AC 21-4(0)
10 March 2017

Civil Aviation Authority of Singapore

Advisory Circular

TEST WITNESSING AND CONFORMITY INSPECTION

1. GENERAL. Pursuant to paragraph 88B of the Air Navigation Order (ANO), the Director-General of the Civil Aviation Authority of Singapore (DGCA) may, from time to time, issue advisory circulars (ACs) on any aspect of safety in civil aviation. This AC contains information about standards, practices and procedures acceptable to CAAS. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

2. PURPOSE. This AC provides additional information and guidance related to the compliance with Part 21 of the Singapore Airworthiness Requirements (SAR Part-21) pertaining to application for a design approval which requires test witnessing and/or conformity inspection to meet the affected airworthiness standard requirements.

3. APPLICABILITY. This AC applies to a holder of a CAAS SAR Part-21 design and production approval, and an applicant for a Supplemental Type Certificate (STC), a Singapore Technical Standard Order (STSO) Certificate of Approval or a Repair design approval.

4. CANCELLATION. This is the first AC issued on this subject.

5. EFFECTIVE DATE. This AC is effective on 10 March 2017.

6. REFERENCES. Air Navigation Order; SAR Part-21; Bilateral Aviation Safety Agreement – Implementation Procedures for Airworthiness between Singapore and the United States; Technical Arrangement on Airworthiness Certification between CAAS and CASA.

7. BACKGROUND.

7.1 SAR Part-21 contains the regulatory requirements for the approval of design and production organisation and the certification requirements for a design change or a repair on aircraft, aircraft component or aircraft material. The requirements for approval for these design change or repair are contained in various subparts of SAR Part-21:

(a) SAR Part-21 Subpart C, Supplemental Type Certificates, contains the requirements for a design approval for a major change to the type design of a product;

(b) SAR Part-21 Subpart E, Singapore Technical Standard Order, contains the requirements for a design approval for a STSO article;

(c) SAR Part-21 Subpart F, Repairs, contains the requirements for a repair design approval for a repair design on a product or an article.

7.2 The applicant, who is applying for the relevant design change or repair to CAAS, needs to show that the changed product, article or repair design complies with the applicable airworthiness design standards and provides the corresponding substantiation data to CAAS for evaluation. Hence, one of the compliance methods accepted by CAAS is for the applicant to perform testing.

7.3 Compliance may involve the applicant to carry out a physical testing. This will involve the generation of a test plan; fabrication of fixtures and parts (including proto-type parts) that are used to conduct the test; and the generation of a test report. Conformity inspections may also be conducted on the test articles and test setups to ensure that they are produced in accordance with the test plan. The witnessing of these tests may be conducted by CAAS officers, or personnel who has been accepted by CAAS to do so.

8. TEST WITNESSING AND OTHER ASSOCIATED STAGES OF TESTING.

8.1 Considering that some design change or repair may require extensive demonstrations to demonstrate compliance to airworthiness standards, the applicant is to identify the test(s) required for each design approval application and to inform CAAS upon application or as early as possible during the evaluation process. This allows CAAS to determine CAAS's level of involvement and coordinate with the applicant on the major milestones such as part conformity inspections, installation conformity inspections and tests. Typical tests include, but not limited to, component, ground, and flight testing.

Test Planning

8.2 The applicant for a design approval should, at a minimum, include the following information in a test plan:

(a) Objective(s): To indicate the airworthiness standard(s) for which the test is used to demonstrate compliance with and the associated pass/fail criteria;

(b) Test Location(s): To indicate the details of the test facility and if the test is to be conducted on board an aircraft, the aircraft tail number should be indicated;

(c) Conformity inspection: To indicate details on the conformity inspection of the test article and equipment;

(d) Test Equipment: To list down the equipment required for the test;

(e) Areas of Responsibilities: To indicate the parties involved and their responsibilities. This includes the personnel in which the applicant proposes to use to perform the test;

(f) Test Conditions: To indicate the conditions in which the test shall be conducted in;

(g) Test Procedures: To indicate the procedures for the conduct of the test.

8.3 In preparing the test plan, the applicant may refer to the Advisory Circulars (AC); the Acceptable Means of Compliance (AMC); or Minimum Performance Standard published for the FAA or EASA airworthiness standard(s) that the test is used to demonstrate compliance with.

Test Witnessing

8.4 The applicant is responsible for the test and the test setups. In addition, the applicant has to be aware of the safety hazards involved for the conduct of the test and to take appropriate precautions to ensure that the test can be conducted safely. In the event that the applicant or CAAS decides that it is unsafe for the test to be to be conducted or continued, the test may be called off. In such situations, the applicant has to report the issue to CAAS and ensure that appropriate safety measures have taken before resuming the test.

8.5 In the event where a deviation to the accepted or approved test plan is needed during the conduct of the test, the applicant is to ensure that such deviation has been accepted by CAAS before continuing the test. Such deviation should not affect the results of the test, in particular the pass/fail as stated in the reference material. This deviation should be documented in the test report.

Test Reporting

8.6 After the testing, the applicant should consolidate the test results into a report to be submitted to CAAS.

8.7 If the testing fails to meet the pass criteria that has been accepted by CAAS, the applicant has to identify the reason and thereafter redesign and arrange a re-test. A new test plan has to be resubmitted to and be reassessed by CAAS.

CAAS's discretion in test planning, witnessing and reporting

8.8 Depending on the justifications and complexity of the test, and considering whether the applicant has the appropriate privileges for the design change under his Design Organisation Approval (DOA), CAAS may do one or more of the following:

(a) accept the applicant's Design Signatory (DS) in their field of expertise(s) or equivalent to approve the test plan;

(b) accept applicant's DS in their field of expertise(s) or equivalent to witness the test;

(c) accept the applicant's DS in their field of expertise(s) or equivalent to approve the test report;

(d) assess and approve the test plan;

(e) witness the test;

(f) review and approve the test report submitted by the applicant.

In (a), (b) or (c), the applicant has to submit the test plan or report, as the case may be, for CAAS's acceptance. In return, CAAS will communicate in writing to the applicant of CAAS's decision.

9. CONFORMITY INSPECTION.

9.1 Typically, there are 3 types of conformity inspections: Parts, Installation and Test Setup Conformity. Conformity inspection needs to be conducted prior to the commencement of a test to ensure that the test articles and test setup is in accordance with the test plan and are in compliance to the applicable airworthiness design standards. For complex modifications, conformity inspection may be conducted to ensure that the installation assemblies can be installed without deviations onto the aircraft. To enable CAAS to determine the level of involvement and coordination on conformity inspections in relation to a design approval, the applicant should provide details of the project and provide a conformity inspection plan if available at the application stage.

9.2 Prior to a conformity inspection, the applicant should provide CAAS with the latest revision of the design drawings and/or wiring diagrams of the modified component and their associate reference documentation. In the event where the applicant intends to have personnel other than CAAS officers to carry out the conformity inspections, the applicant should also provide justifications on the proposed conformity inspector.

9.3 Depending on the complexity of the part to be conformed and the experience of the proposed conformity inspector, CAAS may do one or more of the following:

(a) Conduct the conformity inspection on the part or test setups, or both;

(b) Accept a Certifying Staff (CS) from a CAAS approved Production Organsation Approval that is producing the part to carry out parts conformity inspection;

(c) Accept a DS from a CAAS approved Design Organisation Approval that is applying for the design approval to carry out test setups conformity inspection;

(d) Accept a person nominated by the applicant whose competency and experience that CAAS finds acceptable to carry out parts, installation or test setup conformity inspection.

CAAS will communicate in writing to the applicant about the person who may perform the inspection.

9.4 When CAAS accepts the applicant's proposed personnel to conduct the conformity inspection, the conformity inspector is to adhere to the drawings and associated references that were provide to CAAS. Should any of the following conditions arises, the conformity inspector is to report the condition to CAAS:

(a) Additional part numbers to be conformed;

(b) Unclear or ambiguous language found in test plan that may require a revision before proceeding;

(c) Parts unconformed within the test setup or assembly or drawings;

(d) Unsafe conditions for the inspection to continue; or

(e) Any other deviations as noted.

The applicant has to address the reported condition to CAAS's satisfaction before the conformity inspection can be resumed.

9.5 Should there be a need to re-design the part, the applicant has to resubmit all necessary drawings along with the proposed personnel for conduct of conformity inspection to CAAS.

10. TECHNICAL ARRANGEMENT WITH OTHER AUTHORITIES.

10.1 Notwithstanding paragraph 8.8 and 9.3, for testing witnessing and/or conformity inspections that are conducted in States who have established bilateral airworthiness technical arrangements with Singapore, CAAS may request the appropriate foreign aviation authority to witness and/or conduct the test, or to carry out conformity inspection on behalf of CAAS, subject to the agreement of all relelvant parties. The applicant should discuss with CAAS on the possibility of such arrangement with details of the corresponding schedule. CAAS would evaluate each request and inform the applicant accordingly. For these arrangements, unless otherwise agreed by the foreign authorities in the bilateral arrangement, CAAS is responsible for the approval of the design approval's test plan, test procedures, deviation and nonconformity inspections.

10.2 For further information on the coordination process, please refer to the respective Implementation Procedures or Technical Working Arrangement.