



# Advisory Circular

**Subject:                    Type Certification Requirements of Aircraft, Engines and Propellers**

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## TABLE OF CONTENTS

<b>1.0</b>	<b>INTRODUCTION.....</b>	<b>3</b>
1.1	Purpose .....	3
1.2	Applicability .....	3
1.3	Description of Changes.....	3
<b>2.0</b>	<b>REFERENCES AND REQUIREMENTS .....</b>	<b>3</b>
2.1	Reference Documents .....	3
2.2	Cancelled Documents .....	4
2.3	Definitions .....	4
<b>3.0</b>	<b>BACKGROUND.....</b>	<b>4</b>
<b>4.0</b>	<b>OVERVIEW OF THE TYPE CERTIFICATION PHASES .....</b>	<b>5</b>
<b>5.0</b>	<b>PRE-APPLICATION PHASE.....</b>	<b>6</b>
5.1	Application — Section 521.25.....	6
5.2	Eligibility Requirements — Section 521.26 .....	6
5.3	Aircraft Categories — Section 521.27.....	7
<b>6.0</b>	<b>PHASE I – APPLICATION AND ESTABLISHING CERTIFICATION BASIS .....</b>	<b>7</b>
6.1	Application for a Type Certificate — Section 521.28 .....	7
6.2	Effective Period of an Application — Section 521.29 .....	8
6.3	Certification Basis — Section 521.30.....	9
<b>7.0</b>	<b>PHASE II – ESTABLISHING MEANS OF COMPLIANCE AND TRANSPORT CANADA CIVIL AVIATION LEVEL OF INVOLVEMENT .....</b>	<b>9</b>
7.1	Establish Means of Compliance.....	9
7.2	Establish Transport Canada Civil Aviation Level of Involvement .....	10
<b>8.0</b>	<b>PHASE III – DEMONSTRATE AND RECORD COMPLIANCE.....</b>	<b>10</b>
8.1	Compliance with the Certification Basis — Section 521.33 .....	10
8.2	Inspections and Tests — Section 521.44 .....	14
8.3	Test Flights — Section 521.45.....	14
8.4	Test Flight Operations — Section 521.46 .....	16
8.5	Function and Reliability Test Flights — Section 521.47 .....	21
<b>9.0</b>	<b>PHASE IV APPROVAL OF THE TYPE DESIGN.....</b>	<b>21</b>
9.1	Issuance of a Type Certificate — Section 521.57.....	21
<b>10.0</b>	<b>PHASE V – POST CERTIFICATION ACTIVITIES.....</b>	<b>22</b>



10.1	General.....	22
10.2	Designated Provisions and Penalties for Non-Compliance – Subpart 103 .....	22
10.3	Transfer of Type Certificates to a New Holder.....	22
10.4	Retention of Type Certificates and Supporting Data .....	22
10.5	Certificate Holder Responsibilities .....	22
<b>11.0</b>	<b>INFORMATION MANAGEMENT .....</b>	<b>22</b>
<b>12.0</b>	<b>DOCUMENT HISTORY .....</b>	<b>22</b>
<b>13.0</b>	<b>CONTACT OFFICE .....</b>	<b>23</b>
	<b>APPENDIX A – SAMPLE CERTIFICATION PLAN .....</b>	<b>24</b>
	<b>APPENDIX B— EXAMPLE OF FLIGHT TEST OPERATIONS MANUAL SECTIONS.....</b>	<b>25</b>
	<b>APPENDIX C – TYPE CERTIFICATE DATA SHEETS .....</b>	<b>35</b>

## 1.0 INTRODUCTION

- (1) This Advisory Circular (AC) is provided for information and guidance purposes. It may describe an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards. This AC on its own does not change, create, amend or permit deviations from regulatory requirements, nor does it establish minimum standards.

### 1.1 Purpose

- (1) The purpose of this document is to provide guidance on subpart 521 of the *Canadian Aviation Regulations* (CARs).

### 1.2 Applicability

- (1) This document applies to:
  - (a) applicants for, and holders of all new and revised type certificates for aeronautical products;
  - (b) Transport Canada Civil Aviation (TCCA) personnel;
  - (c) delegates; and
  - (d) the aviation industry.

### 1.3 Description of Changes

- (1) Not Applicable

## 2.0 REFERENCES AND REQUIREMENTS

### 2.1 Reference Documents

- (1) It is intended that the following reference materials be used in conjunction with this document:
  - (a) *Aeronautics Act* (R.S., 1985, c. A-2);
  - (b) Part V Subpart 21 of the *Canadian Aviation Regulations* (CARs)—*Approval of the Type Design or a Change to the Type Design of an Aeronautical Product*;
  - (c) Standard 523 of the CARs—*Normal, Utility, Aerobatic and Commuter Category Aeroplanes*;
  - (d) Standard 525 of the CARs—*Transport Category Aeroplanes*;
  - (e) Civil Aviation Directive (CAD) REG-003 —*Exemptions from Regulatory Requirements*;
  - (f) Staff Instruction (SI) 500-003 Issue 02, 2008-02-29—*Level of Involvement (LOI)*;
  - (g) SI 500-004, Issue 01, 2003-06-10—*Special Conditions – Airworthiness (SCA)*;
  - (h) SI 500-018, Issue 02 — 2009-12-22 - *Design Approval Document Transfers under CAR 521: Division VIII—Responsibilities of a Design Approval Document Holder*;
  - (i) Advisory Circular (AC) 500-015 Issue 01, 2004-12-01—*Certification Plans*;
  - (j) AC 561-003, Issue 01, 2007-12-01—*Aircraft Production Test Flights*;
  - (k) Transport Canada form number 26-0756, Version 1007-01—*Type Certificate Application*; and
  - (l) *General Aviation Manufacturers Association (GAMA) Specification No. 1* (Revised in October 1996).

## 2.2 Cancelled Documents

- (1) As of the effective date of this document, the following documents are cancelled:
  - (a) AC 500-014 Issue 01, 2004-12-01—*Aircraft Flight Manuals*; and
  - (b) Internal Process Bulletin (IPB) 2010-04 Issue 01—*Provisions for Test Flights During Aircraft Certification*.
- (2) By default, it is understood that the publication of a new issue of a document automatically renders any earlier issues of the same document null and void.

## 2.3 Definitions

- (1) The following definitions and abbreviations are used in this document:
  - (a) **Certification Plan:** a document that clearly identifies the means and methods by which an aeronautical product will be shown to comply with the applicable airworthiness requirements where the airworthy requirements are identified in the certification basis of the aeronautical product. It is a mandatory document requirement of Sections 521.28 and 521.155 of the CARs. Additional information on certification plans can be found in AC 500-015.
  - (b) **Delegate:** any person or class of persons authorized under the authority of subsection 4.3(1) of the *Aeronautics Act* to perform functions on behalf of the Minister, subject to the requirements in Chapter 505 of the *Airworthiness Manual (AWM)*.
  - (c) **Delegation of Authority:** a privilege granted by the Minister under the *Aeronautics Act*, where the delegate is responsible to the Minister for performing their authorized functions. In the context of product certification, the Ministerial delegation of authority normally consists of the authority to make a finding of compliance to design standards and in some cases, issue the design approval document.
  - (d) **Finding of Compliance (FOC):** a Ministerial determination that the applicant's compliance demonstration satisfies a requirement specified in the certification basis.
  - (e) **Level of Involvement (LOI):** the activities undertaken by TCCA personnel during a product certification activity in performing surveillance of the delegate when the delegate is exercising their granted authority. Detailed information on LOI can be found in SI 500-003.
  - (f) **Means of compliance:** the principal means by which compliance is demonstrated. Examples are: analysis, component/system test, design test, flight test, conformity inspection, drawing review, process specification, and other actions and documents.

## 3.0 BACKGROUND

- (1) With the implementation of Subpart 521 of the CARs, new documents have been created to support the regulations. All guidance material such as SIs, ACs, and Policy Letters (PL) etc., that supported the previous CARs and Chapters 511, 513, 591 and 593 of the AWM have been reviewed and the relevant material included in the 521 series ACs and SIs.
- (2) This AC is organized to mirror the Sections and Subsections of Subpart 521 of the CARs, Division II so that it can be read in conjunction with Subpart 521 of the CARs.
- (3) Most of the information in this document is based on previous advisory material; however Subpart 521 of the CARs also introduced some new requirements, which are described in this document. Those new obligations include the requirement for technical capability, a flight test operations manual, a declaration of demonstration of conformity, and a signed undertaking to carry out the responsibilities of a type certificate holder.

- (4) The content of this AC has been updated to:
- (a) reflect the regulatory changes from the introduction of the new CAR 521 regulations;
  - (b) incorporate the content of the following guidance documents into this AC;
    - (i) AC 500-014 Issue 01, 2004-12-01—*Aircraft Flight Manuals*; and
    - (ii) Internal Process Bulletin (IPB) 2010-04 Issue 01—*Provisions for Test Flights During Aircraft Certification*.
  - (c) incorporate recommended best practices related to the type certification process to facilitate an effective working relationship between the applicant and TCCA.
- (5) Although Subpart 521 of the CARs introduced a change in terminology in the English version from “compliance” to “conformity” this AC will be using “compliance” wherever possible to minimize confusion in this document.

**Note:**

*In December 2010, a Notice of Proposed Amendment (NPA) to Subpart 521 of the CARs (NPA 2010-021) was introduced to revert the terminology “conform” and “conformity” back to “comply” and “compliance.”*

#### **4.0 OVERVIEW OF THE TYPE CERTIFICATION PHASES**

- (1) The TCCA type certification process is divided into a number of phases. The phases of the type certification process include the following:
- (a) **Pre-application Phase:** During this phase TCCA determines if the applicant meets the eligibility criteria and the category of aeronautical product for which they intend to apply.
  - (b) **Phase I—Application and Establishing Certification Basis:** In this phase the applicant formally submits their application for design approval. This phase also identifies the certification approach and strategy up to and including the initial type board meeting. The applicant will have already conducted a considerable amount of design work, so that TCCA can be familiar with the conceptual design and general arrangement of the product. The primary output is the certification basis. Once satisfied that all the necessary regulatory and design standard requirements for the product’s type design are included, the Minister (TCCA) finalizes and “establishes” the certification basis to which the applicant will be required to demonstrate compliance.
  - (c) **Phase II—Establishing Means of Compliance and TCCA LOI:** The applicant and TCCA establish a thoroughly defined certification plan with considerable detail that has been agreed upon between the applicant and TCCA. It should include a definition of, and the agreement on, the proposed means of compliance with each requirement of the certification basis and the identification of TCCA’s level of involvement. TCCA will identify their surveillance of any delegated activities as well as identify the services they will be providing; e.g. where they will be providing Findings of Compliance (FOC).
  - (d) **Phase III—Demonstrating and Recording Compliance:** In this phase the applicant does the bulk of the certification work. The applicant demonstrates compliance with the certification basis, and TCCA accepts this demonstration through FOCs with the specified requirements. In this phase the aeronautical product is built and tested, reports are written, compliance documentation is reviewed for acceptability, the flight-testing begins and the supporting approval documents such as the Aircraft Flight Manual (AFM) and airworthiness limitation (AWL) section are drafted. At the end of this phase, the applicant submits a declaration of demonstration of conformity as per Section 521.33 of the CARs.

- (e) **Phase IV–Type Design Approval:** TCCA approves the type design, AWLs and AFM, and issues the type certificate.
- (f) **Phase V–Post-Certification Activities:** This phase identifies the responsibilities of the type certificate holder and procedures for approval of post-certification design changes.

## 5.0 PRE-APPLICATION PHASE

### 5.1 Application — Section 521.25

- (1) The actions and obligations required to be undertaken by an applicant for, or a holder of, a type certificate under this subpart may be undertaken on their behalf by a person acting as their representative, provided the applicant for or holder of that type certificate can show that they have made an agreement with their representative such as to ensure that their obligations are and will be properly discharged.

### 5.2 Eligibility Requirements — Section 521.26

- (1) Determination of Technical Capability:
  - (a) Technical capability, in the context of eligibility for an application means that an applicant for a type certificate is required to have, or to have access to, all the resources required to demonstrate that their product complies with the certification basis.
  - (b) Access to Technical Capability, is recognized to be that in certain situations, an applicant may not have the required technical capability to develop and control the type design, and supporting data; these applicants are required to obtain this needed capability. If an applicant wishes to obtain the services of a person who happens to hold a delegation of authority for this purpose, it is not in the capacity of a delegate, but in their capacity to meet the technical capability requirements.
  - (c) Determination of whether persons or organizations that have a working relationship with aircraft certification staff have the required “technical capability”:
    - (i) Persons or organizations that have delegation for the approval of aeronautical product designs may be given credit for the applicability of their knowledge and technical capability relative to the design approval application. Credit may be based on the fact they have already satisfied the knowledge and technical capability required to be a delegate with the scope of authority that has been granted; and
    - (ii) Persons or organizations not holding delegation, but that already have a working relationship with aircraft certification staff, may be given credit for their knowledge and technical capability acquired over the years relative to the design approval for which application has been made. The determination of their ability to satisfy Subpart 521 of the CARs “technical capability” requirements is to be done on a case-by-case basis.
  - (d) Determination of whether new persons or organizations NOT having a working relationship with aircraft certification staff have the required “technical capability”:
    - (i) The case may arise where a new person or organization requests TCCA to accept that they have the required technical capability for a specific design approval project. This may occur when:
      - (A) a new person or organization requests TCCA’s acceptance of them as having the appropriate technical capability for a design approval project;
      - (B) a new project is proposed with a new or unknown organization providing the technical capability; and

- (C) a change in the person or organization providing the technical capability in an existing project has occurred for some reason.
- (ii) The determination of whether or not the “technical capability” requirement is met is done on a case-by-case basis. The criteria currently used to approve delegates in accordance with Chapter 505 of the AWM may be used as a guide to determine acceptability.

### **5.3 Aircraft Categories — Section 521.27**

- (1) By determining the category of aircraft, an applicant is helping to determine the applicable certification basis because it is directly linked to a category.
- (2) The applicant for a type certificate in respect of an aircraft needs to determine which category applies. In some cases, more than one category may apply to the aircraft. E.g. in Chapter 523 of the AWM an applicant could apply for an aircraft in the normal and aerobatic categories at the same time.

#### **5.3.1 Restricted Category — 521.27(f)**

- (1) An applicant may request a type certificate in the restricted category for the following types of aerial work which are defined as special purpose operations:
  - (a) Agricultural, consisting of spraying, dusting, seeding and livestock and predatory animal control,
  - (b) Fire prevention and suppression,
  - (c) Aerial surveying, consisting of photography, mapping, oil and mineral exploration,
  - (d) Patrolling pipelines, power lines, and waterways,
  - (e) Weather control, consisting of cloud seeding,
  - (f) Aerial advertising, consisting of skywriting, banner towing, and airborne signs,
  - (g) Wildlife conservation, and
  - (h) Any other specialised role.

**Note:**

*A type certificate in the restricted category is an approval of an aircraft designed specifically to perform a special role, function or purpose (such as the above). It is not the operational approval that determines if an aircraft has to be type certified in the restricted category.*

## **6.0 PHASE I – APPLICATION AND ESTABLISHING CERTIFICATION BASIS**

### **6.1 Application for a Type Certificate — Section 521.28**

#### **6.1.1 General Description — 521.28(b)**

- (1) The Type Certificate Application form (number 26-0756) can be found in the forms catalogue at the TCCA website [http://tcinfo/wwwdocs/Forms/26-0756\\_1007-01\\_BO\\_X.pdf](http://tcinfo/wwwdocs/Forms/26-0756_1007-01_BO_X.pdf) or by request at the nearest TCCA office.
- (2) Pursuant to Section 521.28 of the CARs, an applicant for the issuance of or a change to a type certificate will be required to submit the following documentation. In the event that not all the required documentation is available at the time of application, a submission schedule should be provided:
  - (a) name and address of applicant;
  - (b) name and address of the proposed certificate holder, if different from (a);

- (c) product and type designation;
  - (d) person responsible for the control of the product manufacturing in accordance with the type design (specify applicant or others);
  - (e) the general description of the product which in addition to principal design features and specifications, shall include:
    - (i) for an aircraft, a three view drawing of the aircraft and the available preliminary basic design and performance data; and
    - (ii) for an aircraft engine or propeller, operating characteristics and the proposed operating limitations.
  - (f) proposed certification basis established under Section 521.30 of the CARs, including any other standards for which voluntary compliance will be demonstrated;
  - (g) any Special Conditions, findings of equivalent safety or exemptions that are being requested; and
  - (h) for a foreign product, a copy of the type certificate or equivalent document issued by the airworthiness authority having jurisdiction in the state of design.
- (3) The applicant at this time may also choose to submit their Flight Test Operations Manual (as per Section 521.46 of the CARs) for review or approval. More information on this manual can be found in Section 8.4 of this AC.

**6.1.2 Certification Plans — 521.28(d)**

- (1) The applicant develops proposed certification plans in Phase I of the certification process— Application and Establishing Certification Basis. In Phase II – Establishing Means of Compliance and TCCA Level of Involvement (LOI), TCCA and the applicant discuss, negotiate and modify these certification plans as necessary prior to acceptance by TCCA. Acceptance of the certification plans accomplishes the core goal of Phase II, which is to agree on the means and methods of compliance and LOI. More information on LOI can be found in SI 500-003. More information on certification plans can be found in AC 500-015.

**6.2 Effective Period of an Application — Section 521.29**

- (1) The effective period of an application depends on the aeronautical product:
  - (a) for transport category aircraft the effective period is 5 years;
  - (b) for all other aircraft categories the effective period is 3 years;
  - (c) for aircraft engines the effective period is 3 years; and
  - (d) for propellers the effective period is 3 years.
- (2) The effective period begins on the date of application (e.g. the date the applicant puts on the application form) and is important because it is used to determine the certification basis. There are however certain projects that may take longer than the specified periods. An applicant may ask for an extension of the time period at the time of application, but this should only be granted if the applicant could show something different about the product that warrants the additional time. Extensions of this type must be approved by TCCA.
- (3) For example, an applicant knows that they will be unable to complete the requirements to get a type certificate for an aircraft engine within 3 years, because they are using a new type of exotic material, and the design, development and testing of this material is not scheduled to be completed for 4 years. They may, at the time of application, request an extension to 4 years.
- (4) If during the progress of the project an applicant determines that they will not able to complete the work during the effective period, they have two choices:



- (a) They can reapply, meeting all the requirements at the new date of application (this may mean revisiting the certification basis if the standard has changed since the last date of application); or
- (b) They can apply for an extension. The applicant will provide an intended date of issue for the type certificate, and should calculate back from the intended date to determine what the standards of airworthiness should be on the new theoretical application date.

### **6.3 Certification Basis — Section 521.30**

#### **6.3.1 Elect to Comply with Later Amendments — 521.30(1)(a)(i)**

- (1) Applicants may elect to apply standards that come into effect after the date of application. These later standards become an integral part of the certification basis for the given product and are not optional for subsequent changes to the type design.

#### **6.3.2 Special Conditions-Airworthiness — 521.30(1)(c)**

- (1) Information on Special Conditions-Airworthiness can be found in SI 500-004.

#### **6.3.3 Equivalent Level of Safety — 521.30(1)(d)**

- (1) An equivalent level of safety finding is made where direct compliance is not demonstrated, however other compensating features of the design provide an equivalent level of safety for the unmet standard. To support this finding, further documentation will be required to fully explain and rationalize how the equivalent level of safety will be established or demonstrated.
- (2) The applicant is not requesting an exemption from the requirement, since compliance by another means is proposed. Neither is the particular design novel or unusual to the extent that a Special Condition would be considered appropriate.

#### **6.3.4 Exemptions — 521.30(1)(e)**

- (1) An applicant for a type certificate may apply for an exemption from compliance with specific standards of airworthiness and TCCA will issue the exemption if the exemption is in the public interest and is not likely to affect the safe operation of the aeronautical product as required by Subsection 5.9(2) of the *Aeronautics Act*. However, TCCA will typically specify additional requirements such as:
  - (a) The applicant must demonstrate to TCCA that the consequences of not meeting the standards of airworthiness are negligible with respect to the level of safety, considering the experience accumulated in using the aeronautical product or the tests carried out on the aeronautical product; or
  - (b) The applicant proposes additional conditions or limitations to supplement the unmet standards of airworthiness.
- (2) More information on Exemptions may be found in CAD REG-003.
- (3) Exemptions will not be granted for Special Conditions-Airworthiness.

## **7.0 PHASE II – ESTABLISHING MEANS OF COMPLIANCE AND TRANSPORT CANADA CIVIL AVIATION LEVEL OF INVOLVEMENT**

### **7.1 Establish Means of Compliance**

- (1) Once the Minister has established the certification basis in Phase I, a series of reviews and meetings are held as needed between the Minister and the applicant. The goal is to obtain concurrence on the proposed means and methods that will be used to demonstrate compliance for each of the requirements identified in the established certification basis. This is normally documented as part of the proposed certification plan and should include:

- (a) a complete breakdown of the means and methods of compliance with the applicable standards of the certification basis;
  - (b) the method of compliance and where it is documented;
  - (c) all the delegated functions involved in demonstrating compliance; and
  - (d) the responsibility for findings of compliance (TCCA or delegate).
- (2) TCCA and the applicant may also exchange various technical issue papers to clarify and document concerns identified during this step, and how the two parties arrived at a consensus. Further information on the use of issue and concern papers can be found in SI 500-019.
- (3) The applicant uses this information to update their certification plan that they previously submitted per Subsection 521.28 (d) of the CARs.

## **7.2 Establish Transport Canada Civil Aviation Level of Involvement**

- (1) Throughout this process, the applicant and TCCA work to define how when and to what level of involvement TCCA will participate in the compliance demonstration activities. Further information on level of involvement is described in SI 500-003.
- (2) As part of TCCA's overall oversight responsibilities of the design approval project, TCCA defines its level of involvement in the oversight of findings of compliance made by Ministerial Delegates – Aircraft Certification where applicable. Flight test LOI is defined as witnessing or conducting flight test evaluations based upon the definition of the flight test matrix. In other cases where there is no delegate involved, TCCA may be making findings of compliance that the type design complies with the certification basis. The applicant uses this information to update their certification plan accordingly.
- (3) Documenting the LOI in this way provides a clear definition of where TCCA will be conducting surveillance of the delegate involved in the applicant's compliance demonstration.

### **Note:**

*Although the LOI is established at the end of phase II, it is subject to change throughout the certification process for various reasons such as changes in design, failed tests, changes in means and methods of compliance and changes in scope of delegation. It is also emphasized that concerns identified by the TCCA specialists during the certification program must be addressed as early as possible, whether they are related to LOI or not, in order not to impact the approval of the type design. The output of phase II is the agreed certification plan that defines the applicant's responsibility and participation of the TCCA specialists throughout the compliance demonstration.*

## **8.0 PHASE III – DEMONSTRATE AND RECORD COMPLIANCE**

### **8.1 Compliance with the Certification Basis — Section 521.33**

#### **8.1.1 Declaration of Demonstration of Conformity — 521.33(b)**

- (1) One of the major changes brought in by Subpart 521 of the CARs is the requirement for the applicant to make a declaration of demonstration of conformity to attest that the type design of the aeronautical product complies with its certification basis. The intent of the declaration is to ensure that the applicant has completely finished their demonstration of compliance.
- (2) The following declaration is one example of how the declaration can be made; however, applicants may choose a variant of this:

**Declaration of Demonstration of Conformity**

In accordance with Subpart 521 of the CARs, I hereby declare that the type design of (name of product) has been demonstrated to conform to the best of my knowledge with its certification basis established by the Minister.

Per certification basis / certification plan document number 1243696 version 34 dated 2010-10-06.

Signature: \_\_\_\_\_

On behalf of: \_\_\_\_\_

Position title: \_\_\_\_\_

Company/Organization: \_\_\_\_\_

Date: \_\_\_\_\_

- (3) A person acting in their role as Ministerial delegate shall not sign a declaration of demonstration of conformity on behalf of the applicant, however they could sign as an individual or organization representing the applicant. Any declarations required by the applicant that are signed by a delegate, *shall not* use their delegate number.
- (4) Per Subpart 521 of the CARs, the submission of the declaration of demonstration of conformity with the certification basis is one of the requirements for the Minister to issue the type certificate. The applicant is required to submit their declaration of demonstration of conformity once the type design has been demonstrated to conform to every aspect of the certification basis. This declaration is required for each design approval.

**8.1.2 Submission of Approved Manuals to the Minister — 521.33(e)**

**(1) Instructions for Continued Airworthiness and Airworthiness Limitations**

- (a) AWM 5XX.1529 may allow the Instructions for Continued Airworthiness (ICA) to be incomplete at the time of certification as long as they are complete before the delivery of the first aircraft or the first Certificate of Airworthiness is issued, whichever occurs later. This provision is conditional on the applicant providing a plan for completion of the ICAs.
- (b) Within the appropriate AWM Appendix is the requirement to have a clearly distinguishable section for the Airworthiness Limitations (AWL). This section will contain any mandatory replacement times and mandatory structural inspection intervals and procedures required for compliance with section 5XX.571 of the AWM, Damage-tolerance and Fatigue Evaluation of Structure of the standard of airworthiness applicable to the product. This AWL section should also include other inspection requirements needed to show compliance with section 5XX.1309 of the AWM and possibly other requirements. These are called Certification Maintenance Requirements (CMR).

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**(2) Aircraft Flight Manuals—Acceptable Means of Compliance**

- (a) **Format.** The format of the AFM should be as follows:
- (i) the AFM will be published in a format that can be readily amended or revised;
  - (ii) the AFM will state the manufacturer's name, the model designation or "name", and the manufacturer's document identification number. The effective date or date of approval as well as the name of the TCCA approving office will be shown;
  - (iii) the AFM will include a means of recording the incorporation of revisions or amendments (including temporary revisions where applicable);
  - (iv) the AFM will contain a list of effective pages noting the current revision (or amendment) and/or the effective date of each page;
  - (v) each page of the AFM will be marked with the name of the aircraft or manufacturer's document number, the applicable revision number, and/or the effective date;
  - (vi) a separate section for supplements will normally be provided in an AFM;
  - (vii) if considered appropriate, a list of abbreviations should be included in the AFM;
  - (viii) TCCA considers it acceptable to provide a Pilots Operating Handbook prepared in accordance with General Aviation Manufacturers Association (GAMA) Specification No. 1 and as per AWM 523.1581, for normal, utility, aerobatic and commuter category aeroplanes, provided there is no conflict between the regulatory data and additional information given;
  - (ix) the AFM may address several models of the same type of aircraft; however, the limitations, procedures and performance information that apply to each model will be clearly identified; and
  - (x) for manned free balloons certified to Chapter 531 of the AWM, a single AFM should be used for a number of conventionally shaped hot air balloons of various types and sizes produced by one manufacturer. The type, size and design features of each particular balloon will be specifically addressed in the AFM, and the limitations and procedures applicable to each balloon will be clearly stated.
- (b) **Approved and Unapproved Sections.** A single publication should contain both approved (AFM) and unapproved (manufacturer's) information, however:
- (i) the approved information that is required by regulations will be clearly marked as "approved";
  - (ii) the unapproved information will be separated from and not conflict with the approved information; and
  - (iii) the unapproved sections will contain a note to the effect that they have not been approved by TCCA and are provided by the manufacturer for the use of the operator.
- (c) **Compliance with Limitations.** All AFMs will contain a statement to the effect that compliance with the approved limitations is mandatory.
- (d) **Operating Rules**
- (i) The AFM should not contain references to specific operating rules; however, general references to "the operating rules" or "the national requirements" are acceptable.
  - (ii) If however, a Pilots Operating Handbook prepared in accordance with GAMA Specifications No. 1 that makes reference to specific foreign operating rules, is

accepted, then a statement that foreign operating rules do not apply in Canada should be included. The foregoing may be achieved by either amending the publication or providing a Canadian supplement.

- (e) **Content.** The content of the AFM will include the following:
- (i) The AFM will include the data specified in the certification basis and contain enough information for a trained and current crew to operate the aircraft safely. The AFM should contain sections addressing:
    - (A) limitations;
    - (B) normal procedures;
    - (C) emergency and/or abnormal procedures;
    - (D) performance; and
    - (E) weight and balance (see subparagraph (iii) below).
  - (ii) The AFM may contain a list of secondary components that need not be installed or be functional for the aircraft to operate safely under some specified conditions (e.g. Configuration Deviation List or Kinds of Operating Equipment List).
  - (iii) Weight and Balance Information. A method will be provided for an operator to readily determine the operating weight and centre of gravity of an aircraft in relation to the specified limitations. This will be provided as part of the AFM or in a separate document that is referenced in the AFM.
  - (iv) Any special or unusual procedure that needs to be followed to comply with the published performance or limitations will be detailed in the AFM.
- (f) **Units used in AFMs.** The units used in the AFM will be as follows:
- (i) The units used in the AFM will be the same as those used on the instruments, markings and placards in the aircraft.
  - (ii) When it is necessary to provide data using more than one set of units (metric, and/or imperial):
    - (A) separate charts may be provided in the AFM, but the units being used on each chart will be clearly highlighted (Metric Unit Chart, Imperial Unit Chart, etc);
    - (B) dual or multiple scales may be used on the charts to show different units (e.g. kilograms and pounds) but such charts will be presented in a way to minimize confusion or misunderstanding;
    - (C) conversion charts may be provided but the format used will be clearly understood; and
    - (D) a separate section or an entirely separate AFM using the alternate units may be published.
  - (iii) For operations in Canada, the prescribed units for marking aircraft instruments (and displaying the AFM data) are:
    - (A) airspeed – knots;
    - (B) altitude – feet;
    - (C) altimeter setting – inches of mercury;
    - (D) rate of climb – feet per minute;
    - (E) distances – nautical miles;

- (F) runway distances – feet;
- (G) temperature – degrees Celsius; and
- (H) volumes – litres.

(g) **Fire and Smoke Procedures.** The fire and smoke procedures will be as follows:

- (i) The “Emergency” or “Abnormal” operating procedures section of all AFMs will contain a statement to the effect that:

**Example:**

**Fire and Smoke Procedures**

“In the event of smoke or fire, prepare to land the aircraft without delay while completing fire suppression and/or smoke evacuation procedures. If it cannot be visually verified that the fire has been completely extinguished, whether the smoke has cleared or not, land immediately at the nearest suitable airfield or landing site.”

- (ii) the AFM procedures dealing with smoke or fire will minimize the possibility of an in-flight fire being ignited or sustained; and
- (iii) smoke evacuation procedures should not include the use of the passenger oxygen system.

(h) **AFM Supplements.** In general, the requirements pertaining to the AFM also apply to AFM Supplements. An AFM Supplement will be provided when an aircraft change or modification affects the regulatory information contained in the basic AFM. The supplement will clearly identify the AFM that it supplements and will contain a statement that the basic AFM applies for the data that is not addressed in the supplement. The applicant is responsible for development of the AFM Supplement. The regulatory information in the Supplement will be approved by TCCA.

## 8.2 Inspections and Tests — Section 521.44

### 8.2.1 Conformity Inspections–Test Planning — 521.44(a)

- (1) An agreement must be reached between the applicant and TCCA on the required tests and the responsibility for test witnessing. Test plans should be identified in the certification plan by the applicant, and must be acceptable to TCCA. Details of the testing should be in the test plans and should identify the test apparatus, test vehicle and configuration, test details including conditions and pass/fail criteria, data requirements and hazard level with risk mitigation actions. Test Plans should be written and accepted as early as possible and prior to the test.
- (2) Applicants should be cautioned that if the test plan is not accepted, or if TCCA’s test witnessing requirements are not satisfied before a test is conducted, there is a risk that TCCA will not accept the test results.
- (3) Test articles will be built to an agreed build standard and the applicant is responsible to ensure every test article conforms to that standard. In many cases the TCCA specialist will request that the Regional Aircraft Maintenance and Manufacturing staff perform an additional conformity inspection before the test is conducted.

## 8.3 Test Flights — Section 521.45

### 8.3.1 Emergency Provisions — 521.45(1)(a)

- (1) The provisions for emergency situations required by Paragraph 521.45(1)(a) of the CARs for the first and subsequent flights of an aircraft type include:

- (a) an adequate means of emergency egress and procedures for all expected operating conditions;
- (b) emergency equipment suitable for the expected operating conditions (suitable emergency equipment may include the following: oxygen equipment, smoke masks and goggles, parachutes and survival equipment);
- (c) definition of the aircraft emergency systems, the emergency systems particular to the flight test aircraft, and the limitations under which they are designed to operate;
- (d) demonstration by ground or flight tests, or both plus analysis that the emergency systems will perform their intended functions within the operating conditions and limitations specified by the applicant under Subsection 8.3.1(1)(c) of this AC;
- (e) an inspection program for the systems and equipment which may be required in an emergency; and
- (f) a periodic inspection cycle for redundant systems, components and equipment.

**8.3.2 Conduct of the First Flight of an Aircraft Type — 521.45(2)**

- (1) The requirements of Subsection 521.45(2) of the CARs for first flight of an aircraft type may be subdivided into two categories: company first flight, and first flight involving TCCA personnel. Prior to the first flight of an aircraft type involving TCCA personnel, the written airworthiness declaration made by the applicant pursuant to Paragraph 521.45(2)(a) of the CARs will attest that each of the following requirements and data is met and submitted to the Minister if required:
  - (a) the availability of preliminary Operating Procedures and/or draft AFM which contains Limitations, Emergency, Abnormal and Normal Operating Procedures, and Performance, appropriate to the test aircraft configuration and development status;
  - (b) confirmation that the aircraft has been flown previously by the applicant's test pilot in the configuration to be flown involving TCCA personnel;
  - (c) identification of areas within the flight test envelope where unsatisfactory characteristics have been encountered;
  - (d) submission by the applicant of the following information:
    - (i) airspeed/mach number and altitude boundary flown by the applicant;
    - (ii) the stall speed, lowest speeds flown, or highest angle of attack as a function of weight and centre of gravity position;
    - (iii) the maximum and minimum manoeuvring load factors experienced;
    - (iv) sideslip limits to which the aircraft has been flown; and
    - (v) The weight versus centre of gravity position envelope flown including take-off and landing.
  - (e) completion of limit load tests on all control surfaces;
  - (f) completion of limit load and operational tests for the control systems;
  - (g) identification by the applicant of all the items which do not show sufficient strength analytically but which have been accepted subject to later verification by static tests;
  - (h) definition by means of electrical and mechanical schematics and/or installation drawings and review by TCCA of all aircraft systems and the on-board experimental systems which interface with the aircraft;
  - (i) where qualification testing has not been completed, identification of the component limitations and the corresponding systems limitations;

- (j) identification of systems configurations and operational modes that are not to be used;
- (k) completion of failure analyses (for both aircraft and experimental systems) to identify critical failure modes, including all single failures and single failures plus dormant failures which will result in system failure or degradation to a point which may be hazardous or result in an emergency condition;
- (l) identification of systems and component failures of a hazardous nature which have occurred during the applicant's flight test program (including ground testing), the effects of such failures on the aircraft and confirmation that corrective actions necessary to prevent re-occurrence have been implemented;
- (m) where the aircraft is powered by engines for which no type certificate has been issued:
  - (i) a statement from the airworthiness authority having jurisdiction in the state of design, which attests to the suitability of the engine for use in a flight test program; and
  - (ii) submission by the engine manufacturer of preliminary operating and service instruction and limitations.
- (n) completion of a design and development test review to establish that the engine installation does not contain any features that would render it unsuitable for flight test operations. Such a review will include, but not be limited to:
  - (i) successful functional test demonstration of systems required for engine operation and safety;
  - (ii) review of power plant related software for categorization, design and function; and
  - (iii) management of engine limitations.
- (o) development of an inspection/maintenance program;
- (p) completion of the following statement, signed by the applicant's senior engineering representative and responsible engineering personnel and the equivalent TCCA personnel to verify that to the best of their knowledge, the conditions specified in this section have been satisfied:

**Example of Airworthiness Declaration before Transport Canada First Flight:**

**Airworthiness Declaration**

"To the best of my knowledge, and within my area of technical responsibilities, the conditions specified in paragraphs (a) through (o) above, have been satisfied with respect to (specify aircraft type, registration and/or serial number)."

- (q) The Minister may conduct oversight of the activities outlined in (1) above which is referenced in the declaration, made by the applicant pursuant to Subsection 521.45(2) of the CARs. This may include but is not limited to completion of an acceptance inspection of the aircraft by the Minister, to ensure prior to first flight that the build matches the configuration (type design).

**8.4 Test Flight Operations — Section 521.46**

**8.4.1 Applicability**

- (1) Section 521.46 of the CARs applies to all applicants for type certificates or reissuance of the type certificates who:



- (a) intend to conduct a test flight as part of the demonstration of their product's compliance to its established certification basis; and
- (b) have the resources, personnel and facilities (technical capability) for conducting a test flight. This links to Section 521.26 of the CARs, which requires the applicant to have the technical capability to conduct the design, analyses and tests including flight-testing necessary to demonstrate the product's compliance with its established certification basis.

#### **8.4.2 What is the applicant required to do?**

- (1) The applicant is responsible to establish and maintain a flight test operations manual (FTOM) for their product's certification program whether they have the resources and / or technical capability in-house or have access to that capability through resources outside of their organization. This manual would ideally be presented at time of application, however if this is not possible it should be submitted and approved before the experimental flight permit is issued.
- (2) Where an applicant does not have an in-house flight test organization and is obtaining outside resources to conduct the flight tests, the applicant may opt to use the flight test manual of the outside firm if they determine that the procedures described in the manual meet the requirements of Section 521.46 of the CARs as they apply to their particular type of certification project. The applicant then submits that manual to TCCA for approval indicating that the applicant is committed to following the outside firm's FTOM for that project.
- (3) If the applicant changes outside firms during a project, the applicant is required to obtain TCCA approval of the FTOM being used between the applicant and the new firm before further flight testing is conducted.
- (4) The applicant's FTOM must be reviewed and approved for each type certificate project to determine that the flight test procedures are appropriate to the type of certification project being undertaken. For example, the applicant's second project may be for the certification of a significantly different product than the first project for which the service provider has little experience, or the applicant may be using a different flight service provider as an outside resource. The review or verification (as appropriate) of the FTOM being used for each certification program should be conducted as part of the process of establishing the certification basis.
- (5) TCCA may review the FTOM of a flight test service provider to determine if it meets the requirements of Section 521.46 of the CARs but it should be noted that it is the applicant who has the responsibility to have a manual and get it approved for their particular certification program.

#### **8.4.3 What is a Flight Test Operations Manual?**

- (1) The FTOM is a TCCA approved document that contains a description of how an organization or individual will comply with the requirements of Section 521.46 of the CARs. It is the means for the control and conduct of flight test operations, and in the case of a flight test organization, informing staff about company processes and procedures, and providing better communication between the flight test crew and personnel configuring the aircraft for flight test.
- (2) This section will assist the applicant and if applicable, the Flight Test Organizations/Flight Test service providers, in developing an FTOM by identifying which Regulations must be met, explaining the intent, and providing practical examples to provide further clarification. The "examples" provided in Appendix B of this document are hypothetical and may not apply to an organization's actual methods. This AC does not provide a complete sample manual.

#### **8.4.4 Test Flight Categories**

The categories of flight test described below may be useful when grouping flight test activities performed during the various phases of the development and in-service life of an aeronautical product.

**Note:***Flight Envelope Explanations:*

*The Normal flight envelope is generally associated with routine operation using normal operating procedures.*

*The Operational flight envelope is generally associated with operation outside the normal flight envelope that could be occasionally expected.*

*The Limit flight envelope is generally associated with the limits of design or operating parameters that have been established.*

*For rotorcraft there is no definition of Operational flight envelope; the Flight envelope is generally considered to be the Limit flight envelope.*

**(1) Category 1:**

- (a) Initial flight(s) of a new type of aircraft;
- (b) Flights to determine or expand the flight envelope;
- (c) Initial flight(s) of an aircraft for which performance, flight characteristics, handling qualities or systems operating characteristics must be determined or may have been significantly modified;
- (d) Flights to investigate novel or unusual aircraft design features or operating techniques either within or outside of the normal flight envelope; and
- (e) Flights (including certification flights) to determine performance, flight characteristics, handling qualities, and system operation in areas outside of the operational flight envelope (Flight envelope for rotorcraft).

**(2) Category 2:**

- (a) Flights (including certification flights) done within the operational flight envelope (Flight envelope for rotorcraft) that include manoeuvres and systems operating assessments which are not expected to encounter performance, flight characteristics, handling qualities, or system characteristics significantly different from those already known;
- (b) Display flights and demonstration flights of a non-type-certificated aircraft; and
- (c) Flights conducted for the purpose of Function and Reliability testing.

**(3) Category 3:**

- (a) Flights performed in support of production flight test, prior to issuance or re-issuance of an individual certificate of airworthiness, in order to establish compliance with the approved type design. See AC 561-003 for more information on production test flights.

**(4) Category 4:**

- (a) Flights (including certification flights) performed for the assessment of a system design change or installation, which does not need a performance, flight characteristics, or handling qualities assessment, or an assessment of the impact on crew procedures when the new or modified system is operating.

**(5) Category 5:**

- (a) Maintenance Test Flights/Functional Check Flights: Flights performed after maintenance for the purpose of performing checks using only approved data and procedures. These flights are normally conducted in accordance with Subsections 605.85(2) and (3) and Subsection 571.10(4) of the CARs.

#### **8.4.5 Manual Format**

- (1) The format of each FTOM may be different. The format should be easy to follow and in a logical order with the user in mind. Section 521.46 of the CARs specifies what minimum information must be contained in the manual.
- (2) When the Flight Test Organization or service provider conducts activities other than those regulated under Subpart 521 of the CARs, their FTOM structure must clearly delineate between the TCCA approved areas and those other activities.

#### **8.4.6 Example of Manual Content**

- (1) Refer to Appendix B of this document for a sample FTOM manual with a description of what is required by Section 521.46 of the CARs. Each Flight Test Organization or service provider is invited to tailor the FTOM to best describe its operation.

#### **8.4.7 Certification Statement**

- (1) Paragraph 521.46(1)(a) of the CARs requires that the FTOM include a statement, signed by the person responsible for flight test operations, certifying that the flight test operations will be carried out in accordance with the policies and procedures set out in the FTOM and in any document incorporated into that FTOM.
- (2) Subsection 521.46(2) of the CARs requires the person responsible for flight test operations to submit the FTOM and any amendment to the manual to the Minister for approval. Subsection 521.46(3) of the CARs states that the Minister shall approve the FTOM and any amendment to the manual if they meet the requirements set out in Section 521.46 of the CARs.
- (3) The following information should be included in the Certification Statement:
  - (a) the legal name of the flight test organization or person conducting the flight test and, where that name is not the name under which the organization does business, its registered trade name;
  - (b) the mailing address;
  - (c) a certification statement which is a written commitment by the person responsible for flight test operations that the manual and any incorporated documents (policies and procedures) identified therein describe the manner in which the organization complies with the regulations;
  - (d) a section reserved for ministerial approval.

#### **8.4.8 Table of Contents**

- (1) In order to facilitate access to information in the FTOM a Table of Contents should be provided.

#### **8.4.9 List of Effective Pages**

- (1) In order to facilitate determining whether a copy of the FTOM has been amended correctly it is recommended that a list of effective pages be included. The list is a means of identifying each page of the manual that has been submitted for approval, with each page numbered and either dated or marked with a revision number. Alternatively, in the case of electronic manuals, an equivalent means of ensuring that the manual is complete and up to date is recommended.

#### **8.4.10 Distribution of Manual Amendment**

- (1) Minor amendments to the FTOM, such as editorial amendments, which do not change the intent of the text, or amendments to items that are not required as per Section 521.46 of the CARs may be made without obtaining TCCA approval. Substantive amendments to any of the items required by Section 521.46 of the CARs require TCCA approval while TCCA should be advised of minor or other amendments.

- (2) In order to facilitate the ability to control distribution of the FTOM, it is recommended that each manual include the process for issuance and control of amendments, including a description of the amendment distribution procedures and a reference to the list stating the title of each person who holds a copy of the manual.

#### **8.4.11 Description of Organization**

- (1) It is recommended that each FTOM include a brief description of the organization including the approximate size, geographic location and basic layout of the facilities, scope of flight tests conducted, organizational chart, and duties and responsibilities.

#### **8.4.12 Flight Test Operations Control System**

- (1) Paragraph 521.46(1)(b) of the CARs states in part that the FTOM must contain a description of the system used to supervise flight test operations. Each manual should include a description of the flight test operations control system which, depending on the complexity of the flight test operations, include the following:

- (a) flight authorization and flight preparation procedures;
- (b) guidance or instructions regarding preparation of operational flight plans and other flight documents;
- (c) management of aircraft defects;
- (d) flight watch, flight following, and communications requirements;
- (e) emergency response plan to include accident/incident reporting procedures and procedures for reporting overdue aircraft;
- (f) use of check lists, Standard Operating Procedures, Aircraft Flight Manual, Aircraft Operating Manual, Minimum Equipment Lists as applicable;
- (g) abnormal operating procedures which might include such things as minimum fuel procedures, landing gear malfunction, radio failure, fuel dumping, severe weather plan, etc;
- (h) operating weather minima and operations in hazardous conditions such as icing, thunderstorms, white-out, and windshear;
- (i) flight test limitations;
- (j) flight test equipment operation and limitations;
- (k) off site testing and evaluation;
- (l) aircraft ice, frost, and snow critical-surface contamination procedures;
- (m) fuelling procedures; and
- (n) list of emergency and survival equipment carried on aircraft, how to use the equipment, and periodic inspection details.

#### **8.4.13 Ground Operations**

- (1) It is recommended that each manual include a description of ground operations such as engine runs and telemetry room.
- (2) Section 521.46 of the CARs also describes the requirements for:
- (a) record keeping;
  - (b) a safety and risk management system;
  - (c) aircraft configuration control;
  - (d) flight test crew qualification;

- (e) training and currency requirements;
- (f) crew duty time limitations; and
- (g) flight test planning.

(3) These items must be included in the FTOM.

**8.5 Function and Reliability Test Flights — Section 521.47**

- (1) Function and reliability test flights should be identified in the certification plan and proposed at the beginning of the certification project. Also at this time the applicant should present a function and reliability test flight-specific Certification Plan or test plan. This should be agreed to by TCCA.
- (2) The applicant should submit for acceptance a separate schedule of test activities, including systems to be exercised, the frequency of exercising each system, test flight witnessing, etc.

**9.0 PHASE IV APPROVAL OF THE TYPE DESIGN**

**9.1 Issuance of a Type Certificate — Section 521.57**

**9.1.1 Issuing the Type Certificate and Data Sheet — 521.57(1)**

- (1) Appendix C of this document outlines the information that the applicant should provide for recording on their type certificate data sheet.

**9.1.2 Signed Undertaking to Carry Out the Responsibilities Specified in Division VIII — 521.57(1)(b)**

- (1) The following example is provided as one way the signed undertaking can be presented to the Minister, however it is up to the intended holder to decide how they meet this regulatory requirement, subject to approval by the Minister.

I, **[NAME OF INTENDED HOLDER]** hereby undertake to carry out the responsibilities of a design approval document holder, as set out in Division VIII of Subpart 521 of the CARs, including:

- (a) Technical capability;
- (b) Service difficulty reporting;
- (c) Establishing a service difficulty reporting system;
- (d) Investigation of service difficulty reports;
- (e) Mandatory changes;
- (f) Transfers;
- (g) Record keeping and loss or disposal of records;
- (h) Manuals;
- (i) Instructions for continued airworthiness; and
- (j) Supplemental integrity instructions.

\_\_\_\_\_

Signature of Intended Holder \_\_\_\_\_  
Date

- (2) The intended holder must make this signed undertaking, as it is ultimately the type certificate holder who will be responsible for these areas. If the holder does not have the technical capability to maintain the continued airworthiness of the aeronautical product, they can obtain the services

of an agent, however since the holder ultimately has responsibility for the design, there needs to be an agreement in place between the holder and the agent.

- (3) The type certificate will not be issued until the Minister has received this declaration.
- (4) More detailed information on these areas can be found in Subpart 521 of the CARs Division VIII.

## **10.0 PHASE V – POST CERTIFICATION ACTIVITIES**

### **10.1 General**

- (1) Once the Minister has approved the type design, the applicant becomes the type certificate holder and assumes the responsibilities for the continued airworthiness of the product's design as described in Division VIII of Subsection 521 of the CARs.
- (2) If the holder wishes to effect minor changes to the approved type design of their product per Subsection 521.154 of the CARs, they must submit their procedures for acceptance to their TCCA contact office in their region or at the National Aircraft Certification branch as applicable.
- (3) Type certificates are considered under the *Aeronautics Act* to be "Canadian Aviation Documents". As such, they remain the property of the Minister. The holder must surrender them to TCCA upon request by the Minister.

### **10.2 Designated Provisions and Penalties for Non-Compliance – Subpart 103**

- (1) The penalties for non-compliance can be found in Subpart 103 of the CARs

### **10.3 Transfer of Type Certificates to a New Holder**

- (1) Provisions have been made to allow the transfer of a type certificate from one Holder to another. The original certificate must be returned to the Minister who will issue a new certificate to the new type certificate holder once the Minister is satisfied that the proposed holder meets the requirements in Section 521.357 of the CARs. As the responsibilities associated with the approval apply to the Holder, Holder responsibilities also transfer under such an arrangement. Certificate transfers are subject to approval by the Minister.
- (2) Additional guidance on certificate transfers is provided in SI 500-018.

### **10.4 Retention of Type Certificates and Supporting Data**

- (1) Should the Holder of the type certificate be unable or unwilling to continue to hold such documents and maintain the associated responsibilities, they shall make their intentions known to the Minister in writing. Original certificates will be required to be surrendered to the Minister at which time the person ceases to be the holder.

### **10.5 Certificate Holder Responsibilities**

- (1) All type certificates carry with them Holder responsibilities. These responsibilities are identified in the regulations and are therefore it is the Holders responsibility to become familiar with these responsibilities.

## **11.0 INFORMATION MANAGEMENT**

- (1) Not applicable.

## **12.0 DOCUMENT HISTORY**

- (1) Not applicable.

**13.0 CONTACT OFFICE**

Suggestions for amendment to this document are invited, and should be submitted via the following e-mail address:

[AARTInfoDoc@tc.gc.ca](mailto:AARTInfoDoc@tc.gc.ca) Attn: Chief, Aircraft Certification Standards (AARTC)

[original signed by Eric Lucas for]

Jacqueline Booth  
A/Director, Standards Branch  
Civil Aviation  
Transport Canada

-----  
*Transport Canada documents or intranet pages mentioned in this document are available upon request.*

**APPENDIX A – SAMPLE CERTIFICATION PLAN**

- (1) The following sample certification plan illustrates the data / information elements for the:
- (a) established certification basis;
  - (b) agreed to certification plan. At this stage, “*N/A*” is placed in the “*LOI Completion*” column for each design requirement that delegate surveillance will *not* be conducted; and
  - (c) actual demonstration of compliance where findings of compliance are signed-off by TCCA specialists and delegates, and the completion of the LOI is signed-off by the TCCA specialist in the right-hand column.

Elements for Certification Basis				Elements for Certification Plan				Demonstration of Compliance	
Item	Airworthiness Requirement Reference	Regulatory Change / Amendment Level	Airworthiness Requirement Description	Means and Methods of Compliance	Test Plan Method	Form of Final Substantiating Data or Documentary Proof	Who Is Planned to Make FOC?	Signature of Person Making FOC	LOI Completion (TCCA Specialist)
1	525.303	Original	Factor of Safety	Analysis			Delegate 1254	<i>D. Smith</i> (DE 1254)	<i>J. Harvester</i>
2	525.305	Change 525-8	Strength and Deformation	Laboratory Test	ABC company Test Script A-32-09	ABC company report No. 1234	Delegate 135	<i>J. Doe</i> (DE 135)	N/A
3	525.345	Change 525-8	High Lift Devices	Ground Test			TCCA	<i>Y. Swan</i> (TCCA)	N/A
4	525.395	Change 525-3 (91-11-01)	Control System	Flight Test			Delegate 1254	<i>D. Smith</i> (DE 1254)	N/A
5	525.519	Change 525-7 (96-09-30)	Jacking and Tie-down Provisions	FMEA / FHA / FTA			Delegate 1254	<i>D. Smith</i> (DE 1254)	<i>J. Harvester</i>



**APPENDIX B— EXAMPLE OF FLIGHT TEST OPERATIONS MANUAL SECTIONS**

The “examples” provided here are hypothetical and may **not** apply to an organization’s actual methods. This guidance does not provide a complete sample manual.

**B1 CERTIFICATION STATEMENT**

123456 Canada Inc.  
Acme Aviation Ltd.  
8876 Any Street  
Anytown, Ontario M2T 1H8  
Phone: 123-456-7890  
Fax: 123-456-7899  
Email: [acme@flighttest.ca](mailto:acme@flighttest.ca)

**CERTIFICATION OF COMPLIANCE**

This manual, and any incorporated documents, reflects this organization’s means of compliance with Subpart 521 of the CARs as required by Section 521.46. In cases of conflict between company policy and the regulatory requirements, the regulatory requirements shall prevail. All incorporated documents identified herein and every amendment thereto, shall meet the requirements established in this manual. The policies and procedures outlined in this manual and in all incorporated documents identified herein must be strictly adhered to at all times.

Signature of Director, Flight Test: \_\_\_\_\_  
Print name \_\_\_\_\_ Date: \_\_\_\_\_  
Transport Canada Approval

This manual is approved as meeting the requirements for a Flight Test Organization pursuant to Subpart 521 of the CARs.

\_\_\_\_\_  
For the Minister of Transport

Date: \_\_\_\_\_

**B2 TABLE OF CONTENTS**

	Page
Table of Contents	
Cover page	
ii. Certification Statement	1
iii. List of Effective Pages (LEP)	2
iii. Amendment Record	3
iv. Introduction	4
Section 1 Administration	
1.1 Manual Distribution	6
1.2 Amendments	7
1.2.1 Amendment Procedure	8

1.2.2	Amendment Control Page	9
Section 2 Company Description		
2.1	Facilities	10
2.1.1	Location	10
2.1.2	Capabilities	11
2.2	Personnel	12
2.2.1	Organization Chart	12
2.2.2	Key Personnel	13
2.2.3	Duties and Responsibilities	14
2.3	Scope of Flight Tests	15
Etc.		

**B3 LIST OF EFFECTIVE PAGES**

This manual includes the pages listed below at the revision status indicated.

Page	Revision	Date	Page	Revision	Date
1	0	1 Dec 2009	14	0	1 Dec 2009
2	0	1 Dec 2009	15	0	1 Dec 2009
3	0	1 Dec 2009	16	0	1 Dec 2009
4	0	1 Dec 2009	17	3	1 Dec 2010
5	1	20 Feb 2010	18	0	1 Dec 2009
6	1	20 Feb 2010	19	0	1 Dec 2009
7	0	1 Dec 2009	20	0	1 Dec 2009
8	0	1 Dec 2009	21	0	1 Dec 2009
9	2	30 Mar 2010			
10	0	1 Dec 2009			
11	0	1 Dec 2009			
12	0	1 Dec 2009			
13	0	1 Dec 2009			

**B4 MANUAL DISTRIBUTION**

The person responsible for flight test operations is responsible for distribution of this manual, and will ensure that all holders have an updated manual. Copies are identified by serial number. The President (Certificate Holder) and Transport Canada will hold hard copies while all others will have access through the company intranet system.

Manual Holder	Serial Number
President (Certificate Holder)	001
Transport Canada	002

**B5 MANUAL AMENDMENT**

The Flight Test Manager will amend the contents of the Flight Test Operations Manual when:

- (a) there is a change to the company policy and/or procedures;
- (b) an error is noted in the manual; and
- (c) Transport Canada requests a change to the content.

All amendments will be shown by inserting a vertical line in the margin to indicate where changes in the text have been made. Each amended page will show the amendment number and date in the lower right hand corner. If an amendment requires that additional pages be inserted into the manual, these pages will bear the page number of the preceding page and be suffixed alphabetically.

The Flight Test Manager will send two copies of the manual amendment including amendment instructions to TCCA for approval. When the approved amendment is received from TCCA, it will be copied by the Data Control Officer and distributed with an amendment control page (see following page for sample) in accordance with the distribution list to all manual holders. The distribution list can be found in Section XX of this manual.

Amendments will be inserted within 30 days of the amendment date. The holder of the manual is responsible to return the control page to the data control officer within the 30-day period for filing. The Data Control Officer will track and follow up for compliance.

The Flight Test Manager will include the manual amendment distribution process in the annual internal audit program.

**AMENDMENT CONTROL PAGE**

Amendment No. 1      Dated: 20 Feb 2010

Remove Pages	Insert Pages
Amendment 0, LEP-1	Amendment 1, LEP-1
Amendment 0, Page 5	Amendment 1, Page 5
Amendment 0, Page 6	Amendment 1, Page 6
Amendment 0, Page 7	Amendment 1, Page 7

Prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

Person Responsible for Manufacturing Activities

Manual Serial Number \_\_\_\_\_ Amended by: \_\_\_\_\_

Insertion Date: \_\_\_\_\_

**B6 DESCRIPTION OF ORGANIZATION**

Acme Aviation Ltd. has conducted flight test operations since 1990.

Our flight test facility is located at 123 Acme Drive at the Anytown Airport and our corporate office is at 8876 Any Street.

The flight test facility includes a 200 square metre hangar with maintenance, instrumentation and telemetry capability. Fuelling and de-icing facilities are available from other companies located at the airport.

We have approximately 75 employees, including 5 test pilots, and 8 flight test engineers at the Acme Drive site and 10 administration staff at the Any Street office.

### **Scope Of Tests**

Acme Flight Test Ltd. conducts a full range of certification flight tests for aircraft produced by Acme Aerospace, and offers avionics flight test services and instrumentation services for external clients.

### **Organization Chart**

### **Duties and Responsibilities**

## **B7 FLIGHT TEST OPERATIONS CONTROL SYSTEM**

### **Flight Authorization**

The Flight Test Manager must authorize test flights.

When operating away from base this authority is delegated to the Pilot in Command (PIC).

### **Flight Release**

A flight release will be deemed to have been given when the PIC has determined that:

- (1) the flight can be conducted in accordance with the FTOM;
- (2) all required licenses, training, permits and certificates are valid and current;
- (3) all required aircraft maintenance work has been completed (aircraft is airworthy) and sufficient time remains before the next required maintenance, to complete the flight/s for which the aircraft is being released;
- (4) an Operational Flight Plan/Flight Plan or Flight Itinerary has been completed as appropriate;
- (5) the crew has conducted a preflight briefing which includes the following elements:
  - (a) Weather;
  - (b) Notice to airmen (NOTAMs);
  - (c) Aircraft;
  - (d) Mission Plan (Tests to be conducted, test area);
  - (e) Flight Test Safety Management (review hazards, minimizing procedures, mitigation methods, residual risk); and
  - (f) Crew Duties
- (6) All documents and manuals as required by the CARs and FTOM to be carried are onboard the aircraft:
  - (a) Certificate of Airworthiness;
  - (b) Certificate of Registration;
  - (c) Company Operations Manual;
  - (d) Aircraft Radio Licence;
  - (e) Aircraft Journey Log Book;
  - (f) Aircraft Flight Manual;
  - (g) Special Operating Instructions;
  - (h) Flight Crew Licenses; and

- (i) Current Weight and Balance report;
- Etc.

#### **Flight Dispatch and Flight Watch**

- (1) Company pilots shall utilize the pilot self-dispatch system.
- (2) The PIC of any flight has the sole authority to make decisions as to initiation, continuation, delay, diversion or rerouting of the flight when conditions are such that operational decisions are necessary.
- (3) The PIC shall notify the Flight Test Manager of any change of itinerary or schedule.

#### **Aircraft Critical Surface Contamination**

- (1) Where frost, ice or snow exists, the PIC shall not commence a flight unless the aircraft has been inspected to determine whether any frost, ice or snow is adhering to the critical surfaces as defined. Such inspection shall be carried out by the PIC, or a person other than the PIC who is delegated such duties by the company, and has received training concerning surface contamination as required by the CARs and Commercial Air Services Standards (CASS);
- (2) When any frost, ice, and/or snow is found adhering to any critical surface, said contaminant will be removed before any flight is attempted.

#### **Weather**

Company pilots shall not conduct flight tests in weather conditions that are less than VFR, with the following exceptions:

- (1) The tests can be conducted between layers of cloud while maintaining at least 2000 foot vertical clearance from the nearest cloud, flight visibility of at least 5 miles exists, and an acceptable horizon is present; or
- (2) The test plan specifically permits flight in worse weather conditions.

#### **Icing**

Company pilots will not conduct flight tests in icing conditions, unless the tests being conducted are specifically related to certification in icing conditions, or are part of function and reliability testing.

#### **Thunderstorms**

Company pilots shall not commence a flight when thunderstorms are in the immediate vicinity. If thunderstorms are encountered enroute and cannot be circumnavigated, the aircraft shall return to the point of departure or land at the nearest suitable landing area.

#### **Windshear/Turbulence**

Company pilots shall not conduct flight tests when turbulence more intense than light, or if severe windshear is present unless specifically authorized in the test plan.

### **Flight Test Equipment**

- (1) Limitations;
- (2) Normal Operating Procedures; and
- (3) Abnormal/Emergency Operating Procedures.

### **Emergency Provisions**

Emergency Provisions will be installed in the test aircraft to comply with Section 521.45 of the CARs. Limitations, normal operating instructions, and emergency operating instructions for the emergency provisions will be readily available to the flight crew in the aircraft. Installation and maintenance instructions for the emergency provisions will be available to maintenance personnel. Flight crew will wear nomex flight suits, flight boots and nomex gloves for all test flights. Smoke goggles, and oxygen masks will be readily available to all crew members. Fire extinguishing equipment will be available on each flight.

### **Envelope Expansion Flights**

The following emergency provisions shall be provided for the first and subsequent envelope expansion flights:

- (1) An emergency escape chute; and
- (2) Each crew member will wear a properly fitted parachute, and helmet.

### **Emergency Response**

#### **Flight Crew**

- (1) Flight crew shall be conversant with emergency procedures of the flight manual, and any special procedures related to the equipment under test, as well as flight test specific emergency equipment. The flight crew will use the abnormal/emergency procedures and take any other actions they deem appropriate in response to the emergency situation.
- (2) Time permitting, the location of the aircraft, nature of the emergency and intentions shall be communicated to Air Traffic Services (ATS), Telemetry personnel, and Company Dispatch.
- (3) The crew will terminate the flight tests, and land the aircraft at a suitable location at their discretion.

#### **Telemetry Crew**

The telemetry crew will provide whatever aid the flight crew asks for, including acting as a communications link with dispatch, maintenance, and design personnel.

#### **Dispatch**

Upon becoming aware of an airborne emergency involving a Company aircraft the dispatch personnel shall activate the appropriate sections of the Aircraft Emergency Response Plan.

#### **Survival Equipment**

The PIC shall ensure that sufficient survival equipment for the survival on the ground of each person on board, given the geographical area, the season of the year and anticipated seasonal climatic variations, is carried on company aircraft.

## **B8 GROUND OPERATIONS**

### **Aircraft Ground Test**

- (1) A company test pilot shall be at the controls, or have access to the controls, of the aircraft for all ground tests, unless the ground test plan permits otherwise; and
- (2) Aircraft ground tests shall be conducted in accordance with the appropriate test plan(s).

### **Telemetry**

- (1) For test flights that require telemetry as part of the test plan;
- (2) The telemetry room will be staffed by the specialist engineers as described in the test plan;
- (3) The Test Director will lead the telemetry room team, and will ensure that external distractions are not permitted in the telemetry room; and
- (4) One member of the telemetry team will be assigned to communicate with the aircraft for the duration of a test flight.

## **B9 RECORD KEEPING**

### **Flight Records - Aircraft Log Book Entries**

- (1) The aircraft log book shall be completed at the termination of each flight. Pilots shall ensure that each column of the journey log is completed.
- (2) The aircraft log is a legal document and must be completed and signed by the PIC. The log book is the only official medium for written communication between flight crew members and maintenance personnel. Although defects may be discussed orally with maintenance personnel, they must still be recorded in the log book.
- (3) When an aircraft system malfunction or unserviceability is found, a defect description or report shall be entered in the aircraft log book.

## **B10 SAFETY AND RISK MANAGEMENT SYSTEM**

Flight Test Risk Management Plan– The Flight Test Risk Management should contain the following:

- (1) Identification of flight test specific hazards–These are hazards that are in excess to the normal risks of flying. The flight test hazards are due to the tests being conducted, or the environment in which the tests are conducted.
- (2) Minimizing Procedures–The probability of an identified hazard occurring can be minimized by using effective minimizing procedures. Examples of minimizing procedures include adjusting the approach used for the flight tests, by choosing experienced flight test crews, by adjusting the test environment, real-time monitoring of critical system parameters, etc.
- (3) Mitigation Methods–Despite using effective minimizing procedures, the risk remaining from identified hazards may still be in excess of what is acceptable to the company. Mitigation methods are designed to reduce the severity of an identified hazard if the hazard occurs. Examples of mitigation methods include emergency services at the test site (fire fighting, ambulance), spin recovery chutes, escape hatches, crew parachutes, survival equipment, etc.

- (4) Residual Risk—The remaining risk associated with an identified hazard must be assessed taking into account the expected effectiveness of minimizing procedures and mitigation methods. The risk for a test will be the highest of the residual risks for all the identified hazards that apply to that test. The residual risk must be identified in the test plan.

## **B11 AIRCRAFT CONFIGURATION CONTROL**

The FTOM must describe the process to be used to track and document the configuration of the aircraft, including instrumentation, prior to every test flight, highlighting the changes made to the aircraft from the previous flight. The system must include the capability to make the following information, related to the specific test configuration, available to the flight test crew:

- (1) Special limitations;
- (2) Special normal operating procedures; and
- (3) Special abnormal operating/emergency procedures

## **B12 FLIGHT TEST CREW QUALIFICATION, TRAINING, AND CURRENCY REQUIREMENTS**

### **Flight Test Crew Qualification**

#### **Test Pilot**

All Test Pilots shall hold a commercial license or airline transport pilot license that is appropriate to the type of aircraft being tested. The license will be endorsed with a rating appropriate to the type of aircraft being tested.

#### **Flight Test Engineer**

Flight Test Engineers (FTE) must complete the Acme Aerospace Inc. FTE Training Syllabus.

#### **Flight Test Crew Training**

All test pilots and flight test engineers must complete the following training prior to being assigned to participate in any company test flights:

Company Indoctrination—Once in their career.

Aircraft Type Training – All test pilots and flight test engineers must complete aircraft type training as follows:

- (a) Initial – Prior to being assigned flight duties in an aircraft;
- (b) Recurrent – Not more than one year since last training;
- (c) For new types for which no type training is available, all flight crew members will have complete company-developed aircraft systems and flight characteristics training;
- (d) Emergency System Training – Annually;
- (e) Survival Training – Once in their career;
- (f) Aeromedical Training – Every five years; and
- (g) Surface Contamination Training – Annually.



### **Flight Test Crew Recency Requirements**

#### **Test Pilot**

- (1) Before being assigned to act as a crewmember on a test flight, have completed 3 landings and take-offs and 5 flight test hours in the aircraft class (Turbo-jet, Propeller, Rotary Wing) in the past 90 days.
- (2) Before being assigned to act as PIC on a test flight, have completed 3 landings and take-offs and 2 flight test hours in the past 60 days in the aircraft type.

#### **Flight Test Engineer**

Before being assigned to act as a crewmember on a test flight, have completed at least 1 test flight in the aircraft type in the past 90 days, and at least 2 test flights in the aircraft class (Turbo-jet, Propeller, Rotary Wing) in the past 90 days.

## **B13 CREW DUTY TIME LIMITATIONS**

### **Flight and Duty Time Limitations and Rest Periods**

The following system has been established to monitor the flight time, flight duty time and rest periods for all pilots. All Acme Aerospace flight crew shall adhere to the flight time and rest periods described in the following subsections.

#### **Maximum Flight Time**

No test pilot or flight test engineer shall be assigned, nor accept assignment that will exceed, in all flying including flight test, training or proficiency, any of the following flight time limitations:

- (1) 60 hours in any period of 7 consecutive days;
- (2) 120 hours in any period of 30 consecutive days;
- (3) 300 hours in any period of 90 consecutive days; and
- (4) 1200 hours in any period of 365 consecutive days.

When a flight crewmember is scheduled for a flight, which would require them to exceed the maximum flight time, described above, the flight crewmember shall not accept the assignment and shall notify the Flight Test Manager immediately.

#### **Flight Duty Time**

The maximum flight duty time shall be 14 consecutive hours in any 24 consecutive hours.

#### **Flight Time Limitations**

- (1) A flight crewmember who reaches any flight time limitation shall be deemed to be fatigued, and shall not continue on flight duty or be re-assigned to flight duty until such time as they have had the rest period prescribed.
- (2) Flight time limitations include all flight time. Pilots shall make the Flight Test Manager aware of the flight times and flight duty times conducted in all flying activities whether recreational, with Acme Aerospace Ltd. or with other air operators.
- (3) Time spent completing any duties required following flight duty time is not considered to be part of the minimum rest period.

### **Minimum Rest and Time Free from Duty**

Flight crewmembers shall be provided with minimum rest periods as defined. The minimum rest periods provided shall be at least one period of at least 24 consecutive hours free from duty once within each 7 consecutive days. Days off (at least 24 consecutive hours and free from all duty) due to weather or mechanical problems etc. can be applied towards this requirement.

## **B14 TEST PLANNING**

The Test Planning process should include the following elements:

- (1) Test plan Approval—This is dependent on the complexity of the flight test organization, and may be as simple as the test plan being signed as complete by the person who prepares it, to multiple levels of internal review by various engineering disciplines with approval being given by the Chief Test Pilot.
- (2) Test Objectives—The test objectives must be clearly stated in the test plan.
- (3) Test Methods—The test methods used must be described in sufficient detail to ensure that the flight test crews can perform the desired test safely and effectively. Alternatively, the company may develop or refer to a flight test manual that describes the flight test methods and techniques that they intend to use. If a flight test manual is used as a reference, then sufficient detail as to which technique or method is being used must be specified in the test plan.
- (4) Aircraft Configuration—The required aircraft configuration must be defined for each test being performed.
- (5) Test Conditions—The test conditions must be defined for each of the tests being conducted. The conditions must be specific enough to ensure that the flight test crew can perform the desired test safely and effectively. Test conditions may include aircraft state parameters (altitude, normal acceleration, altitude, etc), weather (Ceiling, visibility, wind, temperature), navigation infrastructure (GPS, SBAS, GBAS, Cat II ILS, etc.), air traffic services, etc.
- (6) Test Envelope—The test plan must establish boundaries within which the flight test crew must remain.
- (7) Instrumentation Requirements—If instrumentation is required to conduct the test, then it must be specified in the test plan.

## APPENDIX C – TYPE CERTIFICATE DATA SHEETS

The applicant should provide the following information in the form of a draft Type Certificate Data Sheet (TCDS) applicable to the aeronautical product.

- (1) **For an aircraft:**
  - (a) Date of application;
  - (b) Name and address of the proposed type certificate holder;
  - (c) Party responsible for the control of the product manufacturing in accordance with the type design (specify type certificate holder or others);
  - (d) Model and type designation;
  - (e) Engines;
  - (f) Fuel (specification);
  - (g) Oil (specification);
  - (h) Engine Operating limits;
  - (i) Airspeed Limits;
  - (j) Maximum Weights: Taxi, Take-off (MCTOW), Landing, Zero Fuel;
  - (k) C.G. Limits;
  - (l) Datum;
  - (m) Levelling Means;
  - (n) Minimum Crew;
  - (o) Maximum Occupants (includes crew);
  - (p) Fuel Capacity;
  - (q) Maximum Operating Altitude;
  - (r) Outside Air Temperature Limits;
  - (s) Certification Basis:
    - (i) additional Airworthiness Requirements,
    - (ii) findings of equivalent safety, and
    - (iii) Special Conditions.
    - (iv) The following is an example of a certification basis for an Aircraft of Chapter 525 of the AWM:
      - (A) Canadian Chapter 525 of the AWM, Airworthiness Standards: Transport Category Aeroplanes, at Change 6 dated December 30, 1993 (which is equivalent to FAR 25 including amendments 25-1 through 25-79) and Canadian Additional Airworthiness Requirements.
      - (v) Transport Canada Additional Airworthiness Requirements as published in AWM Chapter 525 are as follows:
        - (A) 525.201(d)(1) Stall Demonstration, First Edition
        - (B) 525.207(b) Stall Warning Change 525-2

- (vi) Chapter 516 of the AWM, Aircraft Noise and Emissions at change 516-7, which refers to:
    - (A) ICAO Annex 16, Vol. 1, Amend. 7, (2002) Noise,
    - (B) ICAO Annex 16, Vol. II, Amend. 2, (1992) Emissions
  - (vii) Transport Canada Special Conditions:
    - (A) SCA 94-11, High Intensity Radiated Fields (HIRF)
  - (viii) Equivalent Safety Findings:
    - (A) FAR 25.109 Rejected Take-off and Landing Performance Criteria;
  - (ix) Exemptions:
    - (A) Mid-cabin Door
    - (B) 1999-01 Rev. A (for CAR Part 604 Operations only)
    - (C) 2003-181 (for CAR Part 604 or 704 Operations)
  - (t) Canadian Configuration;
  - (u) Eligible Serial Numbers;
  - (v) Placards;
  - (w) Approved Publications; and
  - (x) Life Limited Parts.
- (2) **For an engine:**
- (a) Date of application;
  - (b) Name and address of the proposed type certificate holder;
  - (c) Party responsible for the control of the product manufacturing in accordance with the type design (specify type certificate holder or others);
  - (d) Model and type designation;
  - (e) Ratings;
  - (f) Limitations:
    - (i) Engine Speed;
    - (ii) Temperature;
    - (iii) Air Bleed;
    - (iv) Fuel Bleed;
    - (v) Fuel Pressure;
    - (vi) Fuel Temperature;
    - (vii) Fuel Viscosity;
    - (viii) Oil Pressure; and
    - (ix) Oil Temperature.
  - (g) Specifications:
    - (i) Fuel;
    - (ii) Oil Type;

- (iii) Oil Capacity; and
  - (iv) Equipment.
  - (h) Certification Basis;
  - (i) The following is an example of a certification basis for a Part 33 engine:
    - (i) Canadian Chapter 533 of the AWM at change 533-6 (which is equivalent to FAR 33 up to amendment 33-20).
    - (ii) Canadian Subchapter 516 B of the AWM at Change 516-06, "Aircraft Engine Emissions" which refers to ICAO Annex 16 Volume II, (Compliance with FAR 34 up to amendment 34-3, has also been shown).
  - (j) Date of Application for Type Certificate; and
  - (k) Approved Publications.
- (3) **For a propeller:**
- (a) Date of application;
  - (b) Name and address of the proposed type certificate holder;
  - (c) Party responsible for the control of the product manufacturing in accordance with the type design (specify type certificate holder or others);
  - (d) Model and type designation;
  - (e) Ratings;
  - (f) Hub;
  - (g) Blade(s);
  - (h) Governor Type;
  - (i) Weight;
  - (j) Diameter;
  - (k) Eligible Serial Number;
  - (l) Limitations;
  - (m) Certification Basis;
  - (n) Approved Publications; and
  - (o) The following is an example a certification basis for a Part 35 propeller  
AWM Chapter 535, Change 535-1.