

CHAPTER 236 EVALUATE AVIONICS TEST EQUIPMENT

Section 1 Background

1. PTRS ACTIVITY CODES

- Avionics: 5378/5379

3. OBJECTIVE. This chapter provides guidance for evaluating test equipment used during the calibration, repair, and overhaul of avionics equipment.

3. GENERAL. A repair facility certificated to maintain airborne avionics equipment must have test equipment suitable to perform that maintenance. Regardless of the type of equipment being used, the minimum test equipment necessary to perform the maintenance, as required by the manufacturer, is acceptable.

A. Test Equipment Equivalency. Normally, test equipment equivalent to that recommended by the appliance or aircraft manufacturer will be accepted.

(1) Before acceptance, a comparison should be made between the specifications of the test equipment recommended by the manufacturer and those proposed by the repair facility.

(2) The test equipment must be capable of performing all normal tests and checking all parameters of the equipment under test. The level of accuracy should be equal to or better than that recommended by the manufacturer.

B. Test Equipment Updating

(1) State-of-the-art advances often affect the modes and parameters of avionics equipment. Therefore, previously accepted test equipment may need to be modified to ensure compatibility with the new equipment to be tested.

(2) Surplus military test equipment is sometimes used by repair facilities as a primary test unit or as a backup in case of failure of the primary test unit. Modifi-

cation of this equipment may be necessary to meet current industry standards and equivalency requirements.

C. Test Equipment Calibration. The regulations require that maintenance facilities test the test equipment at regular intervals to ensure correct calibration.

(1) National Institute of Standards and Technology traceability can be verified by reviewing test equipment calibration records for references to National Institute of Standards and Technology test report numbers. These numbers certify traceability of the equipment used in calibration.

(2) If the repair station uses a standard for performing calibration, that standard cannot be used to perform maintenance.

(3) The calibration intervals for test equipment will vary with the type of equipment, environment, and use. The accepted industry practice for calibration intervals is usually one year. Considerations for acceptance of the intervals include the following:

- Manufacturer's recommendation for the type of equipment
- Repair facility's past calibration history, as applicable

(4) If the manufacturer's manual does not describe a test procedure, the repair station must coordinate with the manufacturer to develop the necessary procedures prior to any use of the equipment.

(5) Test equipment that is not used to certify items as airworthy (troubleshooting only), should be placarded as such and are excluded from the requirement for periodic calibration traceable to National Institute of Standards and Technology.

7. AUTOMATIC TEST EQUIPMENT (ATE). The following guidance should be used to determine the adequacy

of maintenance procedures and programs established for the use of ATE. This criteria is intended for the application of ATE to the specific performance evaluation of line replacement units.

A. ATE is a self-contained unit configured and integrated to provide rapid and accurate testing of digital and analog avionics equipment. ATE consists of the following:

- Programmable stimulus and measurement devices
- Digital computer hardware and software
- Digital computer peripheral equipment and interface devices
- A means of providing printouts of the test results

B. ATE is generally installed at a repair facility as part of the shop test equipment. ATE can vary in size from large units at a repair station, to smaller portable units used in ramp inspections.

(1) A number of avionics systems used on current aircraft are of such complexity that no manual test equipment has been designed for their testing. Even manufacturers will employ ATE for the testing of production units when no manual test equipment is available.

(2) If an ATE is to be used on different types of avionics equipment that are similar in function, it must have self-testing features that ensure that the unit is operating within acceptable tolerance limits.

9. BUILT-IN TEST EQUIPMENT (BITE)

A. BITE is characterized primarily as a self-test feature built into the airborne component system as a passive fault indicator. If the functional signal flow stops or increases beyond a maximum acceptance level, a visual/aural warning is displayed to indicate that a malfunction has occurred. Warnings are either automatic or generated by the manual selection of switching devices. Some of the functions or capabilities of BITE include the following:

(1) Evaluations that include:

(a) Systems status and malfunction verification

by:

- The use of go/no-go alarms
- Quantitative readouts

(b) Degraded capabilities status, including:

- Marginal circuit operation
- Degree of functional mode deterioration

(2) Continuous critical monitoring that provides:

- Continuous readout
- Sampled recorder readout
- Module and/or subassembly failure isolation

B. Prior to acceptance, the inspector must determine if the limitations, parameters, and reliability of the testing system are equal to or better than the components and/or systems to be tested. If this cannot be proven, then it is the inspector's responsibility to require a complete reevaluation of the program or, when necessary, request assistance from the FAA Regional Office or Directorate.

Section 2 Procedures

1. PREREQUISITES AND COORDINATION REQUIREMENTS

A. Prerequisites

- Successful completion of Airworthiness Inspector's Indoctrination Course for General Aviation and Air Carrier Inspections, or previous equivalent
- Completion of the Test Equipment Course

B. *Coordination.* This task may require coordination with the Principal Maintenance Inspector and the manufacturer.

3. REFERENCES, FORMS, AND JOB AIDS

A. References

- FAR Parts 43, 65, 91, 121, 125, 135, and 145
- Advisory Circular 145-3, Guide For Developing and Evaluating Repair Station Inspection Procedures Manuals, as amended
- Order 8300.10, Vol. 2, Ch. 165, Evaluate FAR Part 145 Repair Station's Facilities and Equipment

B. *Forms.* None.

C. *Job Aids.* None.

5. PROCEDURES

A. Perform the Inspection

(1) Determine what test equipment is required, by reviewing the applicant and/or manufacturer's maintenance manuals.

(2) Determine if the applicant is requesting the use of equivalent test equipment. Prior to the acceptance of equivalent test equipment, accomplish the following:

(a) Ensure that the limitations, parameters, and reliability of the proposed test equipment are equivalent to the manufacturer's recommended test equipment

(b) Compare the specifications of the manufacturer's and applicant's proposed equipment

(c) Observe demonstrations of the proposed test equipment equivalency

(d) Request assistance from the appropriate FAA office, as necessary

(3) Ensure that the applicant has full control of test equipment, i.e. ownership, lease, etc.

(4) Ensure that the applicant's manual includes procedures for the following:

- Identification of the test equipment
- Inspection and calibration of test equipment
- Recording of the date and identification of the person accomplishing the calibration

(5) Inspect all evaluation and test equipment, including precision tools and measuring devices, to ensure the following:

(a) That all equipment has been tested at regular intervals and is within its required currency period

(b) That test equipment calibration standards are derived from and traceable to one of the following:

- The National Institute of Standards and Technology
- Standards established by the test equipment manufacturer
- If foreign manufactured test equipment, the standards of the country where it was manufactured, if approved by the Administrator

B. Evaluate ATE/BITE

(1) Ensure the following:

(a) That the ATE/BITE testing programs provide an in-depth analysis that ensures that the aircraft components are functionally tested within the prescribed manufacturer's limits

(b) That all required checks are accomplished

(c) That the applicant has established procedures that outline and describe the total program and related management control for the ATE unit, to include the following:

- Limits and standards
- Performance evaluation checks and tests
- Identification of individual ATE, by test number
- Maintenance programs
- The source of the ATE program tapes, (either in-house programming or approved purchase)
- The method of controlling and identifying the revision status of software programs

(2) Determine if the applicant's purchasing maintenance service ensures that all services are accomplished in

accordance with the applicant's approved maintenance program.

(3) Ensure that whenever a BITE examination is substituted for a manual check, it performs the required qualitative and quantitative tests and analyses to substantiate the component and/or system performance.

(4) Ensure that when approving BITE as a substitute for actual manual checks, that the self-check is of sufficient depth to perform the required task.

NOTE: Inspectors should not be misled by such statements as "confidence factor" which have no specific meaning unless defined.

(5) Ensure that the analysis of BITE includes the limitations and shows whether it checks the component and its associated plugs and wiring.

NOTE: Some quantitative BITE may not be capable of checking a total system, such as ILS, unless a signal is introduced into the antenna.

C. *Analyze Results.* Review inspection results and discuss any discrepancies with the applicant.

7. TASK OUTCOMES

A. *File PTRS Transmittal Form*

B. Completion of this task may result in the following:

(1) Coordination of inspection results with the certification project manager, if part of a certification project

(2) Acceptance/approval or non-acceptance/disapproval of the test equipment

(3) Issuance of a letter to the operator/applicant detailing the results of the inspection

C. *Document Task.* File all supporting paperwork in the operator's office file.

9. FUTURE ACTIVITIES. Normal surveillance.