

# NASA TECH BRIEF

## Marshall Space Flight Center



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### Joint Preload Properties of Structural Threaded Fasteners

Update information is now available on the joint preload (or clamp load) properties of structural threaded fasteners. Proper installation techniques are described and reliable torque-tension values are presented for nut and bolt combinations made from AISI 8740 steel, 6Al-4V titanium alloy, A286 CRES, H11 steel, AMS6304 steel, AMS6487 steel, 5Al-2.5Sn (ELI) titanium alloy, and 2024-T4 aluminum alloy. In addition, the effects of various parameters on torque tension properties are examined in detail, using bolts fabricated from the first two alloys in both tension- and shear-type wrenching head configurations.

One important finding is that previously tabulated torque values intended to induce desired clamp loads are valid only for the initial installation. Repeated mating of the same nut and bolt is accompanied by a gradual decrease in induced load, with the percentage loss reaching as high as 50% after 15 installation cycles. Clamp load is also affected by such variables as hole size, surface finish, and degree of lubrication, as well as nut and washer designs. It is particularly essential to use compatible washers with high-strength bolts.

For testing purposes, clamp loads up to 90% of bolt yield strength have been employed. However, in practical structural assemblies, the use of a smaller percentage clamp load should be considered.

#### Note:

The following documentation may be obtained from:

National Technical Information Service  
Springfield, Virginia 22151  
Single document price \$3.00  
(or microfiche \$0.95)

#### Reference:

NASA CR-103179 (N71-26568), Development of Technology for Installation of Mechanical Fasteners

#### Patent status:

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