


<p style="text-align: center;">SOUTH AFRICAN</p>  <p style="text-align: center;">CIVIL AVIATION AUTHORITY</p>	<p><b>REPUBLIC OF SOUTH AFRICA</b></p> <p>CIVIL AVIATION AUTHORITY</p>	<p>CAA Private Bag x73 Halfway House 1685</p>
<p>Tel: (011) 545-1000 Fax: (011) 545-1465 E-Mail: mail@caa.co.za</p>	<p><b>AERONAUTICAL INFORMATION CIRCULAR</b></p>	<p><b>AIC</b> 60-16 02 JUN 2011</p>

**AIRWORTHINESS**

**ADMINISTRATION**

**SUPPLEMENTAL TYPE CERTIFICATION PROCEDURES**

**SECTION A: GENERAL INFORMATION**

**Purpose**

The purpose of this AIC is to provide procedural guidelines concerning the planning and conduct of a supplemental type certification activity for a domestic aeronautical product.

**Applicability**

This AIC is applicable to domestic Type Certification projects of Class 1 Aeronautical Products. i.e. Aircraft, Engines and Propellers.

**Reference Documents**

It is intended that the following reference materials be used in conjunction with this document:

Part 21 Subpart 5 of the South African Civil Aviation Regulations (CAR's), General;  
Part 21 Subpart 9 of the South African Civil Aviation Regulations (CAR's) Approval of parts and appliances;  
SA-CATS-AR, South African Civil Aviation Technical Standards, Airworthiness Requirements;  
Aeronautical Information Circular (AIC 61.6);  
CAR Part 43 of the South African Civil Aviation Regulations;  
Product Type Certificate Data Sheet (TCDS);  
Part 147 of the CAR's, Design Organisations for Products, Parts and Appliances;  
SA-CATS-DO, South African Civil Aviation Technical Standards, Design Organisations;  
Part 187 of the CAR's, Fees;  
Part 23 of the Federal Aviation Regulations (FAR), Normal, Utility, Acrobatic and Commuter category Aeroplanes;  
Part 25 of the FAR, Transport Category Aeroplanes;  
Part 27 of the FAR, Normal category Rotorcraft;  
Part 29 of the FAR, Transport Category Rotorcraft;  
Part 31 of the FAR, Manned Free Balloons;  
Part 33 of the FAR, Aircraft Engines;  
Part 34 of the CAR's, Engine Emission Certification;  
Part 35 of the FAR, Propellers;  
Part 36 of the CAR's, Noise Certification;

**Definitions and Abbreviations**

The following definitions and terms will be used in this document:

**Accept** – means the acknowledgement by SACAA that an item or plan should lead to compliance. Applicants' engineering reports are accepted;

**Approve** – means to make formal acknowledgement that a product or document meets the regulations and requirements. Within this instruction the word approve is limited to the Type Certificate, STC, Type Certificate Data Sheet (TCDS), Airworthiness Limitations section of the Instructions for Continuing Airworthiness (ICA), the Flight Manual and refers to approvals made by the Director of Civil Aviation;

**Applicant** – means the applicant who is a legal entity and holds approval under CAR part 147 on whose behalf the application was made. This will normally be the entity to which the Supplemental Type Certificate is issued when the certification activity is completed;

**Approved Model List** – For design change approval which may be implemented on several different aircraft models, the generic STC approval is done to reduce the number of follow on approvals that would have to be obtained for further modifications; e.g. Avionics installations.

**Certification Team** – means those individuals who have been assigned to a particular type certification project, including the applicant, SACAA personnel and personnel authorized by the SACAA;

**Compliance Inspection** – In depth inspection meant to ensure that the change/s to the product design remain compliant to the applicable airworthiness requirements and CAR's.

**Conformity Inspection** – A complete, independent and documented physical and functional inspection process to verify that prescribed production methods have produced an acceptable item as specified by engineering drawings, engineering specifications and other applicable design data.

**Engineering Inspection** – Engineering inspections are physical inspections performed by a SACAA Certification Engineer. This inspection provides an opportunity to review an installation and its relationship to other installations on a product to determine compliance with airworthiness requirements that cannot be determined adequately from an evaluation of the technical data;

**Finding of Compliance** – means a determination that an element of the design satisfies the applicable standard of airworthiness;

**Means of Compliance** – means the principle means by which compliance is demonstrated. Examples are: analysis, test, similarity, flight test, compliance inspection, drawing review, process specification, and other actions and documents;

**Project Manager** – means the assigned individual from within the SACAA Certification Engineering Section, who manages the certification project. The applicant may also have a project manager, who will be referred to as the "applicant project manager" in this document;

**Level of Involvement (LOI)** – means the summation of SACAA activities undertaken during a certification program, as the SACAA share of the overall certification activity, to be satisfied that aeronautical products are compliant with accepted standards using accepted interpretations and that they have no unsafe feature.

**Compliance Program (CP)** – Process to ensure that all the items in the compliance matrix are covered to ensure that the product certification basis is maintained.

**Certification Plans** – Used to define the comprehensive planning details on how compliance will be shown. Certification plans are written for specific systems or technology areas.

**One-Time STC** – STC that applies to only one aircraft/engine/propeller serial number.

**Multiple STC** - Necessary if two or more aircraft/engines/propellers are to be modified, and it must be demonstrated that the modification can be duplicated.

## **Background**

The issuance of the SACAA Supplemental Type Certificate (STC) is a secondary form of approval of the design of a major modification, repair or enhancement of a class I product such as a type-certificated aircraft, engine or propeller. It is supplementary to the original product Type Certificate (TC), and does not supersede or change the effectiveness of the previously issued TC. When the STC is applied to an aircraft, the aircraft type design is now defined by the previously issued TC, plus the change in the type design as stated in terms of Regulation 21.05.3.

This document is meant to provide a consistent process to clarify what is expected at each phase in the certification process of the product design change. Details of each phase are covered in later sections of this document.

The phases are:

- (a) Phase One: Application and Establish Certification basis
- (b) Phase Two: Establish Means of Compliance and SACAA LOI
- (c) Phase Three: Demonstrate and Record Compliance
- (d) Phase Four: Supplemental Type Design Approval

## **SECTION B: PHASES IN THE SUPPLEMENTAL TYPE CERTIFICATION PROCEDURE**

### **PHASE ONE – APPLICATION AND ESTABLISH BASIS OF CERTIFICATION**

*Phase one covers activities starting with pre-application Meeting. The applicant will have already conducted a considerable amount of conceptual and design work. Establishment of Certification basis involves the determination of aeronautical design standards used when the product was certified.*

*The envisaged design change should remain within the boundaries of the established product certification basis. The certification approach and strategy will be determined during this phase.*

**The primary output is an agreement on the initial basis of certification.**

#### **1. Pre-Application Inquiries / Meetings**

*Upon receipt of a certification inquiry, a representative from the Certification Engineering Section may communicate with the potential applicant to obtain a preliminary assessment of the general features and degree of complexity of the given product. The holding of exploratory discussions is useful in assessing the need for and setting the parameters of a concept briefing.*

#### **2. Concept Briefing**

(1) *A concept briefing is suggested for complex projects. During a Concept Briefing the applicant should be prepared to provide a detailed description of the product. The applicant is also expected to advise SACAA how they intend to show compliance for novel or unusual features although at this time the applicant need do so only in a top-level fashion. The Concept Briefing is the first formal discussion of certification basis and means of compliance. Attendees at the briefing should include the applicant, SACAA specialists and managers.*

(2) *The agenda may include the following general topics:*

- (a) *Aircraft overview;*
- (b) *Any applicable lessons learned from previous programs;*
- (c) *Novel and unusual features;*
- (d) *Schedule for follow-on specialist meetings.*

#### **3. Application**

*The applicant must submit an application for the issuance of a South African Supplemental Type Certificate in accordance with the requirements of Subpart 5 of Part 21 of the CAR's and the associated technical standards SA-CATS-AR. The completed application form CA 21.05 needs to be accompanied by the appropriate fee as stipulated in Subpart 187.00.2 of Part 187 of the CAR's.*

#### **4. Fees**

*Subpart 187.00.2 of Part 187 of the CAR's defines the relevant fees for the product design change approval under supplemental type certificate. Fees are charged to the applicant based on the hourly rate for the time spent on the project by SACAA personnel.*

#### **5. Establish Baseline Project Schedule**

*The applicant is required to include a proposed baseline project schedule, which is essentially a top-level schedule that only identifies major milestones. The Project Manager is expected to work with the applicant towards the development of a more detailed project schedule.*

*Ideally, the applicant, who has the most control over the timing of events, writes this schedule and disseminates it to the certification team. Typical events to schedule in addition to the major milestones are design review meetings, major ground or flight tests, and submission and acceptance of major certification reports.*

*The Project Manager will endeavour to assure that any SACAA resource constraints are accommodated in the schedule. The schedule should cover milestones, accomplishments and the expected levels of involvement of both the applicant and the SACAA project team.*

#### **6. Identify SACAA Team Members**

*The Project Manager shall initiate a request for the appointment of the SACAA project team comprising of members from the engineering, manufacturing, operations and continuing airworthiness and other relevant departments.*

**7. Create Action Item Database**

Action items may result from meeting minutes, flight test debrief notes, review of reports or a multitude of other sources. The Project Manager will work with the applicant project manager to create an action item database.

Primary responsibility for maintaining the action item database is the applicant project manager and the SACAA project manager verifies it is accurate. The database is a shared database with input from all members of the certification team, applicant and SACAA alike. It is the responsibility of whoever raises a new action item to advise the SACAA and applicant project managers of the item. Ideally, the applicant, who has the most control over the timing of events, controls the Action Item Database.

Such a database is simply a list of outstanding action items that need to be accomplished in order to reach the certification target. This could include signatures required on the Compliance Program, open action items, open issue papers, remaining tests, reports to be submitted and accepted, or any element of SACAA's LOI or the applicant's compliance demonstration and recording. The list diminishes over time as actions are completed.

The database will remain active to the end of the certification process in order to ensure that no action items are overlooked and that all items are dealt with before the project is completed. A LOI matrix, described in Phase Two, will complement the action item database.

**8. Reports / Meeting Minutes**

Reports are generated as an output from formal meetings, ad hoc meetings, test witnessing and some telephone calls or e-mails. A report might be generated anytime throughout the certification process. The rule of thumb should be that if a decision was made or an action item agreed, some form of report should be made. The essentials of the meeting should be captured, including: identification of personnel involved, date, place, topic, decisions made and action items generated.

In addition, the report should indicate the agreement of the participants to the accuracy of the decisions or action items identified in it. All team members shall ensure that the Project Manager and the applicant project manager are aware of new action items and decisions made. The Project Managers will ensure that the action item database is populated with the new items.

Either the applicant or a SACAA team member may write a report. In either case, copies must be forwarded to both the Project Manager and the applicant project manager. Ideally, both sides of the team will have reviewed it for accuracy. Signatures may be used to record agreement to the accuracy of the report.

Larger, pre-planned meetings should have a secretary named ahead of time who will be responsible for generating minutes / reports.

**9. Identify Special Conditions and Equivalent Level of Safety**

Special conditions may be applicable in situations whereby the proposed design change consists of systems, components or parts which have not been previously certified, new materials, features and or safety challenges which may not be sufficiently covered by any of the applicable certification and/or airworthiness standards for the specific aeronautical product e.g. the use of composite materials.

In cases where special conditions exist, or when it is difficult to show compliance to a published standard, the applicant shall provide a detailed description of any such unusual design features and also to demonstrate that the design meets an alternative and equivalent level of safety as agreed upon by the project certification team.

When the need for a finding of equivalent safety becomes apparent, the Project Manager shall ensure that discussions documenting the logic of the finding of equivalent safety are captured in a technical issue paper.

**10. Identify Required Exemptions**

An applicant may apply to the Director of Civil Aviation (DCA) for an Exemption from a particular requirement.

An Exemption may be issued where it is the opinion of the DCA to be in the public interest and not likely to affect aviation safety. Part 11 of the CAR's is the applicable regulation governing exemption applications.

Exemptions granted to design standards are permanent and are recorded in the basis of certification.

Applicants may elect to voluntarily apply standards later than those required by the CAR's. It must be understood that any additional standards with which the applicant elects to comply will form an integral part of the certification basis for the given product and are not optional for subsequent changes to the type design.

#### 11. **Establish Certification Basis and Certification Plan**

One of the first tasks in an STC project is defining a certification basis. The certification basis is the set of regulations, special conditions, equivalent safety findings, and exemptions to the rules that identify the airworthiness standards and other requirements to which the applicant must show compliance. The applicant must demonstrate compliance with all elements of the certification basis to the satisfaction of the SACAA before the STC may be issued.

The main objective of the Certification Plan is to ensure that the proposed product design change complies with product certification basis.

Once the product certification basis is identified and agreement reached between the applicant and the SACAA, the plan shall also include a compliance checklist or matrix.

The applicant and SACAA shall agree on the specific means of compliance to the airworthiness standards and regulations shown in the compliance matrix.

A typical plan shall consist of some of the following items:

- (a) Introduction.
- (b) A brief System description.
- (c) Type of aircraft involved.
- (d) System Safety Assessment Report.
- (e) Applicable requirements and airworthiness standards.
- (f) Reference to the certification basis as specified on the TCDS of the type certificated product.
- (g) A Compliance Checklist – A list of applicable airworthiness standards or specific certification basis such as CAR's and SA-CATS, FARS, RTCA's, etc versus proposed means of compliance (MOC) on an item by item basis.
- (h) List of all the activities pertaining to compliance demonstrations such as test witnessing, compliance tracking, compliance inspections and records, conformity statements.
- (i) Program time schedule for achieving compliance, milestones and action item assignments, etc.
- (j) Required compliance documents, e.g. Flight test plan, PSAC, FHA, etc.
- (k) For STC's incorporating electrical and avionics systems, the latest electrical load analysis of the aircraft shall be required.

Other information included, such as a proposal for the LOI by SACAA in terms of delegation and test witnessing, as well as the deliverables to SACAA such as documents required for showing of compliance to the applicable requirements and their scheduled date of availability shall be included in the Certification Plan for each compliance item.

#### 12. **Establish the Compliance Program**

The compliance program specifies each item within the compliance matrix as a Means of Compliance (MOC) by which the applicant is proposing to demonstrate compliance with the requirements. The applicant is requested to produce a Compliance Program for review and acceptance by SACAA. A requirement can be complied with for example by flight test, static test and/or substantiation report. Other notable means of compliance may be as follows:

- (a) Calculation/Analysis: Report for the evaluation of loads, strength, performance, flying qualities and other characteristics.
- (b) Safety Assessment: Safety analysis philosophy and methods, safety evaluation plans (e.g. software), system safety assessment, zonal safety assessment and others.
- (c) Flight Test: Flight test reports.
- (d) Inspections: conformity inspections to verify that materials, parts, processes and fabrication procedures conform to type design.

#### 13. **Use of TSO Approved or PMA Approved Parts**

In accordance with CAR part 21.12.3 (1) and 21.09.2 (1), an article manufactured under a ZA-TSO and ZA-PMA respectively, is an SACAA approved article or appliance for the purpose of meeting the applicable regulations and airworthiness standards required for approval of such appliance.

For parts approved by ZA-TSO or ZA-PMA, part conformity will not be necessary for its use in a certification project.

#### **PHASE TWO – ESTABLISH MEANS OF COMPLIANCE AND SACAA LOI.**

By the end of this phase a thoroughly planned certification approach with considerable detail should be available that has been negotiated and agreed with SACAA. Although testing and demonstrating compliance is

part of Phase Three, Phase Two may include cockpit mock-ups and other tools to agree on the certification nuances of proposed configurations.

**1. Provide Fundamental Certification Documents**

Certain compliance documents are required very early in the certification program as aids to discussion and to improve the certification teams' understanding of the applicant's product. These early deliverables are called the Fundamental Certification Documents (FCD). The FCDs should be drafted by the applicant during Phase One and submitted for discussion and acceptance by SACAA early in Phase Two. The list includes, but is not limited to:

- (a) Aircraft Level Safety Assessment;
- (b) Certification Plan;
- (c) Project Description;
- (d) Baseline Certification Project Schedule;
- (e) Plan for software aspects of certification (PSAC) for systems that contain software.

**2. Refine Certification Plan and Project Schedule**

The Certification Plan is developed by the applicant in Phase One. In Phase Two, SACAA and the applicant should discuss, negotiate and modify the certification plan as necessary prior to acceptance of by SACAA. Acceptance of the Certification Plan accomplishes the core goal of Phase Two, which is to agree on the means and methods of compliance and LOI. The witnessing requirements and compliance inspection requirements should be identified in the discussions and should be documented in the plans as appropriate.

In Phase Two, the overall development schedule produced by the applicant as the baseline plan should be expanded into a detailed schedule. The exact testing requirements should be developed mainly from the certification plan. The detailed schedule should be compared to the LOI matrix to provide early identification of busy periods and timing conflicts for SACAA. This schedule should be regularly updated and shared with SACAA.

**3. Define Conformity Inspection Requirements**

At this phase SACAA should identify all the conformity inspections required. The list should consider the rigour of conformity used by the applicant, the adequacy of the applicant's configuration control system, as well as the criticality of the configuration for the relevant tests. The Project Manager should extract all conformity requirements from certification plans. A certification team meeting might be needed to accomplish this planning. Details of the conformity requests will follow in Phase Three.

**4. Create LOI Matrix**

The LOI should be depicted in a "matrix format" created by either the applicant or the SACAA Project Manager. Each activity, such as conducting a test, completing a report or assembling data is listed. The levels of involvement for SACAA for each document, data element or test can then be shown next to the activity.

The matrix should include references to the certification schedule and to any known SACAA resource constraints that could affect the schedule. It should be possible to identify the responsibilities in the matrix at the level of the individual responsible for the activity. The level of detail that can be presented for each requirement using a LOI matrix ensures that SACAA and the applicant understand their respective expectations and obligations. The specialists and managers, both at SACAA and with the applicant, must agree to the LOI.

The SACAA LOI can be considered as the total of all:

- (a) Reports to be reviewed and accepted;
- (b) Flight Manual and Airworthiness Limitation approvals;
- (c) Reports received for information;
- (d) Test witnessing;
- (e) Conformity inspections conducted by SACAA;
- (f) Engineering inspections conducted by SACAA;
- (g) Flight testing activities conducted by SACAA;
- (h) Activities associated with issue papers;
- (i) Software process reviews on site, including those for programmable logic devices;
- (j) SACAA findings of compliance.

**5. Technical Issue Papers**

Provides means for the identification and resolution of significant technical, regulatory and administrative issues that occur during a certification process. Issue papers are primarily intended to provide an overview of

significant issues, a means to determine the status of issues, and a post certification summary statement on how issues were resolved.

An issue paper may be used when the specialists from the applicant and SACAA cannot reach agreement on a subject. The Project Manager should attempt to resolve disagreements between the applicant and the team before issuing a Technical Issue paper.

An issue paper may be raised when design or means of compliance is not traditional, or is of a novel or unusual approach. In this context, the issue paper serves as a recording medium to give special visibility to that aspect of the design even though there is no disagreement between the applicant and the SACAA.

The Project Manager is responsible for raising the issue paper and coordinating the sign-off of the issue paper by the appropriate technical specialists and managers prior to submitting it to the applicant. Sign-off or initialling of the issue papers is used as a control mechanism within SACAA to ensure that the position stated in the paper is accurately and clearly reflected and acceptable to all disciplines. Typically, all affected specialists, including project managers, and their managers will initial each outgoing revision of the technical or administrative issue papers. The format and writing of the issue papers is the Project Manager's responsibility, while technical specialists are responsible for ensuring that the technical details of the issue are correctly represented.

The Project Manager must ensure that agreement is reached on actions required to close the issue paper prior to certification. There may be cases where the technical solution to a problem will not be available until after certification. In these cases the agreement on the proposed solution should be sufficient to close the issue paper.

#### **6. Establish Configuration Control System**

The applicant is expected to have an effective configuration tracking system in place at all times.

Before each certification test such as, for example, flight, ground, fault board analyses, etc., the applicant must document the configuration of the product and must ensure that the product is representative of the type design in those areas that will be the subject of the test.

If the type design is changed subsequent to a certification test, the applicant may have to either repeat the test or substantiate that the design change does not affect compliance with the relevant design standard requirements.

SACAA may conduct conformity inspections as necessary. At the end of the certification project, the configuration control system must result in a definition of the type certified product.

#### **7. Acceptance and Review of Documents**

During Phase Two the first of the compliance documentation may be generated and submitted to SACAA, although the bulk of the documentation is generated in Phase Three. The reports submitted during Phase Two will usually be test plans, certification plans or fundamental certification documents.

Reports submitted for review as part of SACAA LOI, are sent to the Project Manager, logged in and forwarded to applicable team specialists. Comments from the specialists are received by the Project Manager, consolidated into an official correspondence and forwarded to the applicant. Once the applicant has shown compliance to appropriate requirements, the SACAA specialists may sign-off the Compliance Program.

The applicant and SACAA responsibilities are as follows:

- (a) The applicant is encouraged to discuss report content with the SACAA specialist prior to submitting the report to SACAA;
- (b) The applicant is responsible for submitting to SACAA the certification deliverables identified in the Certification Plans;
- (c) The Project Manager shall monitor the submission schedules. Should serious delays occur, he will advise the certification team and management;
- (d) The Project Manager shall also ensure that copies of all other documents referred to in the compliance plan are available to the team;
- (e) The certification team shall review the submissions in a timely manner and provide concise technical comments or acceptance of the documents; and

- (f) *The Project Manager shall facilitate discussions between specialists as needed and collate all technical comments in a letter to the applicant. Once acceptance on a report is reached, the applicant or Project Manager should note acceptance on the LOI matrix.*

### **PHASE THREE – DEMONSTRATE COMPLIANCE**

*The objective of this phase is the demonstration of compliance with the certification basis and the acceptance of compliance demonstrations.*

*Having established and agreed on the means of compliance (MOC), the applicant must provide the SACAA project manager with tests and calculations demonstrating that the design change complies with relevant CAR's and applicable airworthiness standards, notably by means of technical data and reports.*

*Periodic and scheduled project review meetings are generally held to allow SACAA specialists to perform detailed reviews of specific aspects of the project with their counterparts. Project Review meetings should be scheduled well in advance but they may be arranged as required. The objectives of the meetings are to gain detailed knowledge of the product design and certification in specific areas and enable SACAA to accept the applicant's proposals on findings compliance. The applicant is responsible and expected to prepare meeting minutes and have SACAA sign-off on such minutes.*

*The Specialist attending a design review meeting must ensure that:*

- (a) *a detailed report is prepared outlining the specific topics discussed and the aspects of the product reviewed ;*
- (b) *the report identifies agreements reached and records any outstanding action items; and*
- (c) *a copy of the report is given to the Project Manager for updating of the overall project status, the action item database, the LOI Matrix and the compliance plan, and to aid in preparation of project review meetings.*

#### **1. Update Project Schedule**

- (1) *The applicant is responsible for updating the overall project schedule. Updates to the project schedule are likely to affect the LOI matrix and the LOI schedule. Regular communications between the applicant and the Project Manager is needed to avoid conflict with other SACAA commitments and constraints.*
- (2) *The Project Manager may have team meetings or another method to ensure that specialists are aware of significant changes in schedule.*

#### **2. Prepare Test Plans**

- (1) *At the beginning of a project, or soon after the start, an agreement must be reached between the team and the applicant on the required tests and the responsibility for test witnessing. The details must be written into the Certification Plans and LOI Matrix. Test Plans will be written by the applicant and accepted by SACAA. They identify the test apparatus, test vehicle and configuration, test details including conditions and pass/fail criteria, data requirements, and hazard level with risk mitigation actions. Test Plans should be written and accepted as early as possible and prior to the test.*
- (2) *Time for SACAA review must be provided. Applicants should be cautioned that if the test plan is not accepted or if SACAA's test witnessing requirements are not satisfied before a test is conducted, there is a risk that SACAA will not accept the test results.*
- (3) *Test articles will be built to an agreed build standard and shown by the applicant to conform to that standard. In many cases the SACAA specialist will request that an additional conformity inspection be performed before the test is conducted. The Manufacturing inspectors will conduct this compliance inspection.*

#### **3. Witness Tests**

- (1) *Specialists witness tests in order to be able to assess the design and to make a finding of compliance. Authorised Persons are expected to witness all tests, as per SACAA LOI.*
- (2) *SACAA specialists witnessing tests do not participate in the tests. This ensures that the individual remains impartial and can concentrate on the overall activity rather than being tasked with performing a specific function while the test is going on.*

#### **4. Engineering Inspections**

- (1) An engineering inspection is a specific task carried out to review and validate the completed work and/or finished product against the relevant design specifications, airworthiness standards and applicable Civil Aviation Regulations. Inspections can be aimed to achieve compliance to the regulations or Conformance to the product design and/or functional specifications.
- (2) Reasons for an engineering inspection include:
  - (a) To give perspective to the drawings and determine their adequacy;
  - (b) To provide familiarization with the aircraft: its layout, systems operations and structural load paths;
  - (c) To show possible interactions and interference between systems or components;
  - (d) To examine HIRF or lightning related features such as bonding or gaps in metallic enclosures;
  - (e) To conduct zonal inspections for the purposes of compliance to standards for flammable fluids, fire zones or interior installations; and
  - (f) To verify compliance with the requirements of an airworthiness standard.
- (3) SACAA specialists conducting an engineering inspection should document the results and note any discrepancies resulting from design or conformity issues as action items for the applicant. The applicant must be debriefed on the inspection and the action items recorded.

#### **5. Issue Flight Permits/Experimental Certificate of Airworthiness**

In most instances, either a Special Flight Permit or an Experimental Certificate of Airworthiness shall be required for all developmental and certification flight-testing issued in accordance with Subpart 21.08.4 of Part 21 of the CAR's. It must be understood that this flight authority is not an airworthiness declaration but simply permission to fly an aircraft deemed safe for flight. Such a flight permit will have conditions and restrictions attached which will change throughout the certification program.

After each certification flight test, the SACAA keeps record of De-brief Notes. They document the flight test results with comments and identify certification issues and/or ask questions which the applicant must action. The applicant must track the flight test debrief notes and keep SACAA project manager apprised of the status of the action items. The SACAA project manager shall always be kept informed as to flight test debrief notes related to the project.

#### **6. Applicant/SACAA Certification Readiness Review Meeting**

- (1) Near the end of Phase Three it is useful to hold one or more certification readiness review meetings. In such a meeting, specialists and applicant discuss the entire design with the goal of determining how close the project is to the goal of certification or design change approval. Topics for discussion will include open action items, unfinished tests, determination of the flight envelope to be approved, closure of issue papers, approval of airworthiness limitations and of the flight manual, and any other items from the "to-do" list.
- (2) There might be three certification readiness review meetings: one held by the applicant alone, one held by the SACAA team alone and a combined certification team meeting. The purpose of the separate meetings is to prepare for the combined meeting.
- (3) The end of Phase Three will be a declaration that the design is compliant with its certification basis and that no unsafe feature is known to exist. Both are equally important. It is the goal of the certification readiness review to discuss and agree on actions needed to make this declaration.

#### **7. Finding Of Compliance and Compliance Matrix Sign Off**

- (1) Sign-off of compliance matrix by SACAA is done in both Phase Three and Phase Four. The Compliance Matrix sign-off process is a systematic means to record compliance with all the applicable airworthiness requirements. It provides confidence that the approval of the Supplemental Type Certificate is warranted.
- (2) The typical sign-off includes each applicable paragraph of the certification basis signed by each applicable specialty area within the applicant's design approval organization. It is countersigned by SACAA specialists in areas where SACAA has expressed a need for involvement.

- (3) *The original paper copy of the Compliance Matrix is signed by the applicant near the end of Phase Three. Ideally, signatures should be applied at the earliest opportunity once compliance has been shown for an item.*
- (4) *There are essentially four situations that may exist at the end of Phase Three with respect to findings of compliance:*
  - (a) **Applicant and SACAA agree compliance has been demonstrated.** *The applicant indicates their finding or recommendation of compliance by signing the Compliance Matrix against the specific requirement. The SACAA specialist indicates his concurrence that compliance has been shown by also signing the Compliance Matrix against the requirement.*
  - (b) **Compliance with limitations and/or mandated inspections:** *In some instances, compliance can only be found by the imposition of a limitation and/or inspection. If a limitation/inspection can enable compliance to be found, the applicant and the SACAA specialist shall sign the Compliance Matrix. SACAA must provide explicit agreement on the acceptability of the limitations before the applicant can sign. The Compliance Matrix should be annotated to include the nature and location of the limitation/inspection that enabled the finding to be made. Such limitations/inspections must also be included as part of the appropriate approved publication: Flight Manual, Airworthiness Limitations Section of the Supplemental ICA, etc. Compliance items falling into this category are fully compliant, and as such could remain as permanent situations.*
  - (c) **A non-compliance exists:** *Sometimes the SACAA cannot make a finding of compliance because compliance has either not been fully established or the design change has been found not to be compliant with the product certification basis. The SACAA is therefore not able to sign the Compliance Matrix. Requirements that cannot be signed shall be listed as such and clear and agreed reasons shall be defined for each. Compliance finding items falling into this category may require interim limitations or mandatory inspections to be imposed to assure that these are satisfied.*
  - (d) **Applicant and the specialists are known to be in disagreement:** *In cases where disagreement exists between the applicant and the specialist concerning compliance or means and methods of compliance, the Compliance Program shall not be signed. Such a disagreement would normally result in the creation of an issue paper as a vehicle to resolve the problem.*

#### 8. **Review Aircraft Flight Manual**

*An approved Aircraft Flight Manual Supplement may be a requirement to ensure compliance to the certification basis of the aircraft.*

*Determine which sections of the existing Aircraft Flight Manual (AFM) are affected by the design change. The cover page of the AFMS should include a statement that the AFMS should be attached to the SACAA approved AFM when the subject alteration is incorporated into the aircraft, and should reference the aircraft make, model, allocated STC number.*

*Add, Modify, or Update the information contained in the AFM and place in the appropriate section of the AFMS. A dedicated AFM section should address any equipment operation limitations.*

*Once the AFMS is completed, the applicant submits the document to the project manager. The SACAA Flight Test and Engineering specialists shall review the document and submit to Project manager for approval. The cover page must also contain a signature block for the SACAA.*

#### 9. **Create an Approved Model List**

*For designs that may be implemented similarly on several different aircraft models, the standard certification approach used for certain applications such as in avionics modifications is the generic STC approval process. The goal of the generic STC approval process is to develop installation instructions that can be used to install avionics equipment in several different aircraft models. This concept reduces the number of follow-on approvals that must be obtained by prospective avionics installers.*

#### 10. **Develop the Supplemental ICA**

- (1) *At the start of the project, all parties will discuss and agree on the changes and additions to the Instructions for Continued Airworthiness (ICA) that will be needed to maintain proper operation and maintenance of the product in the field. The title, format and content of these instructions should be defined as early as possible.*

- (2) Evaluate the design change against aircraft maintenance instructions and develop Supplemental Instructions for Continued Airworthiness. ICA ensures the existing flight qualities and standards are maintained and where necessary, additional procedures added to maintain the altered product/aircraft
- (3) The ICA must contain any instructions for periodic maintenance requirements such as cleaning, servicing, functional checks, any calibration requirements, procedures, or instructions necessary to maintain the product in a continued airworthiness condition.
- (4) Approved methods and procedures for software revisions or updates must be included in the ICA. Procedures must include any appropriate equipment required along with a method to verify that the software load was successful. Also, the ICA must include a method to verify software revision status.

#### **PHASE FOUR –SUPPLEMENTAL TYPE DESIGN APPROVAL**

The bulk of the compliance demonstrations and findings are made in Phase Three. Phase Four concerns primarily the approval of the design change, its continued airworthiness limitations and maintenance of its operating envelope.

##### **1. Close Issue Papers and Action Item List**

- (1) Issue papers and Action items should be closed as soon as practical. Often they will be closed in Phase Three. Closure should be based on an agreed position and not necessarily on the demonstration of compliance. For example, should the issue concern a means of compliance, it should be closed as soon as SACAA and the applicant have agreed on the appropriate means of compliance.
- (2) It is expected that all action items and issue papers would be closed before certification.

##### **2. Sign-off Compliance Matrix**

As per the project compliance program, the sign-off on the Compliance Matrix by the applicant and by SACAA is done in both Phase Three and Phase Four. At the end of Phase Three the original Compliance Matrix will be sent to SACAA for completion. At this point the applicant will have signed the Compliance Matrix completely, indicating either a finding of compliance or recommendation of such a finding. The Project Manager will have custody of the original Compliance Matrix. The Project Manager ensures that designated specialists have access to provide compliance finding signatures.

##### **3. Review and Approve Supplemental ICA**

Airworthiness Limitations, changes to the ICA and Certification Maintenance Requirements arising from the STC process shall be approved by the Certification Engineering Section. The applicant will have proposed applicable changes to the ICA at the end of Phase Three. The Project Manager will distribute the contents of the proposal for acceptance by the relevant engineering specialists. Once all the affected specialists have accepted the contents, the changes shall duly be approved.

##### **4. Approve Flight Manual Supplement**

The applicant will have provided proposed changes to the Flight Manual at the end of Phase Three. The Project Manager will distribute this for comment by the affected engineering and flight test specialists. The Project Manager will coordinate the discussions and criticisms to establish a basis for consensus. Once all affected specialists have accepted the contents, the amended Flight Manual shall be approved.

##### **5. Engineering Review Board Meeting**

- (1) When the applicant and the certification team are satisfied that all the relevant certification requirements are sufficiently met, the Engineering Review Board (ERB) meeting is convened. The board reviews and validates the whole certification process and decides on the recommendation on whether to issue or not to issue the Supplemental Type Certificate.
- (2) The objectives of the meeting are to review and evaluate the following:
  - (a) Closure of outstanding issue items;
  - (b) Status of the compliance schedule, checklists, etc.
  - (c) Status of amendments to the Flight Manual;
  - (d) Status of the Maintenance Manual and other Instructions for Continued Airworthiness.

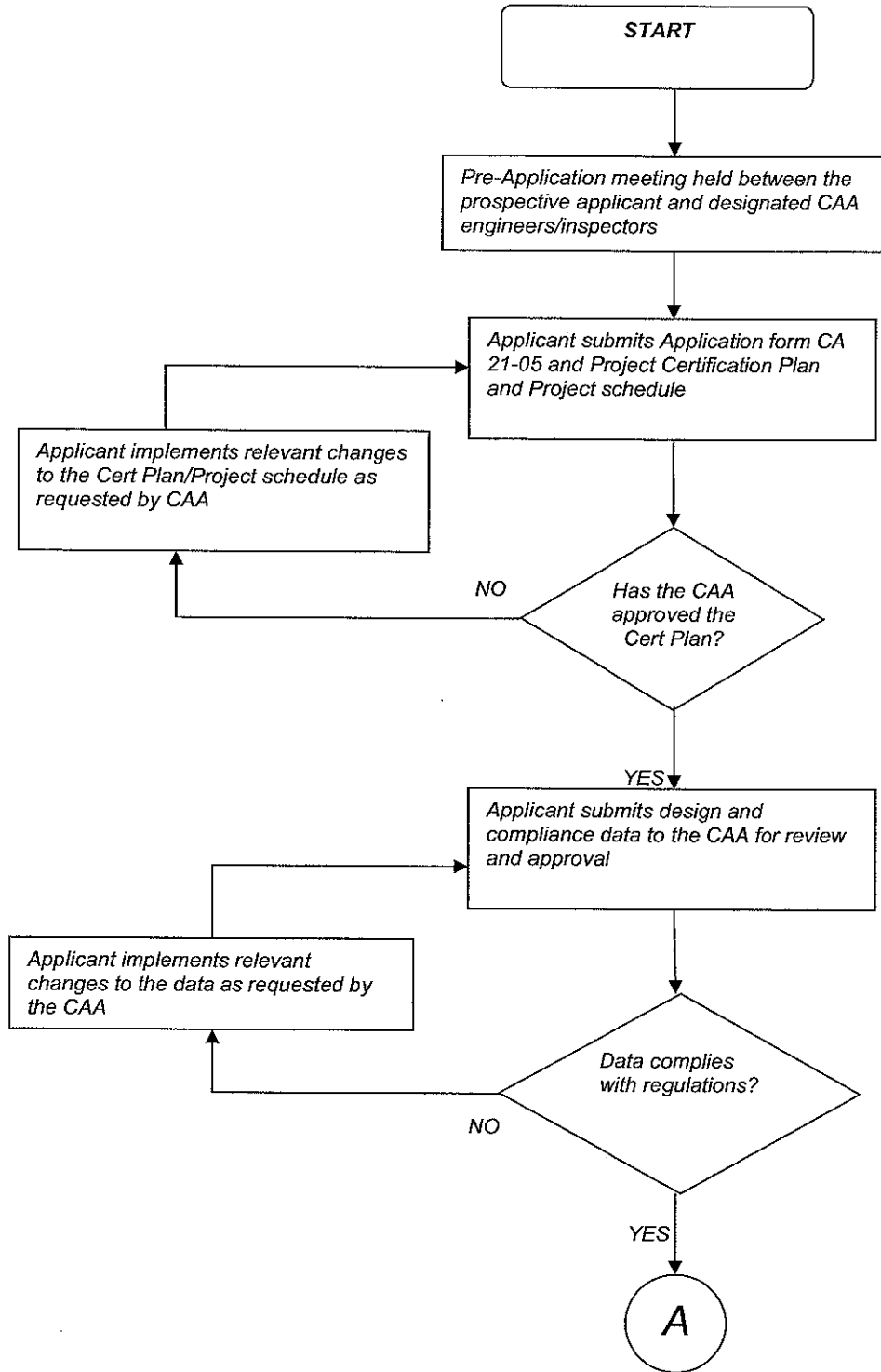
6. **Issuance of Supplemental Type Certificate**

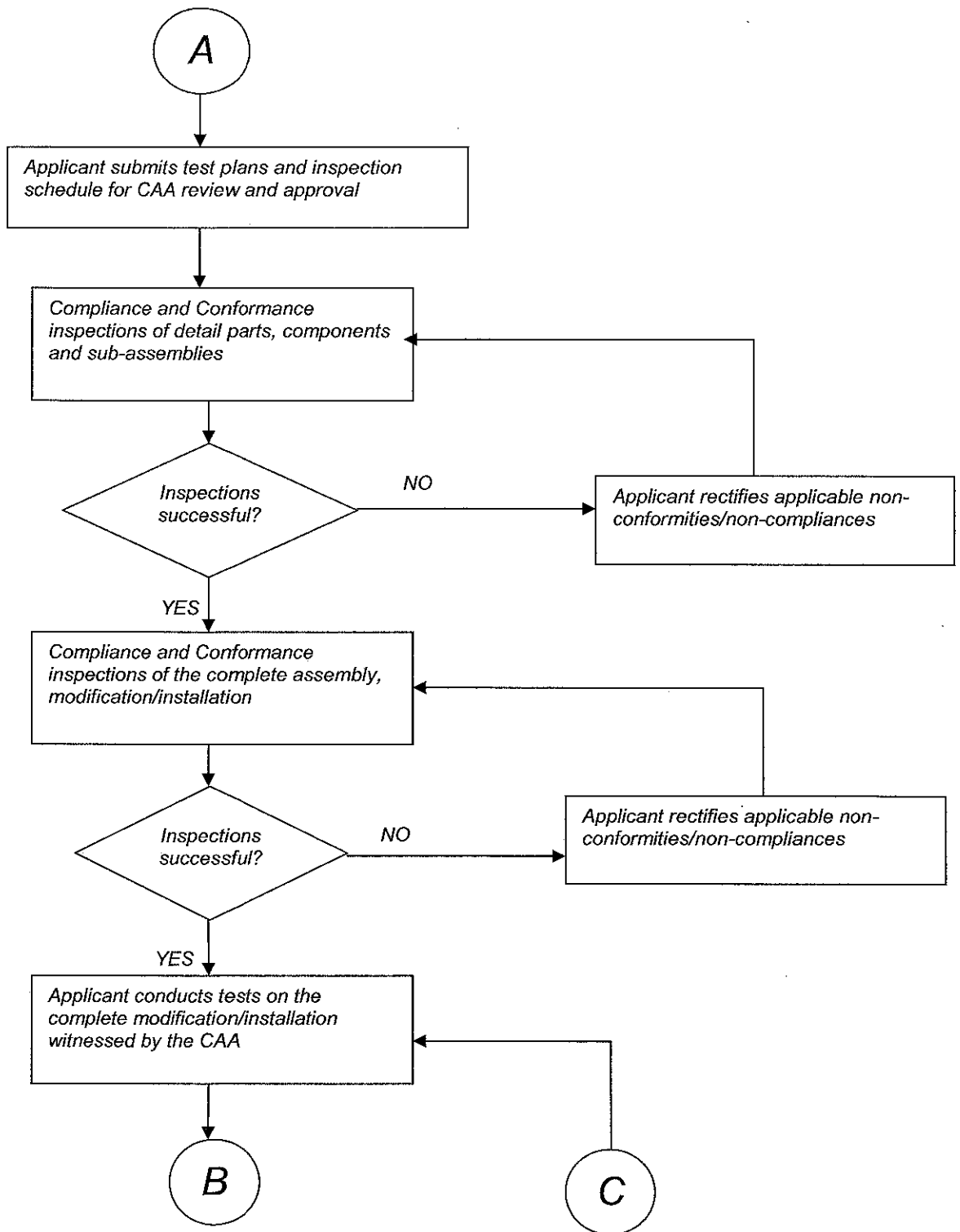
*When all the required data, certification tests, accompanying reports and scheduled inspections are completed satisfactorily as indicated in the certification plan as well as the determination that the design change complies with the product certification basis, applicable airworthiness design standards and relevant CARS and SA-CATS-AR, the STC shall be issued to the applicant on form CA 21.03 and the project formally closed.*

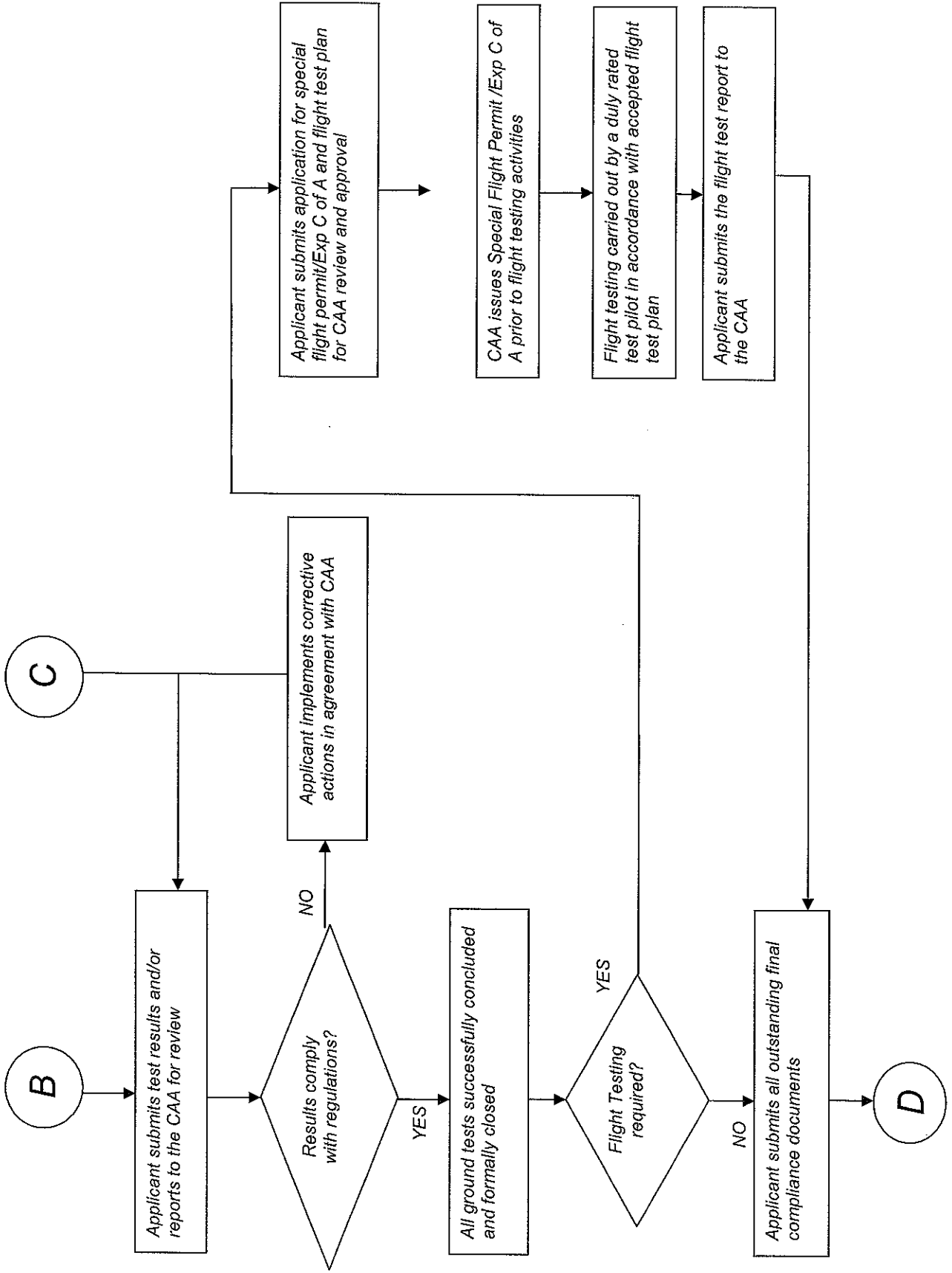
  
DIRECTOR OF CIVIL AVIATION

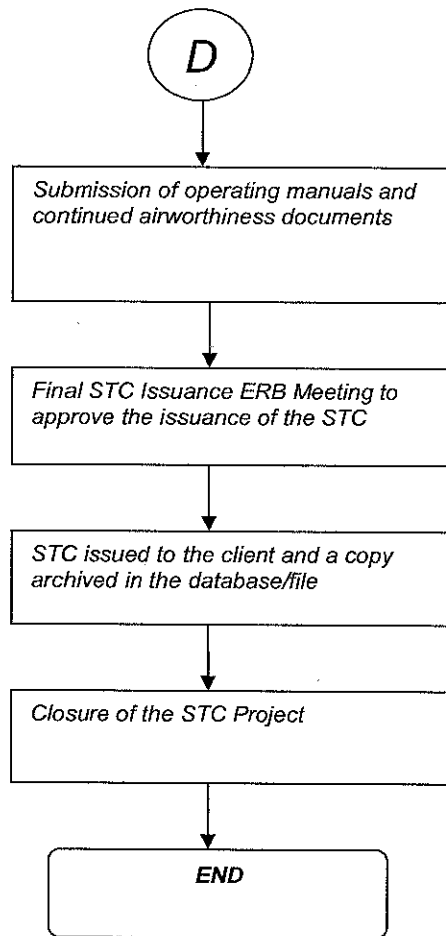
Appendices

STC Process Flow Chart









STC APPROVAL PROCESS FLOW CHART