a system could be described in the MCM or in a separate manual of policies and procedures.

2.3.2.11 **Safety Management System**

Guidance on the details of the content and acceptance of the SMS is contained in Doc 9859.

2.3.3 Cursory review of the formal application package

The CAA certificating team will make a cursory review of the formal application package to check that the required attachments have been presented, that these attachments address required information and that the documentation is of an appropriate quality.

2.3.4 Acceptability of the formal application

2.3.4.1 If the formal application package is incomplete or otherwise unacceptable the CAA should inform the applicant, providing details of the deficiencies and advice on the resubmission of the formal application.

2.3.4.2 If the information in the formal application package is considered acceptable by the certification team, the project manager will schedule a formal application meeting with the applicant.

2.3.5 Formal application meeting

A formal application meeting should be conducted between the CAA project manager, the certification team and all the key management personnel of the applicant, with the objective of resolving any questions on the part of either the CAA or the applicant to establish a common understanding on the future procedure for the application process.

2.4 DOCUMENT EVALUATION PHASE

2.4.1 General

2.4.1.1 After the formal application has been accepted, the CAA certification team will commence a thorough evaluation of all the documents and manuals that are required by the regulations to be submitted to the CAA. The CAA should endeavour to complete these evaluations in accordance with the schedule of events prepared by the applicant and agreed at the formal application meeting. If a document or manual is incomplete or deficient or if non-compliance with regulations or safe operating practices is detected, the document or manual should be returned to the applicant for corrective action.

2.4.1.2 Documents or manuals that are satisfactory will be approved or accepted, as required by the regulations. Approval should be indicated by a signed document or certificate.

2.4.1.3 The complexity of the information that needs to be addressed in the applicant's documents and manuals depends upon the complexity of the proposed operation.

2.4.1.4 Attachment E to Annex 6, Part I, lists the provisions requiring an approval or a technical evaluation. If the State of the Operator is different from the State of Registry, the State of the Operator should take the necessary steps to ensure that operators for which it is responsible comply with the applicable approvals issued by the State of Registry and/or State of Design, in addition to its own requirements.

2.4.2 The following provisions require an approval by the AID:

- a) aircraft-specific maintenance programme;
- b) approved maintenance organization; and
- c) maintenance quality assurance methodology.

2.4.3 The following provisions require a technical evaluation by the AID:

- a) air operator's aircraft-specific maintenance responsibilities;
- b) method of maintenance release;
- c) MCM;
- d) reporting of maintenance experience information;
- e) implementing necessary maintenance corrective actions;
- f) modification and repair requirements; and
- g) minimum competence level of maintenance personnel.

Some States may elect to require an approval for some of these provisions.

2.4.4 Some provisions will require evaluation as a joint task by the AID with another technical specialty area within the CAA prior to approval or acceptance. These may include:

- a) minimum equipment list;
- b) configuration deviation list (CDL);
- c) special operations (e.g. EDTO and RVSM);
- d) aircraft flight manual changes; and
- e) safety management system.

It is important to keep in mind that the AOC certification process is a joint project between different specialties, and one should confer with another to ensure all manuals are coordinated and there is no contradiction or differences in procedures described in different manuals (i.e. defects rectification and MEL procedures). It is therefore imperative that the AID and OPS sections of the CAA coordinate with one another and that there is documented evidence that both organizations have participated in the issuance of the AOC.

2.4.5 All manuals are to be provided with procedures for their development, control and distribution, the means to keep them up to date and the means for the publication and distribution of amendments.

2.4.6 Manuals will require appropriate revision and amendment when new requirements, procedures, aircraft, personnel or facilities are introduced.

2.4.7 Evaluation of the documents

2.4.7.1 *General*

2.4.7.1.1 *Approval actions*

The term “approval” implies a more formal action on the part of the State with respect to a certification matter than does the term “acceptance.” Some States require the CAA to issue a formal written instrument for every approval action taken, and other States allow a variety of documents to be issued as evidence of an approval. The technical evaluation required needs to ensure that all regulatory requirements are met and reflect the actual operation of the applicant.

2.4.7.1.2 *Acceptance actions*

The actual extent of the State’s technical evaluation of an operator’s readiness to conduct certain operations should be much broader than just those requirements which require or imply approval. During certification, the State needs to ensure that an operator will be in compliance with the requirements of Annex 6, Part I, prior to conducting international commercial air transport operations. The State’s technical evaluation should, in addition to ensuring that all required contents are addressed, consider if the specific policies and procedures would result in the desired outcome.

2.4.7.2 *Maintenance control manual*

2.4.7.2.1 The MCM may be issued in separate parts, but must be acceptable to both the State of the Operator and the State of Registry.

2.4.7.2.2 The MCM sets out the applicant’s intentions and procedures with regard to maintaining the airworthiness of the aircraft during its operational life. This applies whether or not the applicant for an AOC also intends to apply for approval as an AMO or intends to contract out maintenance to an AMO.

2.4.7.2.3 Operators are required to ensure that an MCM is provided for the use and guidance of their maintenance and operational personnel, as applicable. The operator is required to ensure that the manual is amended and revised as necessary and that copies of changes are distributed to holders of the manual. The design of this manual should observe Human Factors principles. Some of the basic aspects requiring Human Factors optimization include:

- a) written language, which involves not only correct vocabulary and grammar, but also the manner in which they are used;
- b) typography, including the form of letters and printing and the layout, which has a significant impact on the comprehension of the written material;
- c) the use of photographs, diagrams, charts or tables replacing long descriptive text to help comprehension and maintain interest. The use of colour in illustrations reduces the discrimination workload and has a motivational effect;

- d) consideration of the working environment in which the document is going to be used, when print and page size are determined.

2.4.7.2.4 Details on the requirements and content of the MCM are described in Part III, Chapter 7, 7.2, of this manual

2.4.7.3 **Maintenance programme**

2.4.7.3.1 The maintenance programme is a document which describes the specific maintenance tasks and their frequency of completion necessary for the continued safe operation of those aircraft to which it applies.

2.4.7.3.2 A maintenance programme, approved by the State of Registry, is required for individual aircraft type, taking into account the requirements of the type design authority.

2.4.7.3.3 Details on the requirements and content of a maintenance programme are described in Part III, Chapter 7, 7.3, of this manual.

2.4.7.4 **Reliability programme**

Details on the requirements and content of a reliability programme are described in Part III, Chapter 7, 7.4, of this manual.

2.4.7.5 **Quality assurance system**

2.4.7.5.1 An operator should establish a quality assurance system as part of the management system to ensure its aircraft are maintained in an airworthy condition and in accordance with the maintenance programme. A quality manager should be designated to monitor compliance with, and adequacy of, procedures required to ensure safe maintenance practices and airworthy aircraft. Compliance monitoring should include a feedback system to the manager in charge of the area being audited to ensure corrective action as necessary. The operator may establish a single quality assurance system for both the operations department and the maintenance department.

2.4.7.5.2 The quality system should include a quality assurance programme which contains procedures designed to verify that all tasks are being conducted in accordance with all applicable requirements, standards and procedures. The quality assurance system should be approved by the AID and the quality manager, should be acceptable to the AID, and should be described in relevant documentation.

2.4.7.6 **Alternative to a quality assurance system**

When the AID issuing the approval agrees that setting up a comprehensive quality assurance system is not appropriate, the AID may accept a simpler method of quality verification.

2.4.7.6.1 *Items specific to maintenance*

For maintenance purposes, the operator's system described in 2.4.7.5 should include at least monitoring:

- a) the continued compliance with the MCM;
- b) that the aircraft are maintained in accordance with the approved maintenance programme;

- c) that the maintenance activities related to the responsibilities of the operator are being performed in accordance with accepted procedures;
- d) that all contracted maintenance is carried out in accordance with the contract; and
- e) that implementation actions related to MCAI are performed in time.

2.4.7.6.2 *Contracting of monitoring*

If, in case of a small operator, the monitoring as described in 2.4.7.5 is contracted, the technical details of the contract should be submitted to the AID for review and acceptance.

2.4.7.7 ***Maintenance contracts and other maintenance arrangements***

2.4.7.7.1 Details on aircraft maintenance are provided in Part III, Chapter 7, of this manual.

2.4.7.7.2 When maintenance arrangements are contracted, there should be a formal contract to ensure that the maintenance is carried out in accordance with the MCM, and aircraft are maintained in accordance with the approved maintenance programme.

2.4.7.8 ***Training manual for maintenance personnel***

2.4.7.8.1 Training programmes are required for all operational, maintenance and ground personnel and could be described in separate manuals. These should cover all aspects of initial and recurrent training and conversion and upgrading training.

2.4.7.8.2 The AID inspector needs to ensure that the programme described meets the minimum requirements of the State regulation.

2.4.7.9 ***Management personnel résumés providing qualifications and aviation experience***

2.4.7.9.1 The list should include the management positions, the names of the individuals involved, their qualifications and relevant management experience, and their licences, ratings and aviation experience.

2.4.7.9.2 The AID inspector needs to ensure that the individual meets the criteria set forth in the State regulation.

2.4.7.10 ***Minimum equipment list (MEL)***

2.4.7.10.1 A MEL is required for each type and model of aircraft to be operated which provides for the operation of the aircraft, subject to specified conditions, with particular equipment inoperative. This list, prepared by the applicant, in conformity with, or more restrictive than, the master minimum equipment list (MMEL) for the type approved by the State of Design, is tailored to the applicant's aircraft and installed equipment. The MEL is required to be approved by the State of the Operator. The MEL needs to be available to flight crew, maintenance personnel and personnel responsible for operational control. The MEL also needs to include instructions for its use, including defects entry, categories, and actions to be taken (maintenance or operation) and placarding.

2.4.7.10.2 The AID inspector needs to ensure that the tasks described in the MEL are within the privilege of a pilot or maintenance staff, the maintenance actions and deferral meet the regulatory requirements of the State, and it reflects the applicant's aircraft configuration.

Note.— Annex 6, Part I, Attachment E and Part III, Attachment C provide guidance on the MEL.

2.4.7.11 **Configuration deviation list (CDL)**

2.4.7.11.1 A CDL, for each aircraft type and model, may be established by the organization responsible for the type design and approved by the State of Design, to provide for the commencement of a flight without specified external parts. The CDL contains any necessary information on associated operating limitations or performance corrections and should be available to flight crew, maintenance personnel and personnel responsible for operational control. A CDL needs to include instructions for its use.

2.4.7.11.2 The AID inspector needs to ensure that the tasks described in the CDL are within the privilege of a pilot or maintenance staff, the maintenance actions and deferral meet the regulatory requirements of the State and it reflects the applicant's aircraft configuration.

2.4.7.12 **Safety management system manual**

2.4.7.12.1 A safety management system manual is required and documents all aspects of the safety management system, including: the statement of safety policy and objectives, which clearly describes the safety accountabilities and emergency response planning; the non-punitive reporting system; the safety risk management, which includes hazard identification processes and risk assessment and mitigation processes; the safety assurance, including safety performance monitoring with an investigation capability; and safety promotion and training.

2.4.7.12.2 The AID inspector needs to ensure that the maintenance aspects of the operation are addressed in the manual and meet the criteria set forth in the State regulation.

Note.— Guidance on SMS is provided in the Safety Management Manual (Doc 9859) .

2.5 DEMONSTRATION AND INSPECTION PHASE

2.5.1 General

2.5.1.1 The applicant is required to demonstrate that an organization, with the necessary qualified staff, equipment and facilities, is set up and responsible for ensuring that the aircraft remain in airworthy condition for the duration of their operational life. This is also referred to as managing the continuing airworthiness of the aircraft.

2.5.1.2 It is also assumed that in the case of an applicant seeking authority to operate leased aircraft registered in a different State, suitable arrangements have been made between the State of the Operator and the State of Registry regarding responsibility for the continuing airworthiness of the aircraft (see Part IV, Chapter 6, of this manual for details on the lease and charter of aircraft).

2.5.1.3 These demonstrations will include actual performance of activities and/or operations while being observed by inspectors of the certification team. This will also involve on-site evaluations of aircraft maintenance and support facilities. During these demonstrations and inspections, the CAA evaluates the effectiveness of the policies, methods,

procedures and instructions as described in the manuals and other documents developed by the applicant. During this phase, emphasis should be placed on the applicant's management effectiveness. Deficiencies should be brought to the attention of the applicant in writing and corrective action taken before an AOC can be issued.

2.5.2 Maintenance control organization

2.5.2.1 Annex 6, Part I, 8.1.4 and Part III, Section II, 6.1.4 require an operator employ a person, or group of persons, to ensure that all maintenance is carried out in accordance with the MCM. This requirement should be clearly demonstrated during the inspection.

2.5.2.2 The AID inspector should determine that the structure of the applicant's maintenance control organization is set forth, clearly delineating duties and responsibilities for all key personnel including, but not limited to the manager(s) for engineering, quality and maintenance. The names of all incumbents should be listed. The details of the organizational structure should be included as a part of the MCM and, if necessary, also defined separately.

2.5.3 Maintenance control manual

2.5.3.1 State regulations will need to require the applicant, in accordance with Annex 6, Part I and Part III, Section II, to prepare a detailed maintenance control manual for the use and guidance of maintenance organization personnel. This manual needs to be accepted by the State of the Operator. The operator needs to ensure that the maintenance control manual is revised as necessary to keep the information contained therein up to date. Copies of all revisions will be furnished promptly to all organizations or persons to whom the manual has been issued. Accordingly, one of the first steps in the maintenance inspection is a thorough analysis of the maintenance control manual, the correction of any discrepancies and the tentative acceptance by the AID inspector. During the course of the maintenance control inspection, the AID inspector, should:

- a) determine that the major provisions of the maintenance control manual are being followed in practice;
- b) ensure the procedures described in the maintenance control manual reflect the organizational activities and practices;
- c) ensure that the maintenance control manual provides clear instructions, procedures and information; and
- d) determine that the procedures will result in the desired outcome.

2.5.3.2 The AID inspector should check the maintenance control manual to ensure that it is complete, up to date and appropriately distributed. The AID inspector should also ascertain the efficiency and promptness of the amendment service and determine that all instructions for continued airworthiness issued by the organization responsible for the type design and the States concerned are promptly assessed and circulated to all those who need such information.

2.5.4 Fixed facilities

2.5.4.1 Main base buildings

The inspection should be designed to determine if the buildings to be utilized by the applicant at each base and terminal, including those located in other States, are: properly equipped; provided with the necessary communication equipment, sanitary facilities, security and emergency controls and warnings; and adequate for the operation to be conducted. Such an inspection would include the inspection of hangars, aircraft parts storage, maintenance records storage, technical reference centre, administrative staff and maintenance personnel offices.

2.5.4.2 **Line stations**

Line stations should have the appropriate facilities, equipment and maintenance personnel adequate for the operation to be conducted. The maintenance arrangements should clearly describe the facilities and resources including procedures for maintenance and the authorization of certifying personnel.

2.5.5 **Mobile equipment**

2.5.5.1 As applicable to the operation of the applicant, an evaluation and inspection of the mobile equipment and the procedure for its use should be accomplished. The inspection and evaluation should determine if the equipment required is available, appropriate for the aircraft operated, and in sufficient quantity and quality.

2.5.5.2 Such equipment should include but not be limited to: tow bar, towing vehicles, ground power units, oxygen and compressed gas servicing equipment.

2.5.6 **Aircraft inspection**

2.5.6.1 **Maintenance programme compliance**

2.5.6.1.1 The applicant should demonstrate the bridging from the previous maintenance programme, if necessary, to the current approved maintenance programme and prorate the interval of tasks, as required.

2.5.6.1.2 The applicant should demonstrate on-time compliance with all the maintenance tasks listed in the approved maintenance programme including the tracking, forecasting and planning of all these tasks.

2.5.6.2 **Maintenance records**

2.5.6.2.1 Maintenance records, as described in the maintenance control manual, should be available for all aircraft, particularly compliance with all MCAI and description and certification of all major modifications and repairs.

2.5.6.2.2 The tracking, follow-up and rectification of defects, MEL and CDL items' procedures should be verified for their functionality.

2.5.6.3 **Aircraft physical inspection**

2.5.6.3.1 Depending on the number of aircraft involved and the defects found during the inspection, the AID inspector should inspect at least one aircraft of each type.

2.5.6.3.2 The inspection should extend to a general condition of the aircraft interior and exterior.

2.5.6.3.3 The detail of the aircraft interior inspection should be to the extent to ensure that:

- a) all the on-board emergency and safety equipment is in the designated location and the equipment has been maintained in accordance with the maintenance programme;
- b) all required documentation is on board: AFM, MEL and CDL; and

- c) log book and defects' rectification procedures meet the maintenance control manual.

2.5.6.3.4 The detail of the aircraft exterior inspection should be to the extent to detect:

- a) evidence of fuel leaks;
- b) evidence of oil leaks;
- c) damaged components or aircraft structure damage; and
- d) engine and landing gear damage.

2.6 CERTIFICATION PHASE

2.6.1 Final preparation for the issuance of an AOC

2.6.1.1 The CAA project manager will have to notify the applicant of all discrepancies that need to be resolved before an AOC and its associated operations specifications can be issued.

2.6.1.2 Following the satisfactory completion of the inspections described in this chapter and the required correction of any deficiencies by the applicant, AID inspectors should submit to the inspector-in-charge their recommendations as to the applicant's ability, in respect of maintenance, to safely carry out the proposed operation. These recommendations should of course be accompanied by inspection reports and other documentation to substantiate the recommendation.

2.6.1.3 Typically, the operations section within the CAA would take the lead for an AOC certification with support from the airworthiness section. It is therefore imperative that the AID and OPS sections of the CAA coordinate with one another, and that there is documented evidence that both organizations have participated in the issuance of the AOC.

2.6.1.4 The project manager will provide appropriate recommendations on the issuance or denial of an AOC to the CAA.

2.6.2 Period of validity of an air operator certificate and the associated operations specifications

2.6.2.1 Annex 6 provides for the date of issuance and an expiry date to be entered on an AOC. In practice, States vary in the application of a period of validity to an AOC and the associated operations specifications. Some States apply a specific period and some do not. Generally a period of validity, if applied, should not be less than two years. If the AOC is issued with no limit on the period of validity, the AOC should be appropriately annotated (e.g. "Expiry date: Valid until revoked, suspended or cancelled").

2.6.2.2 In general, an AOC or any portion of an AOC issued by the State of the Operator remains valid until:

- a) the CAA amends, suspends, revokes or otherwise terminates the certificate;
- b) the AOC holder surrenders the certificate to the CAA;
- c) the AOC holder suspends operations for more than a period determined and published in the State regulations; or

- d) the expiry date (if any).

2.6.3 Amendments to the air operator certificate and the operations specifications

2.6.3.1 Any subsequent changes to the operation specified or to the equipment approved for use will necessitate amendments to the operations specifications. It is appropriate that an AOC will itself be a very basic document and that all aspects of the operation that might be the subject of change would be dealt with in the associated operations specifications.

Note.— Provisions for the content of the air operator certificate and its associated operations specifications are contained in Annex 6, Part I, 4.2.1.5 and 4.2.1.6 and Part III, Section 2, 2.2.1.5 and 2.2.1.6.

2.6.3.2 The process for the amendment of operations specifications will be similar to the original certification process, with the exception that in many cases it will be far less complex, depending upon the subject of the change that necessitates the amendment. Where changes involve new types of operation, new geographical areas or new aircraft the appropriate level of complexity will have to be applied to the process.

2.6.4 Renewal of an air operator certificate

2.6.4.1 Annex 6, Part I and Part III, Section II state that the continuing validity of an AOC is dependent upon an operator maintaining the requirements for an adequate organization, method of control and supervision of flight operations, training programme as well as ground handling and maintenance arrangements consistent with the nature and extent of the operations specified in the AOC and the associated operations specifications, under the supervision of the State of the Operator.

2.6.4.2 Whether an AOC has a specific expiry date or not, the State of the Operator is required to conduct continuing surveillance of the operator and thus to continuously determine that the AOC remains valid, as described in Part IV of this manual.

2.6.4.3 Should the State's regulations prescribe a specific duration for an AOC or an expiration date, the operator needs to apply for renewal of the AOC prior to the expiration date. The request for renewal should contain the same basic information (see 2.3 of this Chapter) that was submitted prior to the original certification and should be received by the CAA well in advance of the expiration date of the AOC. In all cases where formal renewal is a requirement, such renewal should not involve a complete recertification procedure and thus will not be an onerous or prolonged process, because of the continuing surveillance exercised by the State of the Operator.

2.6.4.4 The State should develop a procedure for the renewal of the AOC. The process could be administrative in nature or could be considered as part of the continuing surveillance exercised by the State of the Operator. If the process is to be considered surveillance, the State's procedure should identify the critical elements to be inspected before renewal. Critical elements can also be determined and inspected on the basis of a risk assessment exercise so that the aspects of the operation that involve the greatest risk should receive more frequent attention.

2.6.4.5 Aircraft surveillance could be achieved by a non-administrative Certificate of Airworthiness renewal process, by ramp inspection or aircraft inspection during AOC renewal.

Note.— Guidance on the conduct of a ramp inspection is provided in Doc 8335, Part IV, Chapter 3.

Chapter 3

AIRCRAFT MAINTENANCE — MODIFICATIONS AND REPAIRS

3.1 GENERAL

3.1.1 All modifications and repairs must comply with airworthiness requirements acceptable to the State of Registry and must be approved. The State of the Operator should establish a procedure to ensure that modifications and repairs are approved by the State of Registry in accordance with Part III, Chapter 8, of this manual.

3.1.2 The State of the Operator should establish requirements to ensure that air operators have the overall responsibility to ensure that modifications and repairs incorporated in their aircraft are approved by the State of Registry. These requirements should address the compatibility of all design changes incorporated in the aircraft. Procedures should also be established to ensure that the substantiating data supporting compliance with the airworthiness requirements are retained by the air operators and/or aircraft owners.

3.2 COMPATIBILITY OF MODIFICATIONS AND REPAIRS

3.2.1 Introduction

Modifications and repairs may be designed by the same organization that operates the aircraft into which they are incorporated. In a more general case, however, the organization that designs and obtains design approval for the modification or repair, the operator of the aircraft, and the organization that installs the design change on the aircraft may all be different. The operator's and installer's separate responsibilities are discussed below.

3.2.2 Responsibilities of installers

Because the holder of a design approval for a particular modification or repair cannot be expected to be aware and to have conducted analyses and tests for all the possible design changes installed on all aircraft of a given type, the installer has some responsibility to verify compatibility with other modifications and repairs before installing any design change. As stated in the following paragraph, the ultimate responsibility remains with the operator. The installer should survey the aircraft records and the aircraft itself to determine what other design changes exist on the aircraft. Any questions of incompatibility with other modifications or repairs arising from the survey should be referred for resolution to the operator.

3.2.3 Responsibilities of air operators

3.2.3.1 Air operators have the overall responsibility to ensure the compatibility of all design changes incorporated in their aircraft. The air operator contracting with an installer for incorporation of any aircraft modification or repair should provide the installer with information on all existing design changes to the aircraft so that compatibility may be verified. Any questions of design change incompatibility which may arise during installation or in service should be thoroughly investigated by consultation with the approval authority or approval holder. In every case of incompatibility between modifications or repairs, the problem must be corrected and it must be established to the satisfaction of the CAA of the State of Registry that the modified aircraft continues to comply with the applicable standards of airworthiness.

3.2.3.2 The air operator should promptly report any design change incompatibilities detected during installation or in service to the approval holder, to the installer and to its own airworthiness authority.

3.3 RETENTION OF MODIFICATION AND REPAIR DATA AND RECORDS

3.3.1 Introduction

Annex 6 places responsibility for the retention of modification and repair data and records on both the approval holder and the operator. In the case where the air operator is also the design holder, the operator must retain both sets of records (see Section 3.3.2 below for the operator's responsibilities regarding the retention of modification and repair data).

3.3.2 Responsibilities of air operators

3.3.2.1 The records required will vary with the complexity of the design change. In addition to the records of design approval and return-to-service approval, the following lists the kind of data that may be included, as applicable:

- a) a master drawing list and the individual drawings, photographs, specifications and records which identify the design change and location on the aeroplane;
- b) mass and moment change records; and
- c) a record of any change in electrical load caused by incorporation of the design change.

3.3.2.2 Part of the records should include a supplemental type certificate (STC) or equivalent document, or SB or structural repair manual reference, if applicable.

3.3.2.3 Annex 6, Part I, 8.4.2, and Part III, Section II, 6.4.2, require that the details of modifications and repairs to an aircraft and its major components be retained for a minimum period of 90 days after the unit to which the records refer has been permanently withdrawn from service. Annex 6, Part I, 8.4.3 and Part III, Section II, 6.4.3 require that in the event of a temporary change of operator, the records be made available to the new operator; and, in the event of any permanent change of operator, the records be transferred to the new operator.

3.3.2.4 Supplements to the approved aircraft flight manual, maintenance instructions, instructions for continuing airworthiness and repair instructions pertaining to a modification or repair are operating data that the operator should incorporate into the existing operating data for the aircraft. Since these supplements become a permanent part of the operator's operating instructions or instructions for continuing airworthiness, they need not be retained as part of the records required by Annex 6, Part I, 8.4.1 c) and Part III, Section II, 6.4.1 c). The operator should record the incorporation of the required supplements in the appropriate revision logs.

Chapter 4

CONTINUING AIRWORTHINESS OF AIRCRAFT

Note.— General information on the codes of airworthiness adopted and used by individual Contracting States is published in The Continuing Airworthiness of Aircraft in Service (ICAO Circular 95). The Online Airworthiness Information Network launched in October 2014 replaces and expands on Circular 95.

4.1 INTRODUCTION TO THE CONCEPT OF CONTINUING AIRWORTHINESS

4.1.1 Continuing airworthiness covers the processes that require all aircraft to comply with the airworthiness requirements in their type certification basis or imposed as part of the State of Registry's requirements and to be in a condition for safe operation, at any time during their operating life.

4.1.2 Under the control of the respective CAA of the State of Design, the State of Registry and, when appropriate, the State of the Operator, continuing airworthiness includes the following:

- a) design criteria which provide the necessary accessibility for inspection and permit the use of established processes and practices for the accomplishment of maintenance;
- b) information that identifies the specifications, methods and procedures necessary to perform the continuing airworthiness tasks identified for the aircraft and the tasks necessary to maintain the aircraft, as developed by the type design organization; and publication of this information in a format that can be readily adapted for use by an operator;
- c) adoption by the operator into its maintenance programme of the specifications, methods and procedures necessary to perform the continuing airworthiness tasks identified for the aircraft and the tasks necessary to maintain the aircraft, using the information provided by the type design organization;
- d) the reporting of faults, malfunctions, defects and other significant maintenance and operational information by the operator to the type design organization in accordance with the requirements of the State of Registry and the State of the Operator;
- e) the reporting of faults, malfunctions, defects and other significant maintenance information by the maintenance organization to the type design organization in accordance with the requirements of the State having jurisdiction over the maintenance organization;
- f) the analysis of faults, malfunctions, defects, accidents and other significant maintenance and operational information by the type design organization, the State of Design and the State of Registry and the initiation and transmission of information and recommended or mandatory action to be taken in response to that analysis;
- g) consideration of the information provided by the type design organization and action on the information as deemed appropriate by the operator or the State of Registry, with particular emphasis on action designated as "mandatory";

- h) adoption and accomplishment by the operator of all mandatory requirements with particular emphasis on fatigue life limits and any special tests or inspections required by the airworthiness requirements of the type design of the aircraft or subsequently found necessary to ensure structural integrity;
- i) adoption by the operator into its maintenance programme, supplemental structural inspection programmes and subsequent SIP requirements, taking into consideration the SIP for aeroplanes recommended by the type design organization; and
- j) compliance with SIP for aeroplanes.

4.1.3 The structural integrity programme for aeroplanes may include the following, dependent on the structural design criteria:

- a) supplementary structural inspection programme;
- b) corrosion prevention and control programme;
- c) SB review and mandatory modification programme;
- d) repairs review for damage tolerance; and/or
- e) widespread fatigue damage (WFD) review.

4.2 EXCHANGE AND USE OF CONTINUING AIRWORTHINESS INFORMATION

4.2.1 Introduction

4.2.1.1 Aircraft are designed and certificated to airworthiness Standards. In service, however, faults, malfunctions, defects and other occurrences (service difficulties) may be experienced. To satisfy its responsibilities under the Convention on International Civil Aviation, it is essential that the State of Registry be kept informed of service difficulties by its operators and maintenance organizations.

4.2.1.2 Furthermore, it is also essential that the type design organization and the State of Design be kept informed of service difficulties. The type design organization, receiving this kind of information from all operators of the type of aircraft, is in the best position to develop recommendations to solve the problems of the aircraft in service. The State of Design, being the certificating authority of the type of aircraft will, if necessary, make these recommendations mandatory and initiate changes to the airworthiness requirements, if appropriate.

4.2.1.3 The recommendations issued by the type design organization (e.g. SB) and the information made mandatory by the State of Design (e.g. AD) should be obtained by all operators and their authorities and appropriate actions should be taken.

4.2.1.4 Because it is clear that a proper exchange and use of continuing airworthiness information is essential for the continuing airworthiness of aircraft, relevant requirements are incorporated in Annexes 6 and 8.

4.2.1.5 This part of the manual provides guidance material on these requirements for the State of the Operator.

4.2.2 Responsibilities of the State of the Operator

4.2.2.1 Annex 8, Part II, 4.2.4, states that each Contracting State is responsible for establishing, for aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM, the type of service information that is to be reported to its airworthiness authority by air operators, organizations responsible for type design and maintenance organizations. Procedures for reporting this information should also be established.

4.2.2.2 If the State of the Operator is also the State of Registry the responsibilities described in Part III, Chapter 9 of this manual should also apply.

4.2.3 Responsibilities of the air operator

In accordance with Annex 6, the responsibilities of the operator are as follows:

- a) the operator of an aeroplane over 5 700 kg and a helicopter over 3 175 kg MTOM should monitor and assess maintenance and operational experience with respect to continuing airworthiness and provide the information as prescribed by the State of Registry and report through the system specified in Annex 8, Part II, 4.2.3 f) and 4.2.4. This is similarly required in Annex 6, Part I, 8.5.1 and Part III, 6.5.1; and
- b) the operator of an aeroplane over 5 700 kg and a helicopter over 3 175 kg MTOM should obtain and assess continuing airworthiness information and recommendations available from the type design organization and should implement resulting actions considered necessary in accordance with a procedure acceptable to the State of Registry (Annex 6, Part I, 8.5.2 and Part III, 6.5.2).

4.3 NOTIFICATION TO THE STATE OF DESIGN

If the State of the Operator is also the State of Registry, the requirements described in Part III, Chapter 9, of this manual should also apply.

4.4 ACTION BY THE STATE OF THE OPERATOR UPON RECEIPT OF MANDATORY CONTINUING AIRWORTHINESS INFORMATION

4.4.1 If the State of the Operator is also the State of Registry, the requirements described in Part III, Chapter 9, of this manual should also apply.

4.4.2 When the State of the Operator is different from the State of Registry, the operator should comply with all applicable MCAI made mandatory by the State of Registry.

4.5 TRANSMISSION TO THE STATE OF DESIGN OF MANDATORY CONTINUING AIRWORTHINESS INFORMATION ISSUED BY STATE OF THE OPERATOR

If the State of the Operator is also the State of Registry, the requirements described in Part III, Chapter 9, of this manual should also apply.

4.6 TRANSMISSION OF INFORMATION ON FAULTS, MALFUNCTIONS, DEFECTS AND OTHER OCCURRENCES TO THE ORGANIZATION RESPONSIBLE FOR THE TYPE DESIGN

4.6.1 If the State of the Operator is also the State of Registry, the requirements described in Part III, Chapter 9, of this manual should also apply.

4.6.2 When the State of the Operator is different from the State of Registry, the air operator should provide the information as prescribed by the State of Registry (Annex 6, Part I, 8.5.1 and Part III, Section II, 6.5.1).

4.7 INFORMATION TO BE REPORTED TO THE CIVIL AVIATION AUTHORITY

4.7.1 Air operators, organizations responsible for type design and maintenance organizations should report to their airworthiness authority service information such as all faults, malfunctions, defects and other occurrences which cause or might cause adverse effects on the continuing airworthiness of the aircraft.

4.7.2 The State of the Operator should establish a system to collect this information with a detailed procedure describing the reporting process by the air operators.

4.7.3 Some States have established a service difficulty reporting system. Organizations in these States should report information on faults, malfunctions and defects through this system (Section 4.8 of this chapter provides information on such systems).

4.7.4 When the State of the Operator is different from the State of Registry, the air operator should report to the airworthiness authorities of the State of the Operator and the State of Registry.

4.8 SERVICE DIFFICULTY REPORTING SYSTEM

4.8.1 General

4.8.1.1 The Service Difficulty Reporting System (SDR) is established to support the CAA in its mandate to foster an acceptable level of safety by:

- a) promoting product safety improvement;
- b) detecting trends (as opposed to isolated cases); and
- c) giving the CAA the necessary tools to discharge the State of Registry's obligations with regard to continuing airworthiness information, as set forth in Annex 8, Part II, 4.2.3 f) and 4.2.4.

4.8.1.2 The current aircraft population is too large to achieve full knowledge of all potential safety problems solely through inspection. The SDR assists in effective decision making, manpower utilization and enhancement of safety. A properly implemented SDR provides the intelligence needed to assess defects, institute early corrective action and thus assist in accident prevention.

4.8.1.3 The SDR is a feedback system which provides a most effective resource for decision making on matters of reliability and airworthiness. The level of sophistication of the SDR can range from the use of advanced computers with immediate readout capabilities, to manual programmes which utilize a reporting form that is completed by the operator and manually processed by the regulatory agencies.

Note.— Future development of the SDR could result in worldwide sharing of service difficulty information such as is being done now with the ICAO coordinated accident/incident reporting programme (European Coordination Centre for Accident and Incident Reporting System (ECCAIRS)).

4.8.2 Sources of information for the SDR

SDRs should be received from certificate holders such as air operators, AMOs, organizations responsible for type design and from any source having access to aviation safety information, such as air traffic control. Significant malfunctions, failures or conditions brought to the attention of or noted by the AID inspector during surveillance of aviation industry activities should also be reported.

4.8.3 Guidelines for reporting

4.8.3.1 CAA regulations should require certificate holders to submit specified information to the AID. The reports should be submitted on a common form. The regulations should require a report for each malfunction, failure or defect that occurs under the reportable categories. Similar failures that continue to occur should be reported so that the manufacturer and the State of Manufacture are aware of trends that may be developing. In addition, each operator should report any other failure, malfunction or defect in an aircraft that occurs or is detected at any time if, in the operator's opinion, that failure, malfunction or defect has endangered or may endanger the safe operation of an aircraft.

Note.— Examples of forms and methods used for handling SDRs by Contracting States may be found in ICAO Circular 95.

4.8.3.2 Each operator should report the occurrence or detection of each failure, malfunction or defect concerning at least the following:

- a) fires during flight and whether or not a fire warning system was installed and functioned properly;
- b) false fire warning during flight;
- c) an engine exhaust system that causes damage during flight to the engine, adjacent structure, equipment or components;
- d) an aircraft component that causes accumulation or circulation of smoke, vapour, or toxic or noxious fumes in the crew compartment or passenger cabin during flight;
- e) engine shutdown during flight because of flameout;
- f) engine shutdown during flight when external damage to the engine or aircraft structure occurs;
- g) engine shutdown during flight due to foreign object ingestion or icing;
- h) shutdown during flight of more than one engine;
- i) a propeller feathering system or ability of the system to control over-speed during flight;

- j) a fuel or fuel dumping system that affects fuel flow or causes hazardous leakage during flight;
- k) a landing gear extension or retraction, or opening or closing of landing gear doors during flight;
- l) brake system components that result in loss of brake actuating force when the aircraft is in motion on the ground;
- m) aircraft structure that requires significant repair;
- n) cracks, permanent deformation, or corrosion of aircraft structure, if more than the maximum acceptable to the manufacturer or the CAA;
- o) aircraft components or systems that result in taking emergency actions during flight (except action to shut down an engine);
- p) each interruption to a flight, unscheduled change of aircraft en route, or unscheduled stop or diversion from a route, caused by known or suspected mechanical difficulties or malfunctions;
- q) the number of engines removed prematurely because of malfunction, failure or defect, listed by make and model and the aircraft type in which it was installed; and
- r) the number of propeller featherings in flight, listed by type of propeller and engine and aircraft on which it was installed.

4.8.3.3 The reports required of the operator should be submitted in writing to the State's organization and, in the timeframe, identified in the approved air carrier operations specifications.

4.8.4 Significant reports

4.8.4.1 The following significant reports warrant immediate notification of the appropriate State organization by any acceptable means:

- a) primary structure failure;
- b) control system failure;
- c) fire in the aircraft;
- d) engine structural failure; or
- e) any other condition considered an imminent hazard to safety.

4.8.4.2 The report should follow the format of the SDR and, being of an alert nature, should contain the following information when available and relevant:

- a) aircraft owner's name and address;
- b) whether accident or incident;
- c) related SBs, service letters, MCAI; and

- d) disposition of the defective parts.

4.8.4.3 The information contained in the telephone call or interim report should be entered on the SDR form and submitted in the normal manner to the AID as soon as possible after the telephone or interim report submission.

4.9 MANDATORY CONTINUING AIRWORTHINESS INFORMATION (MCAI)

4.9.1 General

4.9.1.1 A primary safety function of the airworthiness organization within the CAA is to require correction of unsafe conditions found in an aircraft, aircraft engine, propeller, equipment or instrument or when such conditions develop in other aeronautical products of the same design. The unsafe conditions may be due to design deficiencies, manufacturing defects, maintenance programme deficiencies or other causes. MCAI are the means used to notify aircraft owners and other interested persons of unsafe conditions and to prescribe the conditions under which the aeronautical product may continue to be operated. One of the most commonly used types of MCAI issued by States is an Airworthiness Directive (AD). Some States may also consider as MCAI any mandatory and alert service bulletins issued by the organization responsible for the type design.

4.9.1.2 ADs are generally divided into two categories:

- a) those of an urgent nature requiring immediate compliance upon receipt; and
- b) those of a less urgent nature requiring compliance within a relatively longer period.

4.9.1.3 The contents of ADs include the aircraft, engine, propeller, equipment or instrument type, model and serial numbers affected. Also included are the compliance time or period, a description of the difficulty experienced and the necessary corrective action.

4.9.1.4 A large number of States operate aircraft that have been manufactured or certificated in another State. In order to continue to maintain such aircraft at a level of airworthiness equivalent to that achieved at type certification, the State in which such aircraft are currently registered needs to regularly obtain all information, particularly ADs and SBs issued by the type certification authority, by the type design organization or, on rare occasions, by the airworthiness authority of any other State in which the same type of aircraft are registered, particularly where such information pertains to the continuing airworthiness and the prevention of recurring defects in an aircraft and its components and equipment. It is therefore necessary that each State receive all continuing airworthiness information relating to aircraft on its registry, no matter what State originates the information. It is equally necessary, to facilitate coordinated corrective measures, for the State of Design to receive continuing airworthiness information originated in any other State relating to aircraft it has certificated. Some States, together with commercial organizations, provide information regarding MCAI via the internet.

4.9.2 Responsibility for MCAI

4.9.2.1 *The aircraft owner's responsibilities*

The aircraft owner, as stated on the Certificate of Registration, should only use its aircraft, or knowingly allow its use by others, when the aircraft is in compliance with MCAI issued up to date. If the aircraft owner leases the aircraft or allows another entity to maintain it, the aircraft owner should take effective steps to assure compliance with MCAI. The aircraft owner cannot assume that others will take over the responsibility of maintenance automatically. The situation may call for a written agreement, or a verbal one, depending on circumstances. There should be a clear procedure as to who will take the necessary responsive action to MCAI.

4.9.2.2 **Role of the air operator**

4.9.2.1.1 The manner in which the operator complies with MCAI issued by the State of Registry depends upon the arrangements under which the operator has leased, chartered or otherwise acquired control of an aircraft. The owner may carry out all actions arising out of MCAI or arrange with the operator to accomplish all these actions.

4.9.2.1.2 The air operator will determine by which means it will be kept informed on MCAI. However, the operator must ensure that the MCAI have been implemented in the manner prescribed and refrain from engaging in flight operations contrary to the provisions of the applicable MCAI.

4.9.2.3 **The role of aircraft maintenance engineers or maintenance organizations**

The responsibility of the certifying personnel or maintenance organizations with regard to MCAI compliance should also be clearly understood. Some operators may be under the impression that when they submit their aircraft for maintenance, or a progressive inspection, the certifying personnel or AMO will routinely ensure that all MCAI in effect on that date are complied with before signing off on the inspection. The certifying personnel or AMO are responsible for the work that has been contracted to them or requested of them.

Note.— The responsibility for compliance with MCAI rests with the owner of the aircraft.

Chapter 5

AIRWORTHINESS REQUIREMENTS FOR EXTENDED DIVERSION TIME OPERATIONS (EDTO)

5.1 GENERAL

5.1.1 This chapter provides guidance on the continuing airworthiness and airworthiness approval for EDTO. These operations are defined in Annex 6, Part I, 4.7, as is when an airworthiness approval is required,.

5.1.2 EDTO is an evolution of ETOPS (extended range twin engine operations) based on industry best practices and lessons learned from over 25 years of ETOPS operations. Annex 6, Part I, Chapter 4, defines the requirements for operations beyond 60 minutes from an en-route alternate aerodrome and also the EDTO requirements for aeroplanes with more than two turbine engines and aeroplanes with two turbine engines.

Note.— EDTO may be referred to as ETOPS in some documents.

5.1.3 Annex 6, Part I, 4.7, provides for the basic requirements for the approval of EDTO. Attachment D of the Annex contains guidance on the setting of a threshold time, maximum diversion time and the means of achieving the required level of safety. Chapter 5.2 of this manual contains the airworthiness considerations for aeroplanes with more than two turbine engines, and the subsequent chapters contain guidance on the continuing airworthiness and airworthiness approval for aeroplanes with two turbine engines.

5.1.4 Many airworthiness considerations for flight dispatch may already be incorporated into approved programmes for other aeroplanes or non-EDTO, the nature of EDTO necessitates a re-examination of these programmes to ensure that they are adequate for this purpose. System redundancy levels appropriate to EDTO should be reflected in the master minimum equipment list (MMEL). An air operator's MEL may be more restrictive than the MMEL considering the kind of EDTO proposed and equipment and service problems unique to the operator.

5.1.5 An EDTO-significant system is a system whose failure or degradation could adversely affect the safety of an EDTO flight or whose continued functioning is important to the safe flight and landing of an aeroplane during an EDTO diversion. Such systems may include, but are not limited to:

- a) electrical systems, including battery;
- b) hydraulics;
- c) pneumatic systems;
- d) flight instrumentation;
- e) fuel systems;
- f) flight controls;
- g) ice protection systems;

- h) engine start and ignition;
- i) propulsion system instruments;
- j) navigation and communications;
- k) propulsion;
- l) auxiliary power units;
- m) air conditioning and pressurization;
- n) cargo fire suppression;
- o) engine fire protection;
- p) emergency equipment; and
- q) any other equipment required for EDTO.

5.2 AIRWORTHINESS CONSIDERATIONS FOR AEROPLANES WITH MORE THAN TWO TURBINE ENGINES

5.2.1 The most limiting EDTO significant system time limitation, if any, must be indicated in the aircraft flight manual (directly or by reference) and relevant to that particular operation.

5.2.2 There are no additional EDTO airworthiness certification, maintenance procedures or maintenance programme requirements for aeroplanes with more than two engines.

5.3 AIRWORTHINESS CONSIDERATIONS FOR AEROPLANES WITH TWO TURBINE ENGINES

5.3.1 General

5.3.1.1 In considering an application from an operator to conduct EDTO, an assessment should be made of the operator's overall safety record, past performance, training and maintenance programmes. The data provided with the request should substantiate the operator's ability and competence to safely conduct and support these operations and should include the means used to satisfy the considerations outlined in this paragraph. Any reliability assessment obtained, either through analysis or service experience, should be used as guidance in support of operational judgements regarding the suitability of the intended operation.

5.3.1.2 Operators without such experience should establish a programme that results in a high degree of confidence that the operator is able to safely conduct and support these operations and should include the means used to satisfy the considerations outlined in this paragraph.

5.3.2 Assessment of the operator's propulsion system reliability

5.3.2.1 A determination should be made of the operator's capability to achieve and maintain an acceptable level of propulsion system reliability based on the operator's past experience or a process review.

5.3.2.2 For operators with past experience, this determination should include trend comparisons of the operator's data with other operators as well as the world fleet average values and the application of a qualitative judgement that considers all of the relevant factors. The operator's past record of propulsion system reliability with related types of engines should be reviewed, as well as its record of achieved systems reliability with the airframe-engine combination for which authorization is sought to conduct EDTO.

5.3.2.3 Operators without such experience should establish a programme that results in a high degree of confidence that the propulsion system reliability appropriate to the EDTO would be maintained.

5.3.3 Engineering modifications and maintenance programme considerations

Although these considerations are normally part of the operator's continuing airworthiness programme, the maintenance and reliability programme may need to be supplemented in consideration of the special requirements of EDTOs (see Sections 5.4 and 5.5). The following items, as part of the operator's programme, should be reviewed to ensure that they are adequate for EDTO.

- a) *Engineering modifications.* The operator should provide to the State of Registry and, where applicable, to the State of the Operator the titles and numbers of all modifications, additions and changes which were made in order to substantiate the incorporation of the configuration maintenance and procedures (CMP) requirement in the aeroplanes used in EDTO;
- b) *Maintenance procedures.* Changes to established maintenance and training procedures, practices or limitations are required in order to qualify for EDTO. These changes should be submitted to the State of the Operator and, where applicable, to the State of Registry before such changes may be adopted. Such procedures will include but are not limited to:
 - i) EDTO training for maintenance personnel;
 - ii) maintenance procedures to ensure the same aircraft technician does not perform maintenance on the same element of identical but separate EDTO significant systems during the same check or visit;
 - iii) maintenance procedures to preclude identical action being applied to multiple similar elements in any EDTO significant system; and
 - iv) parts control procedures;
- c) *Reliability reporting.* The reliability reporting programme, supplemented as appropriate and approved, should be implemented prior to, and continued after, approval of EDTO. Data from this process should result in a suitable summary of problem events, reliability trends and corrective actions and should be provided regularly to the State of the Operator and to the concerned aircraft and engine manufacturers;
- d) *Modifications and inspections implementation.* Approved modifications and inspections that would maintain the reliability objective for the propulsion system and aircraft systems as a consequence of AD actions, updated instruction for continued airworthiness and revised CMP standards should be promptly implemented. Other recommendations made by the engine and aircraft manufacturers should also be considered for prompt implementation. This would apply to both installed and spare parts;

- e) *Aeroplane dispatch and verification procedures.* Procedures and centralized control processes should be established which would preclude an aeroplane's being dispatched for EDTO after propulsion system shutdown or primary aircraft system failure on a previous flight, or significant adverse trends in system performance, without appropriate corrective action having been taken. Confirmation of such action as being appropriate may, in some cases, require successful completion of verification in a flight. Such verification may be accomplished in a non-revenue flight or a revenue flight with non-EDTO. If such verification is to be conducted on a regular scheduled revenue flight with EDTO, then the verification of the affected system should be satisfactorily completed prior to reaching the extended diversion time entry point. The operator should establish verification flight procedures;
- f) *Maintenance programme.* The operator's maintenance programme should ensure that the aircraft and propulsion systems will continue to be maintained at the level of performance and reliability necessary for EDTO. This includes such programmes as an engine condition monitoring programme and an engine oil consumption monitoring programme and, if appropriate, an APU in flight start monitoring programme;
- g) *Considerations affecting contracted maintenance.* Maintenance personnel involved in EDTO should be aware of any potential additional requirements of the maintenance programme associated with it and should be trained accordingly. When maintenance is contracted, the operator needs to ensure that the maintenance and all airworthiness flight dispatch procedures are performed to the requirement as defined in the operator's MCM, and personnel are trained in accordance with its training programme.

5.4 CONTINUING SURVEILLANCE

5.4.1 The State of the Operator should monitor all aspects of the operation it has authorized in order to ensure that the level of reliability achieved in EDTO remains at the necessary level and that the operation continues to be conducted safely. In the event that an acceptable level of reliability is not maintained, that significant adverse trends exist or that significant deficiencies are detected in the design or the conduct of the operation, the State of the Operator should initiate a special evaluation, impose operational restrictions, if necessary, and stipulate corrective action for the operator to adopt to resolve the problems in a timely manner or suspend the EDTO authorization unless there is a corrective action plan acceptable to the CAA.

5.4.2 Causes of engine in-flight shutdown or other engine/propulsion system problems may be associated with design problems and/or maintenance and operation procedures applied to the aeroplane. It is important to identify the root cause of events so that the appropriate corrective action is implemented. An operator should not be considered responsible for the occurrence of a design-related event in its fleet. However, maintenance or operational problems may be wholly or partially the responsibility of the operator. If an operator has an unacceptable engine in-flight shutdown rate attributed to maintenance or operational practices, then action tailored to that operator may be required by the State of the Operator.

5.4.3 A high rate of engine in-flight shutdowns for a small fleet may be due to the limited number of engine operating hours and may not be indicative of an unacceptable rate. The underlying causes for such a jump in the rate will have to be considered by the State.

5.4.4 The State of the Operator should alert the State of Design when a special evaluation is initiated and provide for its participation independent of the determined cause.

5.5 MAINTENANCE REQUIREMENTS

5.5.1 Introduction

The operator's maintenance control system which comprises the maintenance control manual (MCM) and aircraft maintenance programme should include the requirements, guidance and direction necessary to support the intended EDTO. Maintenance personnel involved should be made aware of the special nature of EDTO and have the knowledge, skills and ability to accomplish the requirements of the programme.

5.5.2 Maintenance programme

5.5.2.1 The basic maintenance programme for the aircraft being considered for EDTO should be the continuing airworthiness maintenance programme currently approved for that operator, for the make and model airframe-engine combination. This programme should be reviewed to ensure that it provides an adequate basis for development of EDTO maintenance requirements. These should include maintenance procedures to preclude common cause human failures without proper verification processes or operational testing prior to EDTO. For two-engine aeroplanes, the same person should not perform maintenance action on the same element of identical, but separate, maintenance significant systems during the same routine or non-routine visit. If such dual maintenance actions cannot be avoided, the State of the Operator may allow use of adequate ground tests, inspection procedures, a verification flight or other approved maintenance procedures to preclude common cause human failure modes.

5.5.2.2 If EDTO-related tasks are identified, then these tasks should be included on the operator's routine work forms and related instructions.

5.5.2.3 EDTO-related procedures, such as involvement of centralized maintenance control, should be clearly defined in the operator's programme.

5.5.2.4 A service check should include verification that the status of the aircraft and certain critical items are acceptable for an EDTO flight. This check should be accomplished and certified by an EDTO authorized maintenance person prior to an EDTO flight.

5.5.2.5 Log books should be reviewed and documented as appropriate to ensure proper MEL procedures, deferred items and maintenance checks and that system verification procedures have been performed.

5.5.3 EDTO manual

The operator should supplement the MCM with the maintenance procedures required to support the EDTO. Alternatively, the operator may develop a manual for use by personnel involved in EDTO. This manual need not include, but should at least refer to the maintenance programme and other requirements described by this chapter and clearly indicate where they are located in the operator's manual system. All EDTO requirements, including supportive programme procedures, duties and responsibilities, should be identified and be subject to revision control.

5.5.4 Maintenance training

Maintenance training should take into account the requirements of an EDTO. These requirements should be included in normal maintenance training. The goal of this programme is to ensure that all personnel involved in EDTO are provided with the necessary training so that the EDTO maintenance tasks are properly accomplished and to emphasize the special nature of EDTO maintenance requirements. Qualified maintenance personnel are those that have completed the operator's or manufacturer's training programme which includes the requirements identified above.

5.5.5 Parts control

The operator should develop a parts control programme that ensures the proper parts and configuration are maintained for EDTO. The programme includes verification that parts placed on an EDTO certified aircraft during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the necessary EDTO configuration for that aircraft. A list of EDTO significant parts should be established and the parts identified as EDTO significant when received and stored.

5.5.6 Verification programme

The operator should develop a verification programme or establish procedures to ensure the appropriate corrective action is taken following an engine shut-down, primary system failure, adverse trends or any prescribed events. The corrective action taken may include a verification flight. The operator should also establish means to assure their accomplishment. A clear description of who should initiate verification actions and the section or group responsible for the determination of what action is necessary should be identified in the programme. Primary systems or conditions requiring verification actions should be described in the operator's MCM or EDTO manual.

5.5.7 Reliability programme

5.5.7.1 A reliability programme that focuses on EDTO significant systems must be established. If a reliability programme already exists, it must be supplemented, as applicable, to take account of EDTO. The programme must be designed with early identification and prevention of an EDTO-related significant event when operating EDTO as the primary goal as well as ensuring that the minimum EDTO reliability levels are maintained. The programme must be event-oriented and incorporate reporting procedures for significant events and trends detrimental to EDTO flights. This information must be readily available for use by the air operator and the State of the Operator to help establish that the reliability level is adequate and to assess the air operator's competence and capability to safely continue EDTO. An EDTO reporting programme must be established which ensures that the State of the Operator is notified, at least monthly, of the previous month's activities or more often if adverse trends reportable through this programme are identified.

5.5.7.2 Procedures for the reduction of the EDTO diversion time must be established and implemented if:

- a) a significant event is identified on any flight, including non-EDTO flights, involving the air operator's EDTO-certified aircraft type; or
- b) an adverse trend is identified through the reliability programme; or
- c) the root cause of an EDTO significant reliability issue is not identified and/or if there is no identified corrective action.

The person responsible for maintenance in accordance with Annex 6, Part I, 8.1.4, must have the authority to initiate the reduction of the approved EDTO diversion time.

5.5.7.3 Where reliability data indicate that the propulsion system reliability as per 5.3.2 of this chapter is no longer being met, the State of the Operator must be notified of the corrective measures taken. Where the "minimum criteria" are no longer being met, the air operator must reduce the EDTO diversion time to that specified level as determined by the State of the Operator for the particular in-flight shut down (IFSD) rate noted. An IFSD could be discounted pursuant to conditions such as:

- a) the IFSD is not the result of any action or inaction on the part of the air operator; or

- b) the IFSD is not the result of any action or inaction on the part of the maintenance provider; or
- c) the IFSD is the result of an operational incident such as a bird strike at low altitude.

When discounting of IFSD, the operator and the State of the Operator must have consensus.

5.5.7.4 Failure of an operator to reduce the maximum diversion time when required constitutes grounds for removal of EDTO approval.

5.5.7.5 In addition to the items required to be reported to the State of the Operator, the following items should be included in the reporting programme:

- a) in-flight shut-downs;
- b) diversion or turn-back;
- c) uncommand power changes or surges;
- d) inability to control the engine or obtain desired power; and
- e) significant events or adverse trends with EDTO significant systems.

5.5.7.6 The report should also identify the following:

- a) aircraft identification (make and serial number);
- b) engine identification (make and serial number);
- c) total time, cycles and time since last shop visit;
- d) time since overhaul or last inspection of the defective unit;
- e) phase of flight; and
- f) corrective action.

5.5.8 Oil consumption programme

The operator's oil consumption programme should reflect the manufacturer's recommendations and be sensitive to oil consumption trends. It should consider the amount of oil added at all stations with reference to the running average consumption, i.e., the monitoring should be continuous up to, and including, oil added at the departure station. If oil analysis is relevant to this make and model, it should be included in the programme. If the auxiliary power unit is required for EDTO, it should be included in the oil consumption programme.

5.5.9 Engine condition monitoring

5.5.9.1 This programme should describe the parameters to be monitored, method of data collection and corrective action process. The programme should reflect manufacturer's instructions and industry practice. This trend monitoring should be used to detect deterioration at an early stage to allow for corrective action before safe operation is affected.

5.5.9.2 The programme needs to ensure that engine limit margins are maintained so that a prolonged one-engine inoperative diversion may be conducted without exceeding approved engine limits (e.g. rotor speeds, exhaust gas temperatures) at all approved power levels and expected environmental conditions. Engine margins preserved through this programme should account for the effects of additional engine loading demands (e.g. anti-ice and electrical) which may be required during the one-engine inoperative flight phase associated with a diversion.

5.5.10 Propulsion system monitoring

The operator's assessment of propulsion systems' reliability for the EDTO fleet should be made available to the State of the Operator (with the supporting data) on at least a monthly basis to ensure that the approved maintenance programme continues to maintain the level of reliability necessary for the operator's extended diversion time operational authorization. The assessment should include, at a minimum, engine hours flown in the period, in-flight shut-down rate for all causes and engine removal rate computed on a twelve-month rolling average basis. Any adverse sustained trend would require an immediate evaluation to be accomplished by the operator in consultation with the State of the Operator. The evaluation may result in corrective action or operational restrictions being applied.

5.6 REQUIREMENTS FOR SYSTEMS PERFORMANCE AND RELIABILITY ASSESSMENT

5.6.1 Introduction

5.6.1.1 This section provides guidance to the State of Design on the assessment of the level of performance and reliability of aeroplane systems and associated equipment required by Annex 6, Part I, 4.7.2.

5.6.1.2 The probability of a failure condition happening and the maximum consequences of that failure condition accepted for aircraft certification are as follows:

- a) probable failure conditions are those failure conditions that are anticipated to occur one or more times during the entire operational life of an aircraft. The maximum consequences acceptable are classified as minor. These failure conditions would not significantly reduce aircraft safety and involve flight crew actions that are well within their capabilities but the following may occur:
 - i) a slight reduction in safety margins or functional capabilities;
 - ii) a slight increase in flight crew workload; or
 - iii) some physical discomfort to passengers or cabin crew;
- b) remote failure conditions are those failure conditions that are unlikely to occur to each aircraft during its total life but which may occur several times when considering the total operational life of a number of aircraft of the same type. The maximum consequences acceptable are classified as major. These failure conditions would reduce the capability of the aeroplane or the ability of the flight crew to cope with adverse operating conditions to the extent that the following would occur:
 - i) a significant reduction in safety margins or functional capabilities;
 - ii) a significant increase in flight crew workload or in conditions impairing flight crew efficiency; or

- iii) a discomfort to the flight crew or physical distress to passengers or cabin crew, possibly including injuries;
- c) extremely remote failure conditions are those failure conditions that are not anticipated to occur to each aircraft during its total life but which may occur a few times when considering the total operational life of all aircraft of the same type. The maximum consequences acceptable are classified as hazardous. These failure conditions would reduce the capability of the aeroplane or the ability of the flight crew to cope with adverse operating conditions to the extent that the following would occur:
 - i) a large reduction in safety margins or functional capabilities;
 - ii) physical distress or an excessive workload such that the flight crew cannot be relied upon to perform their tasks accurately or completely; or
 - iii) serious or fatal injury to some occupant other than the flight crew;
- d) extremely improbable failure conditions are those failure conditions that are so unlikely that they are not anticipated to occur during the entire operational life of all aircraft of the same type. The maximum consequences acceptable are classified as catastrophic. The failure conditions would result in:
 - i) multiple fatalities of the occupants; or
 - ii) incapacitation or fatal injury to a flight crew member normally with the loss of the aircraft.

5.6.2 Reliability requirements

5.6.2.1 Aeroplane system failure or failure combinations which could result in the loss of safe flight and landing capability should be extremely improbable.

5.6.2.2 The risk of failure of any aeroplane system essential to continued safe flight and landing at an aerodrome after the failure of one engine should be extremely improbable.

5.6.2.3 Aeroplane system failure or failure combinations which have an appreciable impact on the capability of the aeroplane or crew to cope with anticipated operating conditions should be extremely improbable.

5.6.3 Reliability assessment

5.6.3.1 Compliance with Annex 6, Part I, 4.7.2, should be shown by assessment of the systems operating separately and in relation to other systems. This assessment should, where necessary, be supported by appropriate flight, ground, or flight simulator tests. Further guidance material is contained in the *Extended Diversion Time Operations (EDTO) Manual*, Doc 10085.

5.6.3.2 The assessment should include: the possible modes of normal operation and of failure; the resulting effects on the aeroplane and occupants considering the stage of flight and operating conditions; the awareness of the crew of the failure conditions and the corrective action required; the capability of detecting failures and the aeroplane inspection and maintenance procedures. Consideration should be given to failure conditions being accompanied or caused by events or errors. In such combinations, allowance may be made for the probabilities of the failure conditions, events and errors.

5.6.3.3 In assessing individual systems, due account should be taken of previous experience with similar systems.

5.6.3.4 The assessment should take account of the variation of performance of the system(s). Statistical distribution of performance parameters may be used.

5.6.3.5 Compliance with reliability levels, which are related to the requirements to catastrophic effects, should not be established on the basis of assessed numerical values alone, unless these values can be substantiated beyond reasonable doubt.

5.6.3.6 The probability of a single failure of a system or component may be accepted as being remote only when the system or component is assessed to have the necessary order of reliability based on either:

- a) service experience which analysis shows to be applicable, supported by analysis and/or testing of the particular design; or
- b) a detailed engineering evaluation of the design supported by testing.

5.6.3.7 The probability of a single failure of a system or component may be assessed as being extremely improbable only when it applies to a particular mode of failure (e.g. jamming) and it can be shown to the satisfaction of the certificating authority from the aspects of construction and installation that such a failure need not be considered as a practical possibility.

5.6.3.8 The probability of crew error combined with system failures may be difficult to substantiate in meaningful statistical terms. In considering the probability of crew errors combined with system failures, an evaluation should be made of the likelihood of such errors and their consequences.

5.6.3.9 In the analysis and demonstration of systems reliability, the expected duration of aeroplane flights associated with EDTO should be given special consideration.

5.6.3.10 The following areas of concern are significant in regard to the extension of range of aeroplanes with turbine engines. As a minimum, these areas should be emphasized in the reliability assessment:

- a) no system or equipment failure or combination of failures, not shown to be improbable, should result in a propulsion system failure, either as a direct result of the failure condition or due to crew action resulting from false or misleading information;
- b) in the event of engine failure, cascading failures or consequential damage or failure of remaining systems or equipment should not preclude continued safe flight and landing of the aeroplane;
- c) in the presence of extended-duration one-engine inoperative operation and considering the resulting limitations on the performance of the aeroplane type, malfunction of remaining systems and equipment should not jeopardize the continued safe flight and landing of the aeroplane or place additional sustained workload on the crew;
- d) during extended duration with one engine inoperative, secondary power (electrical, hydraulic, pneumatic) should continue to be available at the levels necessary to permit continued safe flight and landing. Unless it can be shown that cabin pressure can be maintained with one engine inoperative at the altitude required for continued flight to a suitable aerodrome, oxygen capacity should be available to sustain the passengers and crew for the maximum diversion time; and
- e) the aeroplane is capable of continued safe flight and landing for any single failure or combination of failure conditions of electrical power not shown to be extremely improbable, considering the maximum diversion time the aeroplane is approved for.

5.6.3.11 One of the elements considered for the approval of EDTO is the maturity and reliability of the propulsion system appropriate to the flight duration and the maximum extended diversion time. This is:

- a) for EDTO of 180 minutes or less, the reliability target of the propulsion system should be such that the risk of catastrophic loss of thrust from independent causes is extremely remote; and
- b) for EDTO of greater than 180 minutes, the reliability target of the propulsion system should be such that the risk of catastrophic loss of thrust from independent causes is extremely improbable.

5.6.4 Analysis of failure effects

5.6.4.1 The evaluation of failure and failure combinations should be based on engineering judgement. The analysis should include consideration of the effects of continued flight with one engine inoperative, including allowance for damage that could have resulted from engine failure. Reliability analysis should be used as guidance in verifying that the proper level of redundancy has been provided, unless it can be shown that equivalent safety levels are provided (i.e. the probability of failure is not related to exposure time) or the effects of failure are minor.

5.6.4.2 Consideration should be given to the effects on the flight crew's performance and physiological needs of continued flight with an engine and/or system(s) inoperative.

5.6.4.3 In assessing the effects of failure conditions, account should be taken of:

- a) the variations in the performance of the system, the probability of the failure(s), the complexity of the crew action and the likely frequency of the relevant crew training; and
- b) factors which might alleviate or aggravate the direct effects of the initial failure condition including consequential or related conditions existing within the aeroplane which may affect the ability of the crew to deal with direct effects such as the presence of smoke, aeroplane accelerations, interruption of air-to-ground communication and cabin pressurization problems.

5.6.4.4 *Propulsion system.* Effects of failures, external conditions or crew errors that could jeopardize the operation of the remaining engine(s) under one-engine inoperative conditions need to be examined closely. Examples are:

- a) failures of engine controls;
- b) failures of engine instruments;
- c) failures of auto throttle systems (e.g. engine over speed);
- d) failures of ice detection and ice protection systems;
- e) failures of the fire warning system (e.g. false fire warning);
- f) effects of environmental conditions such as lightning, ice, hail and precipitation on engine operation (the vulnerability of an electronic fuel control to lightning damage is an example);
- g) effects of crew errors;
- h) response to system failures (e.g. fire warning); and
- i) improper engine operation that could result in propulsion system failure (e.g. during altitude changes).

5.6.4.5 *Hydraulic power and flight controls.* Consideration of these systems may be combined since many modern commercial aeroplanes have fully hydraulically powered controls. System redundancy should be provided to ensure that the loss of aeroplane control is extremely improbable. A review should be provided of the redundancy features complemented by a statistical analysis considering exposure times associated with extended diversion time operation.

5.6.4.6 *Electrical power.* Electrical power is provided to a small group of instruments and devices required for safe flight and landing and to a much larger group of instruments and devices needed to allow the flight crew to cope effectively with adverse operating conditions. Multiple sources (engine driven generators, auxiliary power units and batteries) are provided to meet both the safe flight and landing requirements and the adverse condition requirements. A review should be provided of redundancy features supported by a statistical analysis considering exposure times and one-engine inoperative consideration associated with extended diversion time operation.

5.6.4.7 *Equipment conditioning (environmental).* A number of elements of equipment in the primary systems are normally provided with equipment conditioning services. Verification of the ability of the system to provide adequate conditioning for the equipment, considering the exposure time associated with extended-range operation and one-engine inoperative condition, should be based on analysis or test data. The data should establish the conditioning equipment's ability to operate acceptably with the conditioning system operating in normal, standby or backup modes.

5.6.4.8 *Cargo compartment fire suppression.* An analysis or tests should be made to verify that the ability of the fire suppression system to suppress or extinguish fires is adequate to ensure that flight safety is not compromised, considering the maximum diversion time required reaching a suitable aerodrome for landing.

5.6.4.9 *Communication and navigation.* It should be shown that under all combinations of propulsion and/or aeroplane system failures which are not extremely improbable, there will be available a reliable means of communication, a sufficiently accurate means of navigation and any required route and destination guidance needed to comply with contingency procedures and achieve continued safe flight and landing at a suitable aerodrome.

5.6.4.10 *Cabin pressurization.* Loss of cabin pressure can affect the flight crew's ability to cope with adverse operating conditions. A review of redundancy features should be undertaken to ensure that the likelihood of such loss is minimized under one-engine inoperative conditions. Aeroplane performance data should be provided or referenced in the aircraft flight manual to enable the flight crew to verify whether an EDTO can be completed after loss of pressure and subsequent operation at a lower altitude.

5.6.4.11 *Auxiliary power unit.* If the auxiliary power unit is considered an essential item of equipment, it should be capable of restart and operation at any altitude suitable for flight with one engine inoperative.

5.6.4.12 *Fuel systems.* The aeroplane fuel system should maintain the engine inlet fuel pressure and flow to all operable engines throughout any diversion. Fuel necessary to complete the EDTO should be available to the operating engine(s) after an engine failure and other system failures unless the combination is shown to be extremely improbable. Alerts should be displayed to the flight crew when the quantity of fuel available to the engines falls below that level required to complete the operation. These alerts should include provisions for abnormal fuel management or transfer between tanks, and possible loss of fuel.

5.6.5 Assessment of manufacturer's maintenance instructions

5.6.5.1 An assessment should be made of the manufacturer's maintenance instructions with the objective of eliminating the possibility of such errors as could produce hazardous and catastrophic effects during EDTO.

5.6.5.2 Maintenance errors can, in general, be divided into two types:

- a) those errors which increase system failure rates and which can, to some extent, be allowed for in the assessment of failure rates; and
- b) those errors which may result in a condition where a system cannot fulfil its design function. It is not usually possible to quantify such errors. An assessment should be made of the design and of the maintenance instructions with the objective of eliminating the possibility of errors which could produce hazardous and catastrophic effects.

5.6.6 Aircraft flight manual information

For EDTO, at least the following information should be included or referenced in the aircraft flight manual:

- a) the maximum flight time, one engine inoperative, for which the system's and engine's reliability and capacity of time-limited systems has been approved in accordance with the airworthiness requirements established for EDTO;
- b) a list of additional equipment installed to meet the airworthiness requirements for EDTO;
- c) additional performance data, including limitations, and flight procedures appropriate to EDTO; and
- d) a statement to the effect that the aeroplane systems associated with EDTO meet the required airworthiness and performance criteria but that the meeting of such criteria does not by itself constitute approval to conduct EDTO.

5.6.7 Continuing surveillance

The fleet average engine in-flight shut-down (IFSD) rate for the specified airframe-engine combination should be monitored by the State of Design. In the event that an acceptable level of reliability is not maintained, significant adverse trends exist, or if significant deficiencies are detected in the design of the aeroplane or propulsion system, the State of Design should inform the State of Registry and the State of the Operator of appropriate action to be taken.

Chapter 6

LEASING ARRANGEMENTS

6.1 GENERAL

6.1.1 The material in this chapter is intended to provide guidance to States on meeting their responsibilities relating to continuing airworthiness when they are involved, either as the State of the Operator or the State of Registry, in the transfer of aircraft under lease, charter or interchange arrangements.

6.1.2 The purpose of the material in this chapter is to draw the attention of the two airworthiness authorities involved, the State of Registry and the State of the Operator, to problems directly concerning continuing airworthiness which have to be considered when such transfers occur. The samples attached to this chapter may serve as models for the transfer of functions and duties, and, in the case of Article 83 *bis* the responsibilities, from the State of Registry to the State of the Operator.

6.1.3 Authorities should give due consideration to the objectives of continuing airworthiness and to the transfer of information as required in:

- a) Annex 6, Part I, 8.3/Part III, Section II, 6.3 "Maintenance programme";
- b) Annex 6, Part I, 8.4/Part III, Section II, 6.4 "Maintenance records";
- c) Annex 6, Part I, 8.5/Part III, Section II, 6.5 "Continuing airworthiness information";
- d) Annex 6, Part I, 8.6/Part III, Section II, 6.6 "Modifications and repairs";
- e) Annex 6, Part I, 8.7.2 "Maintenance organization's procedures manual";
- f) Annex 6, Part I, 8.7.7 Part III, Section II, 6.8 "Records";
- g) Annex 6, Part I, 8.8/Part III, Section II, 6.7 "Maintenance release";
- h) Annex 6, Part I, 11.2/Part III, Section II, 9.2 "Operator's maintenance control manual"; and
- i) Annex 8, Part II, 4.2, "Responsibilities of Contracting States in respect of continuing airworthiness".

In doing so, the authorities should also take into account the type and length of transfers and should develop administrative procedures and arrangements between the States involved to ensure that the continuing airworthiness of the aircraft is maintained.

6.1.4 Part V of Doc 8335 advises of legal and practical operational problems to be considered by the authorities in the certification of an operator proposing to utilize leased aircraft.

6.1.5 Irrespective of the various types of arrangements and categories of lease, charter and interchange, this chapter will discuss the following issues in relation to the transfer of aircraft between the State of Registry and the State of the Operator:

- a) acceptance of the “type design”;
- b) maintenance;
- c) approval for EDTO;
- d) information on faults, malfunctions and defects and other occurrences;
- e) MCAI; and
- f) distribution of mandatory continuing airworthiness information.

6.2 ACCEPTANCE OF THE TYPE DESIGN

6.2.1 The regulations of the State of Registry generally prescribe the airworthiness and the design-related operational requirements for aircraft registered in that State and operated by an operator under its jurisdiction. However, regulations of the State of the Operator may require foreign-registered aircraft utilized by its operators to comply with the same airworthiness and design-related operational requirements applicable to aircraft on its registry.

6.2.2 Notwithstanding the above, the State of Registry and State of the Operator should, when prescribing the airworthiness and design-related operational requirements, give due consideration to the period of time for which the aircraft is transferred.

6.2.3 Resulting from the above, the following issues should be considered when an aircraft is transferred from the State of Registry to the State of the Operator:

- a) the differences between the type certification basis of the State of Registry and that of the State of the Operator;
- b) the differences between the design-related operational requirements of the State of Registry and those of the State of the Operator; and
- c) the respective responsibilities of the State of Registry and the State of the Operator with respect to the approval of:
 - i) changes to the type design; and
 - ii) repairs which require a design approval before implementation.

6.2.4 In accordance with Annex 8, the State of Registry, unless otherwise transferred under Article 83 *bis*, is responsible for ensuring that the aircraft, and any modification to it, complies with an approved design. To preserve this responsibility, the State of the Operator should not endorse the implementation of any change without prior approval by the State of Registry.

6.2.5 To discharge their respective functions States could enter into bilateral airworthiness and transfer of aircraft arrangements, part of which describe procedures for:

- a) the approval of the changes to the type design;
- b) the performance and the certification of the changes; and
- c) the record-keeping of the changes.

6.3 MAINTENANCE

6.3.1 Annex 6, in Part I, 8.3 and Part III, Section II, 6.3 requires the maintenance programme be approved by the State of Registry. The legislation of a State may require it to approve, or accept for foreign-registered aircraft, the maintenance programme for all aircraft operated by the operators of that State.

6.3.2 Some of the factors influencing the selection of the maintenance to be applied when aircraft are transferred are:

- a) the period of time for which the aircraft is transferred;
- b) the differences between the maintenance requirements of the State of Registry and those of the State of the Operator and the compatibility of their approved maintenance programmes;
- c) the different requirements regarding the approval of the maintenance programme by the State of the Operator and/or of the State of Registry;
- d) the location where the aircraft is operated and the State of the Operator, i.e. the aircraft may be operated in a third State for the duration of the transfer; and
- e) any changes in the aircraft utilization or environmental conditions.

6.3.3 Arrangements and procedures regarding the maintenance, the performance and certification of maintenance, including the signing of maintenance releases and the record-keeping should be acceptable to both the State of Registry and the State of the Operator. These arrangements and procedures could be developed on a case-by-case basis or be the subject of bilateral airworthiness and/or transfer arrangements.

6.3.4 Historically there have been a number of difficulties associated with the maintenance of transferred aircraft. To facilitate transfers in a safe and efficient manner, expanded guidance on maintenance aspects is contained in Attachment D to this chapter.

6.4 APPROVAL FOR EXTENDED DIVERSION TIME OPERATIONS (EDTO)

6.4.1 The approval for conducting EDTO applies to an individual operator and to a specific airframe-engine combination of that operator's fleet. The approval, in general, is not transferable with the aircraft, and EDTO with a transferred aircraft should be the subject of an approval by the State of the Operator.

6.4.2 Where an aircraft is transferred from an authorized EDTO operator to an operator with limited EDTO experience and vice versa, the following factors should be considered:

- a) the degree to which the original operator remains responsible for the EDTO elements of the operation in respect of the aircraft being transferred;
- b) the operator experience with the specific airframe-engine combinations;
- c) the experience level of the acquiring operator flight crew members and maintenance personnel; and
- d) the procedures used to ensure that only an EDTO-certified aircraft will be dispatched on an EDTO segment.

6.4.3 Arrangements and procedures regarding the approval of EDTO with a transferred aircraft should primarily be acceptable to the State of the Operator. Where applicable, the experience of the State of Registry's operator being used to approve the new operator EDTO should be clearly identified in the transfer arrangements.

Note.— General guidance material on the continuing airworthiness requirements for EDTO is contained in Chapter 5 of this part and the EDTO Manual, Doc 10085.

6.5 INFORMATION ON FAULTS, MALFUNCTIONS, DEFECTS AND OTHER OCCURRENCES

6.5.1 Annex 8, Part II, 4.2.3 provides that the State of Registry ensures that there exists a system whereby information on faults, malfunctions, defects and other occurrences is transmitted to the organization responsible for the type design. Furthermore, Annex 8, Part II, 4.2.4 also provides that the Contracting States establish which type of service information is to be reported by operators, organizations responsible for type design, and maintenance organizations.

6.5.2 It is clear from the above that the State of Registry is responsible for ensuring the transfer of information on faults, malfunctions, defects and other occurrences to the organization responsible for the type design. For an operator of an aircraft subject to a transfer, it may not be appropriate, convenient or enforceable to report faults, malfunctions, defects and other occurrences according to the system of the State of Registry. Therefore specific arrangements between the State of Registry and the State of the Operator should be developed to ensure that the information on faults, malfunctions, defects and other occurrences for the aircraft is transmitted to the organization responsible for the type design.

6.5.3 At the time an aircraft is transferred the two authorities and the operators involved should decide which reporting systems and procedures apply, to ensure that the information is transmitted to the organization responsible for the type design and, to the State of Registry.

6.5.4 Some of the factors influencing the selection of the system to be used for reporting information on faults, malfunctions, defects and other occurrences, when aircraft are transferred, are:

- a) the period of time for which the aircraft is transferred;
- b) the compatibility/differences between the reporting system of the State of Registry and that of the State of the Operator;
- c) the absence of a reporting system in the State of the Operator and/or the State of Registry; and
- d) the regulatory requirements of the States involved.

6.6 MANDATORY CONTINUING AIRWORTHINESS INFORMATION (MCAI)

6.6.1 Generally, the State of Registry has prime regulatory responsibility for the airworthiness of the aircraft. If the State of Registry is also the State of Design, it will normally be the originator of MCAI, such as ADs.

6.6.2 If the State of Registry is not the State of Design, it should have procedures in place to respond to MCAI received from the State of Design and should decide whether the information will be made mandatory in its State. When made mandatory, the State of Registry will either issue its own mandatory information or require compliance with that issued by the State of Design.

6.6.3 Notwithstanding 6.6.1 and 6.6.2, the State of Registry, without being the State of Design, may issue MCAI applicable to aircraft registered in its State.

6.6.4 Similarly, the State of the Operator may, by virtue of an agreement with the State of Registry, require MCAI it has issued to be applicable to aircraft operated in its State. In such cases 6.5.4 must be considered before the implementation of the information.

6.6.5 Where an aircraft is transferred from the State of Registry to the State of the Operator, irrespective of the fact that either State could be the State of Design, unnecessary costs may arise if the State of Registry and the State of the Operator impose different MCAI on the same aircraft. It is therefore recommended that:

- a) the Authorities of the State of Registry and of the State of the Operator in consultation with the registered aircraft owner and the air operator of transferred aircraft should determine which of the States' MCAI will apply to the transferred aircraft, before they enter into a transfer agreement; and
- b) the States involved in aircraft transfer should develop administrative procedures to this effect.

6.6.6 The intent of 6.6.5 can be achieved by a general "agreement or arrangement on aircraft transfer" between the States or authorities involved or by individual arrangements at the time of transfer.

6.7 DISTRIBUTION OF MANDATORY CONTINUING AIRWORTHINESS INFORMATION

6.7.1 The MCAI issued by the State of Registry in the form of an AD, or equivalent, or issued by the State of Design and made mandatory by the State of Registry, should be made available to affected operators by the State of Registry. Some States disseminate this mandatory information directly to each registered aircraft owner of an affected aircraft on their registers and rely on the registered aircraft owner to transmit the information to the operator. Other States make the information available through the offices of their airworthiness authorities or also publish the information and make it available by subscription.

6.7.2 As described in 6.6.4 above, the MCAI issued, in certain circumstances, by the State of the Operator, and made mandatory on aircraft registered in another State and operated in its State (State of the Operator), should be made available to affected operators by the State of the Operator.

6.7.3 When an aircraft is transferred to another State, distribution of MCAI by the State of Registry may be accomplished by making the mandatory documents available to the registered aircraft owner, who should be responsible for transmitting them to the air operator. If the State of Registry has an agreement with the State of the Operator to provide surveillance and assistance, or if the State of the Operator wishes to be kept informed regarding transferred aircraft operated by its operators, then the State of Registry should also transmit the MCAI documents to the State of the Operator.

6.8 ATTACHMENTS

6.8.1 As stated in 6.3.4 above, Attachment D entitled "Maintenance aspects of aircraft transfer" is included as guidance material.

6.8.2 In most of the issues referred to in 6.1.4 and discussed in this chapter, the State of Registry and the State of the Operator could enter into a bilateral airworthiness agreement, maintenance agreement or lease agreement, technical arrangement or memorandum of understanding to facilitate the discharge of their respective responsibilities by transferring certain of their functions.

Note.— Examples of such agreements are given in Attachments A, B and C. They are verbatim copies, without names, of agreements and arrangements in effect between States or Authorities. They are included as examples and could be adapted, including their terminology, to particular situations.

6.8.3 Similar arrangements could also be formulated by an exchange of letters between authorities. In formulating these arrangements, due consideration should be given by each State to its knowledge of the airworthiness system of the other State.

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Attachment A to Chapter 6

SAMPLE AGREEMENT ON AIRWORTHINESS BETWEEN CIVIL AVIATION AUTHORITIES

Note.— This example covers the exchange of aeronautical products, the acceptance of airworthiness compliance and certification, the performance of modification and maintenance, the continuing airworthiness, and mutual cooperation and assistance.

AGREEMENT ON AIRWORTHINESS BETWEEN (Name of first Party) and (Name of second Party)

The (Name of first Party) and the (Name of second Party), hereinafter referred to as the “Contracting Parties”,

Whereas:

- each Contracting Party has determined that the standards and systems of the other Contracting Party for the airworthiness and environmental certification or acceptance of aeronautical products are sufficiently equivalent to its own to make an agreement practicable;
- each Contracting Party wishes to develop and employ procedures for granting airworthiness and environmental certification or acceptance of aeronautical products imported from the other Contracting Party so as to give as much recognition as is practicable to technical evaluations, test results, inspections, conformity statements, marks of conformity and certificates accepted or issued by or on behalf of the airworthiness authority of the exporting Party in granting its own domestic certification of such aeronautical products; and
- each Contracting Party wishes, in the interest of promoting aviation safety and preservation of the environment, to foster cooperation and assistance between their airworthiness authorities in achieving common safety and environmental quality objectives, to establish and maintain airworthiness and environmental standards and certification systems which are as similar to those of the other Contracting Party as practicable and to cooperate in the reduction of the economic burden on aviation industries and operators arising from redundant technical evaluations, tests and inspections;

Therefore, *having agreed* on certain principles and arrangements in order to:

- facilitate the airworthiness and environmental certification, approval or acceptance by the airworthiness authority of the importing Party of aeronautical products, including maintenance services, imported and exported between the two Contracting Parties;
- provide for the development of procedures between the two airworthiness authorities for these purposes and to facilitate the discharge of their responsibilities resulting from multinational design, manufacture, maintenance and interchange of aeronautical products involving the joint interests of the Contracting Parties in airworthiness and environmental certification;
- provide for cooperation in sustaining safety and environmental quality objectives;

The Contracting Parties agree as follows:

ARTICLE I

Definitions

For the purpose of this agreement:

Additional technical conditions means the terms notified by the importing Party for the acceptance of the type design of an aeronautical product or for the acceptance of an aeronautical product to account for differences between Contracting Parties in:

- a) adopted airworthiness and environmental standards;
- b) special conditions relating to novel or unusual features of the aeronautical product design which are not covered by the adopted airworthiness and environmental standards;
- c) application of exemptions from, or equivalent safety findings to, the adopted airworthiness and environmental standards;
- d) maintenance requirements;
- e) mandatory airworthiness action taken to correct unsafe conditions.

Aeronautical product means any aircraft, aircraft engine, aircraft propeller or a part to be installed thereon.

Airworthiness authority means the national government organization of a Contracting Party responsible for regulating the airworthiness and environmental certification, approval or acceptance of aeronautical products.

Airworthiness criteria means criteria governing the design, performance, materials, workmanship, manufacture, maintenance and alteration or modification of aeronautical products as prescribed by the airworthiness authority of the importing Party to enable it to find that the design, manufacture and condition of these aeronautical products comply with its own laws, regulations, standards and requirements concerning airworthiness.

Design-related operational requirements means operational requirements related to design features of an aeronautical product or data relating to its operation or maintenance that make it eligible for a particular kind of operation.

Environmental criteria means criteria governing the design, performance, materials, workmanship, manufacture, maintenance and alteration or modification of aeronautical products prescribed by the importing authority to ensure compliance with the laws, regulations, standards and requirements of the importing Party concerning noise and emissions abatement.

Exporting authority means the airworthiness authority of the exporting Party.

Exporting party means the Contracting Party exporting a type design, a modification thereof, or an aeronautical product, under the provisions of this agreement.

Importing authority means the airworthiness authority of the importing Party.

Importing party means the Contracting Party importing a type design, a modification thereof, or an aeronautical product, under the provisions of this agreement.

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

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

Product airworthiness approval means granting an airworthiness certificate, approval or acceptance, as appropriate, by or on behalf of an airworthiness authority for a particular aeronautical product to permit its operation or use consistent with applicable laws, regulations, standards and requirements.

State regulating the airworthiness of an aircraft means the Contracting Party responsible for issuing a Certificate of Airworthiness for an aircraft, or the Contracting Party responsible for the certification of an operator operating, under lease or charter, an aircraft which possesses a Certificate of Airworthiness issued by another State.

Type design means the set of data and information necessary to define an aeronautical product type for the purpose of airworthiness determination to any later aeronautical product of the same type.

Type design approval means granting a certificate, approval or acceptance by or on behalf of an airworthiness authority for the type design of an aeronautical product.

ARTICLE II

Scope

This agreement applies to:

- a) the acceptance by the importing authority of the exporting authority's type design approval, including environmental approval, and at the option of the importing authority, of the exporting authority's finding of compliance with the importing authority's design-related operational requirements for aeronautical products, where the exporting authority is:
 - i) the authority which has first taken responsibility for the type design approval of the aeronautical product; or
 - ii) the authority which has assumed responsibility for the type design approval of the aeronautical product from a third authority with which both the importing authority and the exporting authority have in effect bilateral agreements or arrangements similar in scope to this agreement;
- b) the acceptance by the importing authority of the airworthiness certification, approval or acceptance of aeronautical products exported from the territory of the other Contracting Party, including both new and used aeronautical products designed or manufactured partially or wholly in other States;
- c) the acceptance by one airworthiness authority of maintenance, alterations or modifications performed under the authority of the other airworthiness authority on aircraft, or on aircraft engines, propellers, appliances, materials, parts or components installed or suitable for installation in civil aircraft;
- d) cooperation and assistance with respect to maintaining the continuing airworthiness of in-service aircraft;
- e) exchange of information regarding environmental standards and certification systems;

- f) cooperation in providing technical evaluations and assistance.

ARTICLE III

Acceptance of the type design approval

1. If the exporting authority, applying its own certification system, certifies to the importing authority that the type design of an aeronautical product or a change to an aeronautical product type design previously approved by the importing authority, complies with airworthiness and environmental criteria prescribed by the importing authority, the importing authority should, in establishing compliance with its own laws, regulations, standards and requirements for granting type design approval, give the same validity to the technical evaluations, determinations, tests and inspections made by the exporting authority as if it had made them itself.
2. The importing authority should prescribe the airworthiness and environmental criteria for the type design approval of any aeronautical product, in terms of the laws, regulations, standards, requirements and certification system of the exporting authority together with any additional technical conditions it deems necessary.
3. The exporting authority should assist the importing authority to become familiar with the aeronautical product to be imported and with the laws, regulations, standards, requirements and certification system applied by the exporting authority.
4. Notwithstanding 2, the importing authority may prescribe additional technical conditions to ensure that the aeronautical product meets the airworthiness and environmental standards equivalent to those which would be required for a similar aeronautical product, designed or manufactured in the territory of the importing Party, at the time that the application was received, for the approval of the aeronautical product type design, by the exporting authority.
5. As soon as practicable after it has become familiar with the design of an aeronautical product, the importing authority should notify the exporting authority of its requirements concerning airworthiness and environmental criteria for type design approval.
6. On request from the exporting authority, the importing authority should promptly advise the exporting authority of its current design-related operational requirements.
7. If pursuant to agreement between them, the exporting authority certifies to the importing authority that the design of an aeronautical product or data on the design relating to the operations or maintenance of such aeronautical product comply with those design-related operational requirements prescribed by the importing authority, the importing authority, in establishing compliance with its own operational requirements, should give the same validity to the technical evaluations, determinations, tests and inspections made by the exporting authority as if it had made them itself.

ARTICLE IV

Acceptance of aeronautical product airworthiness certification

1. If the exporting authority certifies to the importing authority that an aeronautical product in respect of which type design approval has been issued or is in the process of being issued by the importing authority, conforms in construction to a type design description notified by the importing authority and is in a condition for safe operation, the importing authority should give the same validity to the technical evaluations, determinations, tests and inspections made by the exporting authority as if it had made them itself on the date of the certification by the exporting authority.
2. The importing authority may, as it deems necessary, specify or make additional inspections, at the time of its airworthiness and environmental certification, approval or acceptance of an aeronautical product.

ARTICLE V

Maintenance and performance of alterations or modifications

1. If maintenance or an alteration or modification is performed and certified under the authority of one airworthiness authority in accordance with its own approval system, on an aircraft which is under the airworthiness regulation of the other airworthiness authority, or on any aeronautical product designed for installation on such aircraft, the other airworthiness authority should give the same validity to such maintenance, alteration or modification and certification as if performed or certified in its own territory provided it has, directly or by delegation, approved such maintenance or alteration or modification.
2. The Contracting Parties may jointly determine which of them will regulate the airworthiness of an aircraft registered in the territory of one Contracting Party that is operated by an air operator of the other Contracting Party.

ARTICLE VI

Continuing airworthiness

1. The airworthiness authorities of both Contracting Parties should cooperate in analysing airworthiness aspects of accidents and incidents related to aeronautical products to which this agreement applies.
2. In respect of aeronautical products designed or manufactured in its territory the exporting authority should, where appropriate, specify any action it deems necessary to correct any unsafe condition of the type design that may be discovered after an aeronautical product is placed in service, including any actions in respect of components designed or manufactured by a supplier under contract to a prime contractor.
3. In respect of an aeronautical product designed or manufactured in its own territory, the exporting authority should assist the importing authority in establishing procedures deemed necessary by the importing authority for maintaining the continuing airworthiness of such aeronautical product.
4. Each airworthiness authority should promptly inform the other of all mandatory airworthiness modifications, special inspections, special operating limitations or other actions which it deems necessary for maintaining the continuing airworthiness of relevant aeronautical products designed or manufactured in the territories of the Contracting Parties.

ARTICLE VII

Mutual cooperation and assistance

1. In respect of aeronautical products designed or manufactured in its territory, the exporting authority should on request assist the importing authority in determining whether the design of major changes or repairs made under the control of the importing authority comply with the airworthiness and environmental standards under which such aeronautical products were originally approved by the exporting authority.
2. Each airworthiness authority should apprise the other of all its relevant airworthiness and environmental laws, regulations, standards and requirements and of its airworthiness and environmental certification system.
3. Each airworthiness authority should as soon as practicable notify the other of proposed significant revisions to its standards and system for airworthiness and environmental certification or approval, offer the other airworthiness authority an opportunity to comment and give due consideration to the comments made by the other airworthiness authority on the intended revisions.

4. Amendments to certification procedures for aeronautical products covered by this agreement should be by agreement in writing between the airworthiness authorities.

5. The airworthiness authorities should provide to each other such technical evaluation assistance as they agree is appropriate.

ARTICLE VIII

Interpretation

In the case of conflicting interpretations of the airworthiness or environmental criteria prescribed by the importing authority pertaining to certifications, approvals or acceptances under this agreement, the interpretation of the importing authority should prevail.

ARTICLE IX

Implementation

1. The airworthiness authorities may develop a schedule of implementation procedures for this agreement.

2. When such a schedule has been agreed between the airworthiness authorities, this agreement will be implemented in accordance with its provisions.

3. The airworthiness authorities will jointly review such schedule from time to time and may amend it as appropriate by written agreement.

ARTICLE X

Entry into force

This agreement should enter into force on the first day of the second month following the day on which the Contracting Parties should have notified each other that their legal requirements have been complied with.

ARTICLE XI

Termination

Either Contracting Party may at any time give notice, by diplomatic note to the other Contracting Party, of its decision to terminate this agreement. The agreement should terminate twelve months following the date of receipt of the notice by the other Contracting Party, unless the said notice of termination has been withdrawn by mutual agreement before the expiry of this period.

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Attachment B to Chapter 6

SAMPLE TECHNICAL ARRANGEMENT ON AIRWORTHINESS BETWEEN THE CIVIL AVIATION AUTHORITIES

Note.— This example covers the performance of modification and maintenance, the continuing airworthiness, and mutual cooperation and assistance.

TECHNICAL AGREEMENT ON AIRWORTHINESS BETWEEN THE CIVIL AVIATION AUTHORITY OF (Name of first State) AND THE CIVIL AVIATION AUTHORITY OF (Name of second State)

The Civil Aviation Authority of (Name of first State) and the Civil Aviation Authority of (Name of second State), hereinafter referred to as the “Contracting Parties”,

Whereas:

- each Contracting Party has determined that the standards and systems of the other Contracting Party for the airworthiness and environmental certification or acceptance of aeronautical products are sufficiently equivalent to its own to make an arrangement practicable;
- in the interest of promoting aviation safety and preservation of the environment and with a view to fostering cooperation and assistance between their airworthiness authorities in achieving common safety and environmental quality objectives, establishing and maintaining airworthiness and environmental standards and certification systems which are as similar to those of the other Contracting Party as practicable and cooperating in the reduction of the economic burden on aviation industries and operators arising from redundant technical evaluations, tests and inspections;

Therefore, *having agreed* on certain principles and arrangements in order to:

- facilitate the airworthiness and environmental acceptance, by the airworthiness authority of a Contracting Party, of the maintenance services and certification of aeronautical products, operated or registered in the State of the other Contracting Party;
- provide for the development of procedures between the two airworthiness authorities for these purposes and for facilitating management of the emerging trend towards the interchange of aeronautical products involving the joint interests of the Contracting Parties in airworthiness and environmental maintenance services and their certification;
- provide for cooperation in sustaining safety and environmental quality objectives;

The Contracting Parties agree as follows:

ARTICLE I

Definitions

For the purpose of this arrangement:

Aeronautical product means any aircraft, aircraft engine, aircraft propeller or a part to be installed thereon.

Airworthiness authority means the national organization of a Contracting Party responsible for regulating the airworthiness and environmental certification, approval or acceptance of aeronautical products.

Airworthiness criteria means criteria governing the design, performance, materials, workmanship, manufacture, maintenance and alteration or modification of aeronautical products as prescribed by the airworthiness authority of the importing State to enable it to find that the design, manufacture and condition of these aeronautical products comply with its own laws, regulations, standards and requirements concerning airworthiness.

Design-related operational requirements means operational requirements related to design features of an aeronautical product or data on its design relating to its operation or maintenance that make it eligible for a particular kind of operation.

Environmental criteria means criteria governing the design, performance, materials, workmanship, manufacture, maintenance and alteration or modification of aeronautical products prescribed by the importing authority to ensure compliance with the laws, regulations, standards and requirements of the importing Party concerning noise and emissions abatement.

Exporting authority means the airworthiness authority of the exporting Party.

Exporting party means the Contracting Party exporting a type design, a modification thereof, or an aeronautical product.

Importing authority means the airworthiness authority of the importing Party.

Importing party means the Contracting Party importing a type design, a modification thereof, or an aeronautical product.

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

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

State regulating the airworthiness of an aircraft means the Contracting Party responsible for issuing a Certificate of Airworthiness for an aircraft or the Contracting Party responsible for the certification of an operator operating, under lease or charter, an aircraft which possesses a Certificate of Airworthiness issued by another State.

Type design means the set of data and information necessary to define an aeronautical product type for the purpose of airworthiness determination to any later aeronautical product of the same type.

ARTICLE II

Scope

This arrangement applies to:

- a) the acceptance by one airworthiness authority of maintenance or modifications performed under the authority of the other airworthiness authority on aircraft or on aircraft engines, propellers, appliances, materials, parts or components installed or suitable for installation in civil aircraft;
- b) cooperation and assistance with respect to maintaining the continuing airworthiness of in-service aircraft;
- c) exchange of information regarding environmental standards and certification systems; and
- d) cooperation in providing technical evaluations and assistance.

ARTICLE III

Maintenance and performance of modifications

1. If maintenance or modification is performed and certified, under the authority of one airworthiness authority in accordance with its own approval system, on an aircraft which is under the airworthiness regulation of the other airworthiness authority, or on any aeronautical product designed for installation on such aircraft, the other airworthiness authority will give the same validity to such maintenance or modification and certification as if performed or certified in its own territory, provided it has, directly or by delegation, approved such maintenance or modification.
2. The Contracting Parties may jointly determine which of them will regulate the airworthiness of an aircraft registered in the territory of one Contracting Party that is operated under lease or charter by an air operator of the other Contracting Party.

ARTICLE IV

Continuing airworthiness

1. The airworthiness authorities of both Contracting Parties will cooperate in analysing airworthiness aspects of accidents and incidents related to aeronautical products to which this arrangement applies.
2. In respect of aeronautical products designed or manufactured in its territory the exporting authority will, where appropriate, specify any action it deems necessary to correct any unsafe condition of the type design that may be discovered after an aeronautical product is placed in service, including any actions in respect of components designed or manufactured by a supplier under contract to a prime contractor.
3. In respect of an aeronautical product designed or manufactured in its own territory, the exporting authority will assist the importing authority in establishing procedures deemed necessary by the importing authority for maintaining the continuing airworthiness of such aeronautical product.
4. Each airworthiness authority will promptly inform the other of all mandatory airworthiness modifications, special inspections, special operating limitations or other actions which it deems necessary for maintaining the continuing airworthiness of relevant aeronautical products designed or manufactured in the territories of the Contracting Parties.

ARTICLE V**Mutual cooperation and assistance**

1. Each airworthiness authority will apprise the other of all its relevant airworthiness and environmental laws, regulations, standards and requirements and of its airworthiness and environmental certification system.
2. Each airworthiness authority will as soon as practicable notify the other of proposed significant revisions to its standards and system for airworthiness and environmental certification or approval, offer the other airworthiness authority an opportunity to comment and give due consideration to the comments made by the other airworthiness authority on the intended revisions.
3. Amendments to maintenance certification procedures for aeronautical products covered by this arrangement will be by agreement in writing between the airworthiness authorities.
4. The airworthiness authorities will provide to each other such technical evaluation assistance as they agree is appropriate.

ARTICLE VI**Interpretation**

In the case of conflicting interpretations of the airworthiness or environmental criteria, or design-related operational requirements relating to acceptance under this arrangement, the interpretation of the Contracting Party regulating the airworthiness of the aircraft or the aeronautical product installed or suitable for installation on that aircraft will prevail.

ARTICLE VII**Implementation**

1. The airworthiness authorities may develop a schedule of implementation procedures for this arrangement.
2. When such a schedule has been agreed between the airworthiness authorities, this arrangement will be implemented in accordance with its provisions.
3. The airworthiness authorities will jointly review such schedule from time to time and may amend it as appropriate by written agreement.

ARTICLE VIII**Entry into force**

This arrangement will enter into force upon signature by both Parties.

ARTICLE IX

Termination

Either Contracting Party may at any time give notice to the other Contracting Party of its decision to terminate this arrangement. The arrangement will terminate twelve months following the date of receipt of the notice by the other Contracting Party, unless the said notice of termination has been withdrawn by mutual agreement before the expiry of this period.

Attachment C to Chapter 6

SAMPLE MEMORANDUM OF UNDERSTANDING ON THE LEASING OF AIRCRAFT BETWEEN THE CIVIL AVIATION AUTHORITIES

Note 1.— This example covers the operation, the maintenance and its performance, the performance of modifications, the MMEL/MEL, the information on faults, malfunctions, defects and other occurrences, the surveillance and the continuing airworthiness of aircraft transferred between the States.

Note 2.— The following Memorandum of Understanding is based on the existence of one of the bilateral arrangements described in Attachments A or B above.

MEMORANDUM OF UNDERSTANDING ON THE LEASE OF AIRCRAFT BETWEEN THE CIVIL AVIATION AUTHORITY OF (NAME OF FIRST STATE) AND THE CIVIL AVIATION AUTHORITY OF (NAME OF SECOND STATE) (HEREINAFTER REFERRED TO AS “THE AUTHORITIES”)

Whereas

- a) the State of each authority has ratified the Protocol Relating to an Amendment to the Convention on International Civil Aviation (Chicago Convention) signed at Montréal on 6 October 1980 (Article 83 *bis*);
- b) the State of each authority has signed with the State of the other authority a bilateral airworthiness agreement providing for the approval or acceptance by the importing authority of approvals or findings of compliance by the exporting authority in respect of airworthiness;
- c) each authority acknowledges that it is desirable to enter into an arrangement providing for the development of procedures between the authorities that will facilitate the lease of aircraft between operators of the States of the authorities, thereby enabling greater flexibility in the commercial aviation industry and avoiding redundant technical evaluations, tests and inspections by the authorities;
- d) each authority has determined that the standards of airworthiness and systems for airworthiness, environmental certification and maintenance of the other authority are sufficiently equivalent to its own to make this arrangement practicable;
- e) each authority has determined that the operating requirements and design-related operational requirements of the other authority are sufficiently equivalent to its own to make this arrangement practicable; and

Therefore the authorities have reached the following understanding to provide for the carrying out and the acceptance of certain functions, in particular the performance of inspection and surveillance activities, required to ensure that an aircraft during the term of a lease is operated and maintained to their mutual satisfaction.

1. DEFINITIONS

Authority includes any person acting on its behalf.

Aviation document means any licence, permit, accreditation, certificate or other document issued by an authority to a person or in respect of an aircraft.

Design-related operational requirements means the operational or environmental requirements affecting either the design features of an aircraft or performance data on the design relating to the operations or maintenance of an aircraft that make that aircraft eligible for a particular kind of operation in a State.

Lease includes a transfer of an aircraft only or a transfer of an aircraft with crew, but for greater certainty does not include a charter of an aircraft or any other arrangement where there has not been a transfer of custody and control of an aircraft.

Lease approval means an authorization, by the lessee authority, pursuant to Article 4, of the operation of an aircraft that is proposed to be subject to a lease.

Lessee authority means the authority of the State of the lessee air operator of an aircraft subject to a lease.

Lessor authority means the authority of the State of Registry of an aircraft subject to a lease.

2. SCOPE OF APPLICATION

This memorandum will apply only to a lease of an aircraft:

- a) from an operator of the State of one authority to an operator of the State of the other authority;
- b) which is operated by the lessee;
- c) which is registered in the State of one of the authorities; and
- d) which is authorized for commercial operations.

3. GENERAL PROVISIONS

3.1 Each authority will provide for the requisite authority and administrative procedures to enable and facilitate the authorization of leases of aircraft registered in the State of that authority to air operators of the State of the other authority.

3.2 Each authority will provide for the authority and administrative procedures to permit the carrying out and acceptance of the functions contemplated in this memorandum.

3.3 Each authority will endeavour to ensure the harmonization of administrative procedures and practices relating to the authorization of leases of aircraft registered in the State of that authority to operators of the State of the other authority and relating to the control of those aircraft during the term of the lease.

4. LEASE AUTHORIZATION

4.1 Where, on receipt of an application from an operator of the State of the lessee authority seeking approval of a lease to it of an aircraft registered in the State of the lessor authority should the lessee authority approve that lease, the lessee authority will notify the lessor authority of its intention to issue a lease approval and of any conditions that it proposes to apply to the lease approval.

4.2 Upon notification by the lessee authority of its intention to issue a lease approval, the lessor authority will notify the lessee authority of any objection it has to the lease of the aircraft or of any condition that it desires to apply to the lease approval.

4.3 In considering the application, the authorities will exchange such information as they consider necessary for the purpose of ensuring that there will be compliance with the applicable standards of airworthiness, operating requirements, design-related operational requirements and associated requirements.

4.4 Except as provided in Article 4.5, the lessee authority may issue a lease approval in respect of an aircraft, subject to any conditions it considers appropriate, where it is satisfied that the aircraft will be operated and maintained in accordance with the applicable standards of airworthiness, operating requirements, design-related operational requirements and associated requirements.

4.5 Neither authority will issue a lease approval or otherwise authorize a lease unless there is agreement between the authorities.

4.6 Where the lessee authority issues a lease approval in writing, it will, on the request of the lessor authority, provide a copy of the lease approval to the lessor authority.

4.7 Where the lessor authority issues an aviation document authorizing a lease, it will, on the request of the lessee authority, provide a copy of the aviation document to the lessee authority.

4.8 Each authority will require that the following documents be carried on board the aircraft during the term of the lease:

- a) the lease approval, if in writing;
- b) any aviation document authorizing a lease; and
- c) a copy of any supplemental document setting out the authorization or acceptance between the authorities to perform certain functions.

4.9 Each authority may terminate at any time its authorization of a lease and will consult the other authority prior to so acting.

5. MODIFICATION AND REPAIRS

5.1 The lessee authority, as a condition of issuance of a lease authorization in respect of an aircraft, may require a modification to that aircraft for the purpose of compliance with its approved type design for that aircraft or with its standards of airworthiness and design-related operational requirements.

5.2 Prior to issuing a lease authorization, the lessee authority will ensure that the design for any modification has been approved or accepted by the lessor authority.

5.3 During the term of a lease authorized for an aircraft, the lessee authority may authorize the performance and certification, in accordance with the bilateral airworthiness agreement, of modification or repairs to that aircraft.

5.4 The lessee authority will ensure, prior to authorizing the performance and certification of modification or repairs to an aircraft, that the design for that modification or those repairs has been approved or accepted by the lessor authority.

5.5 The lessor authority will accept the performance and certification of modification or repairs to an aircraft where that performance and certification has been authorized by the lessee authority.

6. CONTINUING AIRWORTHINESS

6.1 The lessor authority will notify the lessee authority of any mandatory airworthiness modification, special inspection, special operating limitation or other action required by the State of the lessor authority in respect of a leased aircraft during the term of a lease.

6.2 The lessee authority will endeavour to ensure that the required action is carried out within the time limit prescribed therein and that the required action is performed and certified in accordance with the terms of the bilateral airworthiness agreement between the States of the authorities.

7. MAINTENANCE

7.1 Unless the authorities specifically agree otherwise, the lessee authority, in respect of a leased aircraft, will accept the maintenance inspection schedule approved or accepted by the lessor authority.

7.2 The lessor authority will notify the lessee authority of any change in the approved maintenance inspection schedule which may affect the lease authorization.

7.3 Where the lessee authority proposes in a particular case to grant an extension to the time requirements of the approved maintenance inspection schedule, it will seek the consent of the lessor authority to that extension.

7.4 During the term of a lease authorized for an aircraft, the lessee authority may authorize the performance and certification, in accordance with the bilateral airworthiness agreement, of maintenance of that aircraft.

7.5 The lessor authority will accept the performance and certification of maintenance of an aircraft where that performance and certification has been authorized by the lessee authority.

8. SERVICE DIFFICULTY REPORTING

8.1 During the term of a lease, the applicable requirements in respect of service difficulty reporting, or equivalent procedure, are those of the State of the lessee authority.

8.2 The lessee authority will provide in a lease authorization a condition requiring the lessee operator to provide SDRs to a specified authority and that authority will ensure that a copy of the report is forwarded to the other authority as soon as practicable.

9. FLIGHT AUTHORIZATION

For the purpose of enabling the repositioning or testing of a leased aircraft in a situation where a Certificate of Airworthiness for the aircraft is not in force:

- a) the lessee authority may issue a temporary authorization in respect of the aircraft, where the flight will be conducted entirely within the State of the lessee authority; and
- b) the lessor authority may, on the recommendation of the lessee authority, issue a flight authorization in respect of the aircraft for any flight outside the territory of the State of the lessee authority.

10. OPERATIONS

10.1 The lessee authority will be responsible for the authorization of all operations in respect of an aircraft during the term of a lease authorized for that aircraft.

10.2 The lessee authority may approve or accept a MEL in respect of an aircraft.

10.3 The lessee authority will endeavour to ensure that an aircraft is operated in accordance with:

- a) the aircraft flight manual approved by the lessor's civil aviation authority; and
- b) the operations manual approved or accepted by it.

11. SURVEILLANCE AND INSPECTION

11.1 During the term of a lease, the lessee authority will conduct such surveillance activities and inspections as it considers necessary to verify that a leased aircraft is operated and maintained in accordance with the applicable standards of airworthiness, operating requirements, design-related operational requirements and associated requirements and with the terms and conditions of the lease authorization.

11.2 On the request of the lessor authority and for reasonable cause, the lessee authority will:

- a) perform an inspection of the lessee operator or the leased aircraft; or
- b) permit the lessor authority to enter the State of the lessee authority for the purpose of inspecting a lessee operator or a leased aircraft and will assist the lessor authority in the performance of the inspection.

12. ENFORCEMENT

12.1 Each authority will notify the other authority of any finding or act which affects the status of an aviation document issued by the other authority in respect of a leased aircraft or the terms and conditions of a lease authorization.

12.2 Each authority will make all reasonable efforts to secure evidence relating to any suspected contravention of requirements affecting the status of an aviation document issued by the other authority or the terms and conditions of a lease authorization.

12.3 Nothing in this memorandum will be interpreted so as to preclude the lessor authority from taking any enforcement action pursuant to the laws of its State in respect of the operation or maintenance of a leased aircraft.

13. COOPERATION

13.1 Each authority will ensure that the other authority is kept informed of all applicable standards of airworthiness, operating requirements, design-related operational requirements and associated requirements of its State and will consult the other authority on any proposed changes thereto to the extent that they may affect the implementation of this memorandum.

13.2 Each authority will render such assistance as may reasonably be required by the other authority in its carrying out of inspections, investigations, prosecutions and other functions in respect of a leased aircraft.

14. PREVAILING INTERPRETATION

In the case of conflicting interpretations as to the applicable standards of airworthiness, operating requirements, design-related operational requirements or associated requirements in respect of a leased aircraft:

- a) the authorities will jointly determine which State's requirements are applicable in the particular case; and
- b) the interpretation of the authority of that State will prevail.

15. AMENDMENT

15.1 The authorities will meet, at such times as they may decide, for the purpose of jointly reviewing the memorandum.

15.2 Any amendment to this memorandum will, unless otherwise specified by the authorities, take effect on the date on which the authorities sign the amendment.

16. TERMINATION

Either authority may terminate this memorandum upon the expiration of not less than one year from the date of giving written notice to the other authority of its intention to terminate.

Attachment D to Chapter 6

MAINTENANCE ASPECTS OF AIRCRAFT TRANSFER

1. INTRODUCTION

The content of this Attachment is intended to facilitate the leasing and/or transfer of aircraft in a safe and efficient manner. Historically there have been a number of difficulties associated with the transfer and leasing of aircraft, usually caused by:

- a) differing national airworthiness standards;
- b) differing national operational standards;
- c) differing build standards; and
- d) non-standard application of the above a), b) and c).

2. GENERAL

2.1 This Attachment is intended to define the minimum requirements for aircraft owners, airlines or regulatory authorities who are planning or preparing to transfer or lease an aircraft across international boundaries.

2.2 The material contains recommended methods and practices which could be used during preparation and organization of an aircraft lease or an international aircraft transfer. The proposed requirements are intended to be used as minima; additional requirements may be demanded by the lessor/buyer.

2.3 Documentation should be provided to establish the national regulations under which the maintenance and operation of the aircraft have been carried out. This should also include, where applicable, details of any deviations from, or exemptions issued against, those regulations.

2.4 The maintenance programme should be identified to the following standard:

- a) *Approval*. The approval or acceptance of the maintenance programme by the associated regulatory Authority should be identified:
 - i) approved by the State of Registry and accepted by the State of the Operator; or
 - ii) approved by both States;
- b) *Traceability*. The maintenance programme should be identified and be traceable to its approved minimum requirements standard, e.g. Maintenance Review Board (MRB) Report, the manufacturer's recommended maintenance programme or recommended tasks. In the event that the programme fails to meet the minimum requirement standard, all areas of such deficiencies should be identified and corrective action taken, on the aircraft or to the programme, as necessary. The minimum standard is understood to mean only minimum required tasks and not the intervals; and

- c) *Documentation.* A printed copy of the maintenance schedule should be provided which identifies all tasks and functions in such a manner as to permit traceability to the corresponding work cards. This includes sampling programme tasks.

3. RECORDS AND DOCUMENTATION

3.1 General

3.1.1 Consideration should be given to aircraft records and documentation as indicated in the following paragraphs.

3.1.2 Governing requirement

Prior to initiation of the lease or other transfer, representatives of both parties should coordinate the scope and content requirements of the technical logs and the aircraft journey log book which will eventually be required upon aircraft return or further transfer. The governing record-keeping regulation under which the aircraft records should be maintained should be determined prior to initiation of the lease or transfer.

3.1.3 Language

All aircraft records should be maintained in a language which is acceptable to the CAA. For practical purposes another language may be used; however, a translation to the acceptable language should be provided at the time of transfer, if required by the CAA.

3.1.4 Documentation requirements

3.1.4.1 Documentation requirements for incoming components and parts should be identified in the operator's maintenance control manual to support its purchasing and receiving inspection functions. This includes, but is not limited to, documentation of airworthiness directives (AD) compliance, time on life-limits, descriptions of work performed and certification of new and repaired parts. Once these requirements are satisfied and the essential information is entered into the operator's records system, the only source documentation required to be retained is that necessary to:

- a) satisfy the requirements of the CAA;
- b) support the operator's continuing analysis and surveillance system; and
- c) support future maintenance on the affected parts.

However, operators are required to retain or archive documentation of AD compliance, life-limited part service times and other information which may be useful in the future.

3.1.4.2 Before a used aircraft is introduced into an operator's fleet, the receiving operator should review the records to ensure they provide the current maintenance information necessary to phase the aircraft into the maintenance programme of the operator. This includes records such as the documentation of the last scheduled inspection, the current status of AD, life-limited parts and components, Supplemental Structural Inspection Document, damage-tolerance inspection status, Certification Maintenance Requirements, major repairs and major alterations.

3.1.4.3 If the aircraft is being transferred to another operator, the records from the transferring operator of the status of life-limited parts and AD, including the method of AD compliance, should be acceptable as valid unless obvious discrepancies are apparent. The transferring operator should provide a written statement that the records are correct.

3.1.4.4 If the aircraft is being transferred from another State, it may be necessary to evaluate the previous operator's maintenance scheduling and record-keeping system to ensure the validity of the records. The available records may vary, depending on the State of origin. Therefore a means of assuring the integrity of the previous operator's records system may be necessary. This may require communication between the two regulatory authorities concerned.

3.1.4.5 The following are recommendations for determining the validity of the current status of life-limited parts and AD compliance:

- a) if the State of the Operator is an ICAO signatory, the operator's records should meet ICAO requirements and a record of current status would be acceptable;

Note.— The requirement on record-keeping requirements are specified in Annex 6, Part I — Aeroplanes, Chapter 8 and Part III — Helicopters, Section II, Chapter 6.

- b) a spot check of visible AD would be indicative of the accuracy of those records;
- c) a spot check of source records for the record-keeping system of the transferring operator would indicate the quality of those records;
- d) the State of the transferring operator's shop records would be indicative of the integrity of the operator's record-keeping system;
- e) significant errors or omissions in a records status report would indicate inadequate records and record-keeping.

3.1.5 Part numbers

Records must accurately reflect the manufacturer's part number as applicable. In the event that the operator utilizes a part numbering system other than the manufacturer's system, a complete cross-reference should be provided with the records. If alternative part numbers are recorded, technical substantiation should be available to support the part substitution.

3.1.6 Serial numbers

All components and assemblies controlled by serial numbers should have their serial numbers recorded in the maintenance records. In the event that the operator utilizes a serial numbering system other than the manufacturer's system, a complete cross-reference should be provided with the records.

3.1.7 Dates

All records should be properly dated with reference to an installation or maintenance function accomplishment. If the date format is numeric, a specific format should be defined to date the records.

3.2 Record-keeping requirements for airworthiness directives (AD)

3.2.1 The current status of applicable MCAI for a particular airframe, engine, propeller, rotor or appliance should be maintained. This record should identify the particular airframe, engine, propeller, rotor or appliance; identify the applicable AD (including amendment number, if required); the date when the AD was accomplished, if required, and/or when the next recurring inspection (action) is due; describe the method of compliance (if more than one method is specified in the AD) and show the appropriate measuring parameters (hours, cycles and/or calendar times).

3.2.2 The requirements of the CAA will determine the specific data required as part of a maintenance record. An operator is not required to retain actual work documents to show accomplishment of the work on a given airframe, engine, propeller, rotor or appliance to document AD compliance unless such records are otherwise called for by the requirements of the CAA.

Note.— Current status information is required to be maintained as long as the airframe, engine, propeller, rotor or appliance is used or intended to be used by the operator. The requirements for retention of records are specified in Annex 6, Part I — Aeroplanes, Chapter 8 and Part III — Helicopters, Section II, Chapter 6.

3.3 Record-keeping requirements for life-limited parts

3.3.1 Each operator should maintain the current status of life-limited parts. If the operator obtained such parts new from the manufacturer, the current status will be based upon the operator's in-service history of the part. If the part has been obtained from a previous operator, the current status will be based on the status from the previous operator plus the present operator's in-service history. The current status of life-limited parts is required upon each transfer throughout the operating life of the part. When such parts are transferred, the previous operator should produce an in-service history for life-limited parts, irrespective of the operator's governing regulations. When life-limited parts are transferred between operators, a written statement by the previous operator, attesting to the current status of life-limited parts, is an acceptable method of indicating prior operating service of the part(s).

3.3.2 When the records of current status for life-limited parts are lost or destroyed, an equivalent level of safety may be determined by consideration of other records available, such as technical records, utilization reports, manufacturer's information or presentation of other evidence. If review of other available documentation reveals significant errors or omissions that prevent the development of a current status for the life-limited part(s), the part(s) in question should be retired from service. It is the operator's responsibility to notify the CAA when such records are lost or destroyed and to initiate an immediate search for records from which the current status of the life-limited part(s) can be determined.

3.4 Transfer of records

3.4.1 When an aircraft, airframe, engine, propeller, rotor or aeronautical product is transferred to a new operator the records of these products should accompany the transfer. Such records should include the current status of maintenance, MCAI and life-limited parts and should clearly identify the person responsible for the data in the report and the date associated with the records.

3.4.2 When an aircraft, airframe, engine, propeller, rotor or aeronautical product is leased, the associated records should be transferred as if the transaction were a sale. By agreement between the lessee and the lessor, some records, such as work cards and inspection records, may be retained by the owner; however, the lessee has a responsibility to review the records retained by the owner and ensure that the summary information used to support the airworthiness of the item is complete and accurate.

3.5 Lost records

In the event that required maintenance records have been lost or destroyed, alternative proof should be provided that the tasks in question have been performed.

3.6 Service bulletins (SBs)

All SBs that have been incorporated should be listed together with accomplishment dates. If options are available, the option complied with should also be indicated. When a SB involves recurring action, the times and/or dates, as applicable, of the last action and the next action due should be provided.

3.7 Modifications/alterations

3.7.1 All modifications/alterations performed since the original aircraft delivery which are still existent on the aircraft should have been carried out in accordance with the requirements of the airworthiness Authority of the State of Registry at the time of their incorporation.

3.7.2 A list of such modifications/alterations should be provided indicating their classification and supported by appropriate documentation. In the case of a major modification/alteration this documentation should include at a minimum:

- a) the document defining the modification/alteration;
- b) the certification basis; and
- c) the approval of the CAA.

3.8 Repairs

All major repairs performed since original aircraft delivery and which are still existent upon the aircraft should be listed and demonstrated to be in compliance with the requirements of the airworthiness Authority of the State of Registry at the time of their incorporation. If additional action is required, e.g. recurring inspection, this should also be indicated.

4. DOCUMENT PRESENTATION

4.1 Presentation

A standard method of presenting the records is encouraged. It is recommended that the summary of records and other pertinent information be compiled into a book or other concise document in order to simplify, as much as possible, the record review process.

4.2 Recommended format

Below is a recommended format for the collation and presentation of aircraft technical records at transition. The format may be regarded as a best practice example for purposes of demonstrating that the aircraft is in compliance with the airworthiness and operational requirements applicable to the current operator or owner.

The format is suitable when:

- a) no transfer of operational control and responsibility for continuing airworthiness is occurring (such as a wet lease); and
- b) operational control and responsibility for continuing airworthiness is transferring to a different owner or operator (such as a dry lease).

Occasionally technical records referenced in this recommended format are lost or destroyed. In this case the owner or operator should refer to procedures to reconstruct records in accordance with applicable rules and otherwise in consultation with the relevant CAA.

<i>Sections 1 to 3 apply to all transfers</i>		
Section 1. Aircraft Description		
This section should include the following statements from the current operator or owner:		
a)	A general description of the aircraft including manufacturer, type and model, serial number, registration markings, certification basis, installed engine(s) (model and serial number), propeller(s) (model and serial number, if applicable) and APU (model and serial number, if installed)	
b)	Certified statement of total hours and total cycles accumulated as of the date of transfer on the airframe, each engine and propeller (if applicable)	
c)	A description of the aircraft current operational configuration (seat configuration and emergency equipment)	
d)	Details of specific operational capability approvals for which aircraft is equipped or certified (e.g. RVSM, EDTO, EU-OPS, FAR 121)	
Section 2. Operating Authority		
This section should contain a copy of the operating authority issued by the applicable CAA to establish the rules under which the aeroplane is, or was, operated and maintained, as applicable:		
a)	If no transfer of operational control and continuing airworthiness responsibility (as in <i>wet lease</i>):	
i)	Air operator certificate (of the lessor); and	
ii)	Copy of lease agreement between lessor and lessee (excluding commercial terms)	
b)	If transfer of operational control and continuing airworthiness responsibility (as in a <i>dry lease</i>):	
i)	Air operator certificate of the last operator or owner (if available)	
<p><i>Note.— In respect of a dry lease, a copy of the new lease agreement between the lessor and lessee should be filed by the new lessee with their authority. This would ensure that the authority is fully aware of the responsibilities of the lessor and lessee in relation to the new lease agreement.</i></p>		

Section 3. Aircraft certificates		
This section should contain a copy of the aircraft certificates including:		
a)	Current Certificate of Airworthiness	
b)	Current certificate of aircraft registration	
c)	Certificate of noise limitation	
d)	Radio license	
e)	Current maintenance release certificate	
f)	Export Certificate of Airworthiness (if applicable)	
<i>Sections 4 to 7 apply to transfers of operational control and responsibility for continuing airworthiness to a new owner or operator only (e.g. dry lease)</i>		
Section 4. Log Books		
a)	Aircraft logbooks	
b)	Engine logbook(s)	
c)	APU logbook (if applicable)	
d)	Propeller logbooks (if applicable)	
Section 5. Manuals		
This section should contain the following manuals and applicable supplements:		
a)	Aircraft flight manual and evidence of approval satisfactory to the State of Registry of the current operator	
b)	Instructions for continuing airworthiness associated with non-type certificate holder modifications (if applicable)	
c)	Documents describing the detailed specification of the aircraft at manufacture, as provided by the type certificate holder, including systems and equipment installed	
Section 6. Current status summaries		
a)	A summary of compliance with each AD applicable to the aircraft type, engine type, propeller type (if applicable) and fitted components as detailed in Section 3.2.1 of this Attachment D.	
b)	The summary of compliance with the current approved aircraft maintenance programme scheduled tasks, whether in block or equalized format (see note) and unscheduled tasks, indicating when the task was “last accomplished” and is “next due” in flight hours, flight cycles, or calendar time, as appropriate. The status should provide a description of:	

i)	The action performed and, if the approved maintenance programme task numbers are different from the type certificate holders maintenance task numbers, a cross-reference should be provided	
ii)	Airworthiness Limitation Items (ALIs) and Certification Maintenance Requirements (CMRs) should be identified	
iii)	The status of life-limited parts including life consumed and remaining life;	
iv)	The status of hard-time components, including the life accumulated on each component in calendar time, flight hours or flight cycles, as appropriate, since the last accomplishment of scheduled maintenance specified in the aircraft maintenance programme	
<p><i>Note.— If the approved maintenance programme is arranged in block events directly in accordance with a maintenance planning document controlled by the type certificate holder then the status of each block event may be provided. If the maintenance programme is customized or equalized then the status of each inspection task should be provided.</i></p>		
c)	The summary of service bulletins issued by the type certificate holder, incorporated on the aircraft, engine(s) and propeller(s) including:	
i)	A reference to the applicable approval data (with revision level) for each service bulletin	
ii)	A description of the action performed	
iii)	The date of accomplishment	
iv)	Details of operational limitations, aircraft flight manual supplements, and mandatory instructions for continuing airworthiness which are part of the approval	
v)	Where future or recurring actions are required, the status of such actions (when last accomplished and next due) should be specified	
d)	The summary of modifications not originating from the type certificate holder, incorporated on the aircraft, engine(s) and propeller(s) including:	
i)	A reference to the applicable approval data (with revision level) for each modification acceptable to the state of registration of the current owner or operator	
ii)	A description of the action performed	
iii)	The date of accomplishment	
iv)	Details of operational limitations, aircraft flight manual supplements, and mandatory instructions for continuing airworthiness which are part of the approval	
v)	Where future or recurring actions are required, the status of such actions (when last accomplished and next due) should be specified	
e)	The status of structural repairs and allowable damage on the aircraft including:	
i)	A reference to the type certificate holder's structural repair manual (SRM) repair or allowable damage limitations. Otherwise details of the approval authority acceptable to the state of registration.	

	<i>Note.— A repair map should be provided to facilitate the identification of structural repairs and allowable damage visible from the exterior of the aircraft.</i>	
ii)	A description of the action performed	
iii)	The date of accomplishment	
iv)	Details of operational limitations and mandatory instructions for continuing airworthiness which are part of the approval	
v)	For repairs or allowable damage having requirements for future or recurring actions, the status of such actions (when last accomplished and next due) should be specified	
f)	If the aircraft is approved for extended diversion time operations (EDTO):	
i)	A listing of each associated configuration and maintenance requirement embodied on the aircraft, engine and component should be provided	
ii)	The status of EDTO significant components and maintenance tasks associated with such operational approval (when last accomplished and next due)	
g)	The mass and balance report of the aircraft	
h)	A listing of each deferred maintenance item	
i)	A list of operator loadable aircraft software installed (description and part number)	
Section 7. Maintenance Records		
This section should contain the individual maintenance records and certified job cards to substantiate the status summaries in Section 6. This section should be further subdivided as follows:		
a)	General Data:	
i)	The maintenance release and detailed maintenance records demonstrating compliance with airworthiness directives applicable to the aircraft, engine, propeller and components fitted thereto, as appropriate, until such time as the information contained therein is superseded by new information equivalent in scope and detail.	
ii)	The maintenance release and detailed maintenance records of all scheduled maintenance tasks and unscheduled maintenance in respect of the aircraft, engine, propeller, as appropriate, until such time as the information contained therein is superseded by new information equivalent in scope and detail.	
iii)	The maintenance release and detailed maintenance records demonstrating accomplishment in accordance with each type certificate holder's service bulletin embodied on the aircraft, engine(s) and propeller(s).	
iv)	The maintenance release and detailed maintenance records demonstrating accomplishment in accordance with the applicable approved data for each non-service bulletin modification embodied on the aircraft, engine(s) and propeller(s).	

v)	The maintenance release and detailed maintenance records demonstrating accomplishment in accordance with the applicable approved data for structural repairs and allowable damage to the aircraft, engine(s) and propeller(s).	
<p><i>Note.— If the approval data requires that material used be tested in accordance with specific requirements in order to verify acceptability (e.g. burn test) then the applicable test certificate or report should be retained in the maintenance records. If the approved data permits the use of alternate materials then the actual material used should be recorded.</i></p>		
b)	Data specific to components:	
i)	Life-limited parts: The in-service history record of installations and removals (for the life of the part), the maintenance release and detailed maintenance records for the last accomplishment of any maintenance.	
ii)	Hard-time components: The maintenance release and detailed maintenance records for the last accomplishment of any scheduled, and any subsequent maintenance, until the scheduled maintenance has been superseded by another scheduled maintenance of equivalent scope and detail.	

5. MINIMUM AIRWORTHINESS STANDARDS FOR LEASING AGREEMENTS

In the area of airworthiness standards, the lease agreement should include at least that:

- a) the lessor and lessee are properly identified;
- b) the aircraft subject to the lease agreement is identified by aircraft make and model, registration number and manufacturer's serial number;
- c) the effective dates of the lease are properly identified;
- d) the person having operational control is specifically identified;
- e) the State of Registry and the airworthiness code under which the aircraft will be maintained are identified;
- f) the responsibilities for the accomplishment of maintenance in accordance with the designated airworthiness code are specifically identified;
- g) the responsibilities for keeping the aircraft maintenance records in accordance with the designated airworthiness code are specifically identified; and
- h) the maintenance/inspection programme that will be utilized is specifically identified.

PART V

STATE OF DESIGN AND STATE OF MANUFACTURE

Chapter 1

STATE AIRWORTHINESS LEGISLATION SYSTEM AND ORGANIZATION STRUCTURE

1.1 GENERAL

1.1.1 In order for a State of Design and State of Manufacture to effectively perform its duties and responsibilities an effective organization and regulatory system should be firmly in place. The foundation of a solid safety oversight system by which a State of Design and State of Manufacture can exercise its certification and surveillance responsibilities is to have primary legislation that establishes the framework for the creation of a CAA with authority to develop and amend regulations to ensure the airworthiness of aircraft that are designed, manufactured, maintained and operated in the State. The primary legislation or law needs to ensure the regulations are uniform to the greatest extent possible with those required by Article 12 of the Convention on International Civil Aviation, and the Annexes to the Convention. The civil aviation organization needs to be appropriately organized, funded, staffed and empowered to carry out its duties and responsibilities. Further, the State should assess its aviation industry and ensure sufficient qualified technical personnel are available to fulfil the needs of the industry. The State may consider reviewing Annexes 6 and 8 and assessing its aviation industry and anticipated growth in determining the organizational structure needed for the State. For all States it will be necessary to establish a certification and surveillance group/division within the organization. Included in the organization should be a group to monitor the necessity to amend the regulations with regard to the continuing airworthiness of aircraft.

1.1.2 The overall responsibility of the State of Design and State of Manufacture can be found in Annex 8, Part II, Chapters 1, 2 and 4. The State of Design and State of Manufacture should also establish a State Safety Programme as required by Annex 8, Part II, Chapter 5. From 14 November 2013, a State of Design or Manufacture requires, as part of its State safety programme, that an organization responsible for the type design or manufacture of aircraft implement a safety management system acceptable to the State, and from 7 November 2019, this requirement was extended to States of Design or Manufacture for organizations responsible for the type design or manufacture of engines or propellers.. Additional State of Design and State of Manufacture responsibilities can be found in Annex 6, Parts I, II, and III.

1.2 RESPONSIBILITIES OF THE STATE OF DESIGN AND STATE OF MANUFACTURE

The following are responsibilities normally associated with State of Design and State of Manufacture. There may be additional responsibilities based on the complexity of the State's aviation industry.

1.2.1 State of Design

- a) Ensure the design aspects of the appropriate airworthiness requirements of the aircraft, engine and/or propeller type comply with the Standards in Annex 8;
- b) Issue a type certificate to define the type design and to signify approval of these designs upon receipt of satisfactory evidence that the type designs in compliance with the design aspects of the appropriate airworthiness requirements;

Note.— In some Contracting States, a document equivalent to a type certificate may be issued for an engine or propeller type.

- c) As required in Annex 8, Part II, Chapter 4, notify States of Registry in the event of a suspension of a type certificate and establish with the State of Manufacture if, other than the State of Design, any actions necessary to address their respective airworthiness responsibilities;
- d) As required in Annex 8, Part II, Chapter 4, notify all Contracting States of intent to revoke a type certificate and consult with States of Registry for the collection, identification and establishment of supplemental airworthiness requirements considered necessary for the continued airworthiness of the candidate orphan aircraft type;
- e) Review and approve, as required, requests for modification to the type certificate and make this information available to other Contracting States;
- f) As required in Annex 8, Part II, Chapter 4, transmit to every Contracting State which has in accordance with Annex 8, Part II, 4.2.3 a) advised the State of Design that it has entered an aircraft on its register, and to any other Contracting State upon request, any MCAI necessary for the continuing airworthiness and safe operation of the aircraft and notification of the suspension or revocation of a type certificate;
- g) As required in Annex 8, Part II, Chapter 4, ensure there is a system to address the information received from the State of Registry on faults, malfunctions, defects and other occurrences that might cause adverse effects on the continuing airworthiness of the aircraft;
- h) Ensure that, for aeroplanes over 5 700 kg MTOM, there exists a continuing SIP to ensure the airworthiness of the aeroplane;
- i) Ensure that, where the State of Design is not the State of Manufacture of an aircraft, engine or propeller, there is an agreement to ensure the organization responsible for the type design cooperates with the manufacturing organization in assessing the information received on the experience with operating the aircraft;
- j) Ensure that the State of Design of an engine or propeller, where it is different from the State of Design of the aircraft, transmits any continuing airworthiness information to the State of Design of the aircraft and any other Contracting State upon request;
- k) Ensure that the State of Design for a modification, where it is different from the State of Design of the product being modified, transmits the MCAI to the States that have the modified aircraft in their registries;
- l) Ensure the development and promulgation of national regulations regarding the design of aeronautical products; and
- m) Notify ICAO of differences between ICAO Standards and national regulations and practices.

1.2.2 State of Manufacture

- a) Ensure that, where the State of Manufacture of an aircraft, engine or propeller is not the State of Design, there is an agreement to ensure the manufacturing organization cooperates with the organization responsible for the type design in assessing the information received on the experience with operating the aircraft, including such period when the State of Design takes action to suspend in whole or in part the type certificate of the affected aircraft type;

- b) Ensure that the production of aircraft parts manufactured under the design approval referred to in Annex 8, Part II, Chapter 1, are airworthy at the time of release;
 - c) Ensure that all aircraft and aircraft parts, including aircraft parts manufactured by contractors and/or suppliers, are airworthy at the time of release;
 - d) Issue a production approval to the manufacturing organization upon satisfactory evaluation of its processes and systems and inspection of the production facilities;
 - e) As required in Annex 8, Part II, Chapter 4, terminate production approvals when the State of Design revokes the type certificate corresponding to that aircraft type;
 - f) Ensure the development and promulgation of national regulations regarding the manufacture of aeronautical products; and
 - g) Notify ICAO of differences between ICAO Standards and national regulations and practices.
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Chapter 2

TYPE CERTIFICATION

2.1 GENERAL

2.1.1 Article 31 of the Convention prescribes that every aircraft engaged in international civil aviation be provided with a Certificate of Airworthiness issued or rendered valid by the State of Registry. Annex 8, Part II, states in part that the issuance or rendering valid of a Certificate of Airworthiness must be based on satisfactory evidence that the aircraft complies with the design aspects of the appropriate airworthiness requirements (i.e. the airworthiness standards) of the State of Registry. An example of evidence that is used by a majority of Contracting States, for the purpose of the Certificate of Airworthiness, is the aircraft type certificate.

Note.— Amendment 98 to Annex 8 introduced the formal requirement for a State of Design to issue a type certificate as evidence of approval for any new application for aircraft certification on or after 2 March 2004.

2.1.2 The original issuance of an aircraft type certificate by the State of Design is regarded as satisfactory evidence that the design and details of such aircraft type have been reviewed and found to comply with the airworthiness standards; that the aircraft type has been subjected to the required ground and flight tests; and that no known or suspected unsafe aircraft characteristics exist against those standards with which it had shown compliance. Subsequently, a State of Registry may accept the original type certificate in lieu of issuing its own or use it as a basis for issuing its own Type Certificate when processing an aircraft type intended to be entered on the State's civil aircraft registry for the first time.

2.1.3 A type certificate is a formal document issued by the State of Design or the State of Registry for the approval of a type design. Type certificates are generally issued for aircraft, engines and propellers. Other forms of design approval may be issued to cover the remaining aeronautical product categories such as major components, auxiliary power units, appliances, equipment, instruments, and other parts intended for installation in the aircraft, engine or propeller. Thus, prior to issuing a type certificate for the aircraft, States would also have to ensure compliance with those airworthiness requirements that specify separate type certificates for engines and/or propellers or separate design approvals for major components prior to their installation on the aircraft.

2.1.4 The airworthiness organization of the State of Registry, as discussed under Part III of this manual, is responsible for ensuring the airworthiness of aircraft to which it issues a Certificate of Airworthiness. It is incumbent upon the State of Registry to facilitate this through a validation or acceptance of the State of Design's type certificate. In doing so, it will rely on the State of Design's certification programme to the maximum extent practicable, in order to ensure the State of Registry's airworthiness standards are satisfied. If adopting the State of Design's airworthiness requirements, the State of Registry may validate the State of Design's type certificate without a technical investigation, provided that it is satisfied with the State of Design's airworthiness certification process and findings. When determining the level of technical investigation, the State of Registry may consider the outcome of an audit by the ICAO Safety Oversight Audit Programme or rely on a bilateral agreement between the State of Design and the State of Registry. The State of Registry may also issue its own type certificate to indicate a satisfactory validation of the State of Design's type certificate.

2.1.4.1 For CAAs with an airworthiness engineering division (AED), the AED will normally establish and carry out procedures for the type certification or other design approval of aircraft, engine, propellers, equipment and instruments that are designed or produced in that State, as well as including procedures for the validation of type certificates and other design approvals issued by another State. It is essential that the basic criteria and procedures be developed in detail by

the AED, approved by the DGCA, and made available to all parties involved within the CAA and the aviation industry. The criteria and procedures should be set forth in straightforward terms and in a form suitable for use by the AED engineers, as well as the design and test engineers employed by the manufacturers. The procedures should be of a general nature and normally not tailored to a specific aircraft type or specialized equipment and components. Furthermore, the procedures should provide for active participation of the AED at an early stage of the type certification/design approval process and for effective communication between all parties concerned.

2.1.4.2 Many States do not have an aviation manufacturing industry and, consequently, do not necessarily have in their airworthiness organization the engineering capability to perform type design review or technical validation of a foreign type certificate. States in this category should establish through regulations or policy, the recognition and direct acceptance of the type certification already done by the State of Design. Alternatively, States may obtain the services of qualified persons or organizations on a temporary basis to allow the fulfilment of its responsibilities for type certification under Annex 8.

2.1.5 A Contracting State is encouraged to give maximum credit and recognition to the type certification already done by the State of Design, and avoid duplicate or redundant testing where practical and without prejudice to its own unique national requirements. The majority of airworthiness standards currently used by States with aviation manufacturing industries are already harmonized, and the remaining differences are either with the unique technical requirements, due to operational or environmental constraints, and/or interpretation of the same requirements. Although full harmonization of all airworthiness requirements is yet to come, the overall objective that all States should work towards is reducing the amount of work needed to accomplish the approval of an aircraft type design and, subsequently, the issuance of a Certificate of Airworthiness under Annex 8 by the State of Registry.

2.2 APPLICATION FOR A TYPE CERTIFICATE

2.2.1 General

A type certificate is normally issued for an aircraft, engine or propeller. The type certification process is initiated when an applicant submits a formal application to the AED for the issuance of a type certificate for the applicant's type design. The official acceptance of the application by the AED may be subject to certain prerequisites or conditions of application. As an example, some States have a financial policy on recovering their costs for services rendered and may require the applicant's commitment to such policy before the AED begins type certification. The application phase of any type certification activity normally involves exploratory discussions between the AED and the applicant on various issues, the intent of which is to acquire as much understanding as possible on the type certification project. In many cases, an application is also made for concurrent certification by another State. Some of these aspects are discussed in the following paragraphs. Once the application is officially accepted by the AED, the type certification process begins, usually involving the five common key activities of Section 2.3 of this chapter.

2.2.2 Applicant

2.2.2.1 An applicant for a type certificate can be an organization, an individual or, where allowed by a State, a representative for that organization or individual. Regardless, the applicant is, for purposes of type certification, the organization or individual that has responsibility for the type design of the aircraft, engine or propeller and in whose name the type certificate will be issued. The applicant should have the technical capability, or have access to a technical capability, to establish and demonstrate compliance of the type design to the applicable airworthiness and environmental standards. In cases of complex design and production of aeronautical products involving multinational agreements, joint ventures, partnerships or similar collaboration, the applicant for a type certificate remains responsible overall for the type design of the aircraft, engine or propeller that is under consideration for a type certificate.

2.2.2.2 Some States require an individual or organization to first demonstrate competency by formally obtaining accreditation or designation from their CAA as an approved design specialist (known in some States as an approved design organization or individual, or of an equivalent status). This technical capability can be a function of the extent and complexity of the aeronautical product being certified and the nature of the substantiating data needed to establish and demonstrate compliance with the applicable airworthiness and environmental standards. Type certification of an aircraft, engine or propeller should not be attempted unless the applicant has a sound knowledge of the design principles embodied in the type design being considered.

2.2.3 Application form

A formal application for a type certificate should be submitted in a form and manner prescribed by the CAA and submitted to the AED. Information should be provided as follows:

- a) for an application for an aircraft type certificate, a three-view drawing of that aircraft and preliminary basic data, including the proposed operating characteristics and limitations;
- b) for an application for an engine or propeller type certificate, a general arrangement drawing, a description of the design features, the operating characteristics, and the proposed operating limitations of the engine or propeller;
- c) a statement identifying the airworthiness standards to which the aircraft, engine or propeller is designed and with which it is intended to show compliance; and
- d) an indication from the applicant on the need for concurrent or subsequent type certification in another State or States.

2.2.4 Validity period of an application

An application for a type certificate is normally subjected to a validity period prescribed by the CAA, within which the type certification process should be completed. The validity period starts from the date of application up to a predetermined number of years, the exact number being commensurate to the complexity of the review and approval of the type design. For example, many States have a validity period of five years when certifying large transport aircraft, and three years when certifying an engine or propeller. In cases where an applicant can show that its type design requires a longer period of time for design, development and testing, the CAA can approve a longer validity period; or if during the type certification process, the CAA believes that the type certificate will not be issued by the end of the validity period, the applicant should be requested to submit a new application or apply for an extension of the validity period. As a consequence of any extension granted to an applicant, the certification basis should be reviewed again for currency or validity. The CAA and applicant should jointly review the potential impact or consequence of their extended validity period when requesting foreign validation of their type certificate.

2.2.5 Management of the application

An application is considered outstanding or open until a type certificate is finally issued or denied by the CAA. Given that an application has to be completed within the validity period established in 2.2.4, the CAA needs to convene a certification team that will administer the type certification process and manage the actual certification activities involved in each application. For a State of Design, this team is commonly referred to as the Type Certification Board (TCB). For a State of Registry, this team is commonly referred to as the Validation Team. The functions of both teams are the same, i.e., to process an application for a type certificate and provide a recommendation to the CAA. However, the activities of the Validation Team are expected to be limited in scope and depth, giving due recognition to the work being performed, or already done, by the CAA of the State of Design.

2.2.5.1 **Type Certification Board**

Type certification boards are normally established for all aircraft and engine projects in which a complete type certification is involved. These may also be established for propellers, when considered necessary, and for projects involving complex changes to the type design. The purposes of a TCB are to acquaint the applicant and the AED with the specific certification project, resolve significant problems and establish milestones and schedules for the overall accomplishment of the type certification programme, review the applicant's certification plan, review the proposed certification basis, and assure all outstanding certification issues are resolved. Clear expectations from, and assignments for, the applicant and the AED are established by the TCB. It is also the TCB that submits the final recommendation to the DGCA for the issuance or denial of a type certificate.

2.2.5.2 **Board membership and participation**

2.2.5.2.1 The TCB should have permanent members from both the CAA and the organization responsible for the type design, consisting of at least the following:

- a) a representative of the AED;
- b) a representative of the AID;
- c) a representative of the Operations Division; and
- d) the applicant and their representatives.

2.2.5.2.2 Additional representatives should be invited as participants on an advisory basis when their presence is warranted because of new features, specialized considerations, or due to interregional and regulatory implications. These participants may include the following:

- a) engineering and manufacturing specialists from the CAA;
- b) maintenance and inspection specialists from the AID;
- c) associated aircraft, engine or propeller manufacturers whose representative may assist in providing technical information; and
- d) representatives of other divisions of the CAA, as necessary.

2.2.5.2.3 The representative of the AED should act as the TCB Chairman and should be responsible for: arranging TCB meetings; securing the desired representation, and notifying the representatives as to the time and location of the meetings. The TCB Chairman should be assisted, as necessary, by aircraft, engine, propeller and equipment specialists in the AED.

2.2.5.2.4 Active participation of AID personnel in the early stages of TCB activities is of utmost importance. During the early stages of design and product development, aspects of accessibility and maintainability should be considered. Incorporation of these important design characteristics will enhance the reliability of the aeronautical product and effectiveness of an air operator's maintenance programme.

2.2.5.2.5 The review of manufacturer's maintenance information is another important function of airworthiness inspection activity. Emphasis should be given to the manufacturer's instructions for continuing airworthiness. It is important that these instructions be reviewed by, and have the concurrence of, the AID inspectors assigned to the TCB.

2.2.5.3 Major activities of the board

2.2.5.3.1 The major activities of the TCB are accomplished in progressive sequence and are commonly divided into three phases, as follows:

- a) *Preliminary Phase* — is begun by conducting an initial TCB meeting. The initial TCB meeting is commonly scheduled following formal acceptance by the CAA of an application for a type certificate. The initial TCB meeting should:
 - i) enable the participants to become acquainted with the project;
 - ii) permit the discussion with specialists of design details and possible problem areas;
 - iii) commence the evaluation process;
 - iv) establish the certification basis; (e.g. type of operation, safety level) and criteria that contribute to the determination of the appropriate level and reference the airworthiness requirements to which compliance will be shown; and
 - v) identify areas needing the formation of special compliance teams to attain the earliest possible resolution of potential problem areas.
- b) *Pre-flight Phase* (Pre-Type Inspection Authorization) — is usually initiated by conducting an intermediate TCB meeting. The timing of the intermediate TCB meeting is commonly scheduled either near the completion, or following completion, of all ground tests, but before commencing any official flight testing by the AED. At the requests of the AED or the applicant, the TCB should convene additional meetings as necessary in order to resolve promptly technical and administrative issues or problems as they arise. The intermediate TCB meeting(s) should provide for the discussion and clarification of any questions related to the required test programme of the aircraft, engine or propeller. Any or all outstanding items of significance to the official test programme must be resolved prior to the issuance by the AED of an authorization to commence official aircraft flight testing or the issuance of the Type Inspection Authorization.
- c) *Final Phase* — is usually initiated by conducting a final TCB meeting. The timing of the final TCB meeting is commonly scheduled either near the completion, or following completion, of the demonstration of compliance with the certification basis and successful performance of all ground and flight testing. The final TCB meeting should provide for the:
 - i) review of all outstanding items on which there may be some question of compliance with the agreed certification basis;
 - ii) establishment of the type certification data sheet items and aircraft flight manual or equivalent document items;
 - iii) determination of the status of any outstanding technical data; and
 - iv) establishment of a TCB position on its readiness, which may be contingent on the disposition or full completion of all outstanding items, to recommend to the DGCA the issuance of a Type Certificate for the aeronautical product for which an application was submitted.

2.2.5.3.2 As stated in 2.2.5.3.1 a) iv), the certification basis needs to be established. The applicable airworthiness code often contains requirements that are dependent on specific aircraft criteria like VFR operation or the risk level (e.g.

number of occupants) that need to be mitigated. The type certification process should accommodate a practical application of an approach that is commensurate to those criteria and risk levels of the aircraft. This approach allows for a lighter touch-type certification process for aircraft determined as low risk. This would allow the streamlining of type certification founded on an appropriate and proportionate overall airworthiness level intended by the broad Standards of ICAO Annex 8, Parts II and VB.

2.2.5.3.3 As stated in 2.2.5.3.1 a) v), the TCB may require the formation of special compliance teams for the purpose of conducting special certification reviews of potential problem areas. The special certification review normally involves an in-depth, comprehensive study of complex, controversial or troublesome aircraft design features, or aircraft component problems associated with airworthiness determination of an aircraft, engine, propeller or aircraft component. Examples of potential safety problem areas for which such a special review may be appropriate include the following:

- a) complex or unique design features;
- b) advanced state-of-the-art concepts in design, quality or manufacturing processes;
- c) features that may require special conditions and exemptions;
- d) troublesome features used in similar previous designs requiring further analysis or evaluation;
- e) compliance areas critical to safety and requiring judgment evaluations;
- f) undesirable maintainability characteristics;
- g) equivalent safety proposals with potential for major effects on safety; or
- h) complicated interrelationships of unusual features.

2.2.5.3.4 Special certification reviews are normally conducted with the assistance of specialists groups composed of members of the concerned divisions of the CAA. The groups may seek assistance from other governmental agencies, outside consulting firms and industry, as necessary, to obtain technical expertise for conducting a thorough evaluation. The group's findings and recommendations are submitted to the Chairman of the TCB.

2.2.5.4 **Record-keeping of TCB activities**

Records should be made and kept for each TCB meeting that clearly identify, among other things, all decisions taken, the certification basis, agreements reached, status of action items, tasking and deliverables of persons, and commitments on schedules. Copies of such records should be distributed promptly to the meeting attendees and to all affected and concerned persons. Each item or subject discussed should be summarized under a separate heading and the problem stated clearly, followed by any conclusions and recommendations. Persons required to take action on specific matters by a critical due date should be identified clearly. Based on the knowledge of the design features or potential safety problems obtained from the TCB meetings, those certification areas for which a special certification review is required should also be identified in the records.

2.3 TYPE CERTIFICATION ACTIVITIES: STATE OF DESIGN

2.3.1 General

2.3.1.1 The main objective of the type certification process is for a State to determine the overall compliance of the type design with its applicable airworthiness requirements. This objective applies to both the State of Design and State of

Registry. The State of Design has prime responsibility for the original or initial approval of the type design. A State of Registry has a responsibility to establish that there is satisfactory evidence of design approval of an aircraft being issued a Certificate of Airworthiness under Annex 8. While Annex 8 sets the minimum international airworthiness standards in the form of general design objectives, it is not sufficient by itself to be the sole basis for the approval of a type design and issuance of a type certificate. The ability to issue the type certificate referred to in Annex 8 is conditioned upon States having comprehensive and detailed airworthiness (design) standards for the aircraft, engine and/or propeller that include or implement the design objectives of Annex 8.

2.3.1.2 There are five key activities associated with a type certification process, namely:

- a) establishing the certification basis;
- b) establishing the means or methods of compliance;
- c) demonstration and findings of compliance;
- d) certifying the type design; and
- e) post-type certification activities.

2.3.2 Establishing the certification basis

2.3.2.1 The major components of a certification basis are the airworthiness and environmental standards, including if any, special conditions (SC) of airworthiness, findings of equivalent level of safety, and exemptions.

2.3.2.2 In the application form for a type certificate, the applicant would have already proposed the airworthiness and applicable environmental standards to which he or she intends to show compliance. Depending on the type design, additional airworthiness or operational requirements may be imposed by the State of Design, or an applicant may be required to show that the product meets additional standards in order to receive type certification in another State due to differences in requirements. All these requirements are established collectively to become the certification basis. The applicant should participate in any AED discussion concerning the certification basis, but it remains the ultimate responsibility of the State of Design to review the certification basis, and decide and establish that it is appropriate for the type design.

2.3.2.3 Once the certification basis has been established, it should be confirmed in writing by the AED to the applicant and preserved throughout the validity period of the application for a type certificate (see Chapter 2.2.4 of this Part).

2.3.2.4 It should be noted that while the certification basis is established very early in the type certification programme, the final certification basis of an aeronautical product may, in some cases, end up being different from that initially established during the initial TCB meeting (see guidance in Chapter 2.2.5.3 of this Part). The differences may come when the AED issues SC of airworthiness, findings of equivalent level of safety (FES), or an exemption. The need for the issuance of an SC, FES, or an exemption as part of the certification basis is usually identified by the applicant to the AED at the beginning of the type certification project. However, the need may not be obvious at the beginning and may become evident only during the course of the actual type certification. At the conclusion of the type certification activity, the AED should identify all FES, exemptions and other voluntary compliance that transpired during the certification period in order that these activities may be recorded in the type certificate as part of the final certification basis.

2.3.2.4.1 *Airworthiness standards*

The applicable airworthiness standards for a type certificate are those that are in effect on the date of application for a type certificate, meaning the latest amendment level. Airworthiness standards are amended from time to time to improve the overall level of safety inherent in these standards. At the time of application, it is generally regarded that the latest amendment level of a standard offers the highest level of safety for the aeronautical product, and the intent is to certify the type design to this level. If after the application date, subsequent amendments to the standards become available, the AED should promote further enhancement of the level of safety by encouraging the applicant to comply voluntarily with those newer standards.

2.3.2.4.2 *Environmental standards*

In addition to the Annex 8 airworthiness requirements, Annex 16 provides that States perform certification on certain environmental aspects of civil aircraft and engines intended for use or operation in international air navigation. The applicable environmental standards for aircraft and engines are those defined in Annex 16 that are in effect on the date of application for a type certificate. States that have not adopted or accepted Annex 16 as their environmental standards may use other standards provided they are at least equal to the stringency of Annex 16.

Note.— Some States assign the responsibilities for establishing, and finding compliance with, the environmental standards to another governmental organization, and not necessarily to their AED. States should ensure that both the environmental and airworthiness certifications are addressed at the conclusion of the type certification activity for the affected aeronautical product.

2.3.2.4.3 *Special conditions (SC) of airworthiness*

Annex 8, Part II, 1.2.3 and 1.2.4 require that additional technical requirements be considered in cases where novel or unusual design features of a type design to be certificated render the appropriate airworthiness requirements inadequate. The common instrument used by many States for this purpose is the SC of airworthiness. A SC should be issued as part of the certification basis when the AED finds that a proposed type design for an aircraft, engine or propeller incorporates novel or unusual design features and the existing applicable airworthiness standards do not contain adequate or appropriate safety standards for certifying such features. The phrase “novel or unusual” applies to the design features of the type design to be certificated when compared to the applicable airworthiness standards. For example, the airworthiness standards may contain provisions only for use of metal for structural parts, and therefore a proposal to use composite materials will be novel or unusual to the standards. A SC should contain only such additional airworthiness standards for the novel or unusual features as are necessary to establish a level of safety equivalent to that intended by the certification basis.

2.3.2.4.4 *Finding of equivalent level of safety (FES)*

A FES is not an additional airworthiness requirement by itself, but rather a finding of compliance with the intent of airworthiness standards. Usually, the applicant will identify and inform the AED very early in the type certification programme of a need for an FES against certain airworthiness standards, attributed to a peculiarity in the proposed type design. Once a need for an FES is established, whether early in the programme or later, the AED should identify and record all FES as part of the certification basis.

2.3.2.4.5 *Exemption*

2.3.2.4.5.1 A request for exemption is a proposal that a non-compliance with a specific certification requirement could be allowed. All requests for exemption should be based on convincing evidence that granting the exemption relief will not

adversely affect safety. A request for exemption may be denied, partly granted, or granted by the CAA. For any case involving a request for exemption, the possibility of an FES should be considered prior to accepting a request from the applicant for exemption from specific airworthiness or environmental standards.

2.3.2.4.5.2 An exemption, when granted, is not an approval, but a relief from demonstrating compliance with a specific requirement of the airworthiness or environmental standards. An exemption is usually issued with specific conditions to ensure that granting of such relief will maintain an acceptable level of safety. Any grant of an exemption by a CAA on a type certification project should be identified and recorded as part of the certification basis.

2.3.2.4.6 *Elect to comply*

Airworthiness standards are mandatory requirements. However, there may be aspects of the standards that are not enforceable because they are offered as an optional certification provision (for example, ditching provisions). The decision to avail of optional certification provisions rests with the applicant, and not the AED. In addition, an applicant may choose to comply voluntarily with recent amendments to the airworthiness standards that became available only after submission of the application for a type certificate. In both cases where the applicant elected to comply with later amendments or with optional certification provisions, the AED should identify and record this voluntary compliance as part of the certification basis.

2.3.2.4.7 *Other compliance considerations*

An applicant for an original type certificate (issued by the State of Design) may wish to obtain type certificate validation by another State(s) at the same time it is obtaining the original type certificate. This is an option solely up to the discretion of the applicant as long as it can be supported at the time by the State of Design. If such validation takes place, the validating State may establish additional requirements, beyond those of the State of Design, that are a part of its type certification requirements. These might include:

- a) design-related operating requirements, where the operating rules may affect either the design features of the aeronautical product or data on the design relating to the operations of the aeronautical product that make it eligible for a particular kind of operation in a State; or
- b) additional technical requirements arising from differences in airworthiness and environmental standards, differences in interpretation of the same standards, mandatory airworthiness action taken by a State to correct known or identified unsafe conditions, and other conditions concerning airworthiness that are necessary for the aeronautical products to comply with the laws, regulations, standards and requirements of the importing State.

The additional requirements from the validating States are not included in the type certification basis for the State of Design's approval, but become a part of the type certification basis for the validating State's type certificate. The State of Design need not agree with the additional requirements, but it should determine compliance with them if asked by the validating State. The State of Design should notify the validating State of any situations where it finds that the additional requirements are not compatible with the certification basis of the State of Design.

2.3.3 Establishing the means of compliance

2.3.3.1 **General**

It is the sole responsibility of the applicant to demonstrate compliance of the type design with the certification basis in accordance with the means or methods accepted or agreed to by the AED. In order to manage this aspect during the type

certification process, and before an applicant commits to any compliance action, it is necessary to agree on a certification compliance plan that clearly identifies the types of action to be applied against each item. The majority of States of Design or Registry, when applicable, find it necessary to have a compliance plan. The certification compliance plan can be an effective tool in managing the certification programme by providing an early understanding of what is required to achieve certification and assisting in the identification of certification problems early in the programme.

2.3.3.2 **Means of compliance**

2.3.3.2.1 The means of compliance is usually dictated by the specific item of the certification basis and generally falls into one or any combination of the following:

- a) Test – is performed when the requirement explicitly calls for a demonstration by test (physical, actual or simulation). Examples of test are flight test, ground test, fatigue test, simulation, fire or flammability test, environmental test (e.g. salt spray), functional test, bird strike test, and engine ingestion test.
- b) Analysis – is performed when the requirement explicitly calls for a demonstration by analysis (qualitative, quantitative or comparative), or when the applicant can demonstrate, based on previously accepted test results, the validity of using analysis in lieu of testing. Examples of analysis are failure modes and effects analysis, flight performance data reduction and expansion, structural loads analysis, and software evaluation.
- c) Inspection or evaluation – is performed against an item that does not require test or analysis, but relies on observation, judgment, verification, evaluation, or a statement of attestation from the applicant or its vendors/contractors.

2.3.3.2.2 The means of compliance in the type certification must be commensurate with the assurance level required for the associated risk level and applied in a manner that supports and enables the development of new products and technologies which also contribute to safety. Differences in acceptable levels of safety for different products are recognized; this differentiation when effectively managed as part of an overall safety management system will not preclude the implementation of new technologies on small aeroplanes, but conversely would allow their certification as part of the approved type design and use at reduced costs. In fact, the adoption of a too-demanding stringency in the compliance-finding determination and means of compliance similar to the one used for large transport aircraft, if not appropriately adapted to small aeroplanes, would constitute barriers against the enhanced safety potential offered by the implementation of new technologies. In this respect, principles of the safety continuum (refer to Attachment C to Chapter 7) applied to small aeroplanes have proved effective. As an example, safety-enhancing electronic devices have been made cost effective and have been progressively implemented and approved on small aeroplanes by adoption of a proportionality approach to complex system and hardware safety assessment. An effective focus on safety need to be sustained by a robust SMS approach aimed at defining the right balance between risks and rigour in establishing methods of compliance as well as, and more specifically, the finding of compliance.

2.3.3.3 **Certification compliance plan**

2.3.3.3.1 The certification compliance plan is the primary document in the type certification process that serves both as a checklist and official record of compliance. The applicant should prepare a certification compliance plan and establish its contents with the agreement of the AED. The certification compliance plan should, at a minimum, contain the following information:

- a) itemized breakdown of the certification basis;
- b) identification of items of voluntary compliance;

- c) proposed means of compliance for each item (test, analysis, inspection, or combination of these, or finding of equivalent level of safety);
- d) lists of tests to be conducted;
- e) identification of substantiation reports to be submitted (as proof of compliance);
- f) identification of persons responsible for making findings of compliance;
- g) the level of involvement of the AED, the applicant, or a delegate of the AED in the findings of compliance or witnessing of tests; and
- h) the certification project schedule, including the established milestones and when final certification is expected.

2.3.3.3.2 Tests, analyses and inspections are expensive in terms of cost and time. Applicants, therefore, seek concurrence from the AED that their proposed means of compliance with the certification basis are acceptable. The acceptance of the means, however, is not an acceptance of the data in advance; it is merely recognition of the means as satisfactory for the demonstration of compliance. The certification compliance plan, although initially agreed to by the AED, is a living document whose contents may change (the structure and format will remain the same) throughout the course of type certification. Some of the possible sources of change to this document are as follows:

- a) design changes due to refinements or development;
- b) revised means of compliance;
- c) changes in level of involvement of the AED and applicant;
- d) changes to the certification basis caused by the issuance of special conditions of airworthiness, alternate means of compliance, or exemptions; or
- e) other issues affecting the design or certification that modify any of the aspects of the certification plan.

2.3.3.3.3 The activities involving demonstration of compliance usually begin after a certification compliance plan has been agreed upon between the applicant and the AED. The original (or master) copy of the certification compliance plan is retained by the AED until completion of the type certification activity. Upon completion of the programme, the plan can be the official certification compliance record for the aeronautical product. As a matter of principle applicable to all aircraft in general, but particularly adhering to the proportionality concept for simple and lower risk level small aircraft, the level of involvement could be reduced to a minimum provided that:

- a) the concerned aeroplane design does not need the issuance of special certification review because of its novel or unusual design features; and
- b) the design organization's past certification experience has proven effective with respect to the specific new design to be approved.

The CAA could define a delegation system being applicable a priori when risk levels have been determined to be low. It is assumed that an a priori delegation option would be supported by rational approach, such as an SMS, when the proportionality concept is adopted in relation to the safety continuum approach.

2.3.3.4 **Level of involvement**

Some CAAs have regulations that allow delegation of some or all of their functions, duties or powers to qualified individuals or organizations. The responsibilities assigned by the regulations to a CAA, however, cannot be delegated and always remain with the CAA. Under a delegation system, appropriately qualified individuals or organizations may be granted permission or authority to make a finding of compliance on behalf of their CAA. A finding of compliance by a delegate is a finding of compliance by the CAA. As such, an administrative procedure should exist for the recording of the finding of compliance by the delegated individual or organization. Some findings of compliance, however, may be the exclusive responsibility of the AED and cannot be delegated, or the AED may limit a delegate to making recommendations only instead of making a finding of compliance. If the applicant proposes to utilize delegated persons or organizations in the certification programme, the exact role of these delegates should be clearly identified in the certification compliance plan and agreed to by the AED. The levels of involvement of the AED, applicant and delegates will be defined by the CAA's delegation system, taking into account such factors as limitations of the delegates, complexity of the type design, availability of technical resources, and time constraints of the certification project.

2.3.4 **Demonstration and finding of compliance**

2.3.4.1 **General**

Annex 8, Part II, 1.3.1 and 1.3.2 specify that proof of compliance with the design aspects of the airworthiness requirements be established through the approval of the type design and the performance of necessary inspections and ground and flight tests. In the certification compliance plan, the means of demonstrating compliance (test, analysis or inspection/evaluation) and the levels of involvement (applicant and AED) are already specified for each item of the certification basis. The applicant is responsible for demonstrating compliance through the agreed means, while the AED is responsible for making a finding of compliance on the means demonstrated. Both demonstration and finding of compliance should be recorded against each item in the plan, as evidence of a successful completion. The implementation of the plan is the joint responsibility of the applicant and the AED, however, the applicant is responsible for meeting the established milestones in the certification schedule contained in the certification plan.

2.3.4.2 **Demonstration of compliance**

2.3.4.2.1 The demonstration of compliance requires that the applicant submits substantiating data (design data, reports, analyses, drawings, processes, material specifications, operations limitations, aircraft flight manuals and instructions for continued airworthiness). The data should be complete and in a logical format for review by the AED. Where the demonstration of compliance involves a test, a test plan should be developed and approved prior to any actual test being performed. The test plan should show which certification tests are witnessed by AED personnel or by an AED delegate, when authorized.

2.3.4.2.2 The applicant should give the AED access to the aircraft, engine or propeller in order to make any inspections, engineering assessment or witness any flight or ground test that is necessary to determine compliance with the certification item. However, the applicant should perform his or her own inspection and test necessary to demonstrate compliance prior to presenting the aircraft, engine or propeller to the AED for testing or evaluation.

2.3.4.2.3 If the applicant elects to comply with optional certification items or later amendments of the airworthiness standards for the purpose of obtaining credit in the certification basis, the demonstration of compliance for both cases is mandatory and is not subject to any exemption.

2.3.4.2.4 Where a demonstration of compliance is to be made using an FES, the applicant should provide sufficient justification to the AED that describes the design feature, action taken (i.e. compensating factor), and how such an action provides an equivalent level of safety to that intended by the regulation.

2.3.4.3 Finding of compliance

2.3.4.3.1 Findings of compliance are made against airworthiness and environmental standards, including special conditions, and requests for equivalent level of safety. The finding of compliance can be made by the AED, or by its authorized delegate, depending on the predefined levels of involvement in the certification plan. Following a successful demonstration of compliance by the applicant on a certification item, the AED should make a finding of compliance and subsequently sign-off the item in the certification plan. The findings are usually accomplished by the AED through one or any combination of the following actions:

- a) Acceptance of substantiating data – reports, analysis, drawings or similar documents are usually produced against each certification item and should be reviewed and accepted. Specific attention should be paid to the methodology and assumptions, rather than the detailed calculations or analysis.
- b) Witnessing of test – tests are performed, and witnessed by the AED when required and agreed to, in accordance with an approved test plan. The test should be conducted only after conformity with the test plan has been established for the test articles, test environment and test facilities. The AED does not take part in the actual performance of the test and should remain impartial and concentrated on the test objective.
- c) Engineering inspection – any aspect of the type design, for which compliance with the certification item cannot be determined through review of drawings or reports, should receive an engineering compliance inspection. An engineering compliance inspection is to assure that an installation and its relationship to other installations on an aeronautical product comply with the certification requirements.
- d) Flight Test – for aircraft, an actual demonstration of flight capabilities and characteristics in accordance with an approved flight test plan.

2.3.4.3.2 The adoption of a proportionality approach to type certification can also benefit the streamlining of the finding of compliance. Complementary to the defined Level of involvement (see paragraph 2.3.3.4), the finding of compliance can be limited strictly on the basis of the adherence to the proportionality approach, additionally supported by a delegation option by the AED of its functions. In this context, a risk-based assessment of the appropriate extent of delegation would be of help for the discharging of AED prerogatives and in parallel streamlining the process of compliance finding depending upon:

- a) the complexity and anticipated performances of the design;
- b) the past experience of the applicant with similar product design (including the technology involved);
- c) the novelties of the technologies involved in the design;
- d) the proven experience and competence of the applicant and the appropriate coverage of disciplines within his organization;
- e) the maturity achieved from a procedural standpoint by the applicant based upon his past experience to serve as proven practical capability to appropriately manage the compliance finding process; and
- f) the applicant's capability of maintaining a robust record-keeping system in place of the compliance finding process in order to guarantee traceability of the relevant data and its availability during the product lifetime.

2.3.4.4 **Non-compliance**

The AED should notify the applicant in writing of any non-compliance found during the process of data review, inspections, and ground and flight tests and, if it becomes necessary, the discontinuance of official type certification tests. The applicant should advise the AED when the non-compliance finding has been resolved or when the cause of the discontinuance of the tests has been corrected and a resumption of the type certification tests is requested. The identification and resolution of non-compliance items should be properly documented and kept as part of the record for the type certification project.

2.3.5 **Certifying the type design**

2.3.5.1 **General**

All findings of compliance made by the AED, or its delegate, should be recorded or annotated in the certification compliance plan. When the applicant has demonstrated compliance and the AED has found full compliance on all certification items, including the resolution of outstanding items, the plan is signed off and becomes the official certification compliance record for the type certification project. The certification compliance record serves as the satisfactory evidence specified under Annex 8, Part II, 1.4, for the issuance of a type certificate. The approval of the type design, and subsequent issuance of a type certificate, means that:

- a) the type design meets all the relevant requirements specified in the certification basis, including special conditions issued by the CAA;
- b) all engineering and conformity inspections have been completed, and the prototype aeronautical product has been found to meet all pertinent requirements; and
- c) in the case of aircraft, the prototype has been test flown and found to comply with all the performance requirements of the pertinent airworthiness standards.

2.3.5.2 **Withholding approval of type design**

A situation may exist, although rare, where an applicant successfully demonstrated, and the AED found, compliance with the certification basis but a known or suspected feature makes the type design unsafe, taking into account the category in which certification was requested. Notwithstanding the entitlement of the applicant for a type certificate, the AED has a responsibility under Annex 8, Part II, 1.3.3 to withhold the approval or issuance of a type certificate for an aircraft, engine or propeller if it is known or suspected to have unsafe features that are not specifically guarded against by the certification basis. The type certificate should be denied if the applicant fails to correct the unsafe feature.

2.3.5.3 **Issuance of a Type Certificate**

2.3.5.3.1 A type certificate is issued by the CAA under Annex 8, Part II, 1.4, as evidence of approval of a type design. An example of a Type Certificate is shown in Attachment A to this chapter. A type certificate usually contains the following information:

- a) the approval or type certificate number;
- b) the type certificate holder's name and address;
- c) the type design identification (aircraft, engine or propeller model designation);

- d) the applicable airworthiness requirements;
- e) a statement attesting compliance of the type design with the applicable airworthiness requirements;
- f) a statement incorporating or referencing the type certificate data sheet, which defines the type design, as part of the approval; and
- g) the date of issuance, the original signature and seal (as applicable) of the issuing CAA.

2.3.5.3.2 The holder of the type certificate is the organization that has responsibility for the design of the aircraft, engine or propeller. In the case of jointly designed aircraft, engine or propeller, or in the case where design work is subcontracted to other organizations, the certifying authority will require one organization to be responsible for the type design.

2.3.5.3.3 A type certificate is effective until surrendered, suspended or revoked, or until a termination date is otherwise established by the issuing CAA.

2.3.5.4 **Type certificate data sheet**

The type certificate data sheet is an integral part of, and issued at the same time as, the type certificate. The data sheet is prepared by the AED and identifies in detail the certification basis, the operating conditions, limitations, and maintenance requirements that have been specified as mandatory in the approval of the type design. When several models are included in the same type certificate, information should be repeated for each model, except for such common data as reference datum, mean aerodynamic chord, levelling means and control surface movements. An example of a type certificate data sheet is shown in Attachment B to this chapter.

2.3.5.5 **Documents necessary for approved type design**

The conditions and limitations of the approved type design are specified in the CAA-approved type certificate data sheet. This information is part of the type certificate and is mandatory for the safe operation and continued airworthiness of the aircraft. The type certificate data sheet also references other information that is necessary for the proper operation and maintenance of the aircraft in service. This other information may be developed concurrently during the type certification process and approved after the issuance of the type certificate. The following information should be documented in a form and manner prescribed by the CAA and subsequently made available to air operators of the aircraft:

- a) limitations and procedures necessary for safe flight operation due to design, operating or handling characteristics, including those necessary to maintain compliance with the approved noise limits, if applicable. This information is usually provided in the aircraft flight manual, mass and balance manual, and master minimum equipment list;
- b) limitations and procedures necessary for safe ground operation and maintenance such as:
 - i) mandatory replacement times for structural parts, structural inspection intervals, and related structural inspection procedures (usually identified in an airworthiness limitations document);
 - ii) mandatory maintenance tasks to be performed at predetermined intervals, as established during the type certification process (usually identified as certification maintenance requirements); and
 - iii) instructions for continued airworthiness of the aircraft, engine and propeller (usually contained in

the maintenance review board report), descriptive data and accomplishment instructions for the maintenance, servicing, inspection and repair (usually contained in the aircraft/engine/propeller maintenance manuals, engine installation manual and structural repair manual);

- c) a continuing SIP to ensure the airworthiness of an aeroplane, including specific information concerning corrosion prevention and control.

Note.— The publication of CAA-approved data in any document furnished to air operators should provide for the clear identification or distinction of such approval when such document also contains other data or information accepted or not approved by the CAA.

2.3.5.6 **Other information necessary for operation of aircraft**

Other information necessary for the operation of the aircraft under Annex 6 is typically developed concurrently with the type certification process, although this information or data are not requirements for the issuance of a type certificate. As with airworthiness-related data, this operations-related information should also be provided to air operators of the aircraft. This information includes the:

- a) master minimum equipment list – comprising information relating to the permissibility of dispatching aircraft with a known component or system inoperative (for additional information, see 2.8.3 of this chapter);
- b) continuing airworthiness maintenance information (sometimes issued as a maintenance planning document) – is the basis for the initial recommended maintenance programme for newly certified aircraft; and
- c) configuration deviation list – comprising information relating to the operation of an aircraft without certain secondary airframe or engine parts.

2.3.6 **Post-type certification activities**

2.3.6.1 **General**

A State of Design that issues a type certificate for an aircraft, engine or propeller has responsibilities under Annex 8 to provide continuing airworthiness services to States of Registry. The CAA and the type certificate holder fulfill this responsibility through a system of receiving and exchanging of information, surveillance, assessment of service difficulty experiences, and development of the necessary airworthiness actions. The organization responsible for the approved type design (holder) is an integral part of this process.

2.3.6.2 **Retention of type design data**

The type design data are contained in records, reports, drawings and other documents that describe collectively the exact configuration of the type design when it was approved. The type design data must be maintained by the CAA or the type certificate holder, or both. The CAA should determine the eligibility and type of data to be maintained by the type certificate. In either case, it should be recognized that the type design records are permanent and may not be destroyed as long as an aircraft, engine or propeller remains in service. Data maintained by the type certificate holder must be made available to the CAA for such routine activities as production inspection, surveillance, design change reviews, development of corrective actions, or for any other reasons deemed necessary by the CAA. The record-keeping should consist of at least the following:

- a) the drawings and specifications, and a listing of those drawings and specifications necessary to define the configuration and design features of the aeronautical product as it was shown to comply with the requirements applicable to the aeronautical product;
- b) reports on analysis and tests undertaken to substantiate compliance with the applicable requirements;
- c) information, materials and processes used in the construction of the aircraft, engine or propeller;
- d) an approved aircraft flight manual or its equivalent (type-related document), including the master minimum equipment list and configuration deviation list (if applicable);
- e) an approved MRB report, maintenance programme or equivalent document, and aircraft maintenance manual with details of manufacturer's-recommended and CAA-accepted scheduled maintenance plan and procedures guidelines;
- f) any other data necessary to allow, by comparison, the determination of airworthiness and noise characteristics (where applicable) of later aeronautical products of the same type;
- g) in the case of revalidation of type certificates issued by other States only:
 - i) a statement from the airworthiness authority of the State of Design detailing the deviations or differences permitted between the national airworthiness standards and those of the aircraft, engine(s) or propeller(s) as approved;
 - ii) the type certificate/design approval or equivalent for the aircraft, engine(s) and propeller(s), issued by the airworthiness authority of the State of Design; and
 - iii) a listing and complete set of all ADs or their equivalent.

2.3.6.3 **Responsibility of type certificate holder**

The type certificate holder remains responsible for the continued integrity of the approved type design, and it or its representative must continue to be the CAA's contact point for resolving issues that may require corrective action. To fulfill this responsibility, the holder of a type certificate should have the continued capability, or access to a capability, of providing appropriate technical solutions for service difficulties when service experience warrants it, or when the CAA requires mandatory corrective action. If the holder is no longer capable or if the type certificate is transferred to another holder, the CAA should take action in accordance with the guidance material provided in Chapter 6, Section 6.2 of this Part. In the case of the type certificate being transferred to another holder, the CAA needs to ensure that the new holder is capable of fulfilling the minimum responsibilities described herein.

2.3.6.4 **Changes in approved type design**

The type certificate holder can propose changes to the approved type design, under a system of review and approval established by the AED (see guidance in Chapter 3 of this Part).

2.3.6.5 **Continuing airworthiness**

Annex 8, Part II, Chapter 4, prescribes the activities and corresponding responsibilities of the State of Design, State of Manufacture, the State of Registry, and the organization responsible for the type design and the manufacturing organization in ensuring the continuing airworthiness of an aircraft during its entire operational or service life. Service

experiences involving faults, malfunctions, defects and other occurrences that may affect the continuing airworthiness of the aircraft are required to be recorded, reported and assessed under Annex 8, Part II, Chapter 4. This information is used to determine if an unsafe or potentially unsafe condition exists in an aircraft. The State of Design, State of Manufacture, State of Registry, and the organization responsible for the type design and the manufacturing organization play important roles in deciding if and when airworthiness action is needed to either correct an unsafe, or avoid a potentially unsafe, condition.

2.3.6.6 ***Suspension of Type Certificates***

In accordance with established procedures, States of Design may suspend the validity of a type certificate in order to temporarily address potential unsafe conditions impacting the airworthiness of a fleet of aircraft, or address other legal requirements. As stated in Annex 8, Part II, Chapter 4, during a period of suspension, the State of Design shall continue to fulfil its assigned obligations on continuing airworthiness. Upon suspension, the State of Design should mark the type certificate and associated type certificate data sheet to indicate that the design approval is invalid for the period of suspension. In order for States of Registry to effectively address the continued airworthiness of any aircraft of the affected design and determine the validity of any associated certificate of airworthiness, it is critical that the State of Design notify all States of Registry as soon as the suspension is enforced. In addition, the State of Design should communicate to all States of Registry information regarding the enforcement period, if time-limited, the reason for the suspension and any recommended actions that may be necessary to ensure the continued airworthiness of the affected aircraft type. The State of Design should maintain regular communications with States of Registry regarding the status of the suspension until such time that the type certificate is reissued with full validity or revoked. During the period of suspension of the type design, States of Manufacture must determine if any impacted production approvals should also be suspended. If the State of Manufacture is different than the State of Design, the two civil aviation authorities must ensure that the respective airworthiness responsibilities are maintained per the agreement or arrangement established in accordance with Annex 8, Part II, Chapter 2, section 2.4.5.

2.3.6.7 ***Revocation of Type Certificates***

In accordance with established procedures, States of Design may permanently revoke a type certificate. Revocation of a type certificate may occur as a result of enforcement actions by the State of Design, actions taken to address the airworthiness of the type design, the voluntary surrender or abandonment of the type certificate by the design approval holder, or other legal requirements. Upon revocation, the State of Design should mark the type certificate and the associated type certificate data sheet to indicate that the design approval is no longer valid. As stated in Annex 8, Part II, Chapter 1, the States of Design shall not unduly revoke a type certificate without providing ample notice and guidance to States of Registry, except for reasons concerning the immediate safety of an aircraft type. It is critical that the State of Design notify all States of Registry and States of Manufacture, if different than the State of Design, as soon as the revocation is enforced. The revocation of a type certificate may have significant economic and legal impact on States of Registry. The State of Design must establish procedures for the notification of intent to revoke a type certificate, proposed termination of associated production approvals, and willingness to continue to act as State of Design for the existing fleet of impacted aircraft. The procedures should also establish a means for consultation with any impacted States of Registry for the collection, identification and establishment of supplemental airworthiness requirements considered necessary for the continued airworthiness of the impacted or orphaned aircraft. When considering revocation as a result of the proposed voluntary surrender or abandonment of a type certificate by a design approval holder, States of Design may consider alternatives such as encouraging the transfer of a type design to a third party in order to mitigate the negative impact of revocation on operators and States of Registry. Alternatively, a State of Design may retain State responsibilities under Annex 8 for the design if it has sufficient access to the original design approval data and continued airworthiness information necessary to provide routine oversight of the remaining fleet.

2.4 TYPE CERTIFICATION ACTIVITIES BY STATES OTHER THAN THE STATE OF DESIGN

Annex 8, Part II, Chapter 3, states that the issuance, or rendering valid, of a Certificate of Airworthiness must be based on satisfactory evidence that the aircraft complies with the design aspects of the appropriate airworthiness requirements of the State of Registry. The satisfactory evidence used by a majority of Contracting States is the aircraft type certificate. It is not expected nor encouraged that States of Registry perform the same in-depth determinations of compliance that the State of Design has already done. Instead, States are encouraged, through regulations, bilateral agreements or policy, to give maximum credit to the type certification work already done by the State of Design and, minimize duplicate or redundant testing that adds little or no value to the overall airworthiness of the aeronautical product.

2.5 INSTRUCTIONS FOR CONTINUING AIRWORTHINESS (ICA)

2.5.1 General

Instructions for continuing airworthiness (ICA) are developed by the type certificate holder. They provide guidance to the air operator about what is necessary to maintain the airworthiness of the aircraft, engine or propeller, including incorporated modifications or repairs, over time. They provide documentation of necessary methods, inspections, processes and procedures. These instructions are distributed in two categories depending on the compliance requirements: maintenance requirements that have been specified as mandatory in the approval of the type design and those for which compliance is recommended.

2.5.2 ICA format and topics

2.5.2.1 The format and topics will vary depending upon the subject of the instructions and the complexity of requirements to maintain airworthiness. Specific airworthiness codes specify what needs to be addressed by the ICA.

2.5.2.2 The ICA may include sections on airworthiness limitations, certification maintenance requirement, maintenance instructions, engine and, if applicable, propeller maintenance, component maintenance, system wiring diagrams, and non-destructive test and inspection. A cross-check should be conducted to ensure that ICA elements required by the relevant airworthiness code are addressed in the aircraft documentation. An example of an ICA checklist is provided in Attachment C to this chapter.

2.5.3 Implementation

The State of the Operator needs to ensure that the ICA is being followed by the air operator and its maintenance organization.

2.6 CERTIFICATION MAINTENANCE REQUIREMENTS AND AIRWORTHINESS LIMITATIONS

2.6.1 Introduction

2.6.1.1 Annex 8 places an obligation on States of Design to ensure that information is provided for use in developing procedures for maintaining the aircraft in an airworthy condition. It requires that mandatory maintenance requirements that have been specified by the State of Design as part of the approval of the type design should be identified as such.

2.6.1.2 Where the maintenance tasks result from a system safety analysis, they are usually known as certification maintenance requirements (CMR). A CMR is a required periodic task, established during the design certification of the aircraft as an operating limitation of the type certificate.

2.6.1.3 It should be noted that some CMR require the performance of certain flight crew procedures. When included in a CMR, these procedures are mandatory and should be shown as such in the aircraft flight manual or equivalent document. It is likely that future design developments will limit the use of CMR to maintenance tasks.

2.6.2 Background information for helicopters

2.6.2.1 Helicopter type designs are unique in comparison to aeroplane designs in that transmissions, rotors, and some elements of the flight control systems have critical components that may be adversely affected by operating conditions and time in service, cycle, and retirement index number (RIN) exposure.

2.6.2.2 The ICA mandate airworthiness limitations and maintenance instructions for helicopters. ICA contain airworthiness limitations (structural life limits associated with fatigue requirements for helicopter structures), maintenance provisions, and allow for CMR. In addition, helicopter systems are increasingly complex and are capable of performing more safety-critical functions. CMR for helicopters, while not traditionally included in ICA, may be needed in order to detect and rectify possible hidden (latent) failures.

2.6.2.3 For a number of years, helicopter systems were evaluated to specific requirements, to the single fault criterion, or to the fail-safe design concept.

2.6.2.4 As more demanding helicopter operating environments evolved, more safety-critical functions were required to be performed which generally resulted in an increase in the complexity of the system designed to perform these functions. The potential hazards to the helicopter and its occupants that could arise in the event of loss of one or more functions provided by a system, or the effect of that system's malfunction, had to be considered, as did the interaction between systems performing different functions.

Note.— The guidance provided in the following paragraphs for aeroplanes should be adapted, as appropriate, for helicopters. The airline/manufacturer maintenance programme plan document described below was targeted for aeroplanes. However, elements from the programme plan document can also be used for helicopters, adjusting the procedures as appropriate to account for the differences between the two aeronautical products.

2.6.3 Background information for aeroplanes

2.6.3.1 For a number of years, aeroplane systems were evaluated to specific requirements, to the single fault criterion, or to the fail-safe design concept.

2.6.3.2 As later generation aeroplanes evolved, more safety-critical functions were required to be performed which generally resulted in an increase in the complexity of the system designed to perform these functions. The potential hazards to the aeroplane and its occupants that could arise in the event of loss of one or more functions provided by a system, or the effect of that system's malfunction, had to be considered, as did the interaction between systems performing different functions.

2.6.3.3 These developments led to the general principle that an inverse relationship should exist between the probability of loss of function(s) or malfunction(s) leading to a serious failure condition and the degree of hazard to the aeroplane and its occupants arising therefrom. Airworthiness codes were amended to recognize this principle, two

examples being the introduction of Paragraph 25.1309 in the United States Federal Aviation Regulations, Part 25 and the European Aviation Safety Agency, Certification Specifications (CS)-25. To satisfy these requirements, it is necessary to complete a safety analysis of all system and engine installations to determine the effect on the aeroplane of a failure condition or malfunction.

2.6.3.4 In assessing the acceptability of a design, it was recognized that rational probability values would have to be established, and these were set on the following basis:

- a) historical evidence indicates that the risk of a serious accident due to operational and airframe-related causes is approximately one per million hours of flight. Of this, 10 per cent can be attributed to failure conditions caused by aeroplane system problems. On this basis, it was considered that serious accidents caused by systems should not be allowed a higher probability than this in new designs. Therefore the probability of a serious accident from all such failure conditions should not be greater than one in ten million flight hours, i.e., a probability of less than 1×10^{-7} ; and
- b) to be satisfied that this target can be achieved, it is necessary to analyse numerically all the systems on the aeroplane. For this reason, it is arbitrarily assumed that there are about 100 potential failure conditions which would prevent continued safe flight and landing. The target risk of 1×10^{-7} was apportioned equally among these conditions, resulting in a risk allocation of not greater than 1×10^{-9} to each one. Thus, the upper risk for an individual failure condition which would prevent continued safe flight and landing is set at 1×10^{-9} for each hour of flight.

2.6.3.5 Various analytical techniques were developed to assist designers in completing the necessary safety analysis to satisfy the requirements:

- a) quantitative, by the application of mathematical methods. Such analysis is often used for hazardous or catastrophic failure conditions of systems that are complex, that have insufficient service experience to help substantiate their safety, or that have attributes that differ significantly from conventional systems; and
- b) qualitative, by assessment in a subjective, non-numerical manner. Examples of typical types of qualitative analysis are:
 - i) a review of the integrity of the installation and the design, based on experienced judgement; and
 - ii) a systematic review of each component failure and an evaluation of its effect on the systems of the aircraft. An advantage to this approach is the identification of potential hidden effects of these failures.

2.6.3.6 All hidden (or latent) failures need to be discovered and rectified in a timely manner. The methods for discovering hidden failures may include:

- a) failure monitoring and warning systems;
- b) scheduled maintenance tasks (e.g. operational or functional checks of the sub-systems or components); and
- c) specialized checks (e.g. CMR).

2.6.3.7 Historically, the MRB was the only body responsible for the determination of necessary maintenance tasks to prevent functional system failures, to find out and to eliminate hidden (or latent) failures of redundant systems or

components. These tasks being proposed by an industry steering committee (ISC) then form the initial maintenance programme (or the MRB report) for the aircraft type. This document is subject to approval of the MRB. The MRB report was previously the sole basis for continuing airworthiness of the aircraft type. More recently, a requirement in the United States and European standards concerning the “latent failures” led to the procedures for the Certification Maintenance Coordination Committee (CMCC) activities in the area of defining the scheduled tasks for timely elimination of the latent failures. In fact, these are the same activities as those of the MRB, but there is an option for special kinds of flight crew or maintenance personnel tasks. These tasks cover the type design features that cannot be treated effectively by other means (e.g. design change).

Note.— Guidance on MRB procedures is provided in Section 2.8 of this chapter.

2.6.4 Failure monitoring and warning systems

Completion of a safety analysis, using the techniques described in 2.6.3.5 of this chapter, may identify potential latent failures. Such failures should be identified to the flight crew by failure monitoring and warning systems. However, it is axiomatic that these systems should be practical and reliable, i.e. within the state of the art. A reliable system is one which will not result in either excessive failures of a genuine warning or excessive or untimely false warnings, which can sometimes be more hazardous than lack of provision for, or failures of, genuine but infrequent warnings. If a practicable and reliable monitoring and warning system cannot be provided, other means should be provided to detect significant latent failures, as described in the following paragraph.

2.6.5 Implementation of certification maintenance requirements (CMR)

2.6.5.1 To reduce or eliminate the hazardous consequences of undiscovered pre-existing failures, checks for such failures should be accomplished. These checks can be developed through the MRB process, system safety assessment or CMCC procedures and published as CMR where it is necessary to identify significant latent failures. Some checks of this nature may be performed by flight crews. If this is the case, they will be incorporated as mandatory procedures in the aircraft flight manual.

2.6.5.2 CMR are developed using rational methods, such as quantitative analysis or service experience. The tasks are intended to be implemented concurrently with routine maintenance inspection tasks.

2.6.5.3 CMR are produced by the organizations responsible for the type design and approved by the State of Design during the type certification process. CMR are listed in the type certificate data sheet or equivalent document. In many cases, it is appropriate for the type certificate data sheet to make reference to another document where CMR may be placed for convenience to the operator. For aircraft with maintenance manuals formatted in accordance with Air Transport Association of America Specification 2200 (ATA 2200), formerly Specification 100 (ATA-100), CMR can be included in Chapter 5 but are sometimes contained in the appropriate part of the ATA 100 maintenance planning data document or in a separate airworthiness limitations manual.

2.6.6 Incorporation of airworthiness limitations and CMR in maintenance programmes

2.6.6.1 CMR are an integral part of the validation of the type design and are essential to continuing airworthiness, even though the same conclusion may be made in respect of other types of airworthiness limitations. During the approval of maintenance programmes, the State of Registry needs to ensure that CMR and airworthiness limitations (including their associated intervals and tolerances as established by the State of Design) are included.

2.6.6.2 The State of Registry should not approve changes to airworthiness limitations without consulting with the

State of Design. Some type designs may include approved procedures which allow the air operator to vary airworthiness limitations task intervals (or limits). It is essential that any variation be completed in accordance with these procedures.

2.6.6.3 Based on service experience, it is normal practice for air operators to develop maintenance programmes in terms of variation of task content and escalation of inspection and check intervals. Airworthiness limitations are to be excluded from this escalation process. It is strongly recommended that States of Registry ensure that:

- a) airworthiness limitations are clearly identified as such in the maintenance programme; and
- b) procedures exist to prevent airworthiness limitations being varied in any way without the approval of, or in accordance with, a procedure developed by the State of Design.

2.7 STRUCTURAL INTEGRITY PROGRAMME (SIP)

2.7.1 Introduction

The material for this section applies to aeroplanes of over 5 700 kg maximum certificated take-off mass. It is intended to provide guidance to type design organizations responsible for the type design and to air operators on a continuing structural integrity programme which would include information to ensure that the structural integrity will be maintained over the operational life of the aeroplane. The objective of this section is to assist CAAs in the application of Annex 8, Part II, 4.2.1.1 c), which states:

[The State of Design shall] “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.”

2.7.2 Implementation

2.7.2.1 The type design organization should be responsible for submitting to the certifying authority a programme for making and updating a structural integrity assessment for the type and publishing this programme whenever the analysis of service and test experience of the aeroplane indicate that modified maintenance procedures are needed or supplemental inspections would yield necessary information on fleet conditions.

2.7.2.2 The continuing structural integrity programme should be initiated by the type design organization and developed jointly with representatives of air operators and airworthiness authorities. The authority in each State of Registry having aeroplanes affected should determine how, and to what extent, the substance of the programme is made mandatory, consistent with the State of Registry's own experience with the aeroplane and its procedures for enforcement of continuing airworthiness requirements.

2.7.2.3 At a minimum the continuing structural integrity programme should include, dependent upon the structural design criteria:

- a) supplemental inspections;
- b) corrosion prevention and control;
- c) structural modifications and associated inspections;

- d) repair assessment methodology; and
- e) widespread fatigue damage (WFD) review.

2.7.2.4 The corrosion prevention and control programme should be initiated as early as possible in the service life of the aeroplane and should preferably be available when the aeroplane is introduced into service. The other elements of the continuing structural integrity programme should be developed once sufficient service experience has been accumulated; normally they should be initiated by the time the highest cycle aeroplane has reached the half-design-life goal for the type and be reviewed periodically.

2.7.3 Procedures and methods

2.7.3.1 It is recognized that each air operator should have a maintenance programme when the aeroplanes enter service. In addition, the type design organization is responsible for conducting a continuing assessment of the structural integrity of its type designs over their operational life, taking into account the original design objectives and assumptions, advancements in technology and the behaviour of the structure in service. From this assessment, the type design organization and the air operators are jointly responsible for developing and issuing information to supplement the ongoing air operator maintenance programmes for the purpose of detecting structural damage before it becomes a serious problem in the fleet. This inspection information should be based on analysis supported by test evidence and air operator experience and should be included in a continuing structural integrity programme. This should be published and revised as indicated in 2.7.2.1.

2.7.3.2 The methods, principles and data underlying the continuing assessment of structural integrity and the development of the continuing structural integrity programme should be available for review by the certificating authority. It should be emphasized that the inspections, modifications and replacements described in the programme are additional to the original maintenance programme.

2.7.3.3 Service experience is a vital ingredient requiring the cooperation of all air operators. Each air operator should revise its maintenance programme to include, as appropriate, the data contained in the continuing structural integrity programme and should also provide an adequate system for recording and reporting in a timely way to the type design organization the operational usage, the structural discrepancies experienced in service and, where available, the results of initial analysis. These data should include a description and the location of the damage, identification of the aeroplane, relevant data on its modification status and operating history, time since beginning operations, time since the last maintenance check, the means by which the discrepancy was detected and its probable cause. It should be recognized that each air operator has to make an individual determination as to how the data that are in the continuing structural integrity programme should be incorporated in the maintenance programme owing to the differences in the various air operators' maintenance programmes, operating environment and fleet modification status.

2.7.3.4 Where an air operator wishes to introduce into service an aeroplane of a type for which a structural integrity assessment has been made, the air operator should determine that the continuing structural integrity programme acceptable for the particular aeroplane type is available and that a statement of special additions necessary to cover any particular features of significant structural repairs or modifications is also available. The air operator should also have access to sufficient past maintenance records of the aeroplane to determine the time at which the structural inspection/modification would be required.

2.7.4 Continuing assessment of structural integrity

2.7.4.1 General

2.7.4.1.1 The first essential step is to identify the structural parts and components which contribute significantly to carrying flight, ground, pressure or control loads and whose failure could affect the structural integrity necessary for the safety of the aeroplane and whose damage tolerance, safe-life or fail-safe characteristics it is therefore necessary to establish or confirm.

2.7.4.1.2 Analyses made in respect of the continuing assessment of structural integrity should be based on supporting evidence which includes test and service data. This supporting evidence should include a representative operating loading spectra, structural loading distributions and material behaviour. In establishing inspection threshold, inspection frequency and, where appropriate, retirement life, an appropriate allowance should be made for crack initiation through the life of the structure and the rate of crack propagation. Alternatively, an inspection threshold may be based solely on a statistical assessment of fleet experience, provided that it can be shown that equal confidence can be placed in such an approach.

Note 1.— Operating loading spectra may be confirmed by an in-flight load monitoring programme.

Note 2.— In the case of corrosion, no analytical techniques are available and the establishment of thresholds and repeat intervals will need to be based on the analysis of worldwide service experience.

2.7.4.1.3 Some organizations responsible for the type design find that an effective method of evaluating the structural condition of older aeroplanes is a selective inspection with intensive use of non-destructive techniques and an inspection of individual aeroplanes involving partial or complete dismantling (tear-down) of available structures.

2.7.4.1.4 The effect of repairs and modifications approved by the type design organization should also be taken into account. In addition, it may be necessary to consider the effect of repairs and air operator approved modifications on individual aeroplanes. The air operator is responsible for ensuring notification and consideration of any such aspects.

Note.— The assessment of continuing airworthiness of repairs and modifications is a complex task involving both air operators and organizations responsible for the type design.

2.7.4.1.5 The continuing structural integrity programme should be checked from time to time against current service experience. Any unexpected defect that occurs should be assessed as part of the continuing assessment of structural integrity to determine the need for revision of the programme. Future structural service bulletins should state their effect on the programme.

2.7.4.2 Damage-tolerance assessment

2.7.4.2.1 Damage tolerance characteristics should be based on the best information available, including analysis, test and operational experience and special inspections which can be related to the type. From this information, the site or sites of likely cracking within each structural part or component and the time or number of flights (cycles or hours) at which this might occur may be judged.

2.7.4.2.2 The growth characteristics of damage and the interactive effects on adjacent parts in promoting more rapid or extensive damage should be determined. This study should include those sites which may be subject to the possibility of crack initiation owing to fatigue, corrosion, stress corrosion, wear, dis-bonding, accidental damage, manufacturing defects or other discrepancies in those areas which service experience or design judgement has shown to be vulnerable.

2.7.4.2.3 The minimum size of damage that it is practical to detect and the proposed method of inspection should be determined together with the number of flights required for the crack to grow from detectable to the critical size of damage in such a way that the structure has a residual strength corresponding to the conditions stated for fail-safe qualification. It is recognized that the residual strength requirements include the provision that they apply only where the critical damage would not be readily detectable, whereas in the case of damage which is readily detectable within a relatively short period, a lower residual strength may be agreed with the certificating authority. A probability approach may be acceptable for these latter assessments.

Note.— In determining the proposed method of inspection, consideration should be given to:

- a) *visual inspection;*
- b) *non-destructive testing; and*
- c) *analysis of data from built-in load and defect monitoring devices.*

2.7.4.2.4 The continuing assessment of structural integrity may involve more extensive damage than might have been considered in the original evaluation of the aeroplane, such as:

- a) a number of small adjacent cracks, each of which may be less than the minimum detectable length, developing suddenly into a long crack;
- b) failures or partial failures in other locations, due to a redistribution of loading and a more rapid spread of fatigue, following an initial failure in a particular location;
- c) concurrent failure or partial failure of multiple load path elements (e.g. lugs, planks or crack arrest features) working at similar stress levels;
- d) the influence of corrosion; and
- e) the influence of wear.

2.7.4.3 **Safe-life structures**

The basis for the determination of the safe-life of parts and components should be re-analysed using knowledge gained from service experience, including operational usage, loading assumptions and loading spectra and from any further tests that may have been conducted.

2.7.4.4 **Information to be included in the assessment**

2.7.4.4.1 The continuing assessment of structural integrity for the particular aeroplane type should be based on the principles outlined in 2.7.4.1 to 2.7.4.3. The following information should be included in the assessment and kept by the type design organization in a form available for reference:

- a) the current operational statistics of the fleet in terms of hours or flights;
- b) the typical operational mission or missions assumed in the assessment;
- c) the structural loading conditions from the chosen missions; and
- d) supporting test evidence and relevant service experience.

2.7.4.4.2 In addition to the information specified in 2.7.4.4.1, the following should be included for each critical part or component:

- a) the basis employed for evaluating the damage tolerance or safe-life characteristics of the part or component;
- b) the site or sites within the part or component where damage could affect the structural integrity of the aeroplane;
- c) the recommended inspection methods for the area and the detectable size of damage;
- d) for structure designed and assessed using damage tolerance principles, the maximum damage size at which the required residual strength capability can be demonstrated and the critical design loading case for the latter;
- e) for structure designed and assessed using damage tolerance structures, at each damage site the inspection threshold and the damage growth interval between detectable and critical, including any likely interaction effects from other damage sites; and
- f) information related to any variations found necessary to safe-lives already declared for parts and components.

Note.— Where re-evaluation of fail-safety or damage tolerance of certain parts or components indicates that these qualities cannot be achieved or can only be demonstrated using an inspection procedure whose practicability may be in doubt, then replacement or modification action may need to be defined (refer to Section 2.7.6.3 of this chapter).

2.7.5 Inspection programme

2.7.5.1 The purpose of a continuing airworthiness assessment is to supplement the current inspection programme to ensure continued safety of the aeroplane type.

2.7.5.2 In accordance with 2.7.4.1 and 2.7.4.2 of this chapter, an allowable final size of damage should be determined for each site so that the structure has a residual strength for the load conditions, except where probabilistic methods can be used with acceptable confidence. The size of damage that it is practical to detect by the proposed method of inspection should be determined together with the number of flights required for the crack to grow from detectable to the allowable final size of damage defined above.

2.7.5.3 The recommended inspection programme should be determined from the data described in 2.7.5.2, giving due consideration to the following:

- a) fleet experience, including all of the scheduled maintenance checks;
- b) confidence in the proposed inspection technique; and
- c) the joint probability of reaching a particular load level and size of damage in those instances where the probabilistic methods can be used with acceptable confidence.

2.7.5.4 Inspection thresholds for supplemental inspections should be established. These inspections would be supplemental to the normal inspections, including the detailed internal inspections.

2.7.5.5 For structures with reported cracking, corrosion or wear, the threshold and recurrent inspection interval (i.e. initial inspection and periodicity for repeat inspections) should be determined by analysis of the service data and available test data for each individual case, as appropriate.

2.7.5.6 For structures with no reported cracking or wear it may be acceptable, if sufficient fleet experience is available, to determine the inspection threshold on the basis of analysis of existing fleet data alone. The inspection threshold and intervals for modern structures are determined as part of a complex and extensive analysis and test verification programme. These should not be varied without the agreement of the type design organization and the CAA of the State of Design.

Note.— Some States do not accept the determination of the inspection threshold on the basis of analysis of existing fleet data alone, but also require reference to fatigue analyses supported by test evidence.

2.7.5.7 For corrosion inspection and control, the threshold will need to be established on the basis of worldwide fleet experience and expressed in calendar time.

2.7.6 The continuing structural integrity programme

2.7.6.1 Supplemental inspections

2.7.6.1.1 A supplemental inspection programme should contain the recommendations for the inspection procedures and replacement or modification of parts or components necessary for the continued safe operation of the aeroplane. The programme should include the following information:

- a) identification of the variants of the basic aeroplane type to which the programme relates;
- b) a summary of the operational statistics of the fleet in terms of hours and flights and a description of the typical mission or missions;
- c) reference to documents giving any existing inspections, or modifications of parts or components and to existing structural service bulletins which may still need to be applied, in addition to those given in the programme; and
- d) the types of operations for which the inspection programme is considered valid.

2.7.6.1.2 The following points should be addressed in the inspection programme:

- a) description of the part or component and any relevant adjacent structure (means of access to the part should also be given);
- b) type of damage which is being considered (e.g. fatigue, wear, corrosion, accidental damage);
- c) any service experience and service bulletins which may be relevant;
- d) the likely site(s) of damage;
- e) recommended inspection method and procedure and alternatives;
- f) minimum size of damage considered detectable by the method(s) of inspection;

- g) guidance to the air operator on which inspection findings should be reported to the type design organization;
- h) recommended initial inspection threshold;
- i) recommended repeat inspection interval;
- j) reference to any optional modification or replacement of part or component as terminating action to inspection;
- k) reference to the mandatory modification or replacement of the part or component at given life if fail-safety by inspection is impractical; and
- l) information related to any variations found necessary to safe-lives already declared.

2.7.6.2 **Corrosion prevention and control programme**

2.7.6.2.1 This programme should contain recommendations for the definition of corrosion levels, inspection techniques, re-application of protective treatments and recording and reporting of findings.

2.7.6.2.2 A simple, unambiguous way of defining corrosion severity should be stated, for example:

- a) *Level 1.* Corrosion damage occurring between successive inspections that:
 - i) is local and can be re-worked within structural repair manual limits;
 - ii) can be attributed to an event not typical of operator usage of other aircraft in the same fleet (e.g. mercury spill); or
 - iii) had been blended out several times, and the result of the latest inspection now exceeds the allowable limits and requires repair or partial replacement of a primary structural member.
- b) *Level 2.* Corrosion damage occurring between successive inspections that requires re-work exceeding the structural repair manual limits or that requires repair or partial replacement of a primary structural member, but is not of immediate airworthiness concern.
- c) *Level 3.* Corrosion damage of immediate airworthiness concern requiring expeditious action.

Note.— When Level 3 corrosion is found, consideration should be given to actions required on other aeroplanes in the operator's fleet. The State of Registry needs to ensure that details of corrosion findings and proposed actions are expeditiously reported to the State of Design.

2.7.6.2.3 The action to be taken upon finding corrosion of the different levels should be clearly specified.

2.7.6.2.4 The inspections should be specified as being in areas of the aircraft rather than of specific components.

2.7.6.2.5 The access and cleaning required prior to inspection should be stated.

2.7.6.2.6 The circumstances in which inspection methods other than visual are required should be clearly defined.

2.7.6.2.7 Details of re-protection, both primary and secondary, should be adequately specified for each area.

2.7.6.2.8 Recording and reporting procedures should be defined.

Note 1.— Recording is particularly important in the case of corrosion control so that at subsequent inspection the control of corrosion can be demonstrated.

Note 2.— In some cases it may be appropriate to include the corrosion control programme directly in the aircraft inspection programme.

Note 3.— A means of corrosion control is by use of water-displacing corrosion-inhibiting fluids (see 2.7.9 of this chapter).

2.7.6.3 **Structural modifications and associated inspections**

2.7.6.3.1 This programme should contain, for all locations on the aircraft where there is a known history or hazard of cracking, details of modifications or replacement action that will reduce or eliminate the need for repetitive inspection to maintain structural integrity.

2.7.6.3.2 Appropriate times for accomplishment of these modifications should be established.

2.7.6.3.3 For aeroplanes certificated to damage tolerance requirements, the type design organization, in conjunction with operators, is expected to implement the review, at appropriate time and frequency, of structurally related inspection and modification service bulletins to determine the validity of the design assumptions and hypothesis made for the type certification to damage tolerance requirements. This review should encompass damage tolerance criteria used and assumptions made for the type certification of aeroplane structures in order to assess if these had contributed to an effective inspection programme. The review also assesses if weak, fatigue-prone or deficient design areas were left unidentified or underestimated at the time of type certification. The review should also serve as a basis for complementing the structural integrity programme with elements for widespread fatigue damage (WFD) assessment as well as for coping with human errors and human performance limitations associated with the inspections.

2.7.6.3.4 For aeroplanes not certificated to damage tolerance requirements, the type design organization, in conjunction with operators, is expected to initiate a review of all structurally related inspection and modification service bulletins to determine which require further actions to ensure continued airworthiness, including mandatory modification action or enforcement of special repetitive inspections. Any aeroplane primary structural components that would require frequent repeat inspection, or where the inspection is difficult to perform, taking into account the potential airworthiness concern, should properly consider the human factors associated with the inspection, so as to minimize human error.

Note.— In areas where the inspections are difficult, cover extensive areas, or are frequently repetitive, it is likely that modification or replacement action will be made mandatory.

2.7.6.4 **Repair assessment methodology**

2.7.6.4.1 The repair assessment need only be conducted on aeroplanes that were not designed and certificated to damage tolerance principles.

2.7.6.4.2 Historically, aircraft have commonly been repaired on the basis of the design requirements applicable when the aircraft was first certificated. Many structural repair manuals still retain this concept and, as a result, repairs have been designed on an equivalent static strength basis with little regard for fatigue, crack growth or residual strength. As an

example, repairs to pressure cabin skins can still be observed being carried out by stop-drilling a crack and riveting on a patch of the same or greater thickness, extending beyond the critical crack length and with no specific non-destructive inspections being introduced.

2.7.6.4.3 Uncracked structures of non-damage tolerant designs have long had to be re-evaluated in accordance with the damage tolerance philosophy and the results promulgated by way of supplemental inspection documents. A similar retrospective review of existing structural repairs of aircraft in service is needed.

Note.— This is considered to have been completed by a one-time review by TC holders.

2.7.6.4.4 Even the major organizations responsible for the type designs do not have the capability to handle the volume of work that individual appraisals would require. Accordingly, the organizations responsible for the type designs, with assistance from operators and airworthiness authorities, are working to provide a practical methodology that will allow operators to evaluate existing repairs without complex analysis.

2.7.6.4.5 The repair assessment programme should provide guidelines for the identification and documentation of all repairs in a three-stage programme which, generally, is as follows:

Stage 1. To identify areas where assessment is not required, e.g. secondary structure or low-stress areas.

Stage 2. To provide operators with guidelines for dividing repairs into the following three categories:

Category A. Meets the design certification requirements of the aircraft and requires no special inspections other than normal maintenance.

Category B. Meets design certification requirements of the aircraft; however, must be periodically inspected beyond normal *maintenance* requirements to ensure structural integrity.

Category C. Meets design certification requirements of the aircraft; however, repair is obviously of a temporary nature and to ensure *structural* integrity requires periodic inspection other than normal maintenance and must be replaced or upgraded to Category B or better before a certain time limit.

Stage 3. To provide guidelines for operators to apply in establishing inspection intervals and removal time limits.

2.7.6.4.6 Typical repair parameters to be established by inspection of records or aircraft by the operator are:

- a) location;
- b) proximity to other repairs;
- c) condition;
- d) corrosion protection;
- e) size of damage or cut out;
- f) patch material and thickness;
- g) embodiment date;
- h) ratio of original to repaired thickness;

- i) fastener details for original and repair type, diameter, pitch, number of rows, edge margin; and
- j) extent of wear.

2.7.7 Widespread fatigue damage

2.7.7.1 The likelihood of the occurrence of fatigue damage in an aeroplane's structure increases with aeroplane usage. The design process generally establishes a design service goal (DSG) in terms of flight cycles or hours for the airframe. It is expected that any cracking that occurs on an aeroplane operated up to the DSG will occur in isolation (i.e. local cracking), originating from a single source, such as a random manufacturing flaw (e.g. a mis-drilled fastener hole) or a localized design detail. The supplementary structural inspection programme (SSIP) described above or the maintenance review board (MRB)-derived inspections for damage, are intended to find this form of damage before it becomes critical. Therefore, if aircraft are not operated beyond the initial limit of validity of the maintenance programme, it may not be required to perform a widespread fatigue damage (WFD) assessment.

2.7.7.2 With extended usage, a uniformly loaded structure may develop cracks in adjacent fastener holes or in adjacent similar structural details. These cracks, while they may or may not interact, can have an adverse effect on the structural capability before the cracks become detectable. The development of cracks at multiple locations may also result in strong interactions that can affect subsequent crack growth, in which case the predictions for local cracking would no longer apply. An example of this situation may occur at any skin joint where load transfer occurs. Simultaneous cracking at many fasteners along a common rivet line may reduce the residual strength of the joint below required levels before the cracks are detectable under the routine maintenance programme established at the time of certification.

2.7.7.3 The type design organization, in conjunction with the operator, and in some cases the operator itself, is expected to initiate development of a maintenance programme with the intent of predicting the onset of WFD and establishing an appropriate limit of validity (LoV) of the maintenance programme for the operation without multiple site damage or multiple element damage. Such programmes should be implemented before analysis, tests, and/or service experience indicates that widespread fatigue damage may develop in the fleet and substantially before LoV is reached on any aeroplane in service.

Note.— This may be based on typical construction and may require a different methodology for composite structure.

2.7.8 Limit of validity of maintenance programmes

Associated with these programmes is the need to identify a LoV of the maintenance programme that contains them. Operators may not operate aeroplanes beyond this LoV unless the structural integrity programmes have been reviewed and been found valid for an extension of the maintenance programme. A new LoV will then be defined.

2.7.9 Water-displacing corrosion-inhibiting fluids

2.7.9.1 Water-displacing corrosion preventatives (WDCPs) are a class of products widely used as a temporary and repetitive application to prevent corrosion and inhibit the progression of existing corrosion of metallic structures. There are many products available meeting a number of specifications with various classes of film hardness, tackiness and colour.

2.7.9.2 WDCPs may consist of a mixture of a water-displacing compound, a water-repelling agent and a corrosion-inhibiting agent contained in a low surface tension carrier solvent. Generally, the mixture is sprayed or brushed onto the structure and penetrates into cracks, crevices and contact surfaces of joints by capillary action. Evaporation of the carrier solvent leaves a waterproof corrosion-resistant film on surfaces, and seals cracks and crevices.

2.7.9.3 Apart from discouraging metal dissolution by displacing water, greases and oil films also help to exclude oxygen and simultaneously introduce a high electrical resistance between possible anodes and cathodes.

2.7.9.4 The inclusion of an inhibiting agent encourages the formation of a passive film on the metal surface, a primary corrosion control measure.

2.7.9.5 The efficacy of WDCP compounds depends purely on their ability to prevent corrosion in structural assemblies. They can protect metal surfaces when the original protective systems are no longer fully operative. By their very nature, however, these products raise some concerns. Among them:

- a) There has been considerable investigation into the effect of these fluids on the fatigue life of structural joints. Many joints transfer load through a clamping friction mechanism as well as by bearing on the fasteners. If the successful operation of a joint requires complete dependence upon friction between the members, WDCP or other lubricants should not be used during assembly. In general, however, the prevention of corrosion is even more important to the fatigue life and, except in very special cases, the advantages of using WDCP on joints outweigh any concerns of a possible fatigue life reduction.
- b) WDCPs can effectively seal pre-existing cracks, making it difficult to detect cracks by some common non-destructive testing (NDT) methods such as dye penetrant and ultrasonic. These products may be extremely difficult to remove from deep crevices to perform NDT procedures and hence an operator should consider the implications of using WDCPs in areas which require crack-checking procedures.
- c) The efficacy is maximized if applied during original manufacture and as early in the construction sequence as possible when full coverage is more readily assured and corrosion has not already started. If applied to older aircraft, there is less likelihood of the product penetrating completely into deep lap joints or that moisture and other corrosive agents are truly displaced from the full depth of the joint. But again, the benefits of repetitive use, especially in aggressive environments, are usually worthwhile.
- d) Consideration should be given to the effect of WDCPs on other parts of the aircraft, such as electrical components, hoses or filters, to their environmental effects, and to the safety of personnel applying them.
- e) Some solvent-based WDCP fluids may flush out lubricants, so caution should be exercised, particularly to avoid removing the lubrication from control cables which could lead to high wear rate or even failure.

2.7.9.6 In summary, if the product is recommended by the type design organization or if the operator and airworthiness authority agree that the product is satisfactory for the intended use and it is applied using an appropriate standard, then the service life of the aircraft should be enhanced.

2.8 MAINTENANCE REVIEW BOARD (MRB)

2.8.1 Introduction

2.8.1.1 This chapter provides an introduction to the MRB process used during the development of an initial scheduled maintenance programme, usually done for derivative or newly certificated large aeroplanes, as appropriate. It is not intended to provide comprehensive guidance to States and air operators. When looking for such comprehensive guidance regarding the MRB processes and procedures, the States and air operators have the option to use the International MRB Process Standard (IMPS) document. The document is the result of States' collaborative efforts in the International MRB Policy Board (IMRBPB).

2.8.1.2 Annex 8 requires that a maintenance programme be issued. It should include the maintenance tasks and recommended intervals at which these tasks are to be performed. The development of an initial maintenance programme at the time of aircraft type certification is sometimes referred to as the MRB process.

2.8.1.3 Annex 6, Part I, 8.3 and Part III, Section II, 6.3 require that an air operator provides an aeroplane or helicopter maintenance programme, approved by the State of Registry, containing maintenance tasks, intervals, and how the tasks are to be performed. When an MRB report has been issued, the air operator should take into account its content when developing its own maintenance programme.

2.8.2 General

The primary purpose of the MRB process is to assist the design organization and the air operator in establishing an initial approved maintenance programme for aeroplanes and the CAA in approving that programme. The MRB report becomes the basis for the first issue of an air operator's initial maintenance programme. Adjustments may be necessary to address operational or environmental conditions unique to that air operator. Through air operator experience, and with regulatory approval, additional changes to the maintenance programme may be made by the operator in order to maintain a safe and efficient maintenance programme.

2.8.3 Background

2.8.3.1 The process of developing a maintenance programme for new aeroplanes has evolved from an air operator proposed programme to one in which the regulatory authority and aviation industry work together to develop initial minimum maintenance requirements for new aeroplanes. Subsequent development of initial scheduled maintenance requirements revealed that a programme of effective maintenance tasks could be developed through the use of logical analysis of possible aircraft system failures and their consequences.

2.8.3.2 The handbook *Maintenance Evaluation and Programme Development*, also referred to as "MSG-1," was developed in 1968 for the Boeing 747 aeroplanes by the Air Transport Association (ATA) Maintenance Steering Group (MSG), a group of airframe manufacturers, airlines, United States Federal Aviation Administration (FAA) representatives, and suppliers. MSG-1 used decision logic to develop scheduled maintenance. Through experience gained from this logic, procedures were updated to produce a universal document which could be applied to future newly certificated aeroplanes. This effort resulted in the Maintenance Steering Group (MSG-2) document.

2.8.3.3 For aircraft in the 1970s, the document *Airline/Manufacturer Maintenance Programme Planning*, or "MSG-2," was developed. It was process oriented and analysed failure modes from the part level up. The MSG-2 philosophy was based on the theory that all aeroplanes and their components reach a period when they should be "zero timed" or "overhauled" and restored to new condition.

2.8.3.4 In 1978, the United States Department of Defense developed a methodology for designing maintenance programmes based on tested and proven airline practices. This new methodology was the basis for MSG-3. This methodology has a task-oriented approach to maintenance that analyses system failure modes from a system level, or top down. Maintenance tasks are performed for safety, operational, or economic reasons. They involve both preventive maintenance and failure finding tasks. Revisions to the MSG-3 philosophy have provided added methodology for improving coverage of all modes of failure, such as inclusion of the Corrosion Prevention and Control Programme, Enhanced Zonal Analysis, and Lightning/High Intensity Radiated Fields.

2.8.4 Organization

The MRB process involves the following organizational bodies:

- a) Industry steering committee (ISC). Management of maintenance programme development activities is normally accomplished by an ISC composed of air operators and design organizations. The ISC establishes policies, sets goals for maintenance check intervals, directs activities of working groups, prepares final maintenance programme recommendations and represents air operators in contacts with regulatory authorities;
- b) Working groups (WGs). One or more WGs, consisting of specialists from participating air operators, design organizations and regulatory authorities, may also be formed to develop initial minimum maintenance requirements for new or derivative aeroplanes. The ISC ensures that applicable supporting technical data and analysis are provided to the WG; and
- c) Maintenance review board (MRB). The State of Design should approve certain minimum maintenance requirements that an air operator needs to accomplish when the aeroplane is initially placed in service. The CAA normally approves initial minimum maintenance requirements that are proposed by selected specialists in airworthiness requirements, continuing airworthiness and aeroplane design. The State of Design may also invite participation from authorities of the States of the intended air operators. A group of these specialists is referred to as the MRB. The MRB also ensures that the design organization and manufacturer provide the necessary technical training to MRB, ISC and WG members. The MRB reviews reports, provides notification of potential problem areas and offers guidance and assistance to the ISC and WG. Upon successful review, the regulatory authority approves the MRB report or revision.

2.8.5 Maintenance Review Board process

2.8.5.1 The MRB supports, by active participation, the development of a proposal or a report containing the initial minimum maintenance requirements to be used in the development of an approved maintenance programme for a derivative or newly certificated large aeroplane.

2.8.5.2 The design organization normally provides a recommended maintenance programme for the aeroplane model. In order to assure that this recommended maintenance programme is compatible with the intended operation of the aeroplane, the design organization will assemble an ISC, the goal of which is to review the recommended maintenance programme and revise it as needed so that it meets the requirements of the intended air operators. The authorities of the State of Design and the States of the intended air operators normally participate in the ISC and its individual WGs in an advisory capacity regarding continuing airworthiness requirements.

2.8.5.3 The ISC directs the WGs and coordinates activities with the MRB. The MRB acts on MRB report proposals or revisions, and briefs other concerned regulatory authorities regarding MRB policies and procedures.

2.8.6 Maintenance Review Board report

2.8.6.1 The MRB report outlines the initial minimum maintenance requirements to be used in the development of an approved maintenance programme for the aeroplane and its major components (aircraft, engine, systems and other components). Although the MRB report is approved by the State of Design, there may be a need to identify national regulation differences that are not compatible, acceptable or applicable to all regulatory authorities. When this condition exists, an appendix to the MRB report is normally used to list these differences, each being accepted by the respective regulatory authority. The requirements of the MRB are the basis from which air operators develop their initial maintenance programme.

2.8.6.2 When the MRB has resolved all issues, including those raised by other authorities, the report is forwarded to the MRB Chairman for final approval. Once the report is approved by the State of Design, the design organization will normally publish and distribute the report, together with any supporting documents, to all holders of the maintenance programme, including the authorities in the State of Registry and the State of the Operator.

2.8.6.3 The regulatory authorities in the State of Registry and the State of the Operator review the MRB report and, once it is found acceptable, authorize the air operator to incorporate all applicable maintenance requirements in the report into its initial maintenance programme.

2.8.6.4 The MRB and ISC normally conduct a joint annual review of each MRB report to determine the need for revision. Where the need exists, the ISC and MRB convene and evaluate the proposed changes. Proposed revisions are processed and approved in the same manner as the MRB report.

2.8.7 Implementation of maintenance review board reports and revisions

2.8.7.1 Air operators of the aeroplane type are strongly urged to implement the MRB report, or revisions, in accordance with established procedures. Adjustments to initial maintenance programme intervals may be approved by the State of Registry depending on the air operator's qualifications and overall maintenance experience.

2.8.7.2 With the agreement of the regulatory authority, air operators may elect to deviate from the MRB report or revision. In this case, air operators may have additional requirements placed in their maintenance programme by the State of Registry to ensure that equivalent safety is maintained.

2.9 AIRCRAFT FLIGHT MANUAL (AFM), MASTER MINIMUM EQUIPMENT LIST (MMEL) AND CONFIGURATION DEVIATION LIST (CDL)

2.9.1 General

The AFM, the CDL and the MMEL are approved by the State of Design and often established by the organization responsible for the type design. The State of Registry may either validate these documents or approve its own which could be different due to differences in its airworthiness requirements. These documents should not be less restrictive than the one approved by the State of Design.

2.9.2 Aircraft flight manual (AFM)

2.9.2.1 Annex 8 provides that the AFM should be made available as a main document associated with a Certificate of Airworthiness. The AFM is a primary document for flight operations of an aircraft. It contains the limitations, procedures, performance and other information and instructions required to operate the aircraft safely, plus all required AFM supplements. An AFM supplement is a booklet or group of pages containing changes to the information and instructions in the basic AFM (i.e. the approved AFM that the type certificate holder provides with the aircraft). The AFM supplement contains AFM changes that are necessary for continued safe operation of an aircraft that is modified, is in a non-standard configuration, has special role equipment fitted, or is to engage in some special purpose activity. An aircraft may not conform exactly to the standard aircraft to which the available basic AFM is applicable. The aircraft may have a different configuration or modifications. If these physical differences cause changes to the approved AFM information, those changes must be accounted for by relevant CAA-approved AFM supplements that provide the necessary extra AFM information.

2.9.2.2 The type certificate holder or its licensee should make available a current AFM at the time of delivery of the aircraft to the aircraft owner or air operator. On the other hand, the certificated air operator has an ongoing obligation to keep its flight crew operating manual up-to-date by incorporating amendments approved by the relevant CAA for the AFM.

2.9.2.3 Annex 6, Part I, 4.2.3 and Part III, Section II, 2.2.3 require that an air operator uses the appropriate parts of the AFM approved for the aircraft together with operating instructions issued by the type certificate holders to develop its own operations manual.

2.9.3 Master minimum equipment list (MMEL)

2.9.3.1 The MMEL is a master list appropriate to an aircraft type which determines those instruments, items of equipment or functions that, while maintaining an acceptable level of safety as intended by the applicable requirement, may temporarily be inoperative either due to the inherent redundancy of the design, and/or due to specified operational and maintenance procedures, conditions and limitations, and in accordance with the applicable procedures for continued airworthiness.

2.9.3.2 In conjunction with the certification of each new type of aircraft, a board should be established to develop and maintain the MMEL for the aircraft and additional models of that aircraft developed in the future. The board is an advisory body to the CAA and should have representation from the flight operations and airworthiness (AID and AED) organizations within the CAA, as well as from the organization responsible for the type design and air operators. The MMEL board could be an independent organizational body headed by the CAA.

2.9.3.3 The interaction between systems should be fully analysed to ensure that multiple failures will not result in an unsatisfactory level of safety. When an aircraft is designed, it is designed to achieve a certain level of safety. When any one system, instrument or equipment becomes inoperative, the design level of safety may be reduced. With modern aircraft it is usual to provide extra redundancy in some systems to enable the aircraft to take off and complete a flight with acceptable margins of safety even if, for example, one channel of a system has failed during a previous flight. Minor deficiencies which do not too seriously affect safety may be acceptable to flight, even without the provision of extra redundancy. In any case, the MMEL board will need to carry out a thorough assessment on safety together with engineering judgment as a guide to developing an acceptable list.

2.9.3.4 The MMEL should not include obviously required items such as wings, empennage, and power-units nor should it include items which are not required for safe operation of the aircraft, such as entertainment systems. It must be stressed and understood by all persons developing and using the MMEL that all items which are related to the airworthiness of the aircraft and are not included on the list are automatically required to be operative.

2.9.3.5 The actual format of the MMEL may vary, but all major systems should be listed to indicate they have been considered (e.g. communications systems, navigation systems and automatic flight control systems). In addition, components of those systems required for flight should be listed on the MMEL (e.g. attitude gyros, VSI and DME).

2.9.3.6 The MMEL board should be responsible for maintaining an up-to-date MMEL. Amendment normally results from air operator experience or analyses carried out by the organization responsible for the type design or from rule changes.

2.9.4 Configuration deviation list (CDL)

The CDL identifies any external parts of an aircraft type which may be missing at the commencement of a flight and contains, where necessary, any information on associated operating limitations and performance correction. Operation of the aircraft without certain secondary airframe and engine parts could be allowed through the use of an approved CDL. The CDL should be included in the AFM as a separately approved appendix. The following guidance should be followed when preparing the CDL:

- a) The parts or combinations of parts permitted to be missing, together with the associated performance penalties and other limitations, should be determined and presented in the same format as the MMEL;
- b) Unless it can be established that a zero or negligible performance degradation occurs as a result of a part missing from the aircraft, a performance penalty should be presented for each part or for each combination of parts;
- c) Performance penalties are normally presented as mass or per cent mass decrements. Equivalent penalties expressed as other parameters are also acceptable. A single performance penalty applicable to all AFM performance limitations may be presented for a missing part or, subject to certain restrictions, performance penalties may be presented for each phase of flight. Typical examples are:
 - i) Only a single performance penalty for take-off and a single performance penalty for landing will be permitted. For take-off, the penalty should be the most restrictive of the take-off field length; first, second and final segment climbs, and take-off flight path considerations. For landing, the penalty should be the most restrictive of approach climb, landing climb, and landing distance considerations;
 - ii) Only a single mass penalty for en-route climb performance, applying to both the one-engine-inoperative and two-engine-inoperative cases, as applicable, will be permitted; and
 - iii) The CDL should contain the explanations of take-off performance penalty, landing performance penalty and en-route performance penalty, as appropriate for the aircraft, when individual penalties are used.

2.9.4.2 The following information may be presented in the CDL appendix:

- a) When the aircraft is operated using the CDL, it must be operated in accordance with the limitations specified in the AFM, as amended in the CDL;
- b) The associated limitations should be listed on a placard affixed in the cockpit in clear view of the pilot in command and other appropriate crew member(s);
- c) No more than one part for any one system may be missing, unless specific combinations are indicated in the CDL. Unless otherwise specified, parts from different systems may be missing. The performance penalties are cumulative, unless specifically designated penalties are indicated for the combination of missing parts;
- d) No more than three parts that have each been determined to cause negligible performance degradation may be missing for take-off without applying a performance penalty. When more than three such parts are missing, a performance penalty of either 0.05 per cent of the maximum take-off mass or 50 kg, whichever is less, should be applied for take-off, en route, and landing for each missing part;
- e) Take-off performance penalties should be applied to the take-off mass that is limited by performance considerations (i.e. take-off field length, first, second, or, final segment climb, or take-off flight path). If the performance limited take-off mass is greater than the maximum certificated take-off mass, the take-off performance penalties should be applied to the maximum certificated take-off mass to ensure compliance with the noise requirements;

- f) Landing performance penalties should be applied to the landing mass that is limited by performance considerations (i.e. landing field length, landing climb or approach climb). If the performance limited landing mass is greater than the maximum certificated landing mass, the landing performance penalties should be applied to the maximum certificated landing mass to ensure compliance with the noise requirements;
- g) En-route performance penalties apply only to operations that are limited by the one- or two-engine (s) inoperative en-route climb performance; and
- h) The numbering and designation of systems in the CDL appendix should be based on Air Transport Association (ATA) Specification 2200 (formerly Specification 100). The parts within each system are identified by functional description and, when necessary, by part numbers.

2.9.4.3 **Accountability of performance degradation relative to both minor design changes and CDL items**

2.9.4.3.1 *General*

Whenever a minor change to the type design aerodynamic configuration or a CDL proposal (e.g. installation of wing tip mounted emblem lights and missing flap hinge covers) has been submitted for CAA approval, the applicable performance degradation needs to be determined. In lieu of a complete flight test analysis to determine the performance degradation, simple criteria are prescribed below for establishing an acceptable level of airworthiness for the affected items.

2.9.4.3.2 *Criteria*

- a) **Estimated Drag.** The aerodynamic drag of the type design change or CDL item should be evaluated. Design changes or CDL items that have no impact on, or actually improve, the aerodynamic drag of the aircraft are considered to have no performance penalty. In cases where there are quantifiable effects on aerodynamic drag (no matter how small), the drag value should be estimated and then increased by a factor of two, unless the estimated drag was determined with equivalent conservatism.
- b) **Performance Penalty.** Performance penalties (usually expressed in kg or per cent mass) should be determined for all appropriate performance limitations (take-off, en route and landing) based on the effects of the estimated drag. If the resulting mass penalty is less than the smaller of 0.05 per cent of the maximum certified take-off mass or 50 kg, the performance degradation may be considered negligible. The AFM supplement or CDL appendix should identify those type design changes or CDL items that result in a negligible performance degradation. If the performance degradation is not considered negligible, the appropriate performance penalty should be provided as a limitation in the AFM supplement or in the CDL appendix.

Attachment A to Chapter 2

EXAMPLE OF A TYPE CERTIFICATE

***Contracting State
Civil Aviation Authority***

Type Certificate No. _____

Pursuant to Civil Aviation Regulations Number _____ of Contracting State,
this Type Certificate is issued to:

Name of Holder of Type Certificate

Complete Address of Holder of Type Certificate

For the following aeronautical product(s):

Aircraft Model _____

Details of this type design, basis of certification, operating limitations and other associated airworthiness requirements are specified in:

Civil Aviation Authority Type Certificate data sheet _____ or latest revision



Authorized Person – Civil Aviation Authority

Date of Issue

Attachment B to Chapter 2

EXAMPLE OF A TYPE CERTIFICATION DATA SHEET

CIVIL AVIATION AUTHORITY	
CAA TYPE CERTIFICATE DATA SHEET CAA TCDS Code and Number Aircraft type Manufacturer: Manufacturer's name and address	
For models:	Aircraft name
Issue 1, Draft 1 :	DD.MM.YY
List of effective pages: All pages are at the latest issue	

1. GENERAL

- Data Sheet No: TCDS Authority code and number
- Airworthiness Category: Large aeroplane
- Performance Category: A
- Certifying Authority: NAA
- Type Certificate Holder: Name and address
- EDTO Not applicable

2. AIRCRAFT TYPE

2.I General

Aircraft Type

2.II Certification Basis

-
Reference Application Date for Certification: DD.MM.YY
-
NAA Certification Date: DD.MM.YY
-
Certification Basis

NAA

- The following NAA airworthiness standards effective on the reference date are:

NAA Part 21 dated DD.MM.YY

- Environmental Standards:

Noise level: Annex 16, Volume I, Chapter 4, Amendment 8.

Fuel venting and emissions: Annex 16, Volume II, Part II and Part III, Chapter 2, Amendment 4 applicable on 4 November 1999.

- Additional National Requirements:

To be defined at a later stage.

2.III Aircraft name, technical characteristics and operational limitations type design definition

2.III.1 Type design definition

Aircraft named is a maximum 22 occupants, tri-jet, long range, large aeroplane category. It has a low, high swept airfoil, mid-height horizontal stabilizer and tricycle landing gear. Flight controls are fly-by-wire.

Three engines (manufacturer and model engines) are rear mounted, two on side of fuselage and one in centre position.

2.III.2 Dimensions

Length	xx m
Span	xx m
Height	xx m
Gross wing area	xx m ²

2.III.3 Engines

Model: Engine manufacturer and model

Engine TCDS: NAA TCDS Code and Number

Note.— Engine is approved for operation with thrust reverser p/n ZZZZZ

Number: 3

Ratings:

- Maximum take-off static thrust: xx daN limited to 5 minutes
- Max continuous: xx daN

Engine limits: Refer to the Aircraft Flight Manual and to the relevant Engine Type Certificate data sheet

2.III.4 Auxiliary power unit (APU)

Model: APU manufacturer and model

APU limits: Refer to the Aircraft Flight Manual. APU is usable for ground operation only.

2.III.5 Fluids (Fuel/Oil/Additives)

Approved Fuel, oils and additives: Refer to the Aircraft Flight Manual.

2.III.6 Fluid capacities

Fuel capacity

USABLE FUEL	Litres	kg (*)	US gallons	lbs (*)
Left circuit				
Right circuit				
Centre circuit				
Total usable				
UNUSABLE FUEL				
Drainable				
Undrainable				
Total unusable				

* assuming a fuel density of xx kg/litre
 Engine Oil Tank Capacity*:

	Litres	kg (**)	US gallons	lbs (**)
Max oil level				
Left engine				
Right engine				
Centre engine				
Total				
Min oil level				
Left engine				
Right engine				
Centre engine				
Total				

* Tank quantities do not include undrainable oil or residual oil in the Accessory Gearbox, oil filter bowl or air-cooled oil cooler (ACOC)

** Based on specific gravity of 0.975

2.III.7 Aeroplane speed limits

(Unless otherwise specified, speeds are indicated airspeeds)

VMO	at sea level.....	xx kt
VMO	straight line variation up to 10 000 ft.....	xx kt
VMO	from 10 000 ft to 28 000 ft.....	xx kt
MMO	from 28 000 to 51 000 ft.....	xx

V _A	manoeuvring speed	xx kt
V _{FE}	SF1	xx kt
	SF2	xx kt
	SF3	xx kt

Note.— Above 20 000 ft, do not establish nor maintain a configuration with the slats and the flaps extended.

V _{LO}	Landing gear operation	xx kt
M _{LO}	Xx
V _{LE}	Landing gear extended	xx kt
M _{LE}	Xx
V _{MCA}	minimum control speed in flight	xx kt (CAS)
V _{MCG}	minimum control speed on ground	xx kt (CAS)

2.III.8 **Maximum operating altitude**

xx m (xx ft)

2.III.9 **All-weather capability**

Category I Auto Pilot

2.III.10 **Maximum mass**

Mean aerodynamic chord (MAC): xx mm

Datum is 25 per cent of mean aerodynamic chord (MAC): xx mm from the forward end of the aircraft nose cone.

	Mass		Forward limit	Aft limit
	kg	lbs	% MAC	% MAC
Minimum flight - Aft				
Minimum flight - Forward				
Maximum zero fuel				
Maximum landing				
Maximum for aft CG at 38.5 %				
Maximum take-off				
Maximum ramp				

For mass and balance calculation refer to the Loading Manual (manufacturer document reference) – See Note 1.

2.III.11 **Leveling means**

Aircraft is leveled in the longitudinal and lateral axis by means of a plumb bob and target in the left main landing gear bay.

2.III.12 Minimum flight crew

2 — pilot and copilot

2.III.13 Maximum seating capacity

2 + 1 crew — third crew member seat authorized for take-off and landing in the cockpit.
19 passengers in the cabin.
See Note 2.

2.III.14 Exits

	<i>Type</i>	<i>Size</i>
1 Passenger door	I	
1 Emergency exit	III	

2.III.15 Baggage/cargo compartments

Baggage compartment: xx kg, not to exceed xx kg per square metre.
See Note 2.

2.III.16 Wheels and tires

This aircraft is equipped with wheels, brakes and H type radial tubeless tires.

Main wheel tires are H32 × 10.5R16.5

Nose wheel tires are 16 × 6.0R6

Mixing of tires (tire manufacturer + others) is not approved.

2.IV Aircraft name Operating and Service Instructions

The aircraft must be operated according to the NAA-approved Aircraft Flight Manual manufacturer document reference.

The Instructions for Continued Airworthiness consist of:

Maintenance Review Board Report	<i>Manufacturer document reference</i>
Aeroplane Maintenance Manual	<i>Manufacturer document reference</i>
Structural Repair Manual	<i>Manufacturer document reference</i>
CMR and ALI	

2.V Notes

Note 1.

- a) A current mass and balance report must be carried in the aircraft at all times from the moment the aircraft is originally certified.
- b) Loading of the aircraft must be accomplished in a manner that always maintains the centre of gravity within the specified limits considering crew and passenger movements as well as fuel consumption and transfer.

Note 2.

Cabin interior and seating configuration must be approved.

Attachment C to Chapter 2

EXAMPLE OF A SMALL AEROPLANE ICA CHECKLIST

<i>Instructions for continued airworthiness (ICA) requirements</i>	<i>Regulation (sample reference)</i>	<i>Location in ICA</i>
ICA for each engine.	Xx21.xx	
ICA for each propeller.		
ICA for each appliance required by this chapter.		
Required information on the interface of appliances, engines and propellers with the aircraft.		
If ICA are not supplied by the manufacturer of an appliance, engine or propeller installed on the aircraft, the ICA for the aircraft must include the information essential to the continued airworthiness of the aircraft.		
Applicant's programme showing how they or the manufacturers of aeronautical products and appliances installed on the aeroplane will distribute changes to the ICA.		
ICA in a manual or manuals. Manuals arranged for easy and practical use.		
Manuals prepared in English.		
Manuals must include introductory information that includes an explanation of the aeroplane's features and data to the extent necessary for maintenance or preventive maintenance.		
Description of the aircraft and its systems and installations, engines and their systems and installations, propellers and their systems and installations, and appliances and their systems and installations.		
Basic control and operating information describing how the aircraft components and systems are controlled and how the aircraft components and systems are operated, including any special procedure and imitations.		
Servicing information covering servicing points, capacities of tanks, capacities of reservoirs, types of fluids used, and pressures applicable to the various systems.		

<i>Instructions for continued airworthiness (ICA) requirements</i>	<i>Regulation (sample reference)</i>	<i>Location in ICA</i>
Location of access panels for inspection and servicing.		
Servicing information covering locations of lube points and lube used.		
Equipment required for servicing.		
Tow instructions and limitations.		
Mooring information.		
Jacking information.		
Leveling information.		
Scheduling information for each part of the aircraft, including recommended periods for cleaning, inspecting, adjusting, testing and lubricating; and the work recommended at these periods.		
Scheduling information for aircraft engines, including recommended periods for cleaning, inspecting, adjusting, testing and lubricating; and the work recommended at these periods. <i>Note.— This information may be in the FAA accepted engine ICA.</i>		
Scheduling information for the aircraft's auxiliary power unit, including recommended periods for cleaning, inspecting, adjusting, testing and lubricating; and the work recommended at these periods.		
Scheduling information for aircraft propellers, including recommended periods for cleaning, inspecting, adjusting, testing and lubricating; and the work recommended at these periods.		
Scheduling information for aircraft accessories, including recommended periods for cleaning, inspecting, adjusting, testing and lubricating; and the work recommended at these periods.		
Scheduling information for aircraft instruments, including recommended periods for cleaning, inspecting, adjusting, testing and lubricating; and the work recommended at these periods.		
Scheduling information for aircraft equipment, including recommended periods for cleaning, inspecting, adjusting, testing and lubricating; and the work recommended at these periods.		
Degree of inspection for each part of the aircraft and its engines, the auxiliary power unit, propellers, accessories, instruments and equipment.		

<p style="text-align: center;"><i>Instructions for continued airworthiness (ICA) requirements</i></p>	<p style="text-align: center;"><i>Regulation (sample reference)</i></p>	<p style="text-align: center;"><i>Location in ICA</i></p>
Applicable wear tolerances.		
Applicant may refer to an accessory, instrument, or equipment manufacturer as the source of this information if applicant shows that the item is exceptionally complex and requires specialized maintenance techniques, test equipment or expertise.		
Recommended overhaul periods and necessary cross-references to the ALS.		
An inspection programme that includes the frequency and extent of the inspection necessary to provide for continued airworthiness.		
Troubleshooting information describing probable malfunctions, how to recognize those malfunctions, and remedies for them.		
Description of the order and method of removing and replacing aeronautical products (engines and propellers) with any precautions.		
Description of the order and method of removing and replacing parts, with any precautions.		
Other instructions, including storage limitations and procedures for testing system during ground running, making symmetry checks weighing and determining the centre of gravity, lifting, and shoring.		
Diagrams of structural access plates and information needed to gain access for inspections when access plates are not provided.		
Details for applying special inspection techniques, including radiographic and ultrasonic testing, where such processes are specified.		
Information needed to apply protective treatment to structure after inspection.		
All data on structural fasteners, such as identification, discard recommendations, and torque values.		
List of special tools needed.		
For Commuter Category aircraft: electrical loads applicable to the various systems.		
For Commuter Category aircraft: methods of balancing control surfaces.		
For Commuter Category aircraft: identification of primary and secondary structures.		

<i>Instructions for continued airworthiness (ICA) requirements</i>	<i>Regulation (sample reference)</i>	<i>Location in ICA</i>
For Commuter Category aircraft: any special repair methods applicable.		
ICA must contain a segment, titled Airworthiness Limitations, that is segregated and clearly distinguishable from the rest of the document. <i>Note.— The appropriate CAA office will evaluate and approve the Airworthiness Limitations (ALS) in the applicant's ICA.</i>		
ALS must describe each mandatory replacement time, structural inspection interval, and related structural inspection procedure, including envelope structural integrity, required for type certification.		
If ICA consists of multiple manuals, the ALS required by this paragraph must be in the principal manual.		
ALS must contain a legible statement in a prominent location that reads: "The Airworthiness Limitations are CAA approved and specify the maintenance required, unless an alternative programme has been CAA approved."		

Chapter 3

AIRCRAFT MAINTENANCE — MODIFICATIONS AND REPAIRS

3.1 GENERAL

3.1.1 When the State of Design is also the State of Registry, it should follow the procedures described in Part III, Chapter 8, of this manual when approving modifications and repairs. Consideration should be given during the design process to compatibility between the proposed design change and other existing design changes, such as modifications, repairs and MCAI.

3.1.2 Annex 8 provides that a Contracting State issuing an approval for the design of a modification, repair or replacement part should 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. The requirements to review and approve modifications to the type certificate rest with the State of Design.

3.2 DESIGN CHANGES REQUIRING A NEW TYPE CERTIFICATE

3.2.1 Some design changes may be so extensive that an application for a new type certificate will be required.

3.2.2 Application for a new type certificate would be required if the airworthiness authority finds that the change in design, power, thrust or mass is so extensive that a substantially complete investigation of compliance with the applicable design standards is required. Therefore, a new design derived from an existing type design and proposed either by the original manufacturer, or as a modification to the type design by someone other than the original manufacturer, may require a new type certificate.

3.2.3 A substantially complete investigation is required when most of the existing justification is not applicable to the changed aeronautical product. This applies to the scope of the investigation required to establish compliance. For example, an extensive change may negate the validity of extrapolation or use of certain analyses or tests that were used to show compliance in the original or previous type certification of the aeronautical product.

3.2.4 A new type certificate would normally be required for an increase in the number of engines, particularly from one engine to two, because such a change would generally affect the aircraft's complexity to a considerable extent. Similarly, a change in the principle of propulsion from either a reciprocating or turbo-propeller engine to a turbo-jet usually would be regarded as substantial enough to require a new type certificate.

Chapter 4

PRODUCTION APPROVAL/CERTIFICATION

4.1 PRODUCTION CERTIFICATE/APPROVALS

4.1.1 General

4.1.1.1 An applicant (manufacturer) may be eligible for a production certificate or production organization approval from the CAA, subject to determination by the CAA based on its examination of supporting data and inspection of the production facilities, processes and organization, that the applicant has complied with the relevant requirements.

4.1.1.2 An applicant for a production certificate/approval should hold, for the aeronautical product concerned:

- a) a current type certificate or other approved design (or, in the case of a production organization approval, should have applied for a type certificate/design approval); or
- b) a supplemental type certificate (or, in the case of a production organization approval, should have applied for a supplemental type certificate/design approval); or
- c) the right of access to the applicable design data of a type certificate/supplemental type certificate for production purposes under an agreement.

4.1.2 Quality system

4.1.2.1 The applicant should show that it has established and can maintain a quality system for any aeronautical product for which it requests a production certificate/approval, so that each article will meet the design provisions of the pertinent design approval. The quality system should include the following:

- a) an organization chart indicating the chain of authority, including any delegations of that authority, and documentation of the assigned responsibility and authority of the management representative who ensures implementation and compliance with the quality system, and the interrelation of key personnel affecting the quality system;
- b) procedures for the control of design data. The procedures should ensure that documents and data are reviewed for adequacy, by authorized personnel, prior to design data changes;
- c) procedures to control documents and data that form the quality system and any subsequent changes. The procedures should ensure that documents and data are reviewed for adequacy, by authorized personnel, prior to inclusion in the quality system;
- d) procedures to ensure conformance of supplier furnished aeronautical products, parts, materials and services to the approved design prior to release for installation in the aeronautical product, including, but not limited to:

- i) methods for initial supplier evaluation and selection;
- ii) methods for controlling suppliers at all tiers, including procedures for corrective actions;
- iii) methods for the monitoring/surveillance of suppliers, based on techniques such as risk assessment; qualification and auditing of the supplier's quality system; monitoring continued capability throughout the supply chain; first article inspection; incoming inspections and tests of supplied parts; identification of incoming documentation and data relevant to the showing of conformity; and a supplier rating system, which gives visibility of the performance, capability and reliability of the suppliers;
- iv) an arrangement which defines all necessary elements and procedures between the manufacturer and the supplier, including items such as design data and configuration control, incoming inspections, identification and traceability, non-conformities, sub-tier suppliers, access for the CAA, and significant changes to the quality system; and

Note.— A model supplier arrangement can be found in Attachment A to this chapter.

- v) methods for notification to the CAA of significant changes to the scope of any supplier arrangements;
- e) procedures to control the manufacture and quality of aeronautical products to the approved design;
 - f) procedures for all types of inspection and test, including flight test, to determine the aeronautical products conform to the approved design at points in the manufacturing process where an accurate conformity determination can be made;
 - g) procedures to ensure that all tooling, inspection, measuring, and test equipment, used in determining conformity of aeronautical products to the approved design, is calibrated and controlled;
 - h) procedures for the identification of inspection and test status of materials and aeronautical products supplied or manufactured to the approved design;
 - i) procedures to ensure that aeronautical products, parts and materials that do not conform to the approved design are segregated and submitted to a material review board. Material review board procedures should ensure that a material review board is established and composed of authorized individuals. The procedures should provide for the disposition of nonconforming aeronautical products, parts and materials. The procedures should also address the identification, segregation and documentation of those aeronautical products that are approved for use by the board. Nonconforming aeronautical products that are rejected by the board should be marked and disposed of in a manner that renders them unsuitable for installation on type certificated aeronautical products;
 - j) procedures for implementing corrective and preventive action to eliminate or minimize the causes of actual or potential nonconformities to the approved design;
 - k) procedures to prevent damage and deterioration of materials and aeronautical products in process and in storage;
 - l) procedures for identification and retrieval of inspection and test records that demonstrate the aeronautical product conforms to the approved design, and records that demonstrate compliance with the requirements of the approved quality system;

- m) procedures to include a software quality assurance process, when software is included in the approved design data; and
- n) procedures, in case of production under an agreement, to ensure reporting to the design holder all cases where aeronautical products have been released by the production organization and subsequently identified as having possible deviations from the design, and to investigate with the design holder in order to identify those deviations which could lead to an unsafe condition.

4.1.2.2 The manufacturer should also establish procedures for an independent quality assurance function (e.g. internal quality audits), including any corrective action system, for the purpose of assuring compliance with the approved quality system.

4.1.2.3 The manufacturer should submit, for approval, a quality system manual that documents in detail the quality system and the internal quality assurance function described in 4.1.2.1, in order to ensure that each aeronautical product produced conforms to the approved type design and is in a condition for safe operation.

4.1.2.4 After the issue of a production certificate/approval, changes to the quality system should be subject to review by the CAA. The holder of a production certificate/approval should immediately notify the CAA in writing of any change that may affect the inspection, conformity or airworthiness of the aeronautical product.

4.1.2.5 A production limitation record should be issued as part of a production certificate/approval. The record lists the type certificate of every aeronautical product that the applicant is authorized to manufacture under the terms of the production certificate/approval.

4.1.2.6 Each holder of a production certificate/approval should cooperate with the CAA and allow the CAA to make any inspections and tests necessary to determine compliance with the applicable regulations.

4.1.2.7 A production certificate/approval should be effective until surrendered, suspended or revoked, or until a termination date is otherwise established by the CAA, the associated design approval is revoked, or the location of the manufacturing facility is changed. A production certificate/approval should not be transferable.

4.1.2.8 The holder of a production certificate/approval should retain the production certificate/approval on the premises in which the aeronautical product concerned is manufactured, and make it available to the CAA.

4.1.3 Privileges and responsibilities

4.1.3.1 The holder of a production certificate/approval may:

- a) obtain a Certificate of Airworthiness for an aircraft it produces without further showing that the aircraft conforms to an approved type design and is in a condition for safe operation, except that the CAA may inspect the aircraft for conformity with the type design;
- b) obtain an airworthiness approval for an aeronautical product other than an aircraft, that conforms to the approved design data and is in a condition for safe operation, prior to that aeronautical product leaving the production certificate holder's approved quality system. In the case of a production organization approval, the holder of a production organization approval may directly issue airworthiness approval documents for aeronautical products or parts other than aircraft in accordance with the privileges of the production organization approval.

4.1.3.2 The holder of a production certificate/approval should:

- a) maintain the quality system in conformity with the data and procedures approved for the production certificate/approval;
- b) determine that each part and completed aeronautical product conforms to the type design and is in a condition for safe operation;
- c) mark or tag all aeronautical products in accordance with the applicable regulations;
- d) maintain a complete and current design data file for each aeronautical product produced under the production approval; and
- e) maintain complete and current inspection records showing that all inspections and tests required to ensure compliance with the applicable regulations have been properly completed and documented. These records generally should be retained for five years after the completed aeronautical product is put in service, for the purpose of continued airworthiness.

4.2 PRODUCTION WITHOUT A PRODUCTION CERTIFICATE OR PRODUCTION ORGANIZATION APPROVAL

4.2.1 General

Prior to commencing serial production of aircraft or components for which a type certificate has been applied for or issued, a manufacturer normally obtains approval from the CAA in the form of a production certificate or production organization approval. A production certificate/approval is the preferred method of approving serial production of aircraft or components. In the absence of a production certificate/approval, a manufacturer may fabricate, with limitations, aircraft or parts under a type certificate only, with the establishment of a CAA-accepted or approved production inspection system.

4.2.2 Basic requirements for production without a production certificate/approval

Each manufacturer of an aeronautical product fabricated under a type certificate only should:

- a) make each aeronautical product and part available for inspection by the CAA;
- b) maintain, at the place of manufacture, all technical data and drawings necessary for the CAA to determine whether each aeronautical product and its parts conform to the type design;
- c) establish and maintain an accepted or approved production inspection system that ensures that each aeronautical product conforms to the type design and is in a condition for safe operation;
- d) upon establishment of the accepted or approved production inspection system, submit to the CAA a manual that describes the system and the means for making the determinations required by the materials review board; and
- e) mark or tag each aeronautical product and part in accordance with the applicable regulations.

4.2.3 Production inspection system materials review board

4.2.3.1 Each manufacturer should develop a production inspection system which:

- a) establishes a materials review board, to include representatives from the inspection and engineering departments, and materials review procedures; and
- b) maintains complete records of materials review board action for generally five years for the purpose of continued airworthiness.

4.2.3.2 The production inspection system should provide a means whereby the materials review board may determine at least that:

- a) incoming materials, and bought or subcontracted parts, used in the finished aeronautical product meet the specifications indicated in the type design data;

Note.— A model for a supplier arrangement can be found in Attachment A to this chapter.

- b) incoming materials, and bought or contracted parts, are properly identified, especially when their physical or chemical properties cannot be readily and accurately determined;
- c) all materials are suitably stored and adequately protected from damage and deterioration;
- d) processes affecting the quality and safety of the finished aeronautical product are accomplished in accordance with the specifications established by the design data;
- e) parts and components in process are inspected for conformity with the type design data at points in production where accurate determinations can be made;
- f) current design drawings are readily available to manufacturing and inspection personnel, and used when necessary;
- g) design changes, including material substitutions, are controlled and approved before being incorporated in the finished aeronautical product;
- h) rejected materials and parts are segregated and identified in a manner that precludes their inadvertent installation in the finished aeronautical product;
- i) materials and parts that are withheld because of departures from design data or specifications, and that are to be considered for installation in the finished aeronautical product, are processed through the materials review board. Those materials and parts determined by the board to be serviceable should be properly identified and re-inspected if rework or repair is necessary. Materials and parts rejected by the board should be marked and disposed of to ensure that they are not incorporated in the final aeronautical product; and
- j) inspection records are maintained, identified with the completed aeronautical product where practicable, and retained by the manufacturer for generally five years for the purpose of continued airworthiness.

4.2.4 Production test — Aircraft

4.2.4.1 The manufacturer of an aircraft under a type certificate should establish a CAA-approved production flight test procedure and should flight test each aircraft in accordance with that procedure.

4.2.4.2 The production flight test procedure should include at least the following:

- a) an operational check of the trim, controllability, or other flight characteristics to establish that the production aircraft has the same range and degree of control as the prototype aircraft;
- b) an operational check of each part of the system operated by the crew while in flight to establish that, during flight, instrument readings are within normal range;
- c) a determination that all instruments are properly marked, all placards are installed in appropriate places, and aircraft flight manuals are available in the aircraft;
- d) a check of the operational characteristics of the aircraft on the ground; and
- e) a check on any other items peculiar to the aircraft being tested that can best be done during the ground or flight operation of the aircraft.

4.2.5 Production test — Engines

The manufacturer of aircraft engines under a type certificate should subject each engine (except rocket engines for which the manufacturer should establish a sampling technique) to an acceptable test run that includes at least the following:

- a) break in runs that include a determination of fuel and oil consumption and a determination of power characteristics at rated maximum continuous power or thrust and, if applicable, at rated take-off power or thrust; and
- b) five hours of operation at rated maximum continuous power or thrust. For engines having a rated take-off power or thrust higher than rated maximum continuous power or thrust, the five-hour run should include thirty minutes at rated take-off power or thrust.

Note.— The test runs may be made with the engine installed on the aircraft or appropriately mounted and using suitable power and thrust measuring equipment.

4.2.6 Production test — Propellers

The manufacturer of propellers under a type certificate should give each variable pitch propeller an acceptable functional test to determine only that it operates properly throughout the normal range of operation.

4.2.7 Statement of product conformity

4.2.7.1 Each holder of a type certificate or holder of an authorization (e.g. licensing agreement) to a type certificate who produces an aeronautical product in the absence of a production certificate/approval should provide a statement of conformity, as required by the CAA. The statement of conformity should be provided:

- a) at the time of initial transfer of the ownership of such aeronautical product, provided that product has not been issued an airworthiness approval; or

- b) at the time of application for the original issue of an aircraft airworthiness certificate or an aircraft engine or propeller airworthiness approval tag.

4.2.7.2 The conformity statement should be signed by an authorized person who holds a responsible position in the manufacturing organization, and should include:

- a) for each aeronautical product, a statement that the product conforms to its type certificate and is in condition for safe operation;
- b) for each aircraft, a statement that the aircraft has been flight checked; and
- c) for each aircraft engine or variable pitch propeller, a statement that the engine or propeller has been subjected by the manufacturer to a final operational check.

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Attachment A to Chapter 4

EXAMPLE FOR A SUPPLIER ARRANGEMENT

Note 1.— The term “manufacturer” in this Attachment includes manufacturers:

- a) with a production approval/certificate (see Part V, 4.1), and*
- b) without a production approval/certificate (see Part V, 4.2).*

Note 2.— The term “quality system” in this Attachment includes a quality system according to Part V, 4.1.2 and a production inspection system according to Part V, 4.2.3.

Note 3.— The term “item” in this Attachment comprises aeronautical products or parts as well as consumables, materials, standard parts or services.

The supplier arrangement should be documented through a contract which defines all necessary elements and procedures for the contracting parties. The following list comprises the minimum elements to be defined in the arrangement between the manufacturer and the supplier. Whenever one or more of these elements is found to be not applicable by the manufacturer, it should be stated in the supplier arrangement.

Guidance on the content of each element is provided, but this is not intended to be comprehensive.

LIST OF ELEMENTS FOR A MANUFACTURER — SUPPLIER ARRANGEMENT

1. **Scope**

- a) Identify items (see Note 3) provided by the supplier and the associated supplier facilities.
- b) Identify any limitation(s) defined by the manufacturer.

2. **Manufacturer evaluation**

Stipulate that the supplier is acting under the manufacturer’s quality system, and all the corrective actions requested by the manufacturer are to be implemented.

3. **Implementation procedures**

Attach a quality plan or equivalent documentation to the contract.

4. Internal quality system

- a) Identify methods for the manufacturer to evaluate the internal quality system of the supplier.
- b) Describe the interface between the quality systems of the manufacturer and the supplier in the quality plan.

5. Design data and configuration control

- a) Identify the design data package provided by the manufacturer, which includes all pertinent data required for the supplied item(s) to be identified, manufactured, inspected, used and maintained.
- b) Establish procedures for the management of design changes.

6. Manufacturing data

Identify the manufacturing data developed by the supplier, if any, based on the design data (see item No. 5 above) submitted by the manufacturer.

7. Test and inspections (including incoming)

Identify procedures to define the necessary test and inspection processes:

- a) to ensure and determine conformity of the supplied item(s) during the supplier's manufacturing activities and at receipt by the manufacturer;
- b) to be performed for (re-)qualification of the supplier (including First Article Inspection) and the related documentation requirements.

Note.— The manufacturer may rely on inspection/tests performed by the supplier, provided that:

- a) personnel responsible for these tasks satisfy the quality standards of the manufacturer; and*
- b) quality measurements are clearly identified; and*
- c) the records or reports showing evidence of conformity are available for review and audit.*

8. Identification and traceability

Stipulate that the manufacturer ensures flow down to the supplier, and any sub-tier suppliers, of the item(s) identification and traceability requirements in order to identify the configuration of the item(s) throughout the item(s') life.

9. Supplier personnel competence

Identify the manufacturer's requirements for supplier personnel (i.e. production, inspection, and quality staff) competence, based on qualifications, education, training, skills and experience.

10. **Calibration**

- a) Ensure that calibration is traceable to a national standard that is acceptable to the CAA of the manufacturer.
- b) Ensure that certificates are submitted where suppliers perform calibration services for the manufacturer.

11. **Handling, storage and packing**

- a) Identify requirements from the manufacturer concerning handling, storage, packing, and shelf-life to be followed by the supplier.
- b) Address segregation of approved and non-approved items as well as non-conforming items.

12. **Record completion and retention**

Identify procedures for document management and retention by the supplier.

13. **Non-conformities**

Identify procedures for the handling and documenting of non-conformities between the manufacturer and the supplier, addressing the:

- a) identification, documentation and classification (major or minor) of non-conformities; and
- b) the disposition of non-conformities and the subsequent segregation and control of the non-conforming parts and materials including the secure disposition of scrap items to avoid re-use (see Item 11).

Note.— The disposition of non-conformities is generally the responsibility of the Design Approval Holder. Nevertheless it may be acceptable to the CAA that the Design Approval Holder may delegate under its responsibility the disposition of non-conformities to persons located in the organization of the manufacturer and its suppliers, thus acting as part of the Design Approval Holder in this respect.

14. **Conformity document**

Specify the document by which the supplier certifies conformity to the applicable design data to the manufacturer.

15. **Provisions for direct delivery/direct shipment**

Identify the authorization and the requirements for direct delivery/direct shipment to end users from the supplier's facilities based on relevant regulatory requirements.

16. Assistance for continued airworthiness

Identify procedures for supplier assistance to the manufacturer for continued airworthiness, including methods to notify and act upon notification of already delivered non-conforming items, ensuring proper investigation and implementation of corrective action.

17. Sub-tier suppliers

Specify the conditions under which the supplier may subcontract to or supply from a third party (in some cases specific authorization may be needed, in some others only notification may be sufficient).

Specify procedures:

- a) for a supplier to flow down the applicable CAA and manufacturer requirements to sub-tier suppliers;
- b) for notification to the manufacturer in case of further sub-tier supplier activity and/or significant problems encountered during manufacturing.

18. Significant change to the quality/inspection system

Require that the manufacturer is notified as soon as practical of any changes to the supplier system evaluated by the manufacturer which may affect the quality of the supply.

19. Occurrence reporting system

Specify to the supplier the necessary requirements for occurrence reporting to ensure that the manufacturer can comply with CAA requirements for occurrence reporting.

20. Access for manufacturer and manufacturer's CAA

Ensure the right of access to all involved facilities in the supply chain for the manufacturer and manufacturer's CAA to enable:

- a) the manufacturer to verify compliance with the manufacturer supplier arrangement and to assess the quality of the contracted items; and
- b) the CAA or its designated agent to investigate the manufacturer's compliance with the applicable requirements at supplier level.

21. Language

Identify the language to be used for the exchange of information (to include all working documents such as technical and quality data), which is acceptable to the manufacturer's CAA.

22. **Identification of responsibilities**

Identify responsible office/function/positions in charge for all elements of the manufacturer supplier arrangement.

23. **Duration of the supplier arrangement**

Identify the duration of the supplier arrangement in terms of time and/or quantity of supply to be delivered to the manufacturer.

Chapter 5

ADDITIONAL REQUIREMENTS WHEN THE STATE OF MANUFACTURE IS NOT THE STATE OF DESIGN

5.1 Annex 8, Part II, 2.4.4 provides that where the State of Manufacture is other than the State of Design, there is an agreement or arrangement acceptable to both States to:

- a) ensure that the manufacturing organization has the right of access to the approved design data relevant for production purposes; and
- b) address the responsibilities of each State with regard to design, manufacture and continued airworthiness of the aircraft, engine or propeller..

5.2 Annex 8, Part II, 4.2.2 also provides that when the State of Manufacture of an aircraft is not the State of Design, there is an agreement acceptable to both States to ensure that the manufacturing organization cooperates with the organization responsible for the type design in assessing information on the design, manufacture and operation of the aircraft, engine or propeller.

Chapter 6

CONTINUING AIRWORTHINESS OF AIRCRAFT

Note.— Information on the codes of airworthiness used by different States, methods of handling and exchange of information on airworthiness directives (or their equivalent), details of systems used in States for reporting of information on faults, defects and malfunctions and lists of the design organizations responsible for the type design and continuing airworthiness of aircraft is published in ICAO Circular 95 — The Continuing Airworthiness of Aircraft in Service. The Online Airworthiness Information Network launched in October 2014 replaces and expands on Circular 95.

6.1 INTRODUCTION TO THE CONCEPT OF CONTINUING AIRWORTHINESS

6.1.1 Continuing airworthiness covers the processes that require all aircraft (and their engines and propellers, if type certificated separately) to comply with the airworthiness requirements laid down in their respective type certification basis or being imposed as part of the State of Registry's requirements and to be in a condition for safe operation, at any time, during their operating life.

6.1.2 Under the control of the respective CAAs of the State of Design, the State of Registry and, when appropriate, the State of the Operator, continuing airworthiness includes the following:

- a) definition of design criteria which provide the necessary accessibility for inspection and permit the use of established processes and practices for the accomplishment of maintenance;
- b) information that identifies the specifications, methods and procedures necessary to perform the continuing airworthiness tasks identified for the aircraft, engine and/or propeller tasks identified for the aircraft type and the tasks necessary to maintain the aircraft, as developed, by the type design organization; and publication of this information in a format that can be readily adapted for use by an air operator;
- c) adoption by the air operator into its maintenance programme of the specifications, methods and procedures necessary to perform the continuing airworthiness tasks identified for the aircraft, engine and/or propeller type and the tasks necessary to maintain the aircraft, engine and/or propeller, using the information provided by the type design organization;
- d) reporting of faults, malfunctions, and defects and other significant maintenance and operational information by the air operator to the type design organization in compliance with the requirements of the State of Registry and the State of the Operator;
- e) reporting of faults, malfunctions, and defects and other significant maintenance information by the maintenance organization to the type design organization in accordance with the requirements of the State having jurisdiction over the maintenance organization;
- f) analysis of faults, malfunctions, defects, accidents and other significant maintenance and operational information by the type design organization, the State of Design and the State of Registry and the initiation and transmission of information and recommended or mandatory action to be taken in response to that analysis;

- g) consideration of the information provided by the type design organization and action on the information as deemed appropriate by the air operator or the State of Registry, with particular emphasis on action designated as “mandatory”;
- h) adoption and accomplishment by the air operator of all mandatory requirements with particular emphasis on fatigue life limits and any special tests or inspections required by the airworthiness requirements of the type design of the aircraft or subsequently found necessary to ensure structural integrity;
- i) adoption by the air operator into its maintenance programme of supplemental SIPs and subsequent SIP requirements, taking into consideration the SIP for aeroplanes recommended by the type design organization; and
- j) compliance with SIPs for aeroplanes.

6.1.3 The SIP for aeroplanes may include the following depending on the structural design criteria:

- a) supplementary SIP;
- b) corrosion prevention and control programme;
- c) SB review and mandatory modification programme;
- d) repairs review for damage tolerance; and/or
- e) widespread fatigue damage (WFD) review.

6.2 EXCHANGE AND USE OF CONTINUING AIRWORTHINESS INFORMATION

6.2.1 Introduction

6.2.1.1 Aircraft are designed and certificated to airworthiness standards. In service, however, faults, malfunctions, defects and other occurrences (service difficulties) may be experienced. To satisfy its responsibilities under the Convention, it is essential that the State of Registry be kept informed of service difficulties by its air operators and maintenance organizations.

6.2.1.2 Furthermore, it is also essential that the type design organization and the State of Design be kept informed of service difficulties. The type design organization, receiving this kind of information from all air operators of the type of aircraft, is in the best position to develop recommendations to solve the problems of the aircraft in service. The State of Design, being the certificating authority of the type of aircraft, engine or propeller will, if necessary, make these recommendations mandatory and initiate changes to the airworthiness requirements, if appropriate.

6.2.1.3 The recommendations issued by the organization responsible for the type design (e.g. SBs) and the information made mandatory by the State of Design should be transmitted to all air operators and their authorities and appropriate actions taken.

6.2.2 Organization responsible for the type design

6.2.2.1 Type certificate holder

Annex 8, Part II, Chapter 4 provides for the transmittal of information relating to the continuing airworthiness of the aircraft, engine or propeller to the type design organization of that aircraft, engine or propeller. Normally, this organization will be the holder of the type certificate for the aircraft, engine or propeller type; in some cases (prior to Amendment 98 of Annex 8) it will be the holder of an equivalent document certifying approval of the type design by the certifying authority.

The reference to transmittal of this information to such an organization necessitates that:

- a) for aeroplanes over 5 700 kg MTOM and helicopters over 3 175 kg certificated take-off MTOM engaged in international civil aviation, an organization holding the type certificate (or equivalent document) will exist throughout the operational life of the aircraft, engine or propeller type; and
- b) the holder of the type certificate (or equivalent document) will be in possession of the type design and type certification data and have the competence to use that data as necessary for the continuing airworthiness of the aircraft, engine or propeller.

Note 1.— Throughout the remainder of this chapter, the “organization responsible for the type design” will be referred to as the “type design organization” for ease of reading.

Note 2.— When appropriate, States should also update their information concerning design organizations responsible for type design under their jurisdiction listed in ICAO Circular 95 — The Continuing Airworthiness of Aircraft in Service. The Online Airworthiness Information Network launched in October 2014 replaces and expands on Circular 95.

6.2.3 Transfer of the type certificate (TC) to a new TC holder

6.2.3.1 Cases can be envisaged where the holder of a type certificate (or equivalent document) may transfer legal ownership of a type design to a new owner, for business purposes. If the new owner remains within the same jurisdiction as the previous owner, then the State of Design remains unchanged. However, if the new owner is located under the geographical jurisdiction of another Contracting State, then there is also a change in the designation of the State of Design. The activities involving the transfer of a type certificate should be regulated by the appropriate CAA to ensure that the continuing airworthiness responsibilities under Annex 8, for the affected type design, are maintained or retained by the new holder and/or State of Design.

6.2.3.2 The CAA responsible for the new TC holder will need to be satisfied that all necessary background data, including the type design data and type certification data, have been transferred to the new TC holder and that the new TC holder is able to support the continuing airworthiness of the aircraft type. Where the transfer involves another Contracting State, the CAAs of the previous and new State of Design will need to resolve any problems arising from any different requirements and procedures for type certification in the new State of Design. In addition, if the aircraft is manufactured under the jurisdiction of another Contracting State, Annex 8, Part II, Chapter 4 requires that both the State of Design and the State of Manufacture establish an agreement that ensures the manufacturing organization cooperates with the type design organization in assessing information received on service experiences.

Note.—An outline of the many aspects to be considered when initiating the transfer of a type certificate to a new TC holder is provided in Attachment A to this chapter.

6.2.3.3 Following the successful transfer of a type certificate, the CAA that has jurisdiction over the new holder must:

- a) issue a type certificate to the new holder; and
- b) notify, in a timely manner, Contracting States that have the aircraft type on their aircraft register of the new type design organization responsible for receiving information on faults, malfunctions, defects and other occurrences that are required to be reported for purposes of continuing airworthiness.

6.2.4 Absence of, or deficiency by, a holder

6.2.4.1 It is possible that the holder of a type certificate may cease to legally exist (e.g. due to financial constraints or corporate mergers) or decides to abandon its responsibilities over the type design by surrendering the type certificate (e.g. due to economic constraints to support a smaller number of aircraft in service). Another possible case is when the holder of a type certificate fails to carry out its continuing airworthiness responsibilities over the affected approved type design. As a consequence of all these cases, in-service reports submitted by industry concerning faults, malfunctions, defects and other occurrences may not receive the proper assessment for adverse effects on the continuing airworthiness of the aircraft. When this happens, the State of Design may face difficulties in fulfilling its responsibility concerning dissemination of mandatory continuing airworthiness information, and any required corrective action, to the affected States of Registry. If a State of Design is confronted with any of these cases, the CAA would need to take appropriate action, which could be a combination of any of the following:

- a) to assume the responsibilities of the holder itself;
- b) to seek a new holder (see paragraph 6.2.3 – transfer of the type certificate to a new holder) or an organization that is willing to fulfil the responsibilities of a holder, under a type responsibility agreement with the responsible CAA; or
- c) to suspend or revoke the type certificate (or equivalent document) if no other mitigating factor is possible.

Note.— Under actions a) and b), the responsible organization may need to place limitations on the validity of the type certificate when service experience reveals a potentially unsafe condition, pending availability of a corrective action by an aircraft owner or air operator to address the condition; or, the agreement referenced in b) above should provide for the assignment of the responsibilities and the privileges of the new holder and the CAA for continued airworthiness support, provisions for possible future transfers, surrenders, or cancellation, and timely notification of any information relevant to the type certificate to Contracting States. Such a responsible organization needs to have the basic resources and facilities necessary to review and analyse SDRs, accident and incident reports and trend data, and to issue continuing airworthiness and corrective information, as appropriate.

6.2.4.2 Where a legitimate holder cannot be established as responsible for the affected type design, or where the State of Design decides to suspend or revoke its type certificate (or equivalent document) because of the absence of a holder, the responsible CAA should, in accordance with Annex 8, Part II, Chapter 4, notify in a timely manner all affected Contracting States of such information, including a clear declaration if they are retaining or abandoning their designation as State of Design.

6.2.4.3 Regardless of the availability of a holder for a type certificate or State of Design, Annex 8 ultimately assigns to each State of Registry the responsibility for determining the continuing airworthiness of the aircraft in its aircraft register. Annex 8, Part II, Chapter 4 requires that a State of Registry develop or adopt the requirements necessary for ensuring the continuing airworthiness of the aircraft in its aircraft register during its service life.

6.2.5 Responsibilities of the State of Design

In accordance with Annex 8, Part II, Chapter 4 the responsibilities of the State of Design are to:

- a) ensure that the State of Design of an aircraft transmits to every Contracting State which has in accordance with Annex 8, Part II, 4.2.3 a), advised the State of Design of the aircraft 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 and safe operation of the aircraft, including its engines and propellers when applicable (hereinafter called MCAI) and notification of the suspension and revocation of a type certificate;

Note.— In Annex 8, Part II, Note 3 to 4.2.1.1 states that if the State of Design of the aircraft is satisfied that mandatory continuing airworthiness information previously issued by the State of Design of the engine or propeller under Annex 8, Part II, 4.2.1.2 fully addresses a continuing airworthiness issue, then the State of Design of the aircraft need not retransmit that information to Contracting States that have already been informed.

- b) for the State of Design of the Aircraft, ensure that, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM, there exists a system for:
- i) receiving information submitted in accordance with Annex 8, Part II, 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 Annex 8, Part II, 4.2.1.1 a);
- c) for the State of Design of the aircraft, ensure that, in respect of aeroplanes over 5 700 kg MTOM, a continuing SIP exists to ensure the airworthiness of the aeroplane. The programme includes specific information concerning corrosion prevention and control (Annex 8, Part II, 4.2.1.1 c));
- d) ensure that, where for the State of Design of the aircraft, the State of Manufacture is other than the State of Design, there is an agreement acceptable to both States to ensure that the manufacturing organization cooperates with the organization responsible for the type design in assessing information on the design, manufacture and operation of the aircraft, engine or propeller (Annex 8, Part II, 4.2.1.4));
- e) ensure that the State of Design of an engine or a propeller, where it is different from the State of Design of the aircraft, transmits any continuing airworthiness information to the State of Design of the aircraft and to any other Contracting State upon request (Annex 8, Part II, 4.2.1.2);

Note.— In Annex 8, Part II, the Note to 4.2.1.2 states that while the overall responsibility for the transmission of mandatory continuing airworthiness information rests with the State of Design of the aircraft, it is recognized that some States of Design of the engine or propeller transmit mandatory continuing airworthiness information directly to States of Registry and other Contracting States. This practice has the benefit of speeding up the availability of mandatory continuing airworthiness information and processing this information in the normal way in accordance with 4.2.3.1 d). However, if the State of Design of the aircraft subsequently transmits additional mandatory continuing airworthiness information to that of the State of Design of the engine or propeller, then the mandatory continuing airworthiness information originating from the State of Design of the aircraft must take precedence in case of incompatibility.

- f) ensure that, where the State of Design of a modification is different from the State of Design of the aircraft, engine or propeller being modified, the State of Design of the modification transmits the mandatory continuing information to all States that have the modified aircraft on their registries (Annex 8, Part II, 4.2.1.3); and

- g) establish, in respect of aeroplanes over 5 700 kg and helicopters over 3 175 kg MTOM, the type of service information that is to be reported to its airworthiness authority by organizations responsible for type design. Procedures for reporting this information should also be established (Annex 8, Part II, 4.2.4).

Note.— In Annex 8, Part II, Note 1 to 4.2.1.1 states that 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. Included in such information is that issued by Contracting States in the form of ADs.

(Refer to Part III, Chapter 9, 9.9 of this manual for more details regarding MCAI.)

6.3 ADVISING THE STATE OF REGISTRY AND OTHER STATES

ICAO Circular 95 provides the necessary information to assist Contracting States in establishing contact with the CAA of other Contracting States, for the purpose of maintaining continuing airworthiness of aircraft in service. The Online Airworthiness Information Network launched in October 2014 replaces and expands on Circular 95.

6.4 TRANSMISSION OF INFORMATION ON FAULTS, MALFUNCTIONS AND DEFECTS AND OTHER OCCURRENCES TO THE ORGANIZATION RESPONSIBLE FOR THE TYPE DESIGN

6.4.1 The State of Registry should have a system to ensure that service difficulties reported by organizations are transmitted to the type design organization.

6.4.2 When the State of Design of the engine or propeller is different from the State of Design of the aircraft, the State of Design of the aircraft should have a system to transmit information on service difficulties to the State of Design of the engine or propeller.

6.4.3 It is essential that information on airworthiness deficiencies be transmitted without any delay to the type design organization of the aircraft, engine or propeller affected, so that corrective action may be developed by that organization and communicated to all air operators of the aircraft type.

6.4.4 Details of Contracting States' systems for reporting of information on faults, defects and malfunctions may be found in ICAO Circular 95. The Online Airworthiness Information Network launched in October 2014 replaces and expands on Circular 95.

6.5 TRANSMISSION TO THE STATE OF DESIGN OF MANDATORY CONTINUING AIRWORTHINESS INFORMATION ISSUED BY THE STATE OF REGISTRY

In addition to the MCAI issued by the State of Design, the State of Registry may issue MCAI for an aircraft on its register. States should only make mandatory requirements additional to those of the State of Design when there are urgent safety-related reasons and when they have the capability to develop such requirements. When possible, such action should entail prior consultation with the State of Design, but in all cases the State of Design should be notified as soon as practicable or when the State of Registry has uniquely designed or modified aircraft because of unique airworthiness requirements.

6.6 ACTION BY THE STATE OF DESIGN UPON RECEIPT OF CONTINUING AIRWORTHINESS INFORMATION

6.6.1 The State of Design and the type design organization should assess all airworthiness information received, including the information mentioned under Annex 8, Part II, 4.2.3 e) and 4.2.3 f) and information on accident investigations.

6.6.2 The type design organization should respond to the reporting air operator and should include in the response advice on the actions needed for the reported service difficulty to ensure continuing airworthiness. The type design organization should also inform other affected air operators.

6.6.3 Whenever there is evidence that its aircraft, engine or propeller is unsafe because of a manufacturing or design defect, the type design organization should investigate the reason for the defect and report to the State of Design the results of its investigation and any action being taken or proposed to correct the defect. If action is required to correct the defect, the type design organization should submit the data necessary for the issuance of appropriate mandatory airworthiness information.

6.6.4 When the State of Design considers that the issuance of mandatory airworthiness information is necessary to correct the unsafe condition, the type design organization should propose the appropriate design changes and/or required inspections and submit details of these proposals for approval. Following the approval of the proposed design changes or inspections, it should make available to all air operators appropriate descriptive data and accomplishment instructions. The type design organization should also make updates to user documents not subject to approval by the CAA, such as the aircraft service manual and illustrated parts catalogue.

6.6.5 Type of information on continuing airworthiness to be transmitted by the type design organization

6.6.5.1 Response to the reporting air operator should include advice on the actions needed to overcome the reported service difficulty and ensure continuing airworthiness. Service difficulties that affect continuing airworthiness should be reported to the State of Design. Communications to the air operator and the State of Design should include the following:

- a) a clear discussion of the seriousness and possible causes of the difficulty;
- b) permissible limits for continued operation;
- c) special inspection procedures when required and where applicable;
- d) the repeat inspection interval needed if continued operation is permissible;
- e) repairs or replacement required, and when required; and
- f) limitations for non-revenue ferry flight.

6.6.5.2 The type design organization should also inform other affected air operators of reported service difficulties that affect the continued airworthiness of the aircraft type. Communications should include the following:

- a) a clear description of the difficulty reported using visual aids (photograph or sketch);
- b) a clear discussion of the seriousness of the difficulty;
- c) applicable part and serial numbers;

- d) aircraft and/or component time in landings and flight hours when the difficulty was found;
- e) how the difficulty was discovered;
- f) analysis of the cause, if known;
- g) recommended actions;
- h) permissible limits for continued operation; and
- i) feedback information desired.

6.7 INFORMATION TO BE REPORTED TO THE AUTHORITY

6.7.1 Type design organizations should report to their airworthiness authority service information such as all faults, malfunctions, defects and other occurrences which cause or might cause adverse effects on the continuing airworthiness of an aircraft. The State should establish a system to collect this information with a detailed procedure describing the reporting process by the organizations.

6.7.2 Some States have established a service difficulty reporting system. Organizations in these States should report information on faults, malfunctions, defects and other occurrences which might cause adverse effects on the continuing airworthiness of the aircraft through this system.

6.8 SERVICE DIFFICULTY REPORTING SYSTEM

6.8.1 General

6.8.1.1 The Service Difficulty Reporting (SDR) System is established to support the CAA in its mandate to foster an acceptable level of safety by:

- a) promoting product safety improvement;
- b) detecting trends (as opposed to isolated cases); and
- c) giving the CAA the necessary tools to discharge the State of Registry's obligations with regard to continuing airworthiness information, as set forth in Annex 8, Part II, 4.2.3 f) and 4.2.4).

6.8.1.2 The current aircraft population may be too large to achieve full knowledge of all potential safety problems solely through inspection. The SDR assists in effective decision making, manpower utilization and enhancement of safety. A properly implemented SDR provides the intelligence needed to assess faults, malfunctions, defects and other occurrences which may cause adverse effects on the continuing airworthiness of the aircraft, institute early corrective action, and thus assist in accident prevention.

6.8.1.3 The SDR is a feedback system which provides a most effective resource for decision making on matters of reliability and airworthiness. The level of sophistication of the SDR can range from the use of advanced computers with immediate readout capabilities, to manual programmes which utilize a reporting form that is completed by the air operator and manually processed by the regulatory agencies. Future development of the SDR could result in a worldwide sharing of service difficulty information, such as is being done now with the ICAO coordinated accident/incident reporting programme (ECCAIRS).

6.8.2 Sources of information for service difficulty reports

SDRs should be received from certificate holders such as air operators, AMOs, type design organizations, and from any source having access to aviation safety information, such as air traffic control. Significant malfunctions, failures or conditions brought to the attention of or noted by the AID inspector during surveillance of aviation industry activities should also be reported.

6.8.3 Guidelines for reporting

6.8.3.1 CAA regulations should require certificate holders to submit specified information to the AID. The reports should be submitted on a common form. The regulations should require a report for each malfunction, failure or defect that occurs under the reportable categories. Similar failures that continue to occur should be reported so the manufacturer and the State of Manufacture are aware of trends that may be developing. In addition, each air operator should report any other failure, malfunction or defect in an aircraft that occurs or is detected at any time, if in the air operator's opinion that failure, malfunction or defect has endangered or may endanger the safe operation of an aircraft.

Note.— Examples of forms and methods used for handling SDRs by Contracting States may be found in ICAO Circular 95. The Online Airworthiness Information Network launched in October 2014 replaces and expands on Circular 95.

6.8.3.2 Each air operator should report the occurrence or detection of each failure, malfunction or defect concerning at least the following:

- a) fires during flight and whether or not a fire warning system was installed and functioned properly;
- b) false fire warning during flight;
- c) an engine exhaust system that causes damage during flight to the engine, adjacent structure, equipment or components;
- d) an aircraft component that causes accumulation or circulation of smoke, vapour, or toxic or noxious fumes in the crew compartment or passenger cabin during flight;
- e) engine shutdown during flight because of flameout;
- f) engine shutdown during flight when external damage to the engine or aircraft structure occurs;
- g) engine shutdown during flight due to foreign object ingestion or icing;
- h) shutdown during flight of more than one engine;
- i) a propeller feathering system or ability of the system to control over speed during flight;
- j) a fuel or fuel dumping system that affects fuel flow or causes hazardous leakage during flight;
- k) a landing gear extension or retraction, or opening or closing of landing gear doors during flight;
- l) brake system components that result in loss of brake actuating force when the aircraft is in motion on the ground;
- m) aircraft structure that requires significant repair;

- n) cracks, permanent deformation, or corrosion of aircraft structure, if more than the maximum acceptable to the manufacturer or the CAA;
- o) aircraft components or systems that result in taking emergency actions during flight (except action to shut down an engine);
- p) each interruption to a flight, unscheduled change of aircraft en route, or unscheduled stop or diversion from a route, caused by known or suspected mechanical difficulties or malfunctions;
- q) the number of engines removed prematurely because of malfunction, failure or defect, listed by make and model and the aircraft type in which it was installed; and
- r) the number of propeller featherings in flight, listed by type of propeller and engine and aircraft on which it was installed.

6.8.3.3 An EDTO air operator should supply additional information, as listed in Part IV, Chapter 5, 5.5.7.5 of this manual.

6.8.4 Significant reports

6.8.4.1 The following significant reports warrant immediate notification of the appropriate State organization by telephone or other means acceptable to the CAA:

- a) primary structure failure;
- b) control system failure;
- c) fire in the aircraft;
- d) engine structural failure; or
- e) any other condition considered an imminent hazard to safety.

6.8.4.2 The notification should follow the format of the SDR and, being of an alert nature, should include the following information when available and relevant:

- a) aircraft owner's name and address;
- b) whether accident or incident;
- c) related SBs, service letters, ADs; and
- d) disposition of the defective parts.

6.8.4.3 The SDR should be formally submitted in the normal manner to the AID, as soon as possible following the initial notification.

6.9 MANDATORY CONTINUING AIRWORTHINESS INFORMATION (MCAI)

6.9.1 General

6.9.1.1 A primary safety function of the airworthiness organization within the CAA is to require correction of unsafe conditions found in an aircraft, aircraft engine, propeller, equipment or instrument or when such conditions develop in other

aeronautical products of the same design. The unsafe conditions may be due to design deficiencies, manufacturing defects, maintenance programme deficiencies, or other causes. MCAI are the means used to notify aircraft owners and other interested persons of unsafe conditions and to prescribe the conditions under which the aeronautical product may continue to be operated. One of the most commonly used types of MCAI issued by States is an AD. Some States may also consider as MCAI any mandatory and alert service bulletins issued by the organization responsible for the type design.

6.9.1.2 ADs are generally divided into two categories:

- a) those of an urgent nature requiring immediate compliance upon receipt; and
- b) those of a less urgent nature requiring compliance within a relatively longer period.

6.9.1.3 The type, model and serial number of the aircraft, engine, propeller, equipment or instrument affected should be included in the contents of the MCAI. The mandatory information may require additional or more frequent inspections or maintenance or modifications, and usually with a time limit for compliance in terms of a date, flying hours or number of landings.

6.9.1.4 The State of Design, in determining the time limit for compliance should, without prejudice to safety considerations, take into account the availability of modification kits, tools and material. It should also take into account the service experience in other States and should not limit its evaluation to the service experience in its own State. Time limits for conducting initial inspections, as well as conducting recurrent inspections, are frequently tailored to the inspection methods being used.

6.9.1.5 Annex 8, Part II, 4.2.1.2 requires that when the State of Design of the engine or propeller is different from the State of Design of the aircraft, the State of Design of the aircraft should review mandatory airworthiness information received from the State of Design of the engine or propeller. The State of Design of the aircraft should either promulgate that information as being applicable to the aircraft type in question, determine that the mandatory continued airworthiness promulgated by the State of Design of the engine or propeller fully addresses the continuing airworthiness issue, or supplement it to take account of the specific installation in the aircraft. The aircraft type design organization should assist in this review.

Note.— In Annex 8, Part II, Note 3 to 4.2.1.1 states that if the State of Design of the aircraft is satisfied that mandatory continuing airworthiness information previously issued by the State of Design of the engine or propeller under Annex 8, Part II, 4.2.1.2 fully addresses a continuing airworthiness issue, then the State of Design of the aircraft need not retransmit that information to Contracting States that have already been informed.

6.9.1.6

By the same token, as required by Annex 8, Part II, 4.2.1.3, when the State of Design of a modification is different from the State of Design of the aeronautical product being modified, the State of Design of the modification should transmit the MCAI to all States that have the modified aircraft on their registries. Annex 8, Part II, 4.2.1 ensures that the State of Registry receives any relevant continuing airworthiness information that impacts aircraft on its registry.

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Attachment A to Chapter 6

TRANSFER OF TYPE DESIGN TO NEW TYPE CERTIFICATE HOLDER

1. INTRODUCTION

While there are several different transfer scenarios that could arise, this Attachment is intended to highlight requirements that should be considered in order to facilitate the efficient transfer of a type certificate (TC) and associated type design data from the current TC holder to a new TC holder.

2. GENERAL

A design approval document TC holder should continue to meet the continuing airworthiness responsibilities detailed in Annex 8. To meet these international responsibilities, clear communication between both the previous TC holder's State of Design CAA and the new TC holder's State of Design CAA is paramount. Identifying differences and expectations of what will be required to complete the transfer should be discussed and worked through by all affected parties early in the transfer process as possible.

3. REQUIREMENTS FOR TRANSFER

3.1 Involvement of authorities

3.1.1 The existence of an airworthiness agreement or similar arrangement will often facilitate the transfer of design approval documents between States. While an agreement or arrangement may not explicitly outline transfer protocols, it can help facilitate the transfer as it recognizes the knowledge and confidence that one State has with the other State and often provides a framework upon which the transfer can be executed. Transfers may still occur without such an agreement or arrangement, but may require extensive involvement from the airworthiness authorities of the two States.

3.1.2 Whether an agreement between the two States exists or not, it is the new TC holder's responsibility to bridge between the two authorities where required, and it is the prerogative of the new TC holder's CAA to accept becoming the new State of Design as defined in Annex 8. When transferring a type certificate between two States of Design where no agreement exists, the current TC holder may be required to submit either a familiarization or a complete type certificate data package to their authority for submission to the new authority. Based upon the familiarity of the two CAAs with each other's systems and the details of the proposed transfer, the two authorities should try to resolve issues arising from different backgrounds and type certification procedures.

3.2 Communications and languages

3.2.1 Efficient transfers are facilitated by clear and timely communication between the current TC holder and their CAA, the new TC holder and their CAA, as well as between representatives of each CAA. Early discussions are critical in assuring that a comprehensive type certificate transfer programme is formulated and completed efficiently.

3.2.2 Identifying and agreeing upon language requirements at the start of transfer discussions will be valuable. It is the responsibility of the new TC holder to translate documents into a language acceptable to the new State of Design. Data and reports should be sufficiently detailed to provide proper understanding of the design.

3.3 Transfer plan

3.3.1 The purpose of a transfer plan is to describe the process that will be used to satisfactorily complete the transfer of a design approval document and its associated responsibilities from the current TC holder to a new TC holder. The transfer plan also ensures that the CAA(s) of the previous and new TC holder are involved in the transfer, aware of the details of the type certificate and ready to fulfil their State of Design responsibilities. In general, a transfer plan should be drafted at the beginning of the process, and address design data, production, continued airworthiness and points of contact. It should be tailored to the size and scope of the transfer and the following items should be considered for inclusion:

- a) establish the transfer responsibilities for each authority or country, including those of State of Design (note that per Annex 8, continuing airworthiness responsibilities change on the date when the transfer is complete and may not be shared between authorities);
- b) establish the responsibilities for the current TC holder and the new TC holder;
- c) determine which type certificate and type design data and documents are affected;
- d) assess and determine resources and project timelines;
- e) establish the design transfer schedule;
- f) establish how a request between two authorities for assistance in making additional compliance findings on the other's behalf will be accomplished;
- g) establish how to enhance an authority's understanding of a design;
- h) document how procedural differences will be resolved, if necessary, and how those resolutions will be made visible;
- i) document how differences between the original certification basis and the one under consideration may be minimized;
- j) document details about the manufacturing of parts (for example, production overlap) related to the type design;
- k) document information of known worldwide fleet and States of Registry; and
- l) establish the relationship between the new design holder and production holder, if different.

3.4 Review of applicant's capability

3.4.1 Part V, 2.2.2 of this document describes the requirements and applicant capabilities expected when initiating an application for a type certificate. Similarly, in the case of a transfer of the type certificate the new TC holder's CAA will evaluate the applicant's (i.e. new TC holder's) capability to support the product in service and to determine that the new TC holder has, or has access to, the technical capability:

- a) to maintain and demonstrate ongoing compliance of the type design to the applicable airworthiness and environmental standards; and
- b) to carry out the type certificate holder responsibilities detailed in Part V, 2.3.6 of this document.

3.5 Review of the type design

3.5.1 When a type certificate is being transferred to a new State of Design and the receiving CAA is not already familiar with the type design, it will be necessary for the CAA to conduct a comprehensive examination of the type design. The new TC holder should make all design analyses, test reports and computations necessary to show compliance with the appropriate certification requirements available for review by the CAA. The objectives of the type design review are for the CAA:

- a) to gain an in-depth understanding of the product's characteristics;
- b) to assume the responsibilities as regulatory authority and to support the product's continuing airworthiness worldwide; and
- c) to establish that the type design of the product complies with their certification basis.

3.5.2 Where the new TC holder's CAA may have prior knowledge of the type design based on previous validations and issuance of a type certificate, a new review of the type design with the aim of identifying increased responsibilities going from the State of Registry to being the State of Design should be considered.

3.6 Certification basis

3.6.1 When a product is being transferred from the current TC holder in one State of Design to a new TC holder in another State of Design, the certification basis applied by the previous TC holder's State during the original certification should be reviewed in order to establish a certification basis acceptable to the applicant's State of Design. There are several areas to consider:

- a) the date of original application to the initial state design should generally be used to establish the applicable airworthiness standards by the new State of Design;
- b) special conditions due to the product having novel or unusual design features;
- c) noise and emission standards that were in place on the date of certification by the current TC holder's CAA;
- d) exemptions;
- e) Airworthiness Directives;
- f) additional technical conditions; and

- g) findings of equivalent levels of safety.

3.6.2 Differences between the type design standards of the two States, and the interpretation of those standards, should be applied in order for the transfer to take place. In the event the transfer involves an out-of-production aircraft, and the aircraft is subsequently brought back into production, the certification basis to be used is that which applied to the last original production aircraft. In either case, it may be necessary to update the certification basis, and a new type design examination may be required.

3.7 Substantiating data and reports

3.7.1 The new TC holder needs to ensure that the type design is included as part of the design transfer package. A compliance checklist or other suitable means may be used to ensure this is completed. The complete package should be available for review by the new TC holder's CAA. As applicable and agreed to by the current TC holder, the new TC holder and their respective CAAs, the following documentation should be considered for inclusion as part of the transfer data package:

- a) detailed design description and associated drawings;
- b) certification basis;
- c) certification plans, substantiating data and reports;
- d) all manuals required as part of the ICAs;
- e) structural and component repair manuals;
- f) details of all significant service issues and measures taken to correct them;
- g) details of all airworthiness directives and/or mandatory service bulletins;
- h) installation instructions;
- i) Aircraft Flight Manual (AFM) and supplements (AFMS);
- j) Master Minimum Equipment Lists (MMELs);
- k) production process or inspection documents; and
- l) details of initial sale or distribution of the design or design change. Notification should be provided to all affected aircraft owners or operators of the change of TC holder.

3.8 Type certificates and TC data sheets

3.8.1 In preparing to complete the transfer from the current TC holder to the applicant, who will become the new TC holder, the type certificate along with the associated type certificate data sheet (TCDS) will need to be prepared to reflect all applicable revisions to the information that is contained in these two documents, as detailed in Part V, 2.3.5.3 and 2.3.5.4. Other amendments that could be included on the revised documents are: new notes on changes in responsibility for continued airworthiness; affected serial numbers; changes in placards; production and data plate information; changes in limitations and certification basis. At the time of completing the transfer, the current holder of the TC will return the original approval document to their CAA.

3.8.2 For TCs, it is essential that the history of design approval document transfers be clear on the TCDS in order to resolve issues of eligibility, etc. The TCDS is the document that is first referenced to determine if an aircraft is eligible for importation into other States and under what conditions. A clear history of the ownership of the TC on the TCDS is required, especially in the case of aircraft that are still in production and may show up with different manufacturers.

3.9 Manuals

3.9.1 The relevant AFM, AFM supplements and other applicable documents should be updated by the new TC holder to reflect the transfer, and any change in document number or procedures where required. The new TC holder should have established procedures for revision, approval and distribution of documents required under the ICAs.

3.9.2 To support the operation of the product in service, the new TC holder should provide manuals to their CAA, as well as make current ICAs available to the owners of the aeronautical product.

3.9.3 Any associated MMELs should also be reviewed and revised by the new TC holder in accordance with the applicable requirements of the new State of Design, together with the necessary involvement of the CAA's advisory board responsible for MMELs, as necessary.

3.10 Structural integrity programme

The new TC holder's CAA has the responsibility to review the existing structural integrity programme (SIP) and ensure that any necessary revisions to satisfy and maintain the requirements detailed in Part V, Chapter 2.7 are completed and incorporated into the maintenance programme for the affected products.

3.11 Informing ICAO Contracting States of transfer

3.11.1 The current TC holder's CAA, in coordination with the new TC holder's CAA, will be responsible for notifying ICAO and all known States of Registry of the details of the transfer. The notification should contain the following information:

- a) Legal and trade names and address of the previous TC holder;
- b) Former State of Design;
- c) Legal and trade names and address of the new TC holder;
- d) New State of Design;
- e) List of design approval documents that have been transferred, including:
 - 1) Model designation;
 - 2) Manufacturer;
 - 3) Former State of Design Type Certificate number and issue date; and
 - 4) New State of Design Type Certificate number and issue date;

- f) New State of Design contact information, including name, address and fax number;
 - g) Effective date of transfer; and
 - h) List of countries where the product is on that State's registry.
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Chapter 7

ISSUANCE OF AN EXPORT CERTIFICATE OF AIRWORTHINESS

7.1 GENERAL

7.1.1 Annex 8, Part II, 3.2.4 contains the following 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. ...”

7.1.2 In establishing procedures for facilitating the export of aircraft, States have adopted various titles for the export document, e.g. “export Certificate of Airworthiness” or “Certificate of Airworthiness for Export”. While differing in its title, all such certifications are intended to achieve the same goal which is a statement by the exporting State confirming the airworthiness status of the aircraft in accordance with the exporting State rules and regulations. The Export Certificate of Airworthiness confirms the aircraft’s conformity with the approved type design and its acceptable airworthiness status of the State of Manufacture and that it is in a condition for safe operation. Exceptions to the requirements of the exporting State are a matter of agreement between the States concerned.

Note 1.— Although the guidance provided in this document in relation to the Export Certificate of Airworthiness has been mainly developed for situations where the Export Certificate of Airworthiness attests compliance with the requirements of the exporting State, it also covers cases where, if agreed between the exporting and importing States through bilateral agreements or other means, the Export Certificate of Airworthiness attests compliance with the requirements of the importing State.

Note.2.— A similar guidance for the Export Certificate of Airworthiness for the State of Registry is found in Part III, Chapter 6, of this manual.

7.2 PROCEDURE FOR ISSUANCE

7.2.1 The State of Manufacture issuing an Export Certificate of Airworthiness should closely follow the procedures required for the issuance of a Certificate of Airworthiness described in Part III, Chapter 4, of this manual.

7.2.2 If the exporting and importing States have agreed, through bilateral agreements or other means, that the Export Certificate of Airworthiness attests compliance with the requirements of the importing State instead of compliance with the requirements of the exporting State, then the exporting State should contact the importing State in order to identify any special requirements specified by the importing State.

7.3 EXPORT CERTIFICATE OF AIRWORTHINESS STATUS

It is very important to recognize that an Export Certificate of Airworthiness is not a Certificate of Airworthiness as defined by Article 31 of the Convention, and therefore does not confer the right of international flight and cannot be validated in

accordance with Annex 8, Part II, 3.2.4. To be eligible for an international flight, an aircraft having an Export Certificate of Airworthiness should carry a valid Certificate of Airworthiness issued by the State of Registry, or an equivalent document mutually acceptable to the State of Manufacture and to the importing State, as well as any State over which the aircraft will fly on its delivery flight.

Attachment A to Chapter 7

SAMPLE EXPORT CERTIFICATE OF AIRWORTHINESS

[INSERT CIVIL AVIATION AUTHORITY NAME]

No.

EXPORT CERTIFICATE OF AIRWORTHINESS

THIS CERTIFIES that the aircraft identified below and detailed in [INSERT TYPE CERTIFICATE NO. OF EXPORTING STATE] has been examined and, as of the date of this certificate, is considered airworthy in accordance with the regulations of [INSERT EXPORTING STATE]*.

Note: This certificate does not attest to compliance with any agreements or contracts between the vendor and purchaser, nor does it constitute authority to operate an aircraft.

Aircraft: _____

Manufacturer: _____

Model: _____

Serial No.: _____

New

Used

State to which exported (if known): _____

Exceptions: _____

Signature of Approving Officer

Date

Specify installed engines (manufacturer, model and serial number) and, if applicable, installed propellers (manufacturer, model and serial number).

List the applicable specification or Type Certificate data sheet numbers for the aircraft, engine and propeller. Listed applicable specifications or Type Certificate data sheet(s), if not attached to this Export Certificate, will have been forwarded to the appropriate governmental office of the importing State.

CAA Form No.

* The certificate may attest compliance with the requirements of the importing State and list applicable exceptions to those requirements, if this has been agreed between the exporting and importing States through bilateral agreements or other means.

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Attachment B to Chapter 7

EXAMPLE OF A RELEASE CERTIFICATE

1. Approving National Aviation Authority/Country		AUTHORIZED RELEASE CERTIFICATE			3. Form Tracking Number	
4. Organization, Name and Address					5. Work Order/Contract/Invoice number	
6. Item	7. Description	8. Part number	9. Quantity	10. Serial Number	11. Status/Work	
12. Remarks						
13. Certifies that the items identified above were manufactured in conformity to: <input type="checkbox"/> Approved data and in condition for safe flight <input type="checkbox"/> Non-approved data as specified in block 12.				18. <input type="checkbox"/> Return to service as per National Regulations <input type="checkbox"/> Other Regulations as specified in block 12 <i>Certifies that, unless specified in block 12, the work identified in block 11 and described in block 12, was accomplished in accordance with the National Regulations, and in respect to that work, the items are approved for return to service</i>		
14. Authorized Signature		15. Approval/Authorization number	19. Authorized Signature		20. Approval Certificate number	
16. Name		17. Date (format)	21. Name		22. Date (format)	

CAA Form No.

Attachment C to Chapter 7

ADDITIONAL GUIDANCE ON THE SAFETY CONTINUUM PROPORTIONALITY APPROACH APPLIED TO AEROPLANES UNDER 750KG

(THE STREAMLINING OF TYPE AND PRODUCTION APPROVAL)

Foreword

This Appendix is intended to describe and provide guidelines on the concept of the risk-based proportionality approach to aircraft type certification and production approval. This approach adds an important degree of flexibility to a traditional type and production certification while adapting the rigour applied by the States' authorities during the said approval processes. The said adaptation of rigour should be supported by the implementation of a robust risk management.

The approach, in fact, allows States' authorities to spend resources where risks have been identified as higher, and therefore, would contribute to the overall flight safety at reduced cost to the industry. In addition, by adopting safety standards and implementing rules which are proportionate to the risk, the industry is able to implement new advanced technologies in small aeroplanes at affordable costs.

When a proportionality approach is adopted, it would offer an opportunity for an efficient management of resources, based on a robust safety management system, to balance risks and rigour in applying requirements for type certification and production approval.

Note.— The new Annex 8, Part VB came into effect in June 2018 and would be applicable in November 2020.

1. Introduction (The basic concept)

The concept of safety continuum (see Figure V-7-C-1 below) recognizes the interactive continuous process effectively leading to and maintaining appropriate safety levels for aeronautical products. This concept is characterized by the interrelationship of the three principal constituent phases of managing continued operational safety, setting standards, and certifying products and systems.



Figure V-7-C-1. Basic concept of the safety continuum

In understanding the safety continuum, it is helpful to describe what it is not :

- a) it is NOT a single approach to establish certification requirements for the various aeronautical products;
- b) it is NOT an algebraic expression where an individual can plug in certain numbers and anticipate a quantifiable result. The continuum requires engineering judgement;
- c) it is NOT a tool to justify acceptance of unsafe design features regardless of the safety level;
- d) it is NOT stagnant. The continuum seeks safer aeronautical products as time progresses because acceptable safety levels when established may not meet future public expectations;
- e) it is NOT focused only upon the airworthiness requirements for a product. It is focused on the entire product lifecycle (design, production, operation, maintenance and retirement); and
- f) finally, it is NOT a completely new approach. The approach to certification, continuing airworthiness and development of airworthiness requirements has always been reflected in a scalable manner.

Safety standards and the methods used to apply them must evolve due to advances in technology and demand for higher levels of safety. A systems approach to safety is figured out by looking at all phases throughout the product life cycle, so that information and experience derived from each phase are systemically applied to subsequent phases throughout the continuum. The success of the entire continuum is dependent on effective safety management in every phase which would be beneficial to flight safety and is effectively sustained by the application of safety management principles.

In recent years, there has been an increasing recognition that there are differences in the acceptable levels of safety and certitude across different types of products and operations, exhorting States' authorities to consider the safety continuum approach by determining the appropriate levels of safety, as well as the level of certification and oversight rigour (see Note below) in relation to the type of product, the intended use and applicable operational limits.

Note.— The word “rigour” as opposed to “degree of flexibility” when used in this Appendix means full or extreme severity of rules and regulations, as well as careful accuracy and stringency when adopting procedures for their implementation. A proportional level of rigour should be intended as applying flexibility in that respect when and where justified on the basis of appropriate assessment of the involved risk to safety.

There are two aspects the safety continuum does not illustrate in Figure V-7-C-1:

- a) it does not reflect scalability across product types and operations; and
- b) it does not account for the public's safety level expectations for different products and their intended operations.

The two aspects above indicated are depicted in Figure V-7-C-2.



Figure V-7-C-2. Example of achieving society's expectations

Figure V-7-C-2 illustrates how public demand expects greater safety assurance as the type of aircraft and their operations become more complex. In other words, the public demands a greater safety rigour for a large aeroplane versus a small aeroplane.

The approach to flight safety has been historically embedded within airworthiness design standards for aeronautical products and parts. A more systematic look at safety seems viable to better balance the risks and mitigations through safety requirements, while adhering to safety management principles, to achieve appropriate safety levels. A risk-driven approach would offer the potential for flexibility to adapt design standards, policies, processes and the level of rigour in applying them to the type of products.

Typically, risks need to be identified and mitigated more rigorously for large commercial aeroplanes than for small aircraft. Technology's advances in the building of small aircraft offer the opportunity to remove the lower limit in Annex 8, Part V (MTOM 750 kg) and create a new Part VB.

The said approach would therefore result in a more efficient aviation safety environment as a rational basis is used to:

- a) identify risk levels;
- b) devote resources where higher risks are identified;
- c) determine appropriate mitigations to achieve the acceptable safety levels (e.g. adaptation of design standards, means of compliance proportionate to the risk levels); and
- d) drive CAA's level of involvement and delegation.

On the other hand, the existing airworthiness standards recognize differences in the appropriate level of certification rigour across product types, aircraft category, maximum take-off mass, and propulsion type. Notwithstanding that evidence, technological innovation and evolving international business models have challenged the existing weight-based distinguishing parameters. In parallel, most national standards and policies have evolved to address technological advances thus resulting in requirements and processes that are more rigorous than necessary for small, low-risk airplanes.

New approaches are envisaged to tailor airworthiness requirements for aeronautical products based on targeted safety levels for occupants (i.e. the number of seats) and, if applicable and substantial, the safety levels for people on the ground. The performance, complexity and usage contribute to the level of risk and require appropriate mitigation in order to achieve the targeted safety level.

2. The ICAO SMS Manual

Doc 9859, *Safety Management Manual*, supports the above consideration and clarifies that safety is a concept that must encompass relatives rather than absolutes. In addition, in order to ensure safety, a safe system should manage safety risks arising from the consequences of hazards in operational contexts to an acceptable level through certain organizational processes.

Risk acceptance across product types and operations is more of a fact than a perception as figures related to different product types provide evidence that differences exist across product types.

Understanding the risk and managing it to a level appropriate for the type of operation would promote an effective safety management system envisaged in Annex 19 and the guidance contained in the SMM.

3. Airworthiness Standards

Aeroplanes that are included in Annex 8, Part VB (no longer restricted to a MTOM over 750 kg) are subject to effective Standards. The primary focus for safe small aeroplanes and their operation has to take into account:

- a) the referenced Standards the designs have met; and
- b) their approved operational limits.

In essence, under the prerogative of the CAA of the State of Design the compliance determination should establish that the certification basis, even of a light aeroplane, will be substantially equivalent to the overall level intended by the broad Standards of Part VB.

The above principle led to the introduction of Part VB in Annex 8. The consequence was the ability for new technologies to be applied which were previously not envisaged by several national standards for aeroplanes under 750 kg.

The parallel processes to grant certification and production approval even through streamlined processes are aimed at recognizing those light aircraft as eligible for a standard Certificate of Airworthiness, since they have been shown to be compliant with Annex 8, Part VB.

The elimination of 750 kg limit in Annex 8 for small aeroplanes with the application of the new Annex 8, Part VB is not obligating Contracting States to type certify all aeroplanes under 750 kg MTOM. What is implicitly assumed as being part of the civil aviation community demand, when applying more than the optimal level of safety oversight, is that the safety of the system could in some instances be jeopardized. The lower band of aeronautical products could unintentionally be penalized when certification requirements and their implementation are overly stringent; applicants could refrain from developing or certifying certain safety technologies altogether. In other cases, non-required safety technologies will be certificated and produced but will enter the market at a price that severely limits the aviation community's ability to adopt the technology, with only a fraction of the fleet realizing the safety benefits.

The aim of the application of the safety continuum should be to maximize the safety benefit of new technologies by aligning certification requirements and processes with that concept by virtue of:

- a) applying risk management principles to enable innovation and advancing safety;
- b) solid past experience and database/statistics when available;
- c) adopting airworthiness Standards commensurate to the product type;
- d) treating the degree of innovation and criticality involved by the new products' design with appropriate certification review and special conditions; and
- e) streamlining production and certification approval procedures to a maximum possible, conversely investing resources where necessary, again on the basis of smart application of risk management.

Once adopted, the proportionality approach would provide a benefit in response to the aviation community's expectations, while increasing safety.

4. The level of safety

The level of safety as anticipated when underlining the basic concept of the safety continuum entails the consideration of numerous aspects (e.g. the complexity and performance of the product, the number of passengers, the foreseen risk to people and property on the ground, risk assumed by the pilot/flight crew, risk assumed by the passenger(s), engineering judgment).

Society demands greater safety assurance as the products and their operations become more complex, and as the occupants become further removed from understanding and managing the risks. Society demands a greater safety rigour for a large commercial transport aeroplane than for a small aeroplane. Meeting society's demand for safety is achieved by appropriate measures, including:

- a) rigorous airworthiness requirements for large aeroplanes;
- b) when appropriate, less rigorous but safe Standards for aeroplanes other than large ones;

- c) differentiating operational rules;
- d) differentiating flight crew qualifications, training and medical certification requirements; and
- e) mandatory occurrence reporting appropriate to the type of product and its use.

Safety is then not achieved solely through certification Standards, but it has to be recognized that a different and proportionate rigour in the regulatory approach is essential to balance the risk with affordable cost and burden. A qualitative description of the concept expressed is provided by Figures V-7-C-3 and V-7-C-4 where conceptually the design, introduction, use and continued operational safety of an aircraft are considered a “system” thus evidencing how, if the States’ authorities do not exercise safety oversight commensurate with the risk, an inadvertent decrease to the safety of the system could occur. Safety critical items may not be considered and the rate of fatal accidents might increase. Conversely, as depicted by the right sides of Figures 3 and 4, it is evident that it is equally challenging applying too much rigour. It can be appreciated, in fact, that if certification requirements and oversight are overly stringent, safety can be jeopardized because, as an example, the burden of certification and associated risk could prevent the adoption of safety enhancing technologies thus constituting an impediment for translating the potential safety benefit into practical effects. In other words the development, certification and acquisition burden for small aircraft would not be affordable by those design and manufacturing organizations which are in many cases small entities.

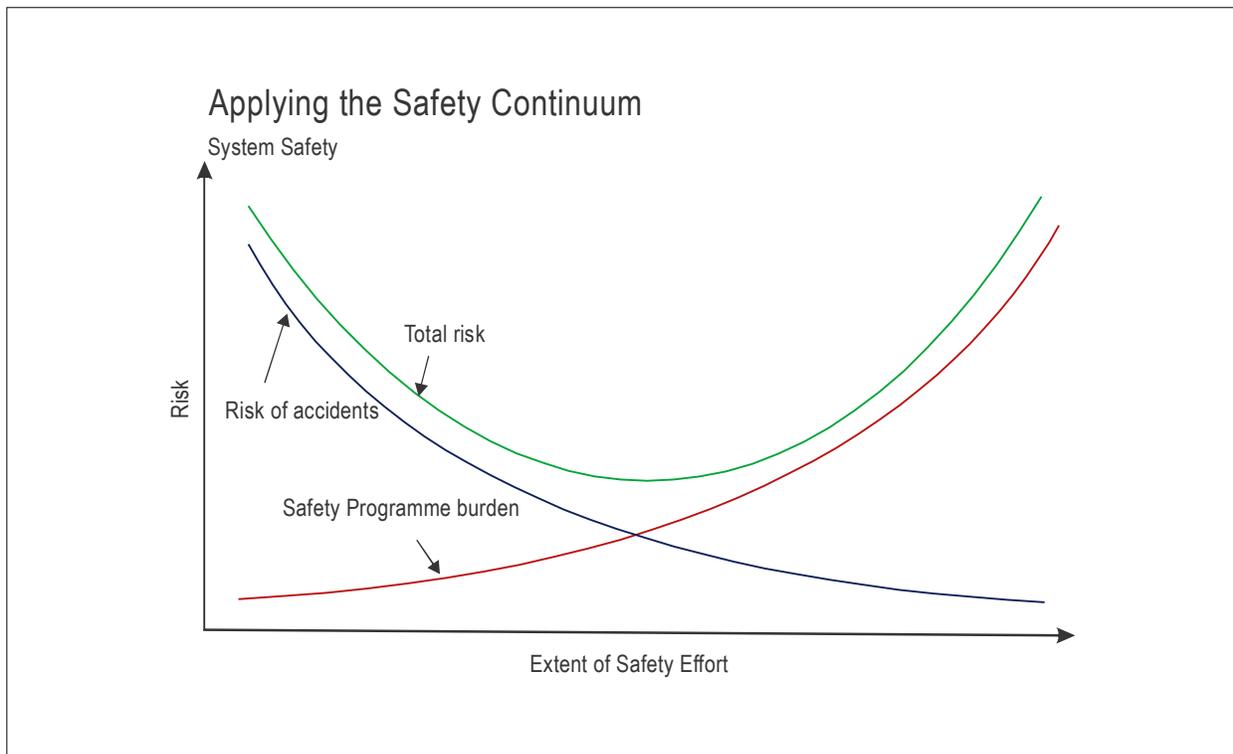


Figure V-7-C-3. Example of applying the safety continuum

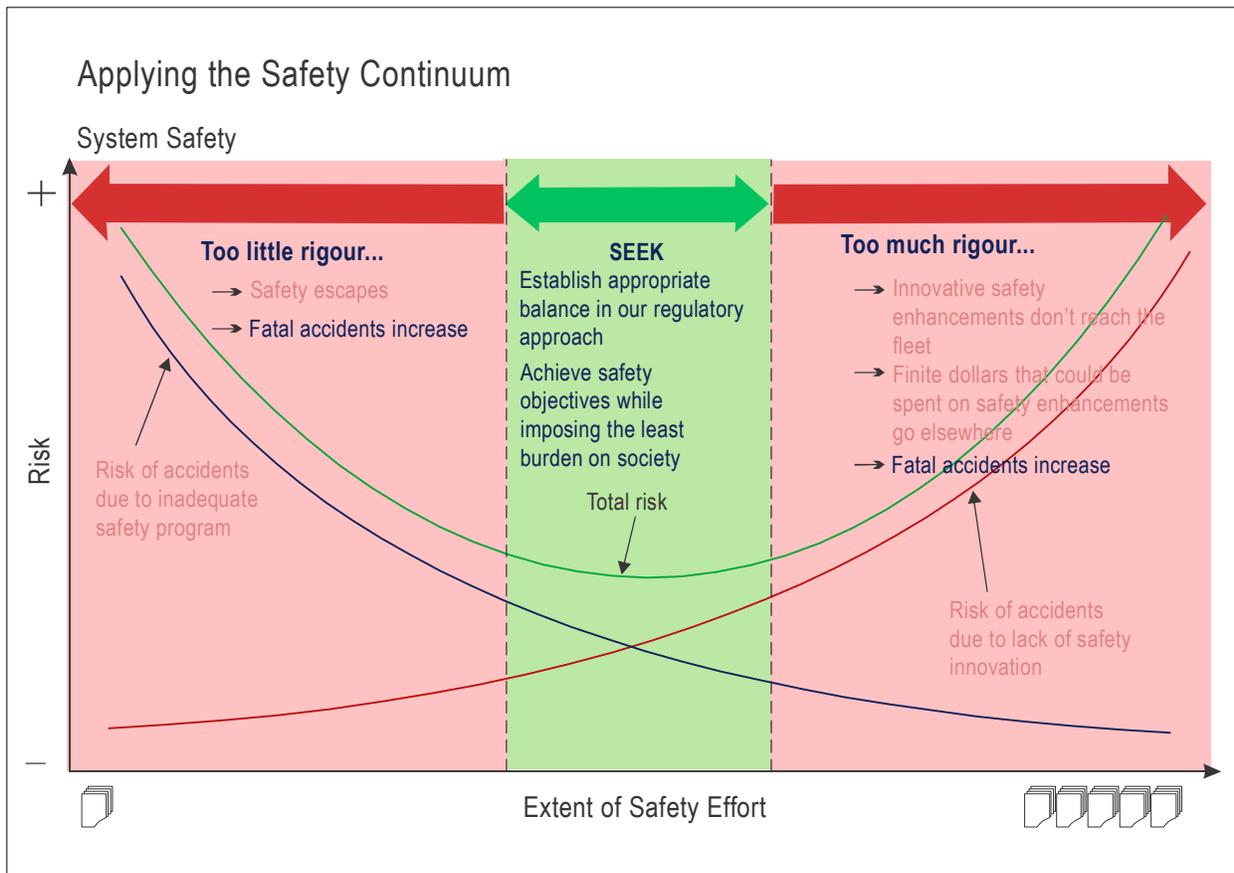


Figure V-7-C-4. Example of applying the safety continuum

5. Tailoring proportionally to the risk (sometimes referred to as “Streamlining”)

Tailoring proportionally to the risk is applicable to a product type as well as production certification as a direct consequence of the application of the safety continuum. The tools for tailoring are:

- a) for type certification — the adoption of appropriate airworthiness design standard, the demonstration of capability and the associated means of compliance with the adopted design standards; and
- b) for production certification — a balanced combination of:
 - 1) quality, production design standards;
 - 2) production risk assessment to be identified early at the design stage resulting from type certification process; and
 - 3) appropriate selection and qualification of suppliers commensurate to the identified criticality of parts and how conformity is maintained and documented.

All of the above to be considered in conjunction with an appropriate level of CAA’s oversight.

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