

CHAPTER 7. AIRCRAFT HARDWARE, CONTROL CABLES, AND TURNBUCKLES

SECTION 1. RIVETS

7-1. GENERAL.

a. **Standard solid-shank rivets** and the universal head rivets (AN470) are used in aircraft construction in both interior and exterior locations. All protruding head rivets may be replaced by MS20470 (supersedes AN470) rivets. This has been adopted as the standard for protruding head rivets in the United States.

b. **Roundhead rivets (AN430)** are used in the interior of aircraft except where clearance is required for adjacent members.

c. **Flathead rivets (AN442)** are used in the interior of the aircraft where interference of adjacent members does not permit the use of roundhead rivets.

d. **Brazierhead rivets (AN455 and AN456)** are used on the exterior surfaces of aircraft where flush riveting is not essential.

e. **Countersunk head rivets MS20426** (supersedes AN426 100-degree) are used on the exterior surfaces of aircraft to provide a smooth aerodynamic surface, and in other applications where a smooth finish is desired. The 100-degree countersunk head has been adopted as the standard in the United States. Refer to MIL-HD BK5 *Metallic Materials and Elements for Flight Vehicle Structures*, and U.S.A.F./Navy T.O. 1-1A-8, *Structural Hardware.*"

f. **Typical rivet types** are shown in table 7-10.

7-2. MATERIAL APPLICATIONS.

a. **Rivets made with 2117-T4** are the most commonly used rivets in aluminum alloy structures. The main advantage of 2117-T4 is that it may be used in the condition received without further treatment.

b. **The 2017-T3, 2017-T31, and 2024-T4** rivets are used in aluminum alloy structures where strength higher than that of the 2117-T4 rivet is needed. See *Metallic Materials and Elements for Flight Vehicle Structures (MIL-HDBK-5)* for differences between the types of rivets specified here.

c. **The 1100 rivets of pure aluminum** are used for riveting nonstructural parts fabricated from the softer aluminum alloys, such as 1100, 3003, and 5052.

d. **When riveting magnesium alloy structures**, 5056 rivets are used exclusively due to their corrosion-resistant qualities in combination with the magnesium alloys.

e. **Mild steel rivets** are used primarily in riveting steel parts. **Do not** use galvanized rivets on steel parts subjected to high heat.

f. **Corrosion-resistant steel rivets** are used primarily in riveting corrosion-resistant steel parts such as firewalls, exhaust stack bracket attachments, and similar structures.

g. Monel rivets are used in special cases for riveting high-nickel steel alloys and nickel alloys. They may be used interchangeably with stainless steel rivets as they are more easily driven. However, it is preferable to use stainless steel rivets in stainless steel parts.

h. Copper rivets are used for riveting copper alloys, leather, and other nonmetallic materials. This rivet has only limited usage in aircraft.

i. Hi-Shear rivets are sometimes used in connections where the shearing loads are the primary design consideration. Its use is restricted to such connections. It should be noted that Hi-Shear rivets are not to be used for the installation of control surface hinges and hinge brackets. Do not paint the rivets before assembly, even where dissimilar metals

are being joined. However, it is advisable to touch up each end of the driven rivet with primer to allow the later application of the general airplane finish.

j. Blind rivets in the MS20600 through MS20603 series rivets and the mechanically-locked stem NAS 1398, 1399, 1738, and 1739 rivets sometimes may be substituted for solid rivets. They should not be used where the looseness or failure of a few rivets will impair the airworthiness of the aircraft. Design allowables for blind rivets are specified in MIL-HDBK-5. Specific structural applications are outlined in MS33522. Nonstructural applications for such blind rivets as MS20604 and MS20605 are contained in MS33557.

7-3.—7-13. [RESERVED.]