

Revision 0

Product Certification—Type Certificates

14 May 2021

General

Civil Aviation Authority (CAA) advisory circulars (ACs) contain guidance and information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rules and legislation.

Consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable, they will be considered for the appropriate AC.

Purpose

This AC describes an acceptable means of compliance with Civil Aviation Rule Part 21. This material is intended to assist organisations and persons in gaining certification for aircraft types to be operated in New Zealand.

The guidance material in this AC reflects international best practice and is what the CAA has found to be the most robust process for achieving type certification and compliance with the various rule requirements.

Related Rules

This AC relates specifically to Civil Aviation Rule Part 21 Subpart B – Type Certificates and Type Acceptance Certificates, and Subpart D – Changes to Type Certificates and Type Acceptance Certificates.

Change Notice

This is the initial release of this AC. It removes information regarding type certification from AC21-1 and consolidates it in this AC.

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1. Introduction

Rule 91.101 requires all aircraft to have a current airworthiness certificate to be eligible for operations under Part 91, General Operating and Flight Rules. Airworthiness certificates are issued under Part 21, Subpart H, in one of four categories—

- Standard
- Restricted
- Special
- Provisional

Only aircraft in the standard or restricted category are eligible for the carriage of persons or goods for hire or reward under Part 91 and only aircraft in the standard category are eligible for air transport operations under Parts 121, 125 or 135. Aircraft are only eligible to be issued with an airworthiness certificate in the standard or restricted category, if they have been type certificated in New Zealand or type certificated in a foreign country and subsequently type accepted in New Zealand.

1.1. Type Certificates

Type certificates are issued under Part 21 Subpart B. This AC provides guidance to an applicant wishing to obtain a New Zealand type certificate (TC) or a TC amendment.

A TC approves the design of an aircraft, engine, or propeller by certifying that the product design has demonstrated compliance with the applicable regulations. As defined in rule 21.3 the TC includes the type design, the operating limitations, the type certificate data sheet (TCDS), the applicable airworthiness design standards, the flight manual and any other conditions or limitations prescribed by the Director under Part 21.

Due to the amount of effort and resource commitment required to undertake a type certification project, it is important that the TC applicant informs the CAA of their plans for product certification as early as possible. This will help to establish a clear understanding of the needs and expectations of both parties in the product certification process.

2. Type Certification Process

2.1. TC Project Management

As with any kind of project, management methodology should be applied to a type certification project to ensure that adequate planning, delegating, monitoring and controlling of certification-related activities and resources is undertaken and can be maintained throughout the TC process. This is achieved by establishing a type certification board (TCB) that is responsible for—

- (a) provision of adequate project governance
- (b) approving project plans
- (c) monitoring adherence to approved project plans
- (d) ensuring the observance of acceptable guidance

- (e) controlling the entry to, and exit from, each project phase, and
- (f) provision of ad-hoc direction as required.

While the TCB provides strategic level project governance and direction, individuals within CAA's and the applicant's organisations should be appointed as Project Managers and be tasked with the day to day management of the TC project.

2.2. TC Project Phases and Controls

A typical type certification project consists of pre-project activities followed by four distinct project phases, which are listed below and illustrated in Figure 1: TC Process Diagram.

Phase I. Requirements Definition

Phase II. Compliance Planning

Phase III. Implementation

Phase IV. Post-Certification Activities

One of the primary means by which progress through the TC process is controlled is the use of formal milestones or "gates" to control the entry into and exit from each project phase. The following paragraphs provide an overview of the purpose of each phase and their respective entry and exit gates.

2.3. Pre-TC Project Activities

While not a project phase in its own right, pre-TC project activities is the period preceding phase 1 when the applicant conducts their own conceptual design, development and proof of concept related activities. Early engagement between CAA and the applicant during this period is highly recommended in order to assist with identifying potentially critical aspects of certification and any related regulatory issues. However, as these activities are undertaken prior to an application for a TC being submitted to CAA, they are not considered to be part of the formal TC process.

While not prescriptive, nor exhaustive, the activities below are likely to occur as part of the pre-TC project activities.

- Familiarisation between CAA and the potential applicant.
- The potential applicant to provide CAA with an understanding of—
 - the preliminary product design for which they are considering applying for type certification
 - the intended operation of the product
 - the potential applicant's company structure, including prior experience in the aviation industry
 - major suppliers, utilisation of already approved equipment within the product design, and
 - the potential applicant's desired project schedule.
- CAA to provide the potential applicant with an overview of the type certification process, including major steps, roles and responsibilities.
- Discussion of the potential certification basis based on the applicant's preliminary design.

- Identification of technical issues that may present a potential risk to certification, such as novel or unique design features.
- CAA to ensure that the potential applicant is aware of the scope, magnitude and potential cost of the certification project.

2.4. Phase I – Requirements Definition

The requirements definition phase is initiated when an applicant applies for a TC in accordance with rule 21.17. The intent of this phase is to clarify the product definition and identify the associated risks to certification by establishing specific regulatory requirements and methods of compliance¹. These, along with any other potentially critical issues, are identified and recorded in formal Issue Papers (IPs). Development of the project specific certification plan (PSCP) commences during this phase, a draft of which is required to initiate the phase I exit gate, the convening of the “type certification board meeting (TCBM) – phase I review”.

2.5. Phase II – Compliance Planning

This phase is initiated when all critical actions from the TCBM phase I review are closed. During this phase, the PSCP is refined further with detailed planning undertaken by both parties. The phase exit gate is the TCBM-PSCP approval, at which the certification basis is approved and the PSCP is agreed as being appropriate for the ongoing management of the product certification project and thus can be approved.

Note: Prior to exiting this phase, an applicant or their supporting organisation should have applied² for a Part 146 Design Organisation and Part 148 Manufacturing Organisation approvals.³

2.6. Phase III – Implementation

Phase III is initiated when all critical actions from the TCBM - PSCP approval are closed. During this phase the content of the PSCP is implemented; design, analyses, manufacture of conforming test articles, ground and flight testing and any other activities needed to develop the applicant’s design and demonstrate its compliance against the applicable requirements. To ensure that all agreed upon product certification requirements are met, the applicant and CAA will need to work closely in managing the resources under their respective control. The PSCP may need refinement during this phase to account for any unplanned eventualities. A TCBM for pre-CAA flight testing will be convened in order to authorise the commencement of CAA’s ground inspection and flight testing activities

¹ Methods of Compliance: FT = Flight Test, GT = Ground Test, A = Analysis, D = Design review, S = Similarity, I = Inspection, ELOS = Equivalent Level of Safety Finding, N/A = Not Applicable

² There is no requirement to obtain a Part 146 or Part 148 certificate before a TC is issued. In practice, however, if the TC holder does not obtain a Part 146/148 certificate until this point, the level of CAA oversight will be extremely high. Therefore it is recommended that if an organisation isn’t already certified, a Part 146 and 148 application should be submitted to the CAA early in the TC programme.

³ A Part 146 Design Organisation approval is required for the provision of certification and continued airworthiness management support. Similarly, a Part 148 Manufacturing Organisation approval is required to ensure the quality and safety management systems required for the manufacture of prototype and production parts that conform to the type design. A TC holder does not have to be both a Part 146 and Part 148 organisation, but there should be a strong relationship between the Part 146 and Part 148 organisation, if they are not one entity.

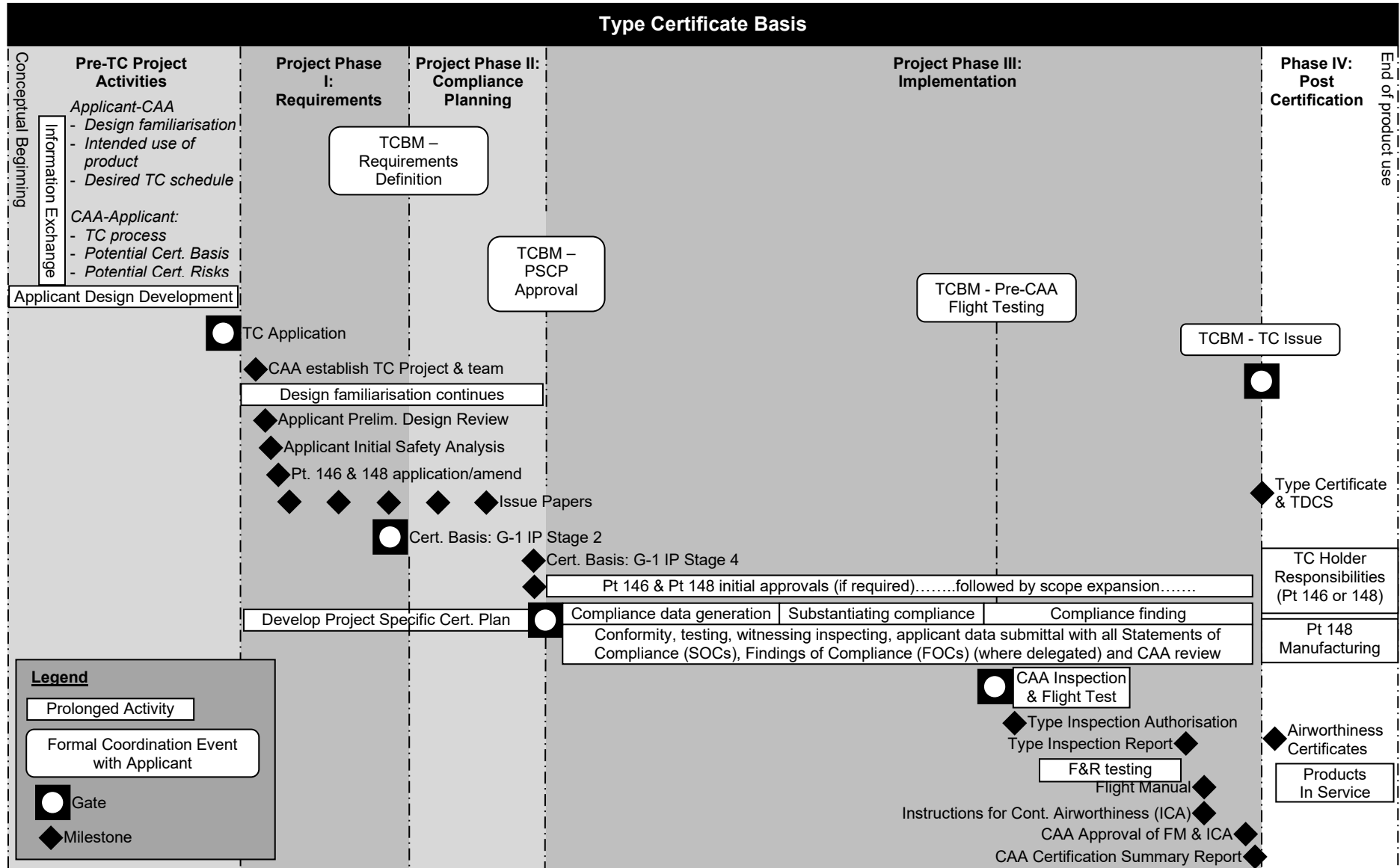
necessary to achieve certification. The implementation phase exit gate is the “TCBM – TC issue” at which the product’s TC is issued.

Note: Prior to any conforming articles being manufactured in this phase, an applicant should have obtained a Part 148 Manufacturing Organisation approval, or engaged with an already approved Part 148 Manufacturing Organisation that will produce the prototype test articles.

2.7. Phase IV – Post-Certification

This phase is initiated by the closure of all critical action items from the TCBM-TC issue. It is focussed on the issue of airworthiness certificates for serial products manufactured and conforming to the TC, and the TC holder providing continuing airworthiness support for the certificated product in accordance with their responsibilities under Part 146. Additionally, all project close-out activities are completed during this phase.

Figure 1: TC Process Diagram



3. Type Certification Boards (TCB) and TCB Meetings (TCBM)

3.1. Purpose of the TCB

The TCB is established to ensure adequate levels of project governance and adherence to the approved PSCP throughout the TC process.

3.2. TCB Membership

In order to ensure that TCB has adequate executive authority and to foster a partnering approach to certification, both the CAA and the applicant should be represented on the TCB with membership consisting of the following representatives.

- Project executive⁴
- CAA project director⁵
- Applicant's project director (An executive who sits above the applicant's project or certification manager).
- CAA project manager / engineer.
- Applicant's project manager, project engineer, and certification manager (or equivalents).

The TCB members should be appointed during prior phase I of the TC project.

3.3. TC Project Managers

While the TCB provides strategic level project governance and direction two individuals within CAA's and the applicant's organisations should also be appointed as project managers. These individuals should be tasked with managing the day to day implementation of the PSCP and other project related activities within their respective organisations.

The TC project managers should be appointed during phase I of the TC project.

3.4. Type Certification Board Meetings (TCBM)

During a TC project, a meeting of the TCB will be convened to approve major milestones, to control the entry into/exit between project phases and to address certification issues that are beyond the authority of CAA's and the applicant's TC project managers.

The following list identifies the four "standard" occasions when the TCBM will convene.

- (1) TCBM – requirements definition review.
- (2) TCBM – PSCP approval.

⁴ The project executive should be at the Authority Leadership Team level and be able to ensure that the CAA is in position to adequately support the project.

⁵ The CAA project director should be in a leadership position covering product certification activities and have good working knowledge of certification requirements in this area.

- (3) TCBM – pre-CAA flight test.
- (4) TCBM – TC issue.

Note: Interim TCBMs may be convened at any time during the TC project at the request of the applicant's or CAA's TCB members. The reason for these meetings will be specific to each project but may be for reasons such as addressing significant certification issues or agreeing to changes to the PSCP which are outside of the authority of CAA's and the applicant's TC project managers (i.e. items that materially affect either the applicant's or CAA's ability to support the programme).

TCBM Participants

In addition to the TCB members the following individuals should participate in all TCBMs.

- CAA's project manager / engineer.
- Applicant's project manager, project engineer, and certification manager (or equivalents).

Additionally, representatives from the following groups may be requested to attend TCBMs as needed, depending on the specific purpose of the TCBM.

- Other CAA staff.
- Applicant's staff (technical or management) staff.
- Technical specialists from outside of the CAA or applicant's organisation.
- Representatives of foreign airworthiness authorities.

Note: During the planning of a TC project, regular status / progress meetings may be scheduled between the CAA and the applicant's project manager. While the meeting attendees may comprise of many of the TCBM participants, the purpose of these progress meetings is entirely different from TCBMs so they do not require the participation of the TCB itself.

TCBM Entry & Exit Criteria and Project Phase Deliverables

Specific entry and exit criteria for each TCBM are required to ensure progress through the TC project is undertaken in a controlled and rational manner. In addition to these criteria, a number of specific deliverables should be completed within each TC project phase. Along with a discussion on the specific purpose of each TCBM, these criteria and deliverables are detailed in the following section.

TCBM Critical Action Items

It is inevitable that in the course of holding a TCBM a number of action items will be raised, some of which may need to be closed prior to the commencement of the subsequent project phase. The TCB can elect to categorise such actions as "critical" thereby providing additional means of control between TC project phases.

TCBM Agenda Items:

While each of the standard TCBMs is convened for a particular reason, the following items should be included as agenda items at each of these meetings.

- Closure of previous TCBM critical action items.
- Status of project against the PSCP—
 - confirmation of phase deliverables
 - adherence to schedule
- Review of any new Issue Papers (IPs) raised since last TCBM.

- TCBM critical actions preventing progress to next project phase.
- General business items which do not need to be included in the TCBM information package, such as —
 - review of the project risk register
 - identification of lessons learned (to be included in lessons log).

3.5. TCBM – Requirements Definition Review

This is the first meeting of the TCB and is held at the conclusion of the TC project phase I - requirements definition. The primary purposes of the meeting are:

- (1) For the applicant to present those aspects of their design that have been identified during phase I as presenting potential challenges to certification.
- (2) For the TCB to approve the G-1 IP (airworthiness, noise, and emissions regulations and amendment levels; special conditions; exemptions; and ELOS findings for the project) at Stage 2 (refer Issue Papers section).

Project Phase I - Requirements Definition Deliverables

The following deliverables should be completed during TC project phase I and their status reviewed at the TCBM - requirements definition review:

- TC application form and associated fee received by CAA from applicant.
- TCB members identified and appointed.
- Application for Part 146 Design Organisation and/or Part 148 Manufacturing Organisation certification or amendment as required submitted by applicant(s).
- CAA and applicant project teams identified.
- Familiarisation activities of proposed design continued from pre-project stage.
- CAA resource and training requirements identified.
- Foreign aviation authorities engaged (if required).
- Applicant undertakes initial safety assessment (this activity is for the purpose of informing the applicant's design as opposed to being for showing compliance).
 - A preliminary design review is undertaken by the applicant that incorporates the outputs of their initial safety assessment.
- Draft PSCP created and submitted by applicant, taking account of the outputs of their Preliminary Design Review (PDR) (including outputs from the initial safety assessment).
 - The applicant should present the preliminary design to the CAA at the time the PSCP is submitted.
- Initial certification basis identified and included in G-1 IP
- Need for special conditions, ELOS and exemptions identified and included in IPs as appropriate.
- The following registers and logs created by the CAA project manager—
 - IP register
 - lessons log.

TCBM – Requirements Definition Review Entry Criteria

The following should be achieved in order to convene the TCBM - requirements definition review.

- (1) Draft PSCP submitted by applicant and initial review completed by CAA.
- (2) G-1 IP completed up to stage 2 (i.e. ready for submission to applicant).
- (3) Applicant initial safety assessments conducted.

TCBM – Requirements Definition Review Exit Criteria (TC Project Phase II Entry)

The following should be achieved in order to successfully exit the requirements definition review phase.

- (1) Closure of all TCBM – requirements definition review critical action items.

3.6. TCBM - PSCP Approval

This TCBM is held at the conclusion of the TC project phase II. The primary purpose of this meeting is for—

- (1) the applicant to present their final “to be certified” design (or deltas to between preliminary design and final design).
- (2) CAA and applicant to agree that the G-1 IP accurately documents the certification basis.
- (3) the TCB to approve the PSCP.

Project Phase II – Compliance Planning Deliverables

The following deliverables should be completed during TC project phase II and their status reviewed at the TCBM-PSCP approval.

- CAA to undertake Part 146 assessment of the applicant’s design organisation.
- Refinement of the applicant’s design to a point where it is both suitable for certification and “frozen” prior to entering TC project phase III.⁶
 - The applicant should present their “design to be certified” to CAA in order for them to be sufficiently informed to finalise the certification basis.
- IPs raised as required
- Finalisation of the certification basis to ensure it adequately addresses any issues identified during or since the TCBM-Requirements Definition Review.
- Compliance Checklist to be updated to reflect finalised certification basis.

⁶ The product design must be agreed as being able to be certified prior to entering phase III. Additionally, the design should be frozen for the purposes of certification; any design changes made during the implementation phase may incur a significant overhead in terms of assessing and accounting for their impact on the certification basis.

- Refinement of project schedule to ensure it contains sufficient detail and clarity to identify certification activities and resource commitments required from both CAA and the applicant.
- Refinement of the PSCP (including Project Schedule and Compliance Checklist) to a point where both CAA's and the applicant's project managers are satisfied it will form an adequate basis for managing TC Project phase III.
- Any delegations necessary to implement the PSCP to be issued to the applicant.

TCBM-PSCP Approval Entry Criteria

The following should be achieved in order to convene the TCBM-PSCP approval.

- Applicant should have a suitable a Part 146 Design Organisation approval or a strong relationship a Part 146 Design Organisation.
- Applicant's "to be certified" design is sufficiently mature such that it is expected to meet the certification requirements.
- G-1 IP to be complete (stage 4)⁷.
- Draft PSCP to be complete and agreed by CAA's and the applicant's project managers as being ready for approval.

TCBM – PSCP Approval Exit Criteria (TC Project Phase III Entry)

The following should be achieved in order to successfully exit the PSCP approval phase.

- (1) Closure of all TCBM – PSCP approval critical action items.

3.7. TCBM - Pre-CAA Flight Testing

This TCBM is held during the TC project phase III with its purpose being the following.

- (1) To review the applicant's completion of design, conformity and showing compliance activities.
- (2) To review CAA's preparedness to commence ground inspection and CAA flight testing activities via the type inspection authorisation (TIA).
- (3) For CAA's project sponsor to approve the TIA.

⁷ See section 5 Issue Papers for how the G-1 IP is managed throughout TC project phase III.

Project Phase III – Implementation Deliverables

The following activities should be completed during TC project phase III and their status reviewed at the TCBM - pre CAA Flight Testing.

- CAA to raise IPs as required addressing any previously unforeseen certification issues.
- Applicant to undertake design, analyses, inspections and testing necessary for showing compliance to the certification basis requirements.
- Applicant to create test plans and submit to CAA for approval.
- Applicant to manufacture conforming prototype articles.
- CAA to undertake conformity inspections of prototype articles.
- Applicant to undertake, and CAA to witness applicant testing activities.
- Applicant to generate and submit to CAA substantiating data.
- CAA to identify ground inspection and flight testing activities necessary for certification and document these in draft TIA.
- CAA review of applicant's design and substantiating data to ensure the aircraft is in a safe condition for the intended CAA flight tests.
- Flight test risk management implemented to cover CAA flight testing activities.
- Maintenance review board to be established.
- Draft aircraft flight manual produced.
- Draft Instructions for Continued Airworthiness (ICA) produced.

TCBM - Pre-CAA Flight Testing Entry Criteria

The following should be achieved in order to convene the TCBM - pre CAA flight testing.

- Applicant should have completed all analyses, inspections, ground and flight tests necessary to demonstrate compliance with rules 21.35 and 21.39, with the exception of those inspections and tests that are agreed to be conducted concurrently with CAA.
- TIA drafted by CAA (ready for approval at TCBM). Refer to section 14 of this AC.

TCBM - Pre-CAA Flight Testing Exit Criteria

The following should be achieved in order to successfully exit the Pre CAA Flight Testing phase.

- (1) Closure of all TCBM – Pre CAA Flight Testing critical action items.

3.8. TCBM – TC Issue

This is the final TCBM and is held at the conclusion of the TC project phase III - implementation phase. Its purpose is for the Director of CAA to approve the issue of the TC.

Project Phase III – Implementation Deliverables

In addition to the TCBM-TC issue entry criteria, the following activities should also be completed during TC project phase III prior to issuing the TC.

- Closure of any open IPs.
- TCBM-TC issue critical action items.

TCBM – TC Issue Entry Criteria

The following should be achieved or completed in order to convene the TCBM – TC issue.

- Applicant to have completed all analyses, inspections, ground and flight tests and any other activities necessary to show compliance with rule 21.31 through rule 21.39.
- CAA to have completed all certification inspections, ground tests, flight tests and data reviews necessary to be able to find the applicant's type design and substantiating data shows compliance with the certification basis requirements.
- Flight manual approved by CAA.
- ICA approved by CAA.
- Certification summary report completed by CAA.
- Draft TC and TCDS prepared by CAA.

TCBM – TC Issue Exit Criteria

The following should be achieved in order to successfully exit the Pre CAA Flight Testing phase.

- (1) Closure of all TCBM – TC Issue critical action items.
- (2) Issue of the TC.

4. Certification Basis

4.1. Introduction

During type certification a product's design should be shown to comply with applicable airworthiness design, noise, engine emission and fuel venting requirements (see Part 21 Appendix C) and other requirements (special conditions, exemptions and equivalent level of safety findings). These requirements are collectively referred to as the certification basis.

Identification of the primary airworthiness design standard, noise, engine emission and fuel venting requirements and their associated amendment levels may be a relatively simple exercise for a "conventional" product such as a helicopter or aeroplane. However, the subsequent identification of the need for and establishment of special conditions, exemptions and ELOS findings requires the CAA to have a thorough understanding of the proposed product design. This dictates that the product design baseline should be sufficiently "frozen" prior to finalising the certification basis and entering the implementation phase of the TC project. Any subsequent changes to the product design during the course of the TC project will require consideration of the impact on the certification basis and may result in changes being introduced by way of IPs.

For the issue of a standard category type certificate, the set of airworthiness, noise and engine emission standards prescribed in Part 21, Appendix C (a), (d) and (e) are those of the Federal Aviation Administration and include the Federal Aviation Regulations (FAR) Parts 23 through 36 inclusive.

For the issue of a restricted category type certificate, the set of airworthiness standards prescribed in Part 21, Appendix C (b) are the standards prescribed in Part 21, Appendix C (a) excluding those requirements that the Director finds inappropriate for the purpose for which the aircraft is to be used, or airworthiness design standards that the Director finds appropriate for the purpose for which the aircraft is to be used.

Relevant rules from CAR Part 26 should also be considered for inclusion within the certification basis.

4.2. Establishing the Certification Basis

Establishing the certification basis for a product is a two-way activity conducted between the applicant and CAA which sets out to establish a comprehensive and contemporary set of requirements that the type design will be certified against. The certification basis is established in accordance with rules 21.31 and 21.32.

The applicant will propose a certification basis as part of their initial PSCP draft. This will be reviewed by CAA, altered if necessary and documented in the G-1 IP, which will then be submitted to the applicant for final comment. The entry criteria for the TCBM – requirements definition review, requires the G-1 IP to be at stage 2 of completion (i.e. to include the CAA position statement). Further development of the certification basis may continue throughout the TC project phase II - compliance planning phase, with it being formally approved by the completion of the G-1 IP to stage 4 and then ratified by the TCB at the TCBM – PSCP approval (refer to section 5 of this AC for how the G-1 IP is managed throughout TC project phase III).

4.3. Certification Basis Amendment Level

To ensure that the level of safety embodied in a product's type design is sufficiently contemporary at the time of certification, the amendment level of the applicable requirements to be applied to a new product type design are those that are in effect on the date of TC application. At any point in the TC project, applicants may also elect to comply with a later amendment level but this will then invoke any associated requirements at their later amendment levels also.

Note: Should an applicant apply to make a change to an already issued type certificate under Part 21 Subpart D the certification basis amendment level will be established by the application of the "changed product rule".⁸ The Director considers FAA AC21-101 at the latest revision an acceptable reference when determining which airworthiness requirements to comply with.

Once the certification basis has been agreed with the applicant, it remains valid until the TC application effective period expires (Ref. rule 21.17(b)). If an extension to the original application is submitted, the certification basis will be reviewed by CAA to ensure it remains contemporary. CAA's review may result in new requirements, or later amendment states of existing requirements being incorporated into the certification basis.

⁸ In essence, the "changed product rule" requires the certification basis for a change to be at the latest amendment level unless it can be proven that the change is not "significant" and that compliance with a later amendment for a significant change does not contribute materially to the level of safety.

4.4. Special Conditions, Exemptions and Equivalent levels of safety (ELOS) Findings

Rules 21.23 and 21.31 allow the Director to specify special conditions, issue exemptions and accept ELOS findings for individual TC projects. These all form part of the certification basis for the applicable project.

Special conditions. Special conditions are rules of particular applicability that are developed for a specific project due to its unique/novel/unusual design features or unconventional intended use of the product. The Director may determine that the airworthiness requirements specified in the airworthiness design standards are not adequate to provide a sufficient level of safety for the product. In this case a special condition may be raised which specifies additional airworthiness or design requirements equivalent to that established by the existing airworthiness standards. Special conditions that are used on one certification project may apply to other projects using the same design feature. The basis and content of special conditions are generally developed via the TC IP process detailed later in this document.

ELOS. ELOS findings are made when literal compliance with a certification regulation cannot be shown and compensating factors exist which can be shown to provide an equivalent level of safety. An ELOS finding is the culmination of a process whereby compliance with a particular design requirement has been proposed, demonstrated and finally accepted by a means other than that specified in the design requirement. ELOS findings may be made when a specific design standard cannot be met exactly, but the safety intent of the standard can be met by other means, often by compensating factors. ELOS proposals are put forward by an applicant during the TC project phase I as part of their draft PSCP submission, or during the course of development and testing of components, systems or the aircraft as a whole. ELOS proposals are processed as discrete IPs.

Exemptions. An exemption is a grant of relief from the requirements of a specified airworthiness standard. Under section 37 of the Civil Aviation Act 1990, the Director may, if considered appropriate, grant an exemption from a rule requirement, with appropriate conditions. Before granting an exemption, the Director will consider whether an applicant's proposal provides a level of safety, or risk control and otherwise satisfies the section 37 criteria.

4.5. Certification Basis for Special Classes of Aircraft

For special classes of aircraft (e.g. gliders, airships and other non-conventional aircraft) CAA may need to develop a unique set of appropriate airworthiness standards. In the first instance the appropriate sections from the airworthiness design standards listed in Part 21 Appendix C will be used, followed by the development of special conditions as required to provide an equivalent level of safety to those standards.

4.6. Recording of the Certification Basis

The certification basis is initially recorded in the G-1 IP and any other applicable IPs addressing special conditions, exemptions and ELOS findings. The content of these IPs is transferred into the compliance checklist (CCL) which is part of the PSCP for the recording the status of compliance findings. Any subsequent changes to the certification basis prior to the issue of a TC will be managed via the IP process with the results being transferred into the CCL. At the time of TC issue, the final certification basis is then recorded on the product's type certificate data sheet (TCDS).

4.7. Changes to the Certification Basis

As the TC project progresses through phase III, unforeseen circumstances may dictate the need for a change to the certification basis. This change will be managed utilising the IP process and will require final approval by the TCB. Once the IP is completed to stage 4 the G-1 IP will need to be updated as applicable and the commensurate change(s) transferred to the CCL.

5. Issue Papers

5.1. Purpose of an Issue Paper (IP)

IPs provide a formal means of communication between the applicant, the CAA and any other supporting authorities to address certification issues throughout a project. They allow significant technical, regulatory, and administrative issues that impact certification during a project to be recorded and tracked from initiation through to closure.⁹

5.2. G-1 Issue Paper (IP) (Certification Basis)

As a minimum, each TC project will have one IP raised against it which is identified as the “G-1” IP. This is a “general” IP and is applicable to all type certification projects.

The G-1 IP is the authoritative source for the TC project certification basis. It is raised during phase I and it defines the airworthiness and environmental regulations (noise, fuel venting and exhaust emissions), ELOS findings, special conditions and exemptions that must be complied with for certification (CAR 21.31 refers.) The G-1 IP should provide the definitive justification for selecting the certification basis, including specific amendment levels.

Despite being completed to stage 4 during phase II, the G-1 IP may need to be re-issued at the next revision during phase III to reflect any IPs raised during phase III that impact the certification basis.¹⁰ At the end of phase III, the G-1 IP conclusion is finally updated to reflect all changes made to the certification basis introduced since the initial issue of the G-1 IP and this data is transferred into the type certificate data sheet.

5.3. Other Reasons for Raising an IP

In addition to the G-1 IP, an IP will be raised by CAA for each certification issue¹¹ that is considered to be “significant”. These typically require detailed technical discussions between the parties involved, review of design data and/or hardware and include reasons such as follows.

Equivalent level of safety: Where an applicant is unable to show literal compliance with an airworthiness requirement and proposes compensating factors that provide an ELOS.

Special conditions: If the existing applicable airworthiness standards do not contain adequate or appropriate safety standards for a product because of novel or unusual design features or the intended use of the product is unconventional special conditions will be required and will be initiated using an IP.

Method of compliance: Where the applicant proposes a method of compliance that requires CAA consideration, as a result of peculiarities in the type design or the need to define specific conditions and/or establish the environment under which compliance must be shown (CAR21.31 refers). Areas of new technology or novel design are those that may not require a special condition, but might

⁹ IPs are not used for the management of normal project related issues. The applicant’s and CAA’s Project Managers should manage these using a project issues register.

¹⁰ Should an IP be raised that results in a change to the certification basis or a method of compliance then the G-1 IP must be updated to reflect this change and which will then be reflected in the PSCP and CCL.

¹¹ Each IP will address a single issue only.

require the development of an acceptable means of compliance with existing regulations and which would establish a national precedent.

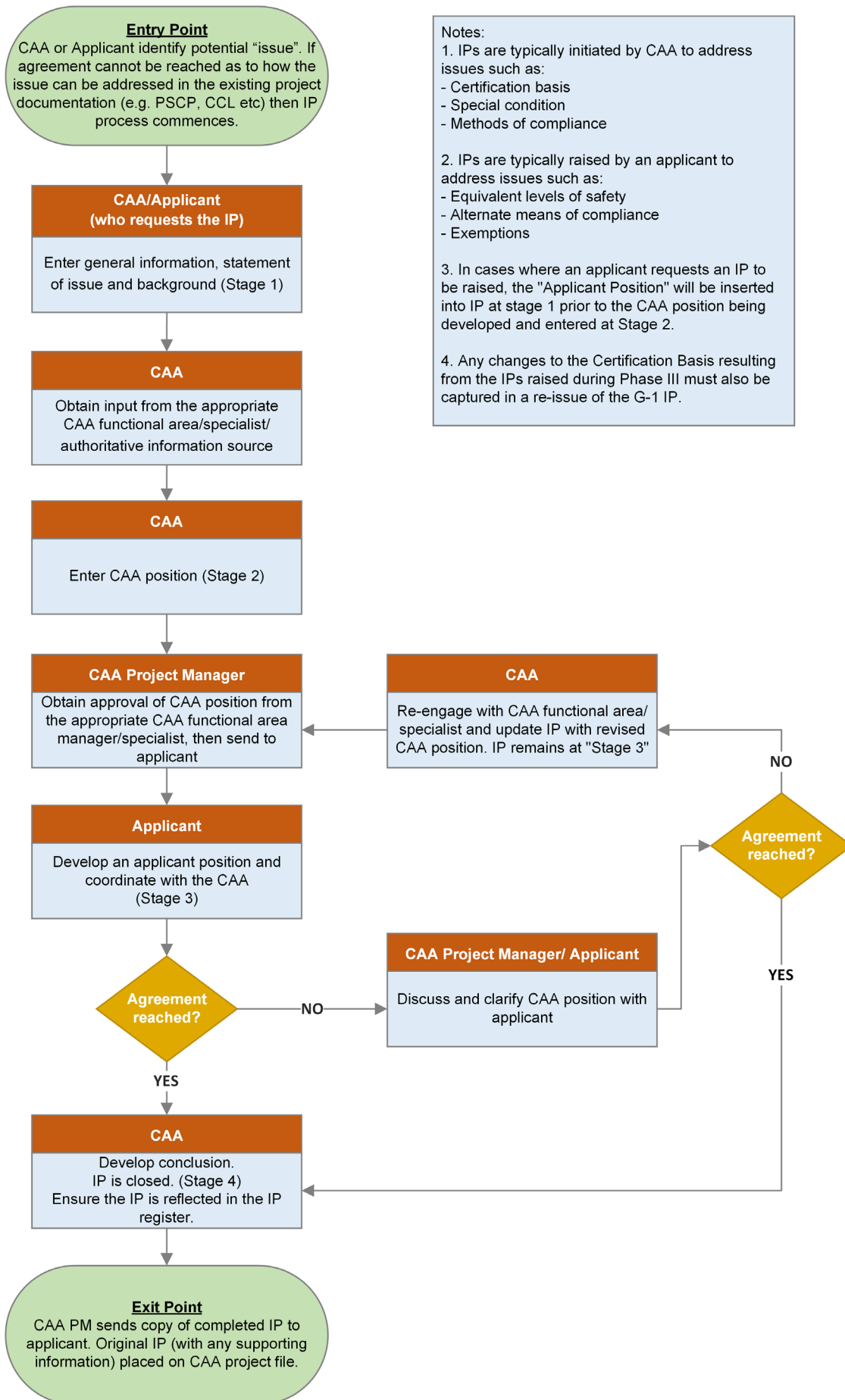
Unsafe features or characteristics: Recording of necessary corrective action of potentially unsafe features or characteristics that could preclude certification in accordance with rule 21.31(3).

5.4. IP Management, Processing and Recording

IPs are prepared by CAA and will normally require a written response from the applicant detailing their position regarding the specific issue. All IPs (both open and closed) are recorded in the IP register which is created during phase I of the TC project and maintained by the CAA TC project manager throughout the project. The IP register forms part of the project certification file. All IPs raised during a TC project should be listed in the certification summary report.

IPs will be processed in accordance with Figure 2: Issue Paper Process.

Figure 2: Issue Paper Process



6. Project Specific Certification Plan (PSCP)

6.1. Introduction

All TC projects require the development and agreement of a PSCP, the primary aim of which is to define and document the agreed plan between the CAA and the applicant to achieve product type certification. The PSCP will be the prime project management tool used by both applicant and CAA for documenting and coordinating essential certification activities necessary to achieve this aim.¹² The PSCP is a shared plan between the applicant and CAA which captures the planning and commitment of resources made by both parties and is developed cognisant of the constraints that both parties are faced with when implementing the plan.

6.2. PSCP Initiation and Development

Drafting of the PSCP is initiated by the applicant during TC project phase I, after they have submitted their TC application, and is developed in conjunction with the CAA throughout phases I and II until it is considered suitably mature for approval at the conclusion of phase II.

Normally the applicant's and CAA's respective project managers should be responsible for the managing, the drafting and development of the PSCP.

6.3. PSCP Acceptance

An approved PSCP is a deliverable of phase II with approval normally occurring at the TCBM-PSCP approval.¹³ In order to demonstrate the commitment of both parties to a shared approach to certification and to ensure that appropriate executive authority has been obtained for the commitment of resources necessary to implement the plan, the PSCP should be endorsed by the CAA project sponsor and an executive in the applicant's organisation (at least at the level of TCB representatives).

6.4. Implementation of the PSCP

Once accepted, the applicant's and CAA's project managers implement the PSCP throughout the TC project phase III in order to manage the certification-related activities undertaken by their respective organisations.

The project managers coordinate with each other to ensure that they can continue to achieve the organisations' commitments in the PSCP and manage the application of allocated resources to do so.

¹² CAA and the applicant may have other internal plans that are necessary for the management of their own project related activities, but these would not address aspects of certification where CAA/applicant interfaces or coordination is required.

¹³ If the PSCP is not approved at the TCBM-PSCP approval, it should be identified as a TCBM critical action Item requiring closure prior to the project progressing to phase III.

6.5. PSCP Content

As a general guide, the PSCP should address the topic areas listed below in sufficient detail such that when implemented, the plan should enable successful management of the TC project resulting in certification of the product. However, it is possible that the following list does not address all topics relevant to specific certification projects. The topics below should therefore be viewed as a “minimum list” with additional areas being added as necessary. In Appendix B: Project Specific Certification Plan (PSCP) Template has been developed to provide a starting point and template for a PSCP. The text in the PSCP template will need to be tailored to the project using the guidance in the following sections.

General PSCP Administrative Information

The following general information should be included in a PSCP:

- PSCP title page identifying the product to be certified, the applicant, the PSCP document identifier and revision state, CAA work request number, signature blocks for the applicant’s and CAA’s respective PSCP approvers and project managers.
- PSCP revision history (revision identifier, date of approval, revision approver, reason(s) for revision).
- Table of contents.
- Reference documents: this section should list reference information relevant to the certification project that is referred to elsewhere in the PSCP. ¹⁴
- Effectivity: identification of when or after what action the PSCP comes into effect.
- Purpose: a simple statement identifying the purpose of the PSCP should be included.
- Amendment of the PSCP: the PSCP is a document that once approved, needs to be kept up-to-date during the TC project phase III. This section should identify when the PSCP will be reviewed and updated (e.g. as a result of TCBMs or project progress meetings) and the tolerances that the respective project managers can work within to approve amendments to the PSCP, beyond which TCB level approval would normally be required. These tolerances should address changes to things such as:
 - The product design.
 - The certification basis and/or means of compliance.
 - The impact on project schedule and resources required to implement the PSCP.

Note: Significant changes should require immediate update of the PSCP while minor changes may be aggregated into a regular update schedule.

- Minimum periods of notice for CAA conformity or compliance inspections and time required for CAA data review and test plan acceptance activities.

¹⁴ The reference data section should not be list of documents that may have current or future relevance to the certification project but are not referred to elsewhere in the PSCP.

Project Description

A general description of the TC project should be provided followed by a detailed description of the product to be certified. The product description should include the following:

- General product description including dimensions, specifications, characteristics, operating limitations.
- Operating environment and perceived use, including overt statement regarding aspects of certification being sought (e.g. day/night VFR only, in non-icing conditions, without provisions for ditching etc.).
- Product details (ideally addressed system by system) sufficient for someone new to the project to obtain a level of understanding that allows the remainder of the PSCP to be put in context. This infers information regarding the following¹⁵:
 - Aircraft, system, subsystem and component level design details¹⁶ including:
 - incorporation of airborne software¹⁷.
 - incorporation of complex hardware¹⁸.
 - Aspects of the design that are novel or unusual, for example new materials or processes.
 - Materials used.
 - Construction methods.
 - Manufacturing processes.
 - Security aspects (where applicable).
 - Equipment permanently fitted and the implementation of its capabilities¹⁹.
 - Optional equipment fitment.
 - Items designed and manufactured by the applicant versus those procured from suppliers.
 - Prior certified aspects of design (e.g. equipment TSOs).
 - Non-certified aspects of equipment.
 - Items and /or components considered to be either “primary structural elements” or “critical parts”.

¹⁵ Extensive use of diagrams and schematics supported by detailed descriptions is recommended.

¹⁶ When discussing the aircraft powerplant an overt statement should be included that it will be operated within its certified design envelope (if this is to be the case).

¹⁷ A design that incorporates elements of airborne software will require the creation of a Plan for Software Aspects of Certification (PSAC) separate to the PSCP (see discussion on PSACs at the end of this section).

¹⁸ A design that incorporates elements of complex hardware will require the creation of a Plan for Hardware Aspects of Certification (PHAC) separate to the PSCP (see discussion on PHACs at the end of this section).

¹⁹ Installed equipment may have aspects of its functionality limited by way of the implementation approach adopted.

- Discussion regarding the applicant's preliminary functional hazard analysis / system safety assessment activities and any influence this has had on the product design and the certification basis.

Project Stakeholders, Roles, Responsibilities and Levels of Authority

The PSCP should identify the following stakeholders as a minimum:

- The applicant (including reference to their application for TC and their Part 146 / 148 approval(s) if held).
- The applicant's organisational structure and certification team members.
 - The PSCP should reiterate that the applicant is to ensure they comply with their Part 146 / 148 expositions when conducting any activities in relation to the TC project.
- CAA certification team members.
- Type certification board members.

The roles, responsibilities and scope of project authority of each of the named individual and collective stakeholders should also be presented.

Communication and Coordination

The success of a TC project will be heavily reliant on the effectiveness of the communication and coordination within and between the applicant's and CAA's certification project, stakeholders and teams, and any other participating parties such as suppliers and foreign aviation authorities. Consideration needs to be given to who with and how communication should be undertaken throughout the project and documented in the PSCP.

It is recommended that focal points within each organisation be identified and kept to a minimum to avoid potential conflict. The applicant and the CAA project managers should be kept informed of all critical communications; while this does not preclude team members from communicating with each other they need to ensure that the respective project managers are kept informed.

Certification Basis

The initial draft of the PSCP will include the applicant's "proposed" certification basis (refer to section 4 of this AC), including the primary airworthiness, noise, and engine emissions standards and their respective amendment levels, Part 26, additional airworthiness requirements, special conditions, ELOS and exemptions. By the time that the PSCP is ready for approval, this section is to reflect and make reference to the agreed certification basis documented in the project G-1 IP (refer to section 5.2 of this AC) and any special conditions, ELOS and exemptions agreed as being applicable.

Compliance Checklist

A compliance checklist listing all the applicable requirements of the certification basis is to be included which identifies the applicable individual requirements, amendment level and proposed method of showing compliance. This should be drafted in accordance with the guidance provided in section 7 of this AC and attached as an Annex to the PSCP. Like the certification basis, the initial draft will reflect the applicant's proposed CCL and the approved PSCP will reflect the CCL that is reflective of the agreed certification basis in the project G-1 IP.

Schedule

A project schedule²⁰ is to be included in the PSCP that identifies the required project milestones, activities and deliverables needing to be achieved, undertaken or produced in order to achieve type certification. When viewed in conjunction with the CCL and a list of compliance documentation to be generated, the schedule should identify when activity related to the creation and submittal of compliance data, conduct of conformity and compliance inspections, and the conduct and witnessing of ground and flight testing will be undertaken.

While the schedule should be sufficiently detailed, the PSCP schedule can be considered the “Master Schedule” and only address the high level project milestones and activities if subordinate plans incorporating sufficiently detailed schedules are created for project aspects such as the creation and submission of compliance data, conformity and testing activities.

An applicant should be able to justify their proposed schedule at a level of detail sufficient to provide CAA with suitable confidence that the planned activities can be reasonably achieved within the proposed timeframe. The schedule should therefore be realistic; overly optimistic schedules may result in undue pressure on those involved in the TC project and so create a safety or compliance risk that will not be accepted by the Director.

Conformity

The PSCP should identify how product conformity will be established and maintained throughout the TC project. Due to the scope of and complexity of project conformity related activities it is recommended that separate conformity inspection plan be included as an annex to the PSCP which should address those aspects discussed in section 8 of this AC including the following:

- Planning of conformity activities.
- Requesting of conformity inspections.
- Conduct of conformity inspections.
- Statements of conformity.
- Recording of conformity inspections.

Engineering Compliance Inspections

The PSCP should include details of any required engineering compliance inspections and can be captured as part of the applicant’s testing plan. As CAA’s engineering compliance inspections are normally conducted as part of the ground and flight type inspections conducted under the TIA reference to their inclusion in this document is sufficient for initial PSCP approval. However, consideration should be given to ensuring that sufficient time is allocated to the conduct of these activities. As the project progresses and the TIA is drafted the PSCP should be updated to reflect activities to be conducted under the TIA.

²⁰ A Gantt chart supported by descriptive text is recommended

Testing

Due to the scope and quantity of testing required for a TC project a separate master test schedule is recommended as an annex to the PSCP. It should detail all proposed compliance testing activities (component and assembly qualification, ground and flight) and when they are scheduled to be undertaken. These activities are in addition to the considerations identified in sections 10 and 11 of this AC. This section of the PSCP should address the following:

- Creation of test plans and their submittal to CAA for approval.
- Generic and specific pre-requisites for conduct of a test.
 - Drawings and specifications sufficiently describing the design and production of the test article, authorised by the applicant.
 - CAA-approved test plan, including a description and/or drawing of the test set-up, instrumentation, calibration requirements, etc.
- Test witnessing considerations.
- Process for obtaining experimental airworthiness certificate(s).
- Applicant test pilot requirements.
- Flight test risk management activities.

As CAA flight testing will be conducted as part of the ground and flight testing conducted under the TIA, reference to their inclusion in this document is sufficient for initial PSCP approval. However, consideration should be given to ensuring that sufficient time is allocated to the conduct of these activities. As the project progresses and the TIA is drafted the PSCP should be updated to reflect activities to be conducted under the TIA.

Delegation

In order to streamline activities during the TC process, CAA may be reliant upon conformity and compliance findings made by the applicant. This should be formalised by way of delegations to the applicant as deemed appropriate by CAA. Delegations to undertake activities such as conformity inspections, witnessing of tests and undertaking compliance inspections may have already been issued to the applicant under their Part 146 or 148 organisational approvals. These may need amending to reflect specificities of the TC project or new delegations may need to be issued.

The PSCP should be specific as to what aspects of the project are delegated and what if any stipulations, coordination, or limitations are placed upon that delegation. It should be clear to applicants that any delegated activities are conducted on behalf of the CAA, and thus requires a working environment where delegated individuals can undertake compliance and conformity findings free from any undue pressure.

Compliance Documentation

The PSCP should identify all compliance data that will be generated by the applicant during the TC project and when it is planned to be submitted to CAA. The PSCP should also identify the means by which the applicant will submit the data to CAA, the means by which it will inform CAA of its

submission and reiterate that all data will be submitted with a *Statement of Compliance* (CAA [Form 8110-3](#)).²¹ Further details of certification data and requirements for its submission to CAA can be found in section 12 of this AC. If the applicant has any specific requirements for the handling of its data beyond those in sub-section 12.8 of this AC they should be included here also.

Production Certification

The PSCP should identify that the production of prototype articles and subsequent production articles will be achieved under a suitable Part 148 organisation approval.

Continued Airworthiness Responsibility

Brief details should be included as to how the applicant (as the TC holder) and the CAA will manage the continued airworthiness of the product and related issues after delivery of the first aircraft or issuance of the standard airworthiness certificate. This will be consistent with CAA rules and policies and should therefore provide cross-references to the existing sources of authoritative data.

Management of Project Issues

Identification should be included in the PSCP addressing how issues that arise throughout the course of the TC project are to be recorded and managed and by whom. As a minimum, a “project issues register” and a “meeting action items register”, both shared between the applicant and CAA, should be created and managed between the respective project managers. Additional registers or logs may be raised as considered appropriate for the specific project.

Additional PSCP Topics

While the preceding list identifies the minimum requirements for a TC project PSCP, the specific project may dictate that additional topics are addressed in the PSCP (e.g. details of any proposed foreign aviation authority involvement such as post CAA NZ TC validation or technical assistance requirements). These should be included as agreed appropriate between the applicant and the CAA.

6.6. Plan for Software Aspects of Certification (PSAC)

In addition to the PSCP, type certification projects that require the certification of software aspects will require the development and approval of a plan for software aspects of certification (PSAC). This plan is produced by the applicant in order to describe how they will satisfy the objectives of *RTCA/DO-178 - Software Considerations in Airborne Systems and Equipment Certification*.²² The PSAC is the primary means by which CAA will determine whether an applicant is proposing a software life cycle that is commensurate with the rigor required for the design assurance level of software being developed.

²¹ Applicants should note that the CAA will not accept the submission of “Draft” data.

²² The CAA recognises FAA AC20-115C an acceptable means of compliance for the software aspects of type certification and which identifies RTCA/DO-178C as being acceptable for this purpose.

The PSAC will identify other software related plans to be produced by the applicant, all of which are required to manage the certification of any software aspects of a TC project, irrespective of the design assurance level of software level²³ to be certified.

- Software development plan (SDP) – may be included in the PSAC.
- Software verification plan (SVP).
- Software configuration management plan (SCMP).
- Software quality assurance plan (SQAP).
- Software accomplishment summary.

Production of the PSAC

As the PSAC is subordinate to the PSCP the applicant can submit a draft PSAC to CAA after they have submitted their draft PSCP and it has undergone initial review by CAA. The PSAC will require approval by CAA prior to the TC project commencing phase III.

6.7. Plan for Hardware Aspects of Certification (PHAC)

In addition to the PSCP, type certification projects that require the certification of complex²⁴ hardware systems will require the development and approval of a plan for hardware aspects of certification (PHAC). This plan is produced by the applicant in order to describe how they will satisfy the objectives of *RTCA/DO-254 /Eurocae Document 80 – Design Assurance Guidance for Airborne Electronic Hardware*.²⁵

The PHAC is the primary means by which CAA will determine whether an applicant is proposing a hardware life cycle that is commensurate with the rigour required for the design assurance level of the hardware and systems being developed. The PHAC will identify other related plans to be produced by the applicant, all of which are required to manage the certification of any complex hardware aspects of a TC project.

- Hardware design plan (may be included in the PHAC).
- Hardware validation plan (may be included in the PHAC).
- Hardware verification plan (HVP) - (may be included in the PHAC).
- Hardware configuration management plan.
- Hardware process assurance plan.
- Hardware accomplishment summary.

²³ RTCA/DO-178C defines software design assurance levels from Level A through Level E which are commensurate with the impact that anomalous behaviour of the software would have on the safety of the affected system(s).

²⁴ A hardware item is considered “complex” if a comprehensive combination of deterministic tests and analyses cannot ensure correct functional performance under all foreseeable operating conditions.

²⁵ The CAA recognises FAA AC20-152 an acceptable means of compliance for complex hardware aspects of type certification and which identifies RTCA/DO-254 as being acceptable for this purpose.

Production of the PHAC

As the PHAC is subordinate to the PSCP the applicant can submit a draft PHAC to CAA after they have submitted their draft PSCP and it has undergone initial review by CAA. The PHAC will require approval by CAA prior to the TC project commencing phase III.

7. Compliance Checklist (CCL)

7.1. Introduction

The CCL is a detailed reflection of the TC project certification basis documented in the G-1 IP. It is used to record how an applicant intends to show compliance against the applicable requirements, as well as summarise an applicant's completeness of showing compliance.

The initial draft of the CCL is submitted by the applicant to CAA as part of their draft PSCP. As the CAA subsequently develops the G-1 IP, special conditions, exemptions and ELOS, the CCL content is refined to reflect these. The CCL is approved at the TCBM-PSCP approval as being an accurate reflection of the contents of the G-1 IP.²⁶

Note: Due to its size and the nature of the CCL it is recommended that it be captured as an Annex to the PSCP or a separate document.

Once the project enters the implementation phase, the CCL is regularly updated to record the applicant's evidence that shows compliance with the applicable requirements. As situations arise throughout the TC project that require an alteration to the certification basis, these will be captured in updates to the G-1 IP and will then be transferred to the CCL.

Once compliance with all requirements of the certification basis has been shown, the CCL should be completed with the addition of a final statement of compliance (SOC) as per the format presented later in the section. This final SOC is in addition to those submitted that are issued upon the release of data throughout the TC project (refer to section 13 of this AC).

7.2. Statement of Compliance (SOC) and Finding of Compliance Responsibility (FOC)

An SOC is a declaration that a particular certificate rule or requirement has been met and references the evidence that substantiates the compliance claim. The **applicant is responsible for making all SOCs** against every requirement within the certification basis. Refer to section 13 of this AC for guidance. The applicant may wish to indicate the person who will be responsible for making SOCs with the individual airworthiness requirements in the CCL.

An FOC against each requirement in the certification basis must be made by either a **Design Delegation Holder (DDH) or the CAA**.

Agreement should be reached between CAA and the applicant over who will find compliance against each requirement. When drafting the CCL, the applicant should identify which requirements that the DDH will find compliance against. These requirements must fall within the scope of the DDH's

²⁶ The G-1 IP should be considered the authoritative source for the project certification basis, with the CCL being subordinate to this.

delegation. CAA will review the application and may request that the applicant changes the finding of compliance responsibilities.

7.3. Content of the CCL

As a minimum the CCL is to include the following information (an acceptable format is presented in Appendix A, Compliance Checklist Template):

- The product to be certified - make and model.
- The primary certification basis and amendment levels (airworthiness, noise, engine emissions, fuel venting, special conditions, exemptions and ELOS findings).
- The configuration of the product that the CCL identifies compliance against.
- A final statement of compliance (only required to be completed once compliance with all requirements in the CCL have been shown) that states the following.

*In accordance with rule 21.37(b) I certify on behalf of **[insert Applicant Name]** that with respect to the **[insert Product Make, Model]** type design as defined by **[insert Master Drawing #, Revision #]** **[insert Applicant Name]** have complied with all applicable requirements identified in the certification basis **[insert primary certification basis and amendment levels]** listed in this Compliance Checklist on pages 2 through **[insert last CCL page #]**. Compliance with the certification basis requirements has been shown using the methods of compliance identified herein, and is documented in the respective substantiating documents and others identified in **[insert Master Data List XXXX Rev #]**. The type design defined by **[insert Master Drawing #, Revision #]** contains no features or characteristics that would make any **[insert Product Make, Model]** manufactured conforming to that type design unsafe for its intended use when operated in accordance with **[insert Flight Manual # Rev #]** and maintained in accordance with **[insert Maintenance Manual# Rev #]**.*

A checklist that identifies the following:

- The applicable regulations/ requirements (Each rule should be broken down to the maximum extent required²⁷).
- The applicable amendment level for each regulation/requirement.
- Methods of compliance:
 - **Analysis (A)** includes a quantitative or qualitative assessment, as appropriate, of structures, systems, components, or the entire aeronautical product. Analysis may be a precursor to ground and flight tests and a validation of the design. Analyses should be validated using published previous experience or appropriate testing to be accepted for showing compliance to the requirements.
 - **Design (D)** encompasses the inherent features of structures, systems, or components and is used when inspection of drawings, bill of materials, or other documentation

²⁷ Where compliance with subparts is demonstrated by the same method of compliance, means of compliance and document, subparts may be grouped. The overall philosophy is to be as detailed as possible, without undue repetition.

such as material specifications are required to establish compliance with the applicable requirements.

- **Flight test (FT)** is a test of the aircraft in the air or on the ground when the nature of the test requires a flight test pilot.
 - **Ground test (GT)** includes component bench testing, testing of systems on a rig and ground testing of the product itself. These tests may precede a flight test or be used discretely to show compliance when appropriate.
 - **Inspection (I)** is used when an engineering compliance inspection of a component, installation or the product itself is required to establish compliance with the applicable requirements.
 - **Similarity (S)** is used when comparison between a previously certificated design (of the applicant's) and the proposed design show that they are the same in all ways relative to showing compliance with the applicable requirement, so the proposed design will perform the same or better than the previously certificated design. The applicant should account for any differences in the requirements if the amendment levels of the requirements differ for the two designs.
 - **Equivalent level of safety (ELOS)** see section 4.4 of this AC for discussion of this.
 - **Petition for exemption (EXE)** see section 4.4 of this AC for a discussion of this.
 - **Not applicable (N/A)** is stated when the specific regulation does not apply to the design or product making a showing of compliance unnecessary. The reason for the rule not being applicable should be included in the "Applicable Guidance, References, and Remarks" column of the checklist.
- The applicant's documents that substantiate their compliance against the applicable requirement (plan, drawing, report I.D. incl. revision number).
 - The person that will find compliance to the requirement: either an individual Design Delegate Holder (should be individually named) or the CAA.
 - Applicable means of compliance i.e. guidance material used to show compliance, references such as relevant AC's, industry consensus standards, and remarks or comments as appropriate.

8. Conformity

8.1. Introduction

Conformity of test articles, prototype components, assemblies, installations and the assembled prototype product against the type design is a fundamental aspect of type certification and must be established in order to demonstrate compliance against the requirements of the certification basis. The regulatory basis for this activity relates to CAR 21.35, 21.37(a) and 21.39(b)(iii). Conformity is established by way of conducting inspections that confirm the following:

- All components of the product conform to drawings in the proposed type design.
- The materials and product conform to the specifications in the proposed type design.
- Manufacturing processes, construction and assembly conform to those specified in the proposed type design.
- Test articles conform to descriptive data.
- Compliance inspection articles conform to descriptive data.
- The type design can be replicated.

Rule 21.35(b)(1) requires the applicant to allow CAA to conduct any conformity inspections it chooses during the type certification process. However, CAA may elect to inspect for conformity via sampling or other means it assesses as being appropriate in the circumstances, with this being recorded in the conformity inspection plan.

8.2. Planning Conformity Activities

Due to the scope and complexity of conformity related activities required during a TC project, an applicant should develop a conformity inspection plan. This will ensure that adequate consideration is given to the planning of conformity activities and the resources required to achieve them. As a minimum, the conformity inspection plan should identify.

- The proposed conformity inspection activities²⁸.
- Locations of facilities where conformity inspections will take place.
- When each proposed activity is to take place (to the extent possible).
- Roles and responsibilities for conformity related activities, including:
 - identification of conformity inspections to be undertaken by CAA.
 - identification of conformity inspections delegated to the applicant²⁹

²⁸ As CAA may also require Vendor parts that undergo qualification testing to be subject to conformity inspection prior to testing it is essential that the PSCP contains sufficient detail regarding what parts are manufactured by the applicant and what are Vendor-supplied parts.

²⁹ The applicant's Part 148 authorised Form 1/Statement of Conformity holder may be delegated the authority to undertake conformity activities on behalf of CAA.

- who within the applicant's organisation is authorised to undertake conformity inspections.
- Use of conformity related documentation, including procedures for:
 - submitting requests for conformity inspections by CAA.
 - issuing statements of conformity.
 - conformity inspection records.
- How non-conforming items will be treated and by whom.
- Configuration control procedures³⁰ for conformed articles, including:
 - how custody of conformed articles produced overseas is assured between the overseas location and the applicant's NZ production facility.
 - quality assurance of supplier parts which cannot be inspected on receipt.
 - treatment of conformity deviations identified.
 - notification to CAA of changes to test articles post conformity checks.
- Applicant's intentions for the use of prototype aircraft or components thereof at the completion of the TC project and the impact this has on conformity activities.

As CAA will retain the discretion to make any and all inspections necessary to determine compliance with the applicable requirements CAA is responsible for approving the final content of the conformity inspection plan.

8.3. Requesting a Conformity Inspection

While the applicant's conformity inspection plan will document when conformity inspections are scheduled, applicants are required to submit a completed *Request for Conformity* (CAA [Form 8120-10](#)) to CAA with the appropriate minimum period of notice³¹ in order to provide CAA with the information necessary to conduct the requested conformity inspection.

8.4. Conduct of Conformity Inspections

Conformity inspections are to be conducted by CAA personnel or an authorised person within the applicant's organisation. Rule 21.35(a)(2), (3) and (4) require an applicant to successfully conduct a conformity inspection prior to conducting engineering compliance inspections and tests (ground or flight). CAA will also conduct its own independent conformity inspection under the type inspection authorisation, prior to it undertaking any engineering compliance inspections and certification testing (ground or flight).

³⁰ Procedures may refer to the applicant's approved Part 148 Manufacturing Organisation procedures if appropriate.

³¹ For conformity inspections conducted within New Zealand, CAA require a minimum of 10 working days notice. For conformity inspections conducted outside of New Zealand, CAA require a minimum of 1 month's notice.

8.5. Conforming Articles to the Type Design

There are four typical levels of conformity inspections:

- **Test article and test setup conformity.** These inspections use design data and approved test plans to determine conformity of the respective articles.
- **Component conformity.** These inspections review all design data and production records used to produce the parts and build assemblies. Inspection of the production process will also be necessary to ensure the acceptable quality of a part or assembly that cannot be completely assured once produced. That is particular attention to a conforming process is required for composite material components.
- **Installation conformity.** These inspections review all design data and production records used to install components and assemblies on an aircraft.
- **Aircraft level conformity.** With these inspections required prior to commencing ground and flight testing, this inspection physically verifies that the aircraft meets the minimum requirements for quality, conforms to the TC design, and is safe for the intended ground and flight tests to be conducted.

In all four scenarios, the components, assemblies, their installation and the product itself should conform to the design data (known deviations may be accepted if they are declared by the applicant and have a corresponding plan for their resolution that is acceptable to CAA. The test article must be representative of the final design such that any test results are valid for the final design (CAR 21.35(a)(3) refers). In undertaking its conformity inspections, CAA will typically examine the test articles, components, assemblies or installations in relation to some or all of the following documents and records:

- Design data (drawings, process instructions, test specifications).
- Material certifications.
- Production records (job cards, work inspection reports, test reports).
- Purchase orders.
- Vendor certificates.

8.6. Statements of Conformity

As per rule 21.37(a) the applicant must issue a *Statement of Conformity* using CAA [Form 8130-9](#) for any test article, prototype component, installation or assembled prototype product prior to a formal CAA conformity inspection of the article being conducted. While CAA will accept receiving the completed *Statement of Conformity* upon their representative's arrival at the applicant's inspection facilities, it is recommended that the completed CAA [Form 8130-9](#) is submitted to CAA earlier than this if possible to inform CAA that the applicant is fully prepared for the inspection.

The applicant may declare known deviations from the type design on the CAA [Form 8130-9](#) but should include a statement of how these will be resolved or incorporated into the final type design.³²

³² The applicant must have a robust configuration control system in place to ensure that the final design submitted to CAA incorporates all changes found necessary as a result of compliance inspections and testing.

These will be assessed as part of the conformity inspection process and their impact on any subsequent inspection or test is to be determined.

Note: A “Statement of Conformity” (CAA Form 8130-9) is not to be confused with a “Statement of Compliance” (CAA Form 8110-3) issued under CAR 21.37(b). The 8130-9 attests that a physical article has been found to conform to its specified design while the 8110-3 attests that data substantiates compliance to airworthiness design requirements.

Treatment of Non-Conformities

All non-conformities³³ identified during a conformity inspection should be notified to the respective project managers and resolved prior to commencing any subsequent test activities as leaving them unresolved may invalidate any test results obtained.

8.7. Recording of Conformity Inspections

The results of all CAA conformity inspections are to be recorded on a *Conformity Inspection Record* ([CAA Form 8100-1](#)), including all deviations and non-conformities and the corrective actions required for their resolution.

9. Engineering Compliance Inspections

9.1. Introduction

Any aspect of a product’s design for which compliance with the certification requirements cannot be ascertained through the review of drawings or reports should undergo an engineering compliance inspection. This regulatory basis for engineering compliance inspections stems from rule 21.35. The purpose of an engineering compliance inspection is to verify that an installation complies with the applicable certification basis requirements. These inspections provide an opportunity to review an installation, its relationship to and compatibility with other installations and the product as a whole.

Note: An engineering compliance inspection should not be confused with a conformity inspection. However, a conformity inspection should be conducted prior to engineering compliance inspections to ensure that the component or installation undergoing the compliance inspection conforms to the type design.

9.2. Need for Engineering Compliance Inspections

The need for an engineering compliance inspection is usually identified in the relevant guidance material. CAA may, however, identify aspects of the product to undergo engineering compliance inspections at its discretion. Examples of typical compliance inspections are as follows:

- Interior compliance inspections:
 - accessibility/inspection provisions – 14 CFR §2X.611
 - doors - 14 CFR §2X.783
 - compartment interiors - 14 CFR §2X.853

³³ Non-conformities are those configuration discrepancies that are not known or declared by the applicant at the time of submitting the Form 8130-9 while Deviations are known and declared by the applicant.

- placards and markings - 14 CFR §2X.1541 – §2X.156X
- System routing inspections – e.g. control, hydraulic, electrical and fuel system routing.
- Control system inspections – e.g. ease of operation, interference etc.
- Powerplant installation inspections.

9.3. Conduct of Engineering Compliance Inspections

The conduct of compliance inspections should follow an applicant's inspection plan and be reported on by the applicant and submitted as part of their substantiating data package. Each airworthiness requirement for which compliance was inspected should be identified, along with confirmation that compliance was found. The report should also identify the configuration of the product or component thereof that underwent inspection, along with confirmation that it was found to conform to the type design prior to the compliance inspection being undertaken.

While engineering compliance inspections are undertaken by the applicant throughout the TC project phase III, CAA's engineering compliance inspections are normally conducted as part of the ground and flight type inspections conducted under the TIA (refer to section 14 of this AC) with the results being recorded in the type inspection report (TIR).

At its sole discretion CAA may elect to delegate the authority to undertake engineering compliance inspections to DDHs within the applicant's design organisation. As engineering compliance inspections for aircraft interiors are generally more complex than other compliance inspections, these inspections are not typically delegated.

Notification of Non-Compliances

Should CAA identify a non-compliance as a result of its engineering compliance inspections, the applicant will be informed in writing. It is the applicant's responsibility to make the changes necessary in order to resolve the non-compliance prior to submitting updated evidence that compliance has now been shown.

Recording of Engineering Compliance Inspections

The results of all engineering compliance inspections undertaken by the applicant should be recorded and presented as part of the substantiation data package. Linkages between the product design, the configuration of the product inspected, the requirement(s) being inspected for compliance and how compliance was established (or not) should be presented.

Engineering compliance inspections undertaken by CAA as part of the TIA activities should be recorded and reported in the type inspection report.

10. Testing and Test Witnessing

10.1. Introduction

In accordance with rule 21.35(a), an applicant for a TC must perform the tests necessary to show that the product complies with the applicable airworthiness requirements (compliance testing). In accordance with rule 21.35(b), CAA is then subsequently able to undertake testing to verify the applicant's test results (certification testing). All compliance and certification testing should be conducted in accordance with tests plans accepted by CAA, be undertaken on test articles that conform to the type design and be witnessed by CAA or a delegated individual within the applicant's

organisation. Where it is deemed appropriate by CAA the two testing activities may be undertaken concurrently.

In addition to compliance testing, the applicant may also elect to conduct developmental tests to provide a level of confidence in the design without including this test data in the final substantiation. An applicant's developmental testing does not require approval by CAA, except where it involves flight test. However, credit for type certification cannot be granted.

CAA have also produced AC 21-10 - Experimental Flight Testing Guidance which provides more detailed guidance regarding flight test practices.

10.2. Test Plans

Prior to any compliance or certification test being carried out, a test plan (also called a test schedule) should be prepared by the applicant and submitted to CAA for review and acceptance. The purpose of each test plan is to ensure that testing is planned and conducted in a structured and methodical manner. This will ensure that the relationship between the certification basis requirements and how each respective test will show compliance against them is clear, traceable and verifiable. In order to achieve this, each test plan should include the following:

- A list of the specific certification basis requirements for which compliance is to be shown.
- A description of the item to be tested (test article) including details of its configuration.
- Details of any test equipment, including calibration requirements and test setup (e.g. test rigs, fixtures or facilities).
- A description of how the test will be conducted and how compliance is expected to be shown.
- A step-by-step test procedure / sequence.
- Defined pass/fail criteria and a description of how this will be determined (for each step if required).

10.3. Pre-Testing Conformity Inspections

Rule 21.35(a)(2), (3) and (4) require an applicant to ensure that before any compliance or certification testing is undertaken, the test article and the associated test equipment and setup must conform to design data. To satisfy these requirements a conformity inspection of the test article and test set-up should be completed and a corresponding statement of conformity issued prior to each respective test commencing (refer to section 8 of this AC). Robust configuration control of the test article is necessary to ensure any subsequent changes are documented and substantiated.

10.4. Witnessing of Tests

All compliance and certification tests are required to be witnessed by an individual authorised to do so and who is not participating in the test itself. An authorised witness is required to verify that the test procedures described in the test plan are adhered to and that any results captured, either manually or via test instrumentation, appear to be valid data for the test in question.

The witness should be an authorised individual from the applicant's organisation. CAA test witnesses may elect to witness the entire tests or only some specific test steps. If CAA does not witness all test steps, an individual within the applicant's organisation will be delegated the authority to act as a witness for those steps not witnessed by CAA.

- The test plan should identify the person responsible for witnessing each test.

- Where compliance tests are performed on foreign soil the Director may delegate witnessing responsibilities to a representative of the national aviation authority for the state in which the test is to take place.

10.5. Conduct of Tests

The minimum participants for conducting are the authorised witness and a knowledgeable representative from the applicant's organisation who is capable of performing the test and recording the results. Depending on the nature and complexity of the test, more than one individual may be required from the applicant's organisation to run the test and record the results. Alternatively, in some cases (e.g. flight tests of single-seat aircraft) the number of test participants can only be one person. For such testing, the applicant's and/or CAA's flight test pilot will act as both test conductor and witness.

When conducting a test, the test plan should be strictly adhered to. The entire test should be undertaken, although any failures encountered need to be assessed for their impact on safety and the validity of continuing on with the test.

10.6. Test Reports

At the conclusion of a test the applicant is to prepare a test report which is to be submitted as part of the substantiating data for the TC. As a minimum a test report should include the following.

- Reference to the approved test plan along with confirmation that the test was conducted in accordance with that plan.

Note: *If the test was not conducted in accordance with the approved test plan a description of the deviations from the plan must be clearly identified along with a justification for the continued validity of the results.*

- A list of the airworthiness requirements for which compliance was shown.
- Identification of the applicant's employee(s) performing the test and recording the results, the test witness, the test date and location.
- Certification by the authorised test witness that the test plan was adhered to.
- Confirmation that the test was conducted on an article whose configuration conformed to the type design. This should be via reference to the *Statement of Conformity* (CAA [Form 8130-9](#)) issued for the test article prior to the test and the corresponding *Conformity Inspection Record* (CAA [Form 8100-1](#)).
- Confirmation that the test set-up conforms to that defined in the test plan and any applicable type design data.
- Details of any instrumentation used in the conduct of the test and its calibration status.
- Results of each test step including details of observations or other relevant information.

Note: *If, for any reason, a test failure is encountered, the test report should not be submitted to CAA until the applicant has determined the cause for the test failure and determined how it proposes to address that cause, or provide justification as to why the failure is considered irrelevant in the context of the respective certification requirement.*

- Details of any analysis of test results or data reduction needed to interpret the test results.
- Conclusions that can be drawn from the test results.

Once completed, the applicant should submit the test report to CAA under a *Statement of Compliance* (CAA [Form 8110-3](#)).

11. Flight Testing

11.1. Introduction

During a TC project, flight testing activities are undertaken to evaluate the aircraft's performance, flight characteristics, operational qualities, and equipment operation. They are also used to establish operational limitations and substantiate procedures and pilot information. FAA ACs 23-8, 25-7, 27-1, and 29-2 at the latest revision provide guidance on how to demonstrate compliance against flight testing requirements.

CAA AC 21-10 provides specific guidance on how to conduct flight test activities within New Zealand.

All flight testing activities conducted during a TC project fall into one of the following categories.

- (1) **Developmental flight testing** is applicant only flight testing activities and undertaken in order to prove the design concept and determine the likelihood of it meeting the applicable requirements.
- (2) **Flight testing to show compliance** are applicant-only flight testing activities and are undertaken to show that the type design and product meet the requirements of rules 21.35(a) and 21.39(a) (airworthiness and functioning and reliability requirements).
- (3) **CAA flight testing** are testing activities undertaken by CAA in order to meet the requirements of rule 21.35(b). They incorporate all activities (on ground or in flight) that are required to be undertaken by a CAA flight test pilot or a flight test pilot within the applicant's organisation delegated to perform those activities. CAA flight tests are used by CAA to verify the flight test data reported by the applicant or to obtain compliance data for flight testing conducted concurrently with the applicant.

11.2. Flight Test Plans and Reports

Applicant's Flight Test Plan

The applicant is required to prepare a flight test plan which should be submitted to and approved by CAA prior to the issue of a *special category - experimental* airworthiness certificate for flight testing to show compliance. The following information should be included in a flight test plan:

- Applicant approval block including applicable signatories.
- A document revision history.
- A high level summary of the purpose of the flight test plan.
- Applicable reference documents.
- A description of the aircraft configuration to be tested, and how the test aircraft will be verified as conforming to type design data.
- A description of how the aircraft configuration will be managed and communicated to the CAA throughout the test programme.
- Identification of the base airfield and test area of operation.
- Identification of the test pilot undertaking the flight testing.
- Identification of any other personnel planned to be on board test aircraft, who will authorise their participation in the test, and their test responsibilities.

Note: Only personnel essential for the conduct of the test flight are to be carried on a test flight.

- A list of test equipment used in the conduct of the test (both fitted to the aircraft and any ground based equipment), its calibration status (date last calibrated and calibration expiry date), or how the equipment is to be calibrated if required as part of the test (reference to the aircraft test instrumentation & calibration plan if created as a separate document is acceptable).
- A list of the certification basis requirements for which compliance is to be shown.
- Linkage between the certification basis requirements and the applicable tests procedure steps.
- A description of how compliance against each of the identified airworthiness requirements is to be shown including step-by-step procedures, expected test results and defined pass/fail criteria.
- An analysis of flight test risks and details of risk management procedures applied to mitigate identified risks (FAA Order 4040.26 can be as guidance for undertaking flight test risk management activities).

Applicant's Flight Test Report

In order to fulfil the requirements of rule 21.35 (b)(2) the applicant is to submit a flight test report signed by the test pilot and any nominated test witnesses that documents the results of all flight tests undertaken to show compliance with the applicable requirements. A flight test report should address the same areas that should be included in a flight test plan along with the actual results of the testing activities.

CAA will review the applicant's flight test report in order to determine conformity of the aircraft with the type design and assess compliance with the applicable airworthiness requirements. In the event that concurrent testing is agreed by CAA (described below) it is recognised that reporting cannot be accomplished for tests the applicant has not previously completed.

11.3. CAA flight Testing

In accordance with rule 21.35(b) CAA flight tests will be required in order for CAA to verify compliance with the applicable airworthiness requirements and to verify correct and reliable operation of the product undergoing type certification. Planning of any CAA flight testing required during a TC project is to be included in the PSCP.

Note: Due to the scope and depth of both ground and flight testing required for a TC project it is recommended that a separate test schedule be created.

The norm is for CAA flight testing to be conducted as a discrete activity after the applicant has successfully completed all flight testing showing compliance and submitted their flight test report(s). However, CAA may elect to conduct some aspects of its flight testing concurrently with the applicant's flight testing showing compliance where it is appropriate. The CAA may accept some of the applicant's flight testing showing compliance as fulfilling the requirements for certification with no CAA verification. The CAA determines at its discretion which tests will be undertaken as part of its discrete flight testing activities, what will be done concurrently with the applicant and what aspects of the applicant's flight testing may be accepted without further CAA verification.

The applicant is responsible for meeting all costs associated with CAA flight testing activities.

Concurrent CAA/Applicant Flight Test

Any tests conducted concurrently will typically be considered as presenting low risk where a successful compliance showing will most likely occur. Higher risk tests which by their nature are impractical to repeat may also be undertaken concurrently. Those test flight activities that are considered to be potentially high risk (e.g. development of the “edge of the envelope”, V_{NE} , stall (for aeroplanes), autorotation, H-V and HOGE performance (for helicopters) etc.) are unlikely to be considered for concurrent testing and the applicant should have completed all flight testing showing compliance against these requirements prior to CAA undertaking flight testing. In undertaking concurrent flight testing the CAA is allowing the applicant to fulfil the requirements of rule 21.39 while also meeting the requirements of rule 21.35(b)(1) at the same time. An applicant is still required to fulfil the requirements of rule 21.35 (b)(2) for any concurrent testing undertaken.

As the TC project progresses, and dependent upon the results of the applicant’s flight testing to show compliance, the scope of flight testing to be undertaken concurrently with the applicant may alter. The TIA will document the final breakdown of CAA / applicant flight testing activities.

With the exception of those flight tests undertaken concurrently, each applicant test showing compliance should be accomplished successfully and all requirements of rules 21.35 (b)(2) and (b)(3) and 21.39 (b) should be met prior to the CAA undertaking any flight test.

Pre-CAA Flight Test TCBM

Prior to CAA flight testing commencing the TC board will convene for the pre-CAA flight testing TCBM (refer to sub-section 3.7 of this AC).

11.4. Experimental Airworthiness Certificates for Flight Testing

In order for an applicant to conduct any developmental flight testing or flight testing to show compliance a *special category - experimental* airworthiness certificate must be issued under rule 21.193. Applications for these certificates should be submitted on CAA [Form 24021/06](#).

11.5. Test Pilot Requirements

Applicant Flight Test Pilot Approval

All applicant test flying necessary for showing compliance must be undertaken by a test pilot who is meet the requirements of rule 19.405 and is approved in writing by the Director. Further information can be found in AC AC19-1. The application for test pilot approval should be filled out and submitted to the CAA using [Form 24019/03](#).

CAA Test Pilot Qualification on Test Aircraft

As a part of the CAA flight test programme for TC projects, the applicant is expected to provide the necessary first pilot qualification flight time for the CAA test pilot(s). The scope of qualification flying should be mutually agreed between the applicant and the CAA test pilots. The checkout should be completed before the CAA test pilot(s) conduct any flight testing in an official capacity.

Pilot-in-Command

The pilot-in-command for CAA flight testing activities is the applicant’s pilot (except for single place aircraft). The CAA test pilot should emphasise the pilot-in-command responsibility as part of any pre-flight briefing.

11.6. Flight Test Conformity Requirements

Prior to conducting test flying for showing compliance and certification test flying it is essential to verify that the product meets the minimum requirements for quality, conforms with the TC design, and is safe for the intended flight test activities. The applicant should have established configuration control procedures that are acceptable to the CAA and which provide assurance that the configuration of the product undergoing testing is known and managed at all times.³⁴

The CAA will verify conformity of the product by way of a ground inspection prior to CAA flight testing being undertaken and will monitor conformity during these activities. For each individual certification test flight any non-conformities should be documented by the applicant in accordance with approved procedures, accepted by the CAA and the test crew informed of these. (Further details regarding configuration management requirements can be found in section 8 of this AC).

11.7. CAA Flight Test Risk Management

The prime consideration in the development of regulations regarding CAA flight testing has been the minimisation of CAA's test pilots and the public's exposure to potentially hazardous situations during flight tests. Risk management processes are to be applied to any flight testing to be conducted by the CAA to ensure the associated flight test risks are mitigated to an acceptable level and have been accepted by appropriately authorised individuals.

CAA flight test personnel are not authorised to participate in developmental flight testing or conduct flight testing until the flight test risk management process has been completed and any residual risk identified has been accepted by the project sponsor (typically at the TCB-M pre-CAA flight test) or an appropriately delegated individual. The applicable guidance contained in the latest issue of FAA Order 4040.26 may be used for undertaking flight test risk management activities.

11.8. Function and Reliability (F&R) Testing

Introduction

Rule 21.39(a)(2) requires the applicant to undertake flight testing in order to verify that the aircraft type and its constituent components are reliable and function properly. The testing required to demonstrate compliance with this requirement should be conducted on the same aircraft that are used for, and following on sequentially from³⁵, flight testing to show compliance against rule 21.39(a)(1) and in the case of rotorcraft, the rotor drive endurance tests prescribed in FAR §27.923 or FAR §29.923 also.

³⁴ The effectivity of an applicant's configuration management system and their implementation of this system will significantly influence the extent to which CAA considers accepting the results of any pre-TIA inspections or flight testing as showing compliance.

³⁵ This is to assure that significant changes resulting from type certification tests are incorporated on the aircraft prior to F&R tests.

Scope of F&R Testing

F&R testing should incorporate the following aspects.

- A comprehensive and systematic check of all aircraft components to assure that they perform their intended function and are reliable.
- Testing on an aircraft that is very close to the final configuration and which is operated and maintained as though it were in service.
 - F&R testing should be accomplished on an aircraft which conforms to the type design with significant changes resulting from certification tests being incorporated on the aircraft prior to F&R tests commencing. Any non-conformities should be documented and accepted by CAA.
- An intensive test schedule with all aircraft components being periodically operated in sequences and combinations likely to occur in service.
- Operation of the aircraft throughout a range of representative ambient operating conditions and sites.
- Ground inspections should be made at appropriate intervals to identify potential failure conditions; however, no special maintenance beyond that described in the aircraft maintenance manual should be applied during F&R testing.
- A portion of the F&R test programme should focus on systems, operating conditions, or environments found particularly marginal during type certification tests.
- A substantial portion of the F&R testing should be conducted on a single aircraft.

For certification requirements needing the demonstration of a minimum number of flight hours, the accrued flight time does not include ferrying to remote areas or tests conducted for purposes other than for determining compliance, unless specifically allowed for in the applicable guidance material.

When undertaking F&R testing, as a minimum, the applicant should continually monitor, evaluate and report on the following.

- The configuration of the aircraft and its conformity to type design.
- Weight and balance of the aircraft, including any loads carried.
- Consumption of fuels, oils and lubricants.
- The overall functioning of the aircraft and all of its systems.
- The serviceability of critical parts and components (preferably after each flight if possible).
- Causes of faults identified and the rectification action undertaken.
- Assessment of whether faults identified justify changes to type design.
- Scheduled inspections and servicing undertaken.

Note: It is recommended that the applicant creates a separate function and reliability test plan and report.

Additional Guidance

FAA ACs 23-8, 25-7, 27-1, and 29-2 provide additional guidance for the conduct of F&R testing.

12. TC Data Requirements

12.1. Introduction

Applicants are entitled to a TC only after they show that their type design complies with the requirements of the certification basis, CAA or DDH finds compliance, and CAA finds that the type design has no unsafe features. The purpose of technical data submitted by the applicant during the course of a TC project is to define the type design and to provide supporting evidence which substantiates that the type design complies with the certification basis requirements. Design data collectively includes drawings, specifications, reports and other information addressing configuration, materials, processes and can be categorised into either descriptive data or substantiating data.

12.2. Descriptive Data (Rule 21.33)

This data should completely and accurately define the dimensions, fabrication, assembly and installation of a product and all of its constituent components. The descriptive data should be adequate for reproduction of parts and their installation on other examples of the same type-certificated product. A hierarchical drawing list should be supplied to identify each drawing and its revision status. Descriptive data also includes aircraft flight manuals, airworthiness limitations and the Instructions for Continuing Airworthiness.

12.3. Substantiating Data (Rule 21.31)

In general, substantiating data is evidence intended to show compliance with the applicable regulations. This data may include analyses, test plans, reports etc., with the top document for presenting substantiating data being the compliance checklist (refer to section 7 of this AC). If computer models are used for generation of substantiation data, details of the validation of those models and software should be included in the evidence submitted.

12.4. Instructions for Continued Airworthiness (ICA) (21.33(1)(iv))

Rule 21.33(1)(iv) requires an applicant to furnish the Director with the airworthiness limitations section of the ICA required by the applicable airworthiness design standard. For those airworthiness design standards identified in Part 21 Appendix C, the requirements for ICA can be found in FAR paragraph 2X.1529 of the respective standard. Only the airworthiness limitations section of the ICA is approved by CAA.

The initial development of ICA is usually undertaken by the establishment of a maintenance review board (MRB), maintenance type board (MTB)³⁶ or another process acceptable to CAA³⁷. The MRB (or equivalent) is required to develop the minimum scheduled tasking and interval requirements in order to maintain the continued airworthiness of the product once it enters operational service. The MRB includes representation from CAA, the applicant and other industry or authority representatives

³⁶ An MTB is essentially the same as an MRB except that there is limited or no operator participation due to the product not being certified and therefore not being in operational service yet.

³⁷ For some aircraft categories it is acceptable for the applicant to develop maintenance procedures using processes other than an MRB or MTB.

considered appropriate. The MRB publish their findings in a MRB report which forms the basis for the manufacturer's recommendations presented in the ICA and which are approved by CAA.

Note: FAA AC121-22 and FAA Order 8110.54 at their latest revisions can be used as guidance for the establishment of MRBs and their associated roles, responsibilities and activities.

ICA need to be available in draft form at the time of the TCBM - pre-CAA flight testing so they can be evaluated as part of the TIA Part III activities. Maintenance of flight test aircraft and F&R aircraft should be in accordance with representative ICA acceptable to CAA. In accordance with rule 21.33(1)(iv) CAA requires that ICA must be complete prior to the TCBM-TC issue³⁸.

12.5. Submission of Data to CAA

In accordance with rule 21.37(b), all data submitted by the applicant must be accompanied by a completed *Statement of Compliance* (CAA [Form 8110-3](#)). Adequate substantiating data presents appropriate evidence to show CAA that the applicant's claim of compliance is justified. Prior to submitting data to CAA, the applicant is to ensure that it is complete with the information presented in a logical order that leads the reader from the requirement, through the evidence to the eventual claim of compliance.

All technical design data submitted by an applicant should be identified on a master document list (MDL) which identifies each document, its revision status and date. The MDL list should differentiate between descriptive data and substantiating data.

12.6. CAA Data Review

It is CAA or the DDH who determines whether or not the applicant has shown compliance. The applicant is deemed to have shown compliance when the data submitted is sufficient to show that the applicable requirements have been satisfied. CAA or the DDH are only responsible for the review of the data submitted by the applicant, not for the development of methods or calculations. Where finding of compliance is conducted by CAA, CAA will return any data deemed unacceptable to the applicant, with a summary of deficiencies and a request for the data to be revised and resubmitted. It is the applicant's responsibility to resolve any deficiencies in the design.

To allow for CAA to complete a timely review of an applicant's data the applicant should submit data to CAA in accordance with the dates agreed in the PSCP and/or compliance plan. Applicants are encouraged to plan to split up the submission of data per the agreed schedule, rather than holding data back to submit in one large package. This will enable a more timely review of the data by CAA.

12.7. Data Approval

Data is reviewed by CAA throughout phase III of the TC project as the data is submitted by the applicant. However, the data is not approved incrementally. Rather the type design and its associated substantiating data is approved as a collective whole by the Director by the issuance of the type certificate.

³⁸ This is in spite of the respective FAR XX.1529 paragraphs stating that the ICA may be incomplete at the time of type certification if a programme exists to ensure their completion prior to delivery of the first aircraft or issuance of a standard certificate of airworthiness, whichever occurs latest.

12.8. Release of and Reference to Technical Data

In accordance with rules 21.31 and 21.33 an applicant is required to provide the Director with a copy of all descriptive and substantiating data that supports the TC. The following sections discuss how this data will be treated when in CAA possession:

Disclosure of Technical Data

Descriptive and substantive data received from applicants are considered to be proprietary information and as such are treated as “commercial-in-confidence” by CAA and are not released to third parties.

Use of Technical Data by CAA

An applicant's or certificate holder's data will be used for reference by CAA without restriction.

Authorised Use of CAA Approved Data

An applicant who applies for a TC and desires to make use of data submitted by a previous applicant or certificate holder, should obtain written consent from the previous applicant or TC holder and submit to CAA prior to the already approved data being able to be used.

13. Statements of Compliance

13.1. Introduction

Rule 21.31 requires applicants to provide CAA evidence (data) that substantiates the type design's compliance with the applicable requirements identified in the certification basis and listed in the compliance checklist. The purpose of rule 21.37(b) is twofold; it firstly makes it mandatory that the applicant provides a statement of compliance attesting that the data submitted in support of a TC complies with the applicable requirements and secondly, it emphasises that it is the applicant who is responsible for satisfying all applicable requirements. These statements of compliance will be issued in accordance with the applicant's procedures established under rule 146.59(b)(5).

13.2. Submission of Statements of Compliance

To achieve compliance with rule 21.37(b) an applicant is required to issue statement of compliance throughout the TC process as substantiating data is submitted to CAA. The statement of compliance should be made using CAA [Form 8110-3](#) which the applicant project manager should forward to the CAA project manager along with the listed technical data. Data submitted without a corresponding statement of compliance will not be accepted by CAA.

Note: A “Statement of Compliance” (CAA Form 8110-3) is not to be confused with a “Statement of Conformity” (CAA Form 8130-9) issued under 21.37(a). Form 8110-3 attests that data substantiates compliance to requirements while Form 8130-9 attests that a physical article conforms to its specified design.

13.3. Final Statement of Compliance

Once an applicant has completed all of its compliance activities, a final statement of compliance is required to be included in the completed compliance checklist. The final statement of compliance is the applicant's attestation that the design complies with all the requirements of certification basis listed in the compliance checklist and should reflect the following statement.

In accordance with rule 21.37(b) I certify on behalf of [insert Applicant Name] that with respect to the [insert Product Make, Model] type design as defined by [insert Master Drawing #, Revision #] [insert Applicant Name] have complied with all applicable requirements identified in the certification basis [insert primary certification basis and amendment levels] listed in this Compliance Checklist on pages 2 through [insert last CCL page #]. Compliance with the certification basis requirements has been shown using the methods of compliance identified herein, and is documented in the respective substantiating documents and others identified in [insert Master Data List XXXX Rev #]. The type design defined by [insert Master Drawing #, Revision #] contains no features or characteristics that would make any [insert Product Make, Model] manufactured conforming to that type design unsafe for its intended use when operated in accordance with [insert Flight Manual # Rev #] and maintained in accordance with [insert Maintenance Manual# Rev #]

14. Type Inspection Authorisation (TIA) and Type Inspection Report

14.1. Purpose of the Type Inspection and the TIA

For some requirements compliance can only be shown by a physical inspection of the definitive aircraft or parts thereof (e.g. clearances, accessibility). For other requirements compliance can only be evaluated by a physical presence in the aircraft (e.g. cockpit ergonomics, interior lighting) or only be shown by actually flying the aircraft (e.g. stalling behaviour, helicopter vibration levels). For such requirements the applicant will have conducted those inspections and tests necessary to substantiate their claims of compliance. The purpose of the type inspection is for CAA to verify the applicant's claims of compliance for those aircraft level requirements that require a physical inspection or test.

The TIA authorises the aircraft (or "type") level conformity and compliance inspections, and ground and flight testing activities necessary to fulfil specified type certification requirements. The TIA is an internal CAA document that also identifies what specific certification inspections and tests will be performed by whom, who certifies finding compliance and who within CAA is authorized to undertake flight testing activities. The TIA may also specify operational and maintenance requirements against which compliance needs to be assessed to verify that the aircraft is operationally suitable for its intended operations (e.g. Parts 91, 121 or 135 and Instructions for Continuing Airworthiness requirements).

In order to satisfy rule 21.35(b)(1) an applicant must permit CAA to perform all inspections and tests identified in the TIA.

14.2. Issue of the TIA

The TIA is approved at the TCBM – pre-CAA flight testing. The following are the minimum prerequisites that should be complete in order for the TIA to be issued.³⁹

³⁹ By default, these are also entry criteria for the TCBM - pre-CAA flight testing

- The applicant's flight testing activities, with the exception of those activities that have been agreed to be undertaken concurrently with CAA.
- The applicant's flight test report addressing all flight testing needing to be conducted prior to the TIA has been submitted to, and accepted by CAA.
- CAA's examination of the applicant's technical data required for type certification is complete, at least to the point where there is a high degree of certainty that the aircraft or product being examined will meet the airworthiness requirements.⁴⁰
- A *Statement of Conformity* (CAA [Form 8130-9](#)) has been issued for the prototype product(s)⁴¹ that TIA activities will be undertaken on.
- A draft aircraft flight manual⁴² is required in order for it to be evaluated during CAA flight testing activities (TIA Part II) and TIA Part III activities.
- Draft Instructions for Continuing Airworthiness are required in order for them be evaluated during TIA Part III activities.

Flight test risk management activities (refer sub-section 11.7 of this AC) should have been completed, reviewed and accepted by those CAA personnel involved in flight testing activities.

Once the TIA is issued the applicant should be officially informed and provided a copy of the TIA so they can plan for the activities to be undertaken.

14.3. TIA Format

The TIA format is structured such that it presents general information relating to the applicant, product and TIA approval on the cover sheet, followed by three subsequent parts that identify in detail the respective ground, flight and operational inspections and tests to be undertaken. Parts I to III of the TIA are essentially lists of those requirements (by individual requirement number from the certification basis) that are subject to a ground or flight type inspection or test, the organisations/persons responsible for verifying compliance for each requirement and where applicable, identification of the test plans or other data that will be used for the conduct of TIA activities.⁴³

- TIA cover sheet (CAA [Form 8110-1](#)) contains general information identifying the product, its configuration, authorised reference data for TIA activities, TIA risk assessment and mitigations, general operating limitations and CAA approval.
- Part I - this section will identify the following.

⁴⁰ Compliance with other non-safety related certification basis requirements does not need to be shown prior to the TIA being issued.

⁴¹ If more than one prototype will be used for TIA activities each product requires its own Statement of Conformity.

⁴² While identified as a "draft" the contents of the aircraft flight manual must be sufficiently mature and accepted as such by CAA to ensure it provides an adequate basis for the safe operation of the aircraft for the planned TIA activities.

⁴³ The applicant's previously submitted (and accepted by CAA) test plans can be used as the basis for any applicable TIA activities. Descriptive data may also be used to verify conformity of the prototype to the design and its compliance against the applicable requirements.

- Conformity inspections required to verify the prototype product conforms to the applicant's design data.
- Compliance inspections and tests to be conducted on-ground.
- Part II - this section identifies the specific requirements that are to be verified by CAA flight testing and the CAA approved test plans that will be used for the conduct of the testing.
- Part III - this section identifies those requirements and tests required to verify compliance with regulations related to operational approvals and maintenance (instructions for continued airworthiness).

Note: Parts I to III of the TIA are presented in this sequence to identify the order in which TIA activities must be undertaken.

14.4. Activities conducted under the TIA

The relevant sections of this AC (conformity, compliance inspection, testing and CAA flight testing) should be referred to for details on the conduct of activities under the TIA.

Throughout the conduct of TIA activities, any condition or feature identified as being non-compliant or unsafe should be reported to the applicant's and CAA's project managers for wider dissemination throughout the respective project teams as appropriate. The applicant is responsible for identifying and implementing solutions to resolve any unsafe or non-compliant condition or feature. Progression to subsequent phases of the TIA should not occur until all unsatisfactory issues are resolved.

14.5. Type Inspection Report (TIR)

The results of all TIA activities are to be recorded in the type inspection report (TIR). This report is required to be completed by CAA prior to convening the TCBM-TC issue.

15. Certification Project Summary Report (CPSR)

The CAA project manager is responsible for producing a certification project summary report (CPSR). This report is a single source document summarising CAA's examinations and activities in support of a TC project leading to a recommendation for the issue of a type certificate being submitted to the Director. Additionally, the CPSR provides a repository for CAA corporate knowledge and lessons learned that may be beneficial for future type certification projects.⁴⁴

All applicant activities required to show compliance and CAA review and acceptance of all substantiation should be complete, prior to the CPSR being finalised. The CPSR should be complete at the time of TCBM-TC issue.

⁴⁴ In a non-concurrent validation type certification project, the CPSR also serves as a useful tool for a foreign CAA to gain an understanding of what CAA activities were undertaken throughout the type certification project.

16. Changes to Type Certificates (TCs)

Part 21, Subpart D prescribes the requirements for making changes to type certificates.

Applications for a change to a type certificate are made using the same form as used to apply for the issue of a type certificate. Under rule 21.95 a new type certificate should be applied for if a change to the product is so extensive that a complete investigation of the airworthiness design requirements will be required. Changes requiring a new certificate include, but are not limited to, changes to:

- the number of engines
- the number of rotors
- the number of blades
- the type of blade material
- the principle of operation

Under rule 21.99 only the type certificate holder can make an application to change a type certificate.

For a type certificate amendment, while the overall intent of the process is the same, the process may be tailored according to the complexity of the application to take credit for the certification requirements that are not affected. This is similar to the approach taken with the majority of Supplementary Type Certificate applications.

If the applicant for a change to a type certificate is not the type certificate holder a supplemental type certificate is required. See AC AC21-8 for supplemental type certificate requirements.

17. Transfer of TCs

In accordance with rule 21.27 a TC holder may apply to the Director to transfer a TC to another organisation. To achieve this, the TC holder (transferor) should write to CAA informing it of the details (name and address for service) of the organisation that will become the new TC holder (transferee). The transferor should also surrender the original TC to CAA. Upon confirmation by CAA that the transferee meets the requirements of rule 21.27 and are capable of meeting the responsibilities of a TC holder (rule 146.61) the Director will issue a new TC that is identical in all respects to the surrendered TC with the exception that the transferee will be identified as the TC holder.

18. Suspension & Revocation of a TC

The primary responsibility of a TC holder is to ensure the continuing airworthiness of the aircraft type in service. This essentially means analysing defect reports and issuing safety bulletins and repairs where required to maintain the safety of the aircraft fleet.

Where a TC holder abandons the TC or is found to be deficient, the CAA 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 (foreign states that operate the aircraft type).

As State of Design, New Zealand and by extension, CAA, have International obligations in the event of the absence or deficiency of a TC holder which are outlined in ICAO document 9760 - Airworthiness Manual.

Following the continued suspension or revocation action on the Part 146, 148 and TC holder, the CAA follows the basic principles of ICAO 9760 and FAA Order 8110.120 which are outlined as follows:

- a) Production of the affected aircraft type is immediately suspended (no new Airworthiness Certificates).
- b) The TC Data Sheet is updated to reflect suspension date, serial number production range, and any limitations on the validity of the TC.
- c) CAA issues a Continuing Airworthiness Notice detailing the situation for industry and foreign States of Registry (national aviation authorities). The notice will include a clear statement as to whether CAA is retaining or abandoning the designation of State of Design in accordance with Annex 8 Part II, Chapter 4.
- d) CAA will encourage transfer of the TC to a different Part 146 Design and/or Part 148 manufacturing organisation.
- e) If no transfer takes place, CAA retains all TC data, but is NOT responsible for type design or continued airworthiness of product.
- f) Current aircraft airworthiness certificates remain valid unless a subsequent serious safety/airworthiness issue is identified that would otherwise require significant design changes by the TC holder.
- g) The CAA will continue to monitor safety and defect reports. Should a significant safety risk be highlighted, a fleet-wide grounding is a possibility. Without a TC holder that has appropriate design capability, there is a risk that the grounding may not be lifted.
- h) No new Airworthiness Certificates also means no importations of affected aircraft.
- i) Export Airworthiness Certificates will note the TC status and the ultimate decision of airworthiness is at the discretion of the importing State of Registry.

19. Appendices

19.1. Appendix A: Compliance Checklist Template

Available as a separate document, in AC 21-7 Appendix A

19.2. Appendix B: Project Specific Certification Plan (PSCP) Template

Available as a separate document, in AC 21-7 Appendix B.