

Revision 1

## Design Changes—Supplemental Type Certificate

02 September 2016

### General

Civil Aviation Authority 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 added to the appropriate AC.

### Purpose

This AC describes an acceptable means of compliance with Part 21 in order to gain a supplemental type certificate (STC).

The guidelines provided in this AC are general in nature and intended to help applicants and design organisations gain a better understanding of the STC process including their respective roles and responsibilities.

### Related Rules

This AC relates specifically to Civil Aviation Rule Part 21, Subpart E – ‘Supplemental Type Certificates’.

### Change Notice

Revision 1 updates and expands on the existing guidance. CAA now requires new STCs to be supplemental to aircraft type accepted or certificated in New Zealand. The PSCP (project specific certificate plan) template now includes a sample compliance checklist and is moved to a separate AC appendix (AC21-8 Appendix A).

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## ***Introduction***

A supplemental type certificate (**STC**) approves a design change to a type certificated aircraft, engine, or propeller, when the change is not so extensive as to require a new type certificate (**TC**). In general an STC would cover the following.

- A major design change which is not a repair.
- Any other design change where the applicant wishes to obtain an STC for commercial reasons, i.e. for sale to a second party or for acceptance by a foreign regulatory authority.

An STC can be applied to multiple aircraft of the same make and model if the descriptive data is of sufficient detail to allow accurate reproduction.

For the issue or amendment of an STC the applicant should submit a statement of compliance prepared by an aircraft design organisation certificated in accordance with Part 146 ***Aircraft Design Organisation***. As such, an applicant should seek advice from an aircraft design organisation when first considering a major design change.

The definition of a major design change is subtly different from the definition of a major modification.

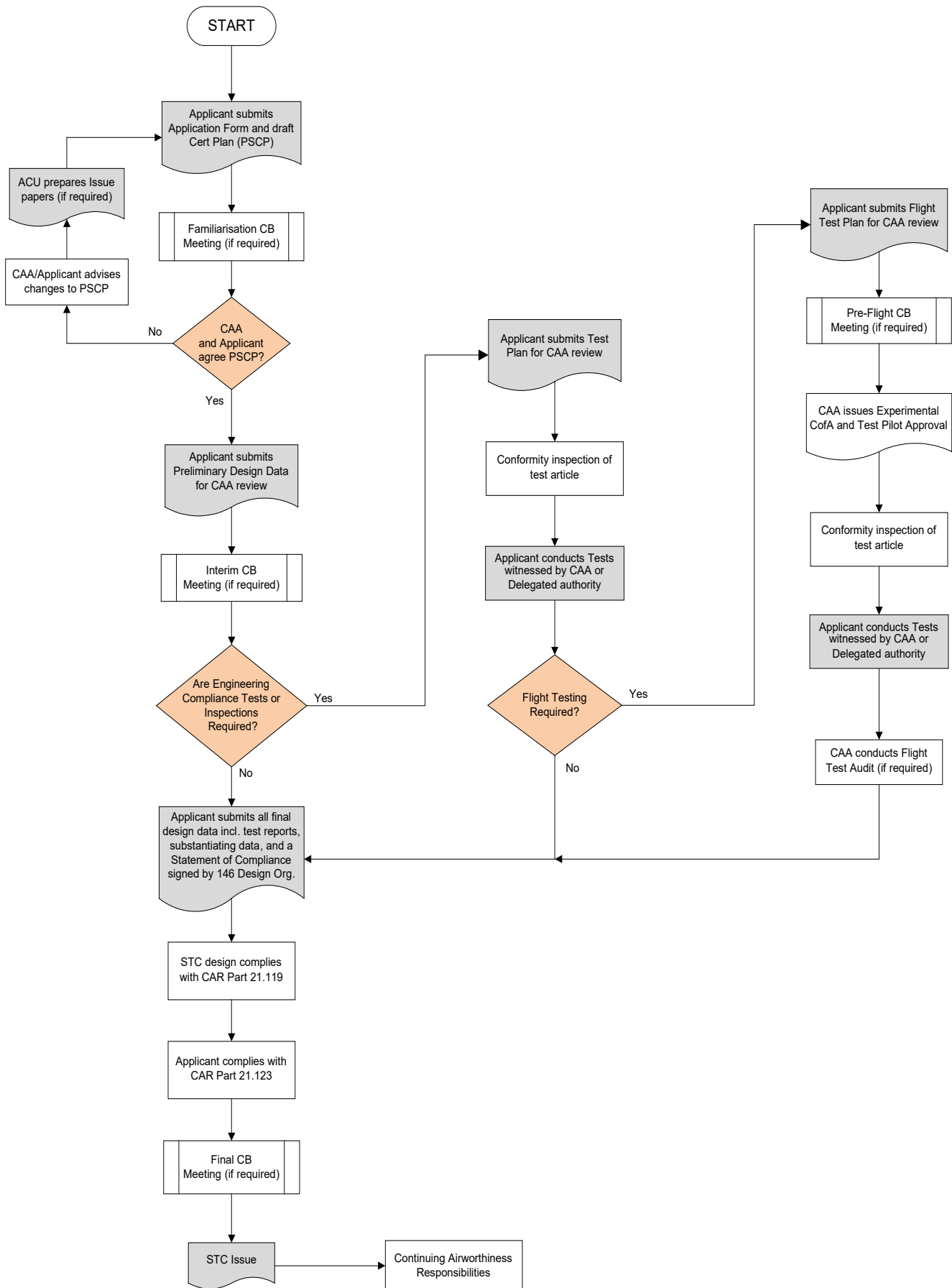
**Major design change** means a change that has any appreciable effect on the weight, balance, structural strength, reliability, operational characteristics, or other characteristics affecting the airworthiness of the product. Further guidance on the definition of a major design change can be found in Schedule One of a design delegation.

**Major modifications** is major if its embodiment has potential to cause unsafe effects (refer AC43-9 for further guidance).

In order to avoid delays and minimise rework it is important that the applicant, the aircraft design organisation and the CAA Aircraft Certification Unit (**ACU**) work together throughout the project. This is particularly important with large projects where an STC must be approved before a prototype aircraft can be certified for release to service in accordance with Part 43.

Where reference is made to an FAA document the current version of the applicable document is to be used for information purposes only.

### STC Approval Process Flowchart



## 1. Compliance Planning Phase

### 1.1 Application

At the earliest opportunity the applicant should notify the Director of a proposed new STC project, or an amendment to an existing STC by contacting the Manager of the Aircraft Certification Unit (ACU). Early contact with the ACU provides the applicant with an opportunity to develop an understanding of the certification process as it applies to their design.

- **New STC Application.** For all new designs, or where significant changes are made to an existing STC design, the applicant should submit CAA [Form 24021/09](#) and tick the “New” box in Section B. The Director will notify the applicant if it is determined that a new TC would be more appropriate because of significant implications to the design, operation, or continued airworthiness of the product.
- **STC Amendment.** Where the holder wishes to make changes to the design data of an existing STC, the holder should submit CAA [Form 24021/09](#) and tick the “Amendment” box in Section B. In this case a new STC certificate will not normally be issued as each STC certificate covers any later amendment of the design data approved by the Director. The Director will notify the applicant if it is determined that a new STC will be required where there are significant changes to the original STC.
- **Transfer of Certificate.** An STC holder may apply to the Director to transfer an STC to another person or organisation in accordance with rule 21.121, by writing to the Manager of the Aircraft Certification Unit. The Director requires a new STC holder to show that they satisfy the responsibilities of a certificate holder as specified in rule 21.123.

An STC may be applicable to a range of aircraft types and type certificates if it is the type of design change that is not significantly affected by the basic aircraft type. A new STC cannot be issued for a product type that does not have a New Zealand Type Certificate or Type Acceptance Certificate or other applicable certification issued by the CAA.

As a statement of compliance is required for every STC design change, the applicant should make contact with an aircraft design organisation at an early stage to provide design and certification advice.

An STC application should be accompanied by a draft PSCP (refer to paragraph 1.4 below). This is a top level document which sets out the key aspects of the STC approval process. If the application is a simple revision to an existing STC, a PSCP may not be necessary depending on the scope of the revision.

### 1.2 STC Holder Responsibilities

Under rule 21.117(3) a new applicant must submit further information to satisfy the Director that they are capable of holding an STC in accordance with rule 21.123. For existing STC holders, a new STC application may simply involve re-affirmation of their responsibilities under this rule part.

Instructions for continuing airworthiness should be included as part of the technical data of any STC, although the extent of these will be consistent with the type of STC involved. In accordance with rule 146.61, the applicant is required to have a system of collecting and analysing defects in the design produced by the applicant. Typically procedures should be established that provide the ability to do the following.

- Collect defect information from STC users.
- Notify users of the STC of any airworthiness issues that arise during the life of the STC.

- Provide service information to users (usually Service Information Letters).
- Provide modification instructions to users (usually a Service Bulletin).

Upon the Director's request the applicant should show evidence of appropriate liaison with the product type certificate holder. This may be necessary where certain aspects of the design or the method of showing compliance rely on OEM data.

In accordance with rule 21.117(3) an applicant will need to demonstrate that all records will be of a legible and permanent nature and, except if Director permits records to be kept for a lesser period, retained for 2 years from the date that the last example of the product type is permanently withdrawn from service, as required by rule 21.123(a)(3). Where the applicant does not already have systems in place as the holder of a Part 146 or Part 148 organisation certificate (in accordance with rule 146.63(b)(6) or rule 148.63(b)(5)), specific procedures will need to be developed and implemented to meet this requirement.

### **1.3 CAA Project Management**

A CAA Project Engineer will be assigned to each STC application to act as the point of contact during a project. Other CAA staff may be involved with the review of technical data, certification tests or inspections as required.

### **1.4 Project Specific Certification Plan (PSCP)**

For the issue or amendment of all STCs the applicant should prepare PSCP, and keep it current throughout the project. The purpose of this document is to provide an overview of the project and to identify key technical aspects such as the certification basis, means of compliance, and testing.

Appendix A to this AC includes a PSCP template, however an applicant may use any document provided the same basic information is listed. The PSCP should include the following information.

- Identification of the product to which the STC applies and the original certification basis, including any Issue Papers (FAA) or Certification Review Items (EASA) applicable to the product which are affected by the design change, and a description of the design change including any unusual or unique design features.
- The name and contact details of the applicant and a project manager nominated by the applicant.
- The name and contact details of the contracted aircraft design organisation and the nominated project design engineer.
- The name and contact details of the CAA project engineer.
- The proposed certification basis for the STC including any special conditions. If the applicant wishes to show compliance with airworthiness requirements NOT effective at the date of the application a justification for doing so should be included. See paragraph 1.7 for more information.
- A compliance checklist listing all the applicable airworthiness requirements, including the amendment status and proposed method of showing compliance with each requirement (ground test, flight test, analysis, similarity etc).
- A request for specific certification board meetings and the proposed date. See paragraphs 1.5, 2.2, 2.5, and 3.2.

- A brief summary of the project schedule including key milestones noting the following.
  - The schedule may be subject to change during the project; however minimum notice periods for activities involving CAA staff or the contracted aircraft design organisation apply. Refer to paragraph 1.4.2.
  - The schedule should be realistic. Overly optimistic schedules that may result in undue pressure on those involved in the design, installation or certification of the STC, and so create a safety or compliance risk, will not be accepted by the Director.
- Details of how STC design data changes and/or production deviations during the STC project will be addressed.
- Details of any proposed foreign regulatory technical assistance requirements.
- If computer models are to be used for substantiation, details of the validation of those models should be included.
- Details of any planned compliance tests or compliance inspections. Include a summary of the test plan with information on conformity inspections, test witnesses etc. Applicants or the ACU may request/recommend functions be delegated to organisations and/or individuals.
- Details of proposed flight tests. Include a summary of the test plan with information on test aircraft type and equipment configuration, conformity inspections, minimum flight test personnel qualifications etc.
- An applicant/ACU sign-off block for each revision of the PSCP.
- Instructions for the amendment and agreement of revisions to the PSCP (if required).

The CAA Project Engineer will notify the applicant of any changes required before the initial PSCP is finalised. Depending on the scope of the proposed STC project, the ACU may request a Familiarisation Certification Board meeting (refer to paragraph 1.5 below). Any significant technical issues which arise at this, or any other stage of the project will be documented and tracked with an “STC Issue Paper” (refer to paragraph 1.6 below).

The PSCP is to be agreed and signed by the CAA Project Engineer and the applicant prior to commencing certification activities.

**1.4.1 Changes to the PSCP.** It is important to note that the PSCP is a working document and should be kept up-to-date during the STC project. Significant changes to the project such as a change to the certification basis, means of compliance, compliance tests or inspections, or major changes to the STC design or project schedule should be agreed in a formal revision by the Part 146 aircraft design organisation, applicant and the CAA.

All parties may agree to changes in certain sections of the PSCP via alternative methods; however the scope of permissible changes and the process to do so should be detailed in the PSCP.

**1.4.2 Minimum Notice Periods.** As major project schedules may be subject to change, exact dates for compliance or conformity inspections may be revised during the course of a project. In addition, deviations during embodiment will require compliance to be re-established for the final design configuration. Any such delays will affect the STC issue date. In order to allow sufficient time for the ACU or contracted aircraft design organisation to review data and prepare documentation, the following minimum notice periods apply.

- For conformity or compliance inspections the applicant should advise the proposed inspection date to all parties involved at least 5 working days prior to any inspection.
- For compliance tests or inspections the finalised test/inspection plan should be submitted to the ACU at least 10 working days prior to any test/inspection.
- Final substantiating data, technical data and a signed statement of compliance should be submitted to the ACU no less than 10 working days prior to the issue of an STC.

### **1.5 Familiarisation Certification Board (CB) Meeting**

For large STC projects which require significant coordination, the CAA may require a certification board (CB) to be formed which will include the CAA Project Engineer and any other CAA staff as required, the applicant's Project Manager, Project Design Engineer and other technical or management staff involved with the STC project.

The purpose of the CB is to familiarise the ACU with the design change, identify potential problems, establish milestones and schedules for the overall accomplishment of the project and ensure all outstanding certification issues are resolved. When a CB is not necessary, the certification team manages the project and performs any functions of the CB to the degree necessary.

A familiarisation CB meeting may also be required where a design change employs new or novel design features or to address technical issues with respect to the certification basis. The ACU or the applicant may request a familiarisation CB meeting, as detailed in the PSCP.

### **1.6 STC Issue Papers**

An issue paper provides a means for identifying and resolving significant technical, regulatory, and administrative issues occurring during the certification process. Issue papers are primarily intended to provide an overview of significant issues, a means of determining the status of issues, and a basis for a post-certification summary statement on how issues were resolved.

Issue papers will be prepared by the ACU and will normally require the inclusion of a written response from the applicant detailing their position or proposed solution.

The FAA issue paper process will be followed as applicable, refer to FAA Order 8110.112A for more information.

### **1.7 Airworthiness Requirements**

**1.7.1 Certification Basis.** During type certification a product is shown to comply with certain airworthiness design requirements which are defined on the product's Type Certificate Data Sheet (TCDS). To find the Type Certificate accepted in New Zealand, refer to the relevant Type Acceptance report or AC21-1 Appendix 2 published on the CAA website. In accordance with rule 21.117 an applicant is required to show that the changed product continues to comply with these design requirements, however design standards are routinely up-dated to improve the safety of aircraft.

In-line with international standards, the Director encourages applicants to show compliance with the version of airworthiness requirements that are effective at the date of the application. This requirement is commonly referred to by other authorities as the "changed product" rule.

The Director considers FAA AC21.101-1B at the latest revision an acceptable reference when deciding which airworthiness requirements to comply with.

The "changed product" philosophy includes exceptions where it may be acceptable to use the original certification basis listed on the TCDS. These exceptions include the following.



- When the CAA finds the change not to be significant. Examples of significant changes can be found in FAA AC21.101-1B.
- When it would be impractical to show compliance with the latest version of the applicable airworthiness requirements.
- When compliance with the latest version of the airworthiness requirements would not contribute materially to the level of safety of the changed product.

For example, a new STC installing external fuel tanks on a Boeing 747-400 (type certified to 14CFR 25 at amendment 59), is a significant change and would need to be compliant with the 14CFR 25 requirements at the latest amendment. However, an applicant is only required to show compliance with those areas that are affected by the design change (in the 747 fuel tank example the applicant would not need to re-establish compliance with “cockpit door” requirements).

**1.7.2 Noise & Emissions.** The certification basis should include the applicable aircraft noise and/or engine emission standards if the proposed design change will affect compliance with these requirements. Where the applicable airworthiness requirements are the Federal Aviation Regulation issued by the FAA, the Director finds it acceptable to adopt the policy detailed in 14CFR 21.93(b) and (c) for the classification of an “acoustical” or “emissions” change.

**1.7.3 Part 26 Additional Airworthiness Requirements.** All STCs should demonstrate compliance to the additional airworthiness requirements of CAR 26 at the latest amendment. For STCs applicable to 14CFR 25 turbine transport category airplanes the applicant should also demonstrate compliance with 14CFR 26 requirements, for example Subpart E for damage tolerance of fatigue critical structures and Subpart B regarding electrical wiring interconnection systems.

**1.7.4 Equivalent Level of Safety.** When a design change cannot be shown to comply directly with a prescribed airworthiness requirement, the Director may accept compensating factors that provide an equivalent level of safety (ELOS). The applicant should carefully consider the compensating factors and request an ELOS as early as possible, ideally making the request part of the PSCP. The basis and content of ELOS requests are generally developed via the STC Issue Paper process.

**1.7.5 Special Conditions.** Special conditions are rules of particular applicability that are developed for a specific project due to its unique design features or unconventional use. The Director and/or applicant may determine that the airworthiness requirements specified in the STC certification basis are not adequate to provide a sufficient level of safety for the changed product. In this case a special condition may be raised which specifies additional airworthiness or design requirements. 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 STC Issue Paper process.

**1.7.6 Documenting the Certification Basis.** The Certification Basis will be documented and agreed in the PSCP. For large or complex STC projects, an Issue Paper may be used to discuss and document the Certification Basis.

## **1.8 Operation and Maintenance of a Product Modified by an STC**

CAA staff will review how the design change will affect aircraft operation and maintenance. CAA operations and maintenance specialists will attend CB meetings as required and may advise applicants of applicable operational and maintenance requirements during the certification process. Additional CB meetings may be called with operations and maintenance specialists to review and accept ICA and revised MMEL documents as required.

**1.8.1 Instructions for Continued Airworthiness (ICA).** In accordance with rule 21.505(a)(4), and the applicable airworthiness requirements, the applicant must submit ICAs as part of the STC descriptive data, to describe the maintenance requirements necessary to maintain product airworthiness. ICAs should be developed in consultation with maintenance personnel to ensure instructions are accurate, can be carried out as documented, and do not conflict with existing OEM or operator maintenance requirements. ICAs should address the following.

- Changes to the applicable aircraft maintenance schedule.
- Maintenance manual revisions (or supplement) that provide a description of the installation, removal / installation instructions, test, adjustment, and troubleshooting instructions.
- Parts listing in a format that ensures only STC approved parts are used for maintenance.
- Aircraft specific wiring diagrams.

The ICA must address continued airworthiness of the design change for which application was made, as well as parts or areas affected by the design change. The Director considers FAA Order 8110.54 at the latest revision an acceptable reference for developing "Instructions for Continued Airworthiness".

In accordance with rule 21.123, the STC holder is also responsible for continuing airworthiness support throughout the life of the STC (refer to paragraph 1.2). If any change to the STC design data, including ICAs, is necessary because of an unsafe condition the STC holder will be responsible for making that information available to all parties who have received the design data.

**1.8.2 Weight and Balance Data.** The STC applicant should determine the weight and balance effects of the design change on the aircraft and verify that the aircraft is within the limits defined by the TC holder. The recording of weight and balance data and determining that each aircraft is operating within the approved limits is an operator responsibility. The STC holder is responsible for ensuring that the weight and balance data is provided to all operators of aircraft which have the STC embodied.

During the development of the STC, the aircraft design organisation should calculate the effects of the weight and balance changes due to the design change. The aircraft design organisation should still calculate weight and balance changes even if the aircraft is to be weighed before its next flight (the aircraft re-weigh should be considered as validating the calculated change).

When the STC is for the installation of role equipment (equipment intended for installation and removal without modifying the aircraft), the associated flight manual supplement should identify the weight and balance effects with the role equipment fitted and with it removed.

**1.8.3 Electrical Load Analysis.** The electrical load analysis forms part of the compliance evidence for any STC where the electrical loads have been affected. The STC applicant should determine the changes to the aircraft electrical load. The aircraft Electrical Load Analysis should be updated to reflect the changes and to verify that under all operating conditions, including abnormal and emergency conditions, the electrical system is operating within the limits defined by the TC holder and is compliant with all applicable airworthiness standards and operational regulations.

In accordance with rule 21.33 the STC holder is responsible for providing the data necessary to allow the determination of the airworthiness of later products of the same type. In accordance

with rule 43.53 it is the responsibility of the person performing maintenance (i.e. embodying an STC design change) to update the electrical load records of individual aircraft.

The STC installation instructions must provide clear instructions to ensure the electrical loads analysis is conducted appropriately, and the results are suitable to ensure compliance. For some simple cases where electrical loads on affected bus bars are reduced it may be adequate to provide only 'delta' information in the installation instructions; agreement from CAA should be sought before undertaking this approach.

**1.8.4 Operating rules.** Products are certificated under one or more of the airworthiness standards. Operating rules, such as 14 CFR parts 91, 121, or 135, may be affected or influence the design. Whilst it is the operator's responsibility to show compliance to operating rules, consideration at the design stage will ensure smooth evaluation by the operator and applicable CAA flight operations unit. Where equipment approvals such as TSOs are affected, these must be considered and if compliance to the TSO requirements or equipment installation requirements is affected (e.g. items placed in the head strike zone of a TSO-C127 seat), CAA will require compliance to be included.

## 2. Implementation Phase

This phase includes the submission of design data to the Director for review and all compliance finding activities including conformity inspections, compliance tests, compliance inspections etc.

### 2.1 STC Data Requirements

The purpose of technical data is to define the design change and to provide supporting evidence which shows that the changed product continues to comply with the applicable airworthiness requirements.

Refer to AC146-1 Appendix A for a description of data required to support a design change. FAA AC 21-40, Chapter 5, is another useful reference on design data. Further information applicable to STC projects is included below for the two categories of design data, *descriptive data* and *substantiating data*.

All design data should be identified on a master document list which identifies each document, its revision status and date. This will form the top document which will be referenced on the STC certificate. The master document list should list substantiating data separately.

#### 2.1.1 Descriptive Data.

- Multiple installation STC – the descriptive data package should completely and accurately describe the fabrication, assembly, and installation of all parts of the design change. The descriptive data should be adequate for reproduction of parts and/or installation on other examples of the same type-certificated product. Where the data package includes a number of engineering drawings, a drawing list should be supplied to identify each drawing and its revision status.
- Single installation STC – if a data package applies to a single installation, a limited descriptive data package may be provided including marked-up photographs with a visible scale, sketches, written descriptions etc. as the design is not required for reproduction. The descriptive data must still be of sufficient quality to define the design and to verify conformity with the design. Whilst the level of descriptive data can be less, the same level of substantiating data showing compliance to airworthiness standards is required for all STCs.
- Check - before submitting descriptive data to the Director, all data should be checked by someone other than the person who prepared it. Where an applicant has prepared the data themselves this may be performed by the contracted aircraft design organisation, or in accordance with company procedures if the aircraft design organisation has prepared it.

#### 2.1.2 Substantiating Data.

- In general, substantiating data is evidence intended to show compliance with the applicable regulations. This data may include analyses, test plans and reports etc.
- The top document for presenting substantiating data is the compliance checklist. A draft compliance checklist is to be included in the PSCP which identifies the proposed means of showing compliance; however this will be updated later, or included in a specific report, to include the specific statement or document which demonstrates compliance.

- If analysis (including computer models) is used for generation of substantiation data, details of the validation of that analysis, models and software should be included in the evidence submitted.
- Statements of compliance, signed by authorised personnel within the contracted aircraft design organisation, are to be submitted with all substantiating data.
- Multiple statements of compliance or a statement of compliance with multiple signatories may be submitted as long as they clearly identify the descriptive data and compliance requirements that each signatory is signing for.

## 2.2 Interim Certification Board (CB) Meeting

An interim CB meeting may be held at any time during the implementation phase to communicate and address any technical issues, or to discuss and agree changes to the PSCP such as the means of showing compliance etc. The applicant or ACU may request an interim CB meeting as required. Refer to paragraph 1.5 for CB participants.

If the PSCP is amended as a result of an interim CB meeting an updated copy is to be signed and dated by the CAA Project Engineer and the applicant's Project Manager.

## 2.3 Conformity Inspections

In accordance with rules 21.117 and 21.35, an applicant for an STC must perform the necessary inspections, and provide evidence, to ensure the materials, parts, manufacturing processes, assembly and installation conform to those defined in the STC design data. The Director may also choose to conduct inspections as required. Details of required conformity inspections are to be included in the PSCP. Conformity inspections are required for the following reasons.

**2.3.1 Prior to compliance tests or inspections.** These inspections compare physical aspects of the actual design to the descriptive data and should be completed before any official compliance tests or inspections are conducted. If conformity with the descriptive data is not confirmed, the findings of compliance may not be valid.

For all compliance test or compliance inspection articles forming part of a design change, a CAA [Form 8130-9](#) "Statement of Conformity", or an alternative document specified in the PSCP, should be signed by the following authorised person.

- For a design change that is not major, a person authorised to certify the release-to-service of the changed product.
- For a major design change a person authorised to certify the conformity of a major modification or repair.
- For stand-alone tests, not performed on an aircraft, a person authorised by a Part 148 certificated Manufacturing Organisation to sign a CAA Form One.
- A person specified in the PSCP.

All prototype modification parts forming part of the test or inspection article require a CAA Form One, or an alternative document specified in the PSCP. Documents issued in accordance with the requirements of a foreign Regulatory Authority (as identified in AC00-1) may be acceptable, as agreed in the PSCP.

For compliance tests, individuals within the aircraft design organisation authorised to make a finding of compliance should verify that the test set-up conforms to the applicable test plan and

include a statement to this effect in the test report or CAA [Form 8100-1](#) "Conformity Inspection Record", in addition to the CAA [Form 8130-9](#) "Statement of Conformity".

Where compliance tests are to be carried out on foreign soil, the Director may request a conformity inspection to be carried out by a representative of the National Aviation Authority (NAA) for the state in which the test is to take place. The results will be recorded by the NAA representative on CAA [Form 8100-1](#) "Conformity Inspection Record" or similar NAA form.

If deviations are made which do not reflect the STC descriptive data, or subsequent maintenance or modifications are carried out, a statement of conformity cannot be issued for the test article. Once a statement of conformity has been issued the aircraft configuration should be tightly controlled to ensure that any subsequent changes are documented and accounted for in the finding of compliance in accordance with rule 21.35(b)(3).

If it is necessary to carry out conformity inspections while an installation is in progress (usually due to lack of access when the installation is complete), the following conditions apply.

- All work to the point that the inspection is carried out should be complete and signed off.
- The installation records have been reviewed and all materials records (Form One, Release Notes, etc.) are complete and correct.
- The installation and the associated records are reviewed by a person authorised in the PSCP to ensure that the installation conforms to the STC descriptive data.
- When the partial conformity inspection has been completed, the installation records should be annotated that the partial conformity inspection has been completed and that there are no changes permitted to the installation without the direct involvement of the relevant aircraft design organisation.
- The installer should have a process in place to ensure that installations that have been inspected for conformity are not changed prior to the completion of the installation.

**2.3.2 Initial STC installation.** A conformity inspection of the first STC installation may be necessary to verify that manufacturing instructions are accurate, to ensure that maintenance instructions for continuing airworthiness can be carried out, and to ensure the design change can be replicated using the STC descriptive data. A CAA [Form 8130-9](#) "Statement of Conformity", or an alternative document specified in the PSCP, may be signed by the following authorised person.

- For a design change that is not major, a person authorised to certify the release-to-service of the changed product, or as specified in the PSCP.
- For a major design change a person authorised to certify the conformity of a major modification or repair, or as specified in the PSCP.

All prototype modification parts installed in the first STC installation must meet the requirements of rule 21.303.

It is important to note that conformity inspections described above are required as part of the STC approval process and *do not* replace or supersede the normal maintenance release-to-service requirements of Part 43.

The results of conformity inspections carried out by the ACU will be recorded on CAA [Form 8100-1](#) "Conformity Inspection Record". The CAA Project Engineer will liaise with the applicant to arrange these inspections if required.

## 2.4 Compliance Testing

In accordance with rules 21.117 and 21.35, an applicant for an STC must perform the necessary tests, and provide evidence to ensure the changed product complies with the applicable airworthiness requirements. The ACU, on behalf of the Director, may also choose to witness certain tests or have additional tests conducted as specified in the PSCP. Compliance tests may include the following.

- *Component Tests* – to verify that certain detail parts, components, or subassemblies meet the applicable airworthiness requirements.
- *Ground Tests* – to verify the complete installation or final assembly meets the applicable airworthiness requirements such as electromagnetic interference (EMI), environmental, fuel flow, or structural requirements.
- *Flight Tests* – to verify the effect of the design change on the aircraft's performance, flight characteristics, operation, noise signature and/or overall handling qualities. (Refer to paragraph 2.6 for specific flight test requirements)

The PSCP will include details of all compliance tests planned during the STC project, including the designated test witness. The applicant may conduct research and development tests to provide a level of design confidence without including this test data in the final substantiation.

**2.4.1 Test Plan.** Before any compliance testing is carried out, a test plan should be submitted to the ACU for review and acceptance. Each test plan should include the following.

- A list of the airworthiness requirements for which compliance is to be shown.
- A description of how compliance is expected to be shown including a step-by-step test procedure.
- A description of the test article.
- A list of test equipment and how the equipment is to be calibrated (if required).
- Details of how the test article and test setup will be conformed to descriptive design data and the test plan.
- Defined pass/fail criteria and a description of how this will be determined.

**2.4.2 Conformity Inspections.** Before any compliance testing, a conformity inspection of the test article and test set-up should be completed against the descriptive data, and a statement of conformity issued (refer to paragraph 2.3). If there is a delay between the conformity inspection and the compliance test itself, the nominated person responsible for making the finding of compliance should ensure that the finding of compliance is valid for the design defined in the STC descriptive data.

**2.4.3 Witnessing Tests.** An authorised witness is required to verify that the test procedures described in the test plan are followed and that any data captured by test instrumentation appears to be valid data for the test in question.

- The PSCP will detail the person responsible for witnessing each certification test.
- Where compliance tests are performed on foreign soil the Director may delegate witness responsibilities to a representative of the National Aviation Authority for the state in which the test is to take place.

**2.4.4 Test Report.** A test report is to be submitted as part of the substantiating data for the STC where compliance with sections of the airworthiness requirements have been shown by test. This report is to include the following.

- A list of the airworthiness requirements for which compliance was shown.
- Reference to the approved test plan.
- A statement of conformity, CAA [Form 8130-9](#) or another document acceptable to the Director, certifying that the test article and the test set-up was in accordance with the STC design data and the test plan (refer to paragraph 2.3).
- Confirmation that the test was conducted in accordance with the test plan, or if it was not, a description of the deviations and a justification for the validity of the results.
- Results of each test case including details of observations or other relevant information.

Each test report should be checked by the Project Design Engineer or another person authorised to do so in the PSCP.

## 2.5 Compliance Inspections

An engineering compliance inspection verifies compliance with airworthiness requirements and also ensures that the STC design is compatible with other installations on the product. A compliance inspection should not be confused with a conformity inspection which compares the changed product with the STC design data (refer to paragraph 2.3). Examples of compliance inspections are as follows.

- Interior Inspections – e.g. emergency placards, aisle widths, occupant protection.
- Control System Inspections – e.g. ease of operation, interference etc.
- Fire Protection Inspections – e.g. 25.981, flammable fluid lines etc.
- System Routing Inspections – e.g. hydraulic and electrical system routing.

Again, the PSCP will include details of all compliance inspections planned during the STC project, including the designated inspector(s).

**2.5.1 Compliance Inspection Checklist.** A checklist is used to record the results of each compliance inspection, and should be submitted to the Director as part of the substantiating data. The completed compliance inspection checklist should include the following.

- A list of the airworthiness requirements for which compliance was shown.
- A description of the items/aircraft which were inspected.
- Name(s) of the designated inspector(s).
- A statement of conformity, CAA [Form 8130-9](#) or another document acceptable to the Director, certifying that the inspected article was found to conform with the STC design data (refer to paragraph 2.3).
- A statement against each airworthiness requirement which confirms compliance or non-compliance, and any other relevant information.

Each compliance inspection checklist should be checked by the Project Design Engineer or another person authorised to do so in the PSCP.



## 2.6 Flight Testing

In accordance with rule 21.39, flight tests may be required to show compliance with the applicable airworthiness requirements, or to verify correct and reliable operation of the changed product. Details of any flight testing required during an STC project will be included in the PSCP. The Director may conduct a flight test audit (refer to paragraph 2.6-7) or request additional flight tests to verify the applicant's flight test results or to confirm compliance with airworthiness requirements.

FAA ACs 23-8, 25-7, 27-1, and 29-2 provide guidance for flight tests of aircraft certificated to those standards.

**2.6.1 Flight Test Plan.** The applicant is required to prepare a flight test plan which should be submitted to the ACU prior to the issue of a *special category - experimental* airworthiness certificate (refer to paragraph 2.6-3). The following information should be included.

- A list of the airworthiness requirements for which compliance is to be shown.
- A description of how compliance is expected to be shown including step-by-step procedures and defined pass/fail criteria.
- A description of the aircraft to be tested, the base airfield and the area of operation.
- Identify all personnel involved with the test flight(s), and their responsibilities. Only personnel necessary for the conduct of the test flight or to ensure safety are to be carried on a test flight. Include details of test pilot approvals (refer to paragraph 2.6-4).
- An analysis of flight test risks and details of risk management procedures.
- A list of test equipment and how the equipment is to be calibrated (if required).
- Details of how the test aircraft will be conformed to descriptive design data.

**2.6.2 Pre-Flight Certification Board (CB) Meeting.** Depending on the scope of the design change a pre-flight CB meeting may be held, at the request of the ACU or the applicant. The requirement for a pre-flight CB meeting should be included in the PSCP. Refer to paragraph 1.5 for CB participants. The purpose of this meeting is to carry out the following.

- Discuss and clarify flight test requirements, the flight test plan, and conformity inspections.
- Confirm flight test risk management procedures.
- Discuss and plan CAA flight test audit (if required).
- Ensure the aircraft has undergone the necessary ground inspections and tests.
- Review substantiating data to ensure the aircraft is in a safe condition for the intended flight tests.

If the PSCP is amended as a result of an interim CB meeting an updated copy is to be signed and dated by the CAA Project Engineer and the applicant's Project Manager.

**2.6.3 Issue of Experimental Airworthiness Certificate.** A *special category - experimental* airworthiness certificate must be issued under rule 21.193 if the applicant wishes to conduct any preliminary research and development flight tests or before conducting flight tests to show

compliance. A separate application should be filled out and submitted to the ACU for the issue of a *special category - experimental* airworthiness certificate (CAA [Form 24021/06](#)).

**2.6.4 Flight Test Pilot Approval.** In accordance with rule 19.405, for the purposes of experimental test flying under a *special category - experimental* airworthiness certificate, the nominated flight test pilot must be approved in writing by the Director. The approved flight test plan will identify the name and details of the nominated test pilot. A separate application should be filled out and submitted to the ACU (CAA [Form 24019/03](#) for a test pilot who does not already hold an approval for the specific aircraft and type of testing to be conducted.

**2.6.5 Flight Test Conformity Inspection.** The ground inspection physically verifies that the aircraft submitted for flight test meets the minimum requirements for quality, conforms to the STC design, and is safe for the intended ground and flight tests. The process defined in paragraph 2.3 is to be followed for all flight test aircraft.

**2.6.6 Flight Test Report.** The applicant is to provide a flight test report signed by the test pilot and any nominated test witnesses, to document the results of all certification flight tests, and to demonstrate compliance with the applicable airworthiness requirements. The ACU will review the applicant's flight test report in order to determine conformity of the aircraft with the type design, compliance with the applicable airworthiness requirements, and to identify tests that may require re-evaluation by way of a CAA flight test audit in accordance with rule 21.35(b).

**2.6.7 CAA Flight Test Audit.** Depending on the scope of the STC application the Director will determine the need for a flight test audit and the applicant will be advised if required. The purpose of a flight test audit is to verify the flight test data reported by the applicant, confirm compliance with the airworthiness requirements, and the adequacy of operational limitations, procedures, and pilot information. A CAA flight test audit may be conducted in conjunction with the applicant's flight testing or may be completed after the applicant's flight test report has been submitted.

## 2.7 Compliance by Similarity

Compliance with airworthiness requirements can be shown by comparing the current design with a similar design which has been previously approved. For example, if a certain interior material has been used in an approved STC, that same material may be eligible for a similar STC without the need for further flammability testing, etc.

The applicant would need to provide evidence of the previous approval ensuring that they meet the following.

- The extent and application of the design is exactly the same as that previously approved. That is the certification basis is the same as the previous approval, the design is physically the same, and the interaction with other parts of the aircraft are the same.
- Access to the technical data being compared to will be required, which may require permission from the approval holder.
- Compliance is re-established where there is any difference from the previously approved configuration. Substantiating data may be submitted which demonstrates that the differences do not affect the compliance of the design.

## 2.8 Compliance by Analysis

Engineering analysis is an integral part of showing compliance. It encompasses the full range of analytical techniques such as textbook formulas, computer algorithms, computer modelling/simulation, or structured assessments. The CAA approves the data, not the analytical

technique, so CAA holds no list of acceptable analyses, approved computer codes, or standard formulas. Analysis methods (including computer models) must be applicable and may be used only if the article to be analysed conforms to those for which experience has shown the methods to be reliable. Where analysis is predicated on a set of assumptions, the article analysed must be shown to conform to those assumptions. The use of a well-established analysis technique or software alone is not enough to guarantee the validity of the result. Validation of the data must be included in the compliance report to show the result is accurate, the technique is applicable, and the analysis does not violate the assumptions of the analysis technique.

## **2.9 Deviations and Changes**

It may be necessary to modify or update the design data during an STC project for a number of reasons; a certain tolerance cannot be achieved during manufacture, a material is out of stock, or it is found that a part cannot be fitted in accordance with the installation instructions.

A production deviation (or concession) may be needed due to factors affecting the installation on one particular aircraft, or the STC design which is then applicable to a series of aircraft.

It is important to remember that if compliance is shown for a particular design, and that design then changes, it will be necessary to re-establish compliance or show that it is unaffected. This is required for changes affecting one installation or the overall STC design. The basis for compliance with the airworthiness requirements is not always obvious and it cannot be assumed that a small change is trivial.

Changes that are made prior to STC approval should be reflected in the final STC design data. The master document list (refer to paragraph 2.1) can be used to identify the status of design data, however the applicant should identify and record all changes from beginning to end as follows.

- Recording the reason for a change.
- Incorporating the change in the descriptive data.
- Establishing that the changed design complies.
- Installing the change.

Details of this procedure or reference to a Part 146 procedure are to be included in the PSCP.

### 3. Completion Phase

The completion phase of an STC project covers a review of any outstanding requirements, submission of all final documentation to the Director, certification activities, and the continuing responsibilities of an STC holder.

#### 3.1 Submission of final data

The applicant and/or aircraft design organisation should submit a consolidated data set including all updated documents to reflect the final design configuration. All design data should be checked and released in accordance with the design organisations procedures by persons authorised to do so.

The final compliance checklist, statement(s) of compliance and master document list should be submitted with current references to descriptive and substantiating data.

#### 3.2 Final Certification Board (CB) Meeting

A final CB meeting may be required for significant STC projects, after the applicant has demonstrated compliance with all applicable airworthiness requirements, in order to review any outstanding design data or technical issues, formalise the decision to issue the STC, and discuss any post certification activities. The applicant or ACU may request a final CB meeting as required. Refer to paragraph 1.5 for CB participants.

#### 3.3 Issue of STC

An applicant is entitled to an STC when the Director is satisfied that the requirements of rule 21.119 have been satisfied. The Director, or authorised CAA staff member, will sign the STC certificate and hardcopies of the STC master document list (**MDL**), flight manual supplement and airworthiness limitations section of the ICA if limitations are specified.

An applicant may request that individual drawings or documents are signed however all data is controlled by reference on the MDL. The STC certificate and one copy of the signed documents will be returned to the applicant, and one copy of all the descriptive and substantiating data will be held on file at the CAA.

#### 3.4 Foreign Acceptance/Validation of CAANZ STCs

Current international bilateral agreements determine the acceptance, or process to accept, a CAANZ STC by a foreign airworthiness authority. Copies of all international agreements and arrangements can be found on [CAA website](#).

An applicant should include details in the PSCP if they wish to obtain a foreign STC following certification. For large STC projects this may necessitate involvement of the foreign regulatory authority while compliance finding activities are being conducted.

**3.4.1 Australia.** As a “recognised” country under CASR Part 21, a New Zealand CAA STC is considered equivalent to a supplemental type certificate that could have been issued by the Australian Civil Aviation Safety Authority. As such, a New Zealand CAA STC is approved for embodiment on aircraft registered in Australia with no further review or approval required.

**3.4.2 United States of America.** An STC holder may apply for the issue of certain US STCs in accordance with the US-NZ Bilateral Aviation Safety Agreement, Implementation Procedures for Airworthiness (IPA). The full scope of STC approvals which are eligible for the issue of an FAA STC is listed in the IPA which is posted on the CAA website. In general, STCs meeting the following criteria are eligible for the issue of an FAA STC.

- 14CFR 25 interior and non-complex in-flight entertainment modifications
- 14CFR 23
- 14CFR 27 and 14 CFR 29 non-complex modifications.

The current working arrangement between the European Aviation Safety Authority and the New Zealand CAA does not cover the acceptance or validation of STCs.

### 3.5 Embodiment of STC

In most cases an STC will be a major modification and must be certified for conformity with the design data in accordance with Part 43 Subpart E.

In some cases an STC may approve a modification that is not major, where for example, the applicant wishes to sell the design package. In this case no conformity inspection will be required for embodiment of the STC design.

The descriptive data of each STC can recommend to the installer whether the installation can be considered to be a major modification or not.

The STC holder should be notified immediately if any issues or difficulties are encountered during installation or embodiment of an STC design. It is important to remember that if compliance is shown for a particular design, compliance may be invalid if that design changes during installation. It cannot be assumed that a small change is trivial.

As the embodiment of an STC will probably include a revision to operating or maintenance documentation, particular attention should be paid to the incorporation of all design data. Instructions for Continued Airworthiness (ICA) should be included in the aircraft maintenance programme and any approved flight manual supplement (FMS) must be included with the documents to be carried in accordance with rule 91.111(2).

### 3.6 Continued Airworthiness

As described in paragraph 1.2, the STC holder is responsible for continuing airworthiness support throughout the life of the STC. Since it may be necessary to contact owners of aircraft with the STC embodied, the STC holder should keep records of those aircraft and organisations that the STC was sold to.

In the event of defects being reported, it is the STC holder's responsibility to investigate and the STC holder may wish to contract a Part 146 design organisation to carry out the failure investigation. The STC holder should also consider their responsibilities to report the defects to CAA under Part 12.

### 3.7 Changes to approved STC data

Rule 21.125 states that the holder of an STC intending to make a significant change must apply for an amendment on CAA [Form 24021/09](#) or apply for a new STC. In reality, all changes to STC technical data need to be approved by the CAA because the STC certificate requires the master document list to be at a 'CAA approved revision' and a Part 146 delegation holder does not have the delegation to approve STCs.

Note that this doesn't preclude the ability of a Delegate to approve a minor modification applicable to an STC in the same way that they can approve a minor modification applicable to a TC. The modification would need separate, clearly differentiated technical data.

## **Appendix A: Project Specific Certification Plan Template**

Available as a separate AC AC21-8 Appendix A.