



AC NO: 20-102

DATE: 12/7/77

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION

SUBJECT: INSTALLATION AND FLIGHT TESTING OF EQUIPMENT INSTALLED IN AIRCRAFT

1. PURPOSE. This advisory circular provides information concerning installation and flight testing of equipment which, if not accomplished in accordance with applicable Federal Aviation Regulations, could lead to serious aircraft accidents.
 2. REFERENCE REGULATIONS. Parts 21, 23, 25, 27, and 29; Sections 21.95, 21.113, 21.115, and 43.13 of the Federal Aviation Regulations (FAR), and Parts 03, 04A, and 04B of the Civil Air Regulations.
 3. BACKGROUND. Safety problems have been discovered following the installation of equipment in aircraft through accident investigations and field inspection as noted below:
 - a. Nonapproved equipment and installations made.
 - b. Installations not based on approved data.
 - c. Failure to ensure that the equipment installed is compatible with the aircraft in which it is installed.
 - d. Installation of equipment by unauthorized personnel.
 - e. Insufficient functional checks following the installation (e.g., failure to conduct complete control systems checks or failure to correlate weight and balance data to weight and balance limits).
 - f. Changes not made to FAA-approved flight manuals following equipment installations.
 4. INSTALLATION. Only appropriately-rated persons (as specified in FAR 43.3) may perform aircraft alterations. Prior to starting any alteration which has not had prior FAA approval, the local FAA Flight Standards District Office should be contacted and the proposed alteration procedures thoroughly
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discussed. When additional equipment has been installed, compliance with applicable airworthiness requirements should be established. When compliance with applicable airworthiness regulations are being considered, the applicant must show by the use of drawings, analysis, descriptive data, ground functional tests, or a combination thereof, that:

a. The additional equipment and its installation meet all the applicable airworthiness requirements which apply to the equipment to be replaced.

b. When modifying aircraft or installing equipment, a determination should be made of the compatibility with installed equipment and with other modifications that have been previously made to the aircraft.

c. A determination has been made of the capability of the aircraft structure to support the load of the installed equipment. Whenever practicable, static testing should be conducted on a duplicate installation in a jig or mockup which simulates the related aircraft structure (reference: AC 43.13-2A, Acceptable Methods, Techniques, and Practices, Aircraft Alterations). Static test loads may exceed the yield limits of the assemblies being substantiated and can result in partially-sheared fasteners, elongated holes, or other damage which may not be visible unless the structure is disassembled.

d. Consideration should be given to the use of areas or locations provided by the airframe manufacturer and use of factory supplied racks or brackets when installing avionic equipment. When this information is not available, use locations in the aircraft of known load carrying capability. If shelves, brackets, or support racks have been fabricated for mounting of equipment, static load testing should be conducted to substantiate the aircraft structure.

5. TESTING AND APPROVAL. Each person performing an alteration or installation of equipment should complete adequate testing to ensure that the original type certification of the aircraft has not been compromised and that the aircraft remains in an airworthy condition. If airworthiness of the aircraft is in question after alteration, and it cannot be conclusively shown by ground tests or inspections or both that the alteration has not appreciably changed the flight characteristics or substantially affected the flight operation of the aircraft, a flight test should be performed. The flight test should be conducted in accordance with FAR's (reference 91.167) and appropriate airworthiness requirements. Upon satisfactory completion of the flight test, the flight should be logged in the aircraft records prior to returning the aircraft to service.



R. P. SKULLY

Director, Flight Standards Service



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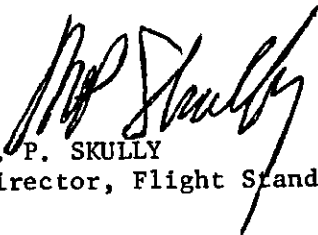
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