

ENGINEERING REVIEW OF EQUIVALENT TEST EQUIPMENT JOB FUNCTION 7

1. Purpose

This chapter provides the guidance for evaluating engineering data that is submitted by the applicant for applying CAA acceptance of equivalent maintenance test tools/equipments/apparatus (hereinafter referred to as equivalent equipments).

2. Background

It is stipulated by the Civil Aviation Regulation that the domestic airliners/maintenance facilities are required to apply for acceptance of equivalent equipments before they are eligible to be used in maintaining, calibration and/or used in the tests of return to service on the aircrafts and their components.

3. Reference

- A. FAA Order 8900.1, Vol. 6, Chapter 11, Sec. 20-*Safety Assurance System: Evaluate Special Equipment or Test Apparatus*, or its later revision.
- B. CAA Airworthiness Inspector Handbook Vol. I, Vol.3, Appendix T “*Equivalent Test Equipments*”, or its later revision.
- C. CAA Advisory Circular No. AC-145-001B” *Engineering Review of Equivalent Maintenance Tools/Equipments/Apparatus*”(In Chinese) , or its later revision.

4. Initiation of Task

This task is initiated when the engineering data reaches the CAA.

5. Procedure

A. Evaluation of the classification of equivalent equipments

Equivalent equipments can be classified into four categories based on the complexity, applicable implementing situations, as well as the sources of engineering data. Among them, equipments of the fourth category are required to apply for acceptance from the CAA, whereas that belong to the second and third categories are required to be assessed and be submitted to CAA for acceptance abided by the approved internal assessment procedures. As the consequence, in the very beginning of task, the inspector in charge should review if both the methodology and process of classification are conducted in accordance with the approved procedures. After that, the inspector should inform the applicant of any non-coincident findings, errors for correction, as if ever exist.

B. Review of processes

As the second step, the inspector should review if the assessment is undergone following the precedent approved assessment procedure. This procedure should contain, but not limit to, the following:

- (1). Criteria of selection
- (2). Methodology for data collection and comparison
- (3). Description of process for internal assessment
- (4). Qualification and privilege of authorized personnel
- (5). Description of process for submitting data to CAA
- (6). The measures for ex post administration

C. Review of engineering data

(1). Review of compliance checklist

The compliance checklist has to be provided as the guidance of other enclosed material when applying for the acceptance of equivalent equipment. The topics of review may include, but not limit to, the following:

- (a) Whether the information enclosed in the compliance checklist is adequate and sufficient? (For example, whether the original and equivalent equipment are both identified? Are both titles and document numbers of the subsequently developed substantiation documentation clearly designated? Have both the titles and document number of the relevant performance standards, limitations, specifications, tolerances, or any other applicable requirements, been clearly defined?
- (b) Is the provided compliance checklist an officially effective document that has undergone the internal assessment process?
- (c) Whether the responsible personnel from both the application division and QC division have their signature on the compliance checklist? Are they qualified and have been authorized beforehand?

(2). Review of compliance data

- (a) Whether the applicant has provided CAA the content of the cited performance standards, limitations, specifications, tolerances, or other applicable requirements? Are these requirements adequate and sufficient for ensuring the equivalency?
- (b) Whether the functions, applicable circumstances and the means of implementation have been clearly defined? Whether the performance of equivalent equipment is equivalent to or better than the original one?
- (c) Whether the equivalent equipment is designed independently by the applicant or is developed based on the OEM provided data? For the former occasions, the applicant should present CAA the detail information regarding his philosophy of designing the equivalent equipment.

- (d) Review the adequacy, completeness and consistency of the blueprints of design that are provided by the applicant.
- (e) Are the configuration and dimensions of equivalent equipment been made are consistent with the provided blueprints? Is the performance/function of that meets the pre-defined criteria?
- (f) Whether the proposed means of compliance (MOC) and the coupling substantiation document will be capable of showing compliance?
- (g) Whether on-site visits and/or test witnesses are needed to identify the compliance status of equivalent equipment?
- (h) Whether the definition of installation dimensions, tolerances, fits between the equipment and the article to be test coincide with each other? Whether the installation test is necessary for validating the compatibility?

D. Review of operating procedure

Whether the applicant has created well-defined operation manual or standard operation procedures (SOP), thus guarantee the correct usage in the future? Are the pre-test check items and the check items for safety concerns already enclosed?

E. Review of QC data

Whether the applicant has adopted the equivalent equipment into its QC system to ensure the validity of test afterwards?

F. Review of maintenance program

Whether the relevant maintenance program (includes, but not limit to, the intervals for check and calibration, the list and life limits of time-replaced parts, etc) has been reasonably and adequately established?

G. On-site evaluation (if conducted)

When the on-site evaluation is required, the following items, but not limit to, maybe covered.

- (1) Whether the operator(s) have received adequate training?
- (2) Whether the operation is consistent with defined SOP?
- (3) Whether the operator is skilled in operating the equivalent equipment?
- (4) Whether the interface and coupling between the equivalent equipment and article under test is adequate?
- (5) Does there any potential interference exist?
- (6) Whether the performance of equivalent equipment is equivalent to or better than the original one?
- (7) Whether design change, amendment of SOP, or provision of supplemental documents is needed?
- (8) Whether the methodology of relevant supervision is adequate and sufficient?

6. Matters Needing Attention

A. The accountability of both equivalency and return to service

As quoted from Article 13, item 3 of "Regulation for Certification of Aircraft Repair Stations" - *The equipment, tools, and material must be those recommended by the manufacturer of the article or must be at least equivalent to those recommended by the manufacturer and acceptable to the CAA.*" CAA can only accept, not to approve, an equivalent equipment that is submitted by the applicant. Therefore, the applicant takes the responsibility of showing and complying with all the relevant requirements and the final adequacy of return to service tests that conducted on the aircraft product, systems and parts.

B. Implementation of reversed engineering technique

If the applicant intends to develop equivalent equipment only through the reversed engineering process, the inspector in charge shall inquire for the provision of additional engineering data that deemed necessary for making the final judgment. These data includes, but not limit to, the engineering drawings, the analysis/test reports, etc. When deemed necessary, the applicant must elucidate the methodology for defining the manufacturing precisions, tolerances, as well as the rationale for defining the fail/pass criteria of substantiation tests.

C. Implementation of safety assessment

For those equivalent equipments used in the return to service test/check, and those used in direct measurements for ascertain the status of airworthiness, the applicant should evaluate if the safety assessment is required to identify the impact to flight safety once erroneous conclusion is aroused from the test result. The inspector in charge should check if the applicant has conducted the all probable correction or prevention actions (e.g., to replicate the test, to raise the required precision, or to increase the frequency of periodical calibration, etc) so as to reduce the possibility of erroneous test result to the extent as possible.

D. Preview of engineering data

To expedite the pace of acceptance and to get acquainted with the equivalent equipment as early as possible, the inspector in charge might agree that the applicant provide partial engineering data (for example, abstract, summary of planning, engineering drawings, technical reports, etc) before the application package is formally submitted to the CAA. However, the applicant is still obligatory to evaluate the equivalency and thereafter to submit a formal application package to the CAA in accordance with the previously approved procedure. As the consequence, the applicant must afford the means for discriminating the documents that provided beforehand (e.g., have a stamp with

notification like “*for engineering review only* “ or “*for reference only*”), so as to preclude the possibility of document misuse when the formal application is submitted.

E. Ex post activities after the engineering acceptance

When the decision of acceptance is made, the inspector should inform the PMI of his/her final decision. In addition, he/she should provide the PMI a description of the whole process of engineering review and provide suggestions for subsequently continuous audit, if deemed necessary.