



U.S. Department
of Transportation

**Federal Aviation
Administration**

Advisory Circular

TITLE 14 OF THE CODE OF FEDERAL REGULATIONS (14 CFR) GUIDANCE MATERIAL

Subject: ACCEPTABLE METHODS,
TECHNIQUES, AND PRACTICES—AIRCRAFT
INSPECTION AND REPAIR

Date: 9/8/98
Initiated by: AFS-640

AC No: 43.13-1B
Change: 1

1. **PURPOSE.** This advisory circular (AC) contains methods, techniques, and practices acceptable to the Administrator for the inspection and repair of nonpressurized areas of civil aircraft, only when there are no manufacturer repair or maintenance instructions. This data generally pertains to minor repairs. The repairs identified in this AC may only be used as a basis for FAA approval for major repairs. The repair data may also be used as approved data, and the AC chapter, page, and paragraph listed in block 8 of FAA form 337 when:
 - a. the user has determined that it is appropriate to the product being repaired;
 - b. it is directly applicable to the repair being made; and
 - c. it is not contrary to manufacturer's data.
2. **CANCELLATION.** The AC 43.13-1A dated 1988 is canceled.
3. **REFERENCE:** Title 14 of the Code of Federal Regulations part 43, section 43.13(a) states that each person performing maintenance, alteration, or preventive maintenance on an aircraft, engine, propeller, or appliance shall use the methods, techniques, and practices prescribed in the current manufacturer's maintenance manual or Instructions for Continued Airworthiness prepared by its manufacturer, or other methods, techniques, or practices acceptable to the Administrator, except as noted in section 43.16. FAA inspectors are prepared to answer questions that may arise in this regard. Persons engaged in the inspection and repair of civil aircraft should be familiar with 14 CFR part 43, Maintenance, Preventive Maintenance, Rebuilding, and Alteration, and part 65, Subparts A, D, and E of Certification: Airmen Other Than Flight Crewmembers, and the applicable airworthiness requirements under which the aircraft was type certificated.
4. **ACKNOWLEDGMENTS.** The FAA would like to thank the following persons and organization for their assistance in producing AC 43.13-1B: Richard Finch, Richard Fischer, Michael Grimes, Ray Stits, William A. Watkins, and the SAE, Aerospace Electronics and Electrical Systems Division. Acknowledgment is also extended to all in the aviation community who commented on the document.
5. **COMMENTS INVITED.** Comments regarding this AC should be directed to DOT/FAA; ATTN: Airworthiness Programs Branch, AFS-610; PO Box 25082; Oklahoma City, OK 73125

Acting Deputy Director, Flight Standards Service

CHAPTER 4. METAL STRUCTURE, WELDING, AND BRAZING

SECTION 3. PRECAUTIONARY MEASURES,

4-36. FLUTTER AND VIBRATION PRECAUTIONS. (page 4-9)

To prevent the occurrence of severe vibration or flutter of flight control surfaces during flight, precautions must be taken to stay within the design balance limitations when performing maintenance or repair.

a. Balance Changes. The importance of retaining the proper balance and rigidity of aircraft control surfaces cannot be overemphasized. The effect of repair or weight change on the balance and center of gravity is proportionately greater on lighter surfaces than on the older heavier designs. As a general rule, repair the control surface in such a manner that the weight distribution is not affected in any way, in order to preclude the occurrence of flutter of the control surface in flight. Under certain conditions, counter-balance weight is added forward of the hinge line to maintain balance. Add or remove balance weights only when necessary in accordance with the manufacturer's instructions. Flight testing must be accomplished to ensure flutter is not a problem. Failure to check and retain control surface balance within the original or maximum allowable value could result in a serious flight hazard.

d. Trim Tab Maintenance. Loose or vibrating trim tabs will increase wear of actuating mechanisms and hinge points which may develop into serious flutter conditions. When this happens, primary control surfaces are highly susceptible to wear, deformation, and fatigue failures because of the buffeting nature of the airflow over the tab mechanism. Trailing-edge play of the tab may increase, creating an unsafe flutter condition. Careful inspection of the tab and its mechanism should be conducted during overhaul and annual inspection periods. Compared to other flight control systems on the aircraft, only a minor amount of tab-mechanism wear can be tolerated.

4-37. LOAD FACTORS FOR REPAIRS. (page 4-10)

In order to design an effective repair to a sheet metal aircraft, the stresses that act on the structure must be understood.

4-38. TRANSFER OF STRESSES WITHIN A STRUCTURE. (page 4-10)

An aircraft structure must be designed in such a way that it will accept all of the stresses imposed upon it by the flight and ground loads without any permanent deformation. Any repair made must accept the stresses, carry them across the repair, and then transfer them back into the original structure. These stresses are considered as flowing through the structure, so there must be a continuous path for them, with no abrupt changes in cross-sectional areas along the way.

Abrupt changes in cross-sectional areas of aircraft structure that are subject to cycle loading/stresses will result in stress concentration that may induce fatigue cracking and eventual failure.

4-57. RIVETING. (page 4-14)

a. The two major types of rivets used in aircraft are the common solid shank rivet, which must be driven using an air-driven rivet gun and bucking bar; and special (blind) rivets, which are installed with special installation tools. Design allowables for riveted assemblies are specified in MIL-HDBK-5.

c. Rivet edge distance is defined as the distance from the center of the rivet hole to the nearest edge of the sheet. Rivet spacing is the distance from the center of the rivet hole to the center of the adjacent rivet hole. Unless structural deficiencies are suspected, the rivet spacing and edge distance should duplicate those of the original aircraft structure. If structural deficiencies are suspected, the following may be used in determining minimum edge distance and rivet spacing.

e. When solid shank rivets are impractical to use, then special fasteners are used. Special fastening systems used for aircraft construction and repair are divided into two types, special and blind fasteners.

f. Blind rivets are used under certain conditions when there is access to only one side of the structure. Typically, the locking characteristics of a blind rivet are not as good as a driven rivet. Therefore, blind rivets are usually not used when driven rivets can be installed.

SECTION 4. METAL REPAIR PROCEDURES (page 4-50)

c. All-metal aircraft are made of very thin sheet metal, and it is possible to restore the strength of the skin without restoring its rigidity. All repairs should be made using the same type and thickness of material that was used in the original structure. If the original skin had corrugations or flanges for rigidity, these must be preserved and strengthened. If a flange or corrugation is dented or cracked, the material loses much of its rigidity; and it must be repaired in such a way that will restore its rigidity, stiffness, and strength.

4-52. ALUMINUM ALLOY STRUCTURES. (page 4-50)

Extensive repairs to damaged stressed skin on monocoque-types of aluminum alloy structures must be made in accordance with FAA-approved manufacturer's instructions or other FAA-approved source.

a. Rivet Holes. Rivet holes are slightly larger than the diameter of the rivet. When driven, solid rivets expand to fill the hole. The strength of a riveted joint is based upon the expanded diameter of the rivet. Therefore, it is important that the proper drill size be used for each rivet diameter.

(2) Avoid drilling oversized holes or otherwise decreasing the effective tensile areas of wing-spar capstrips, wing, fuselage, fin-longitudinal stringers, or highly-stressed tensile members. Make all repairs, or reinforcements, to such members in accordance with factory recommendations or with the specific approval of an FAA representative.