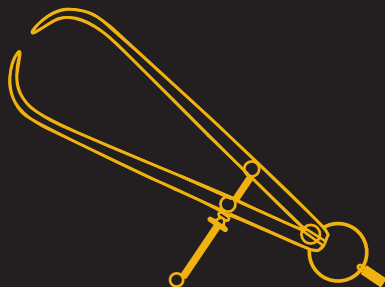


**The Aviation Standard**

# **Aviation Mechanic Handbook**

**Sixth Edition  
by Dale Crane**



**ASA-MHB-6**

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Dale Crane

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## 8.1 Standards

In the past, most manufacturers used standard aircraft parts that had been engineered and approved by the Army and Navy, with their specifications issued as AN standards. AN standard parts were easy to identify and their numbering system was relatively simple. But with the introduction of the turbine engine and high-speed, high-performance aircraft, aircraft hardware has become a much more complex and critical field. AN standards were replaced by Air Force-Navy standards; then other standards were developed—some of the more important standards are listed below:

AN—Air Force / Navy Standards

NAS—National Aerospace Standards

MS—Military Standards

AMS—Aeronautical Material Specifications

SAE—Society of Automotive Engineers

MIL—Military Specifications

The task of looking at markings on a part and measuring it to determine its part number is now a thing of the past. Many parts look alike, but their materials or tolerances can be quite different. **Any replacement hardware must be the part number specified in the aircraft or engine parts manual, and each piece of hardware must be purchased from a source known to be reputable.** Look-alike parts that might be of inferior strength can jeopardize the safety of an aircraft. The most commonly used parts and pertinent facts about their proper use are listed in this Section. AMTs should become familiar with the parts manuals for the aircraft and engines he or she is working on to find the correct part number for each piece of hardware used.

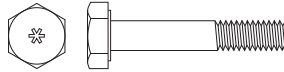
## 8.2 Threaded Fasteners

### Bolts

The most common type of threaded fastener, available in a number of materials such as nickel steel, aluminum alloy, corrosion-resistant steel, and titanium. Different types of heads for special purposes and different thread pitches adapt them to special functions.

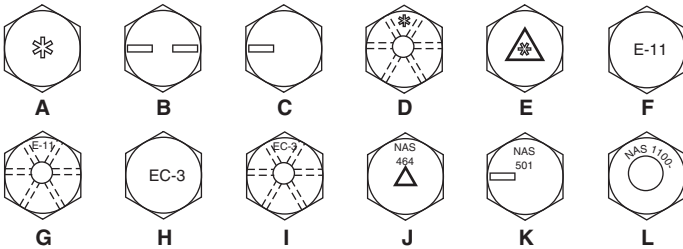
## Hex-Head Bolts

The standard bolt used in airframe and powerplant construction, designed for both tensile and shear loads. They depend on the proper application of torque for the strength of the joint. Available with both



UNC and UNF threads, made of SAE 2330 nickel steel, 2024 aluminum alloy, corrosion resistant steel, and titanium. Most have a medium (class 3) fit and most of the steel bolts are cadmium-plated. Also available with holes drilled through the head for safety wire, and/or with a hole through the shank for a cotter pin. The material or bolt type is identified by marks on the head. Close-tolerance bolts, identified by a triangle, are ground to a fit of  $\pm 0.0005$  inch and the ground surface is not plated, but is protected from rust with grease.

### Bolt Head Identification Marks



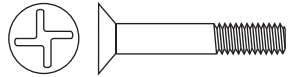
- A** AN3-AN20—Standard alloy steel hex-head aircraft bolt
- B** AN3DD-AN20DD—Standard aluminum alloy hex-head aircraft bolt
- C** AN3C-AN20C—Standard corrosion resistant steel hex-head aircraft bolt
- D** AN73-AN81—Drilled-head aircraft bolt
- E** AN173-AN182—Close-tolerance bolt
- F** AN101001-AN103600—Alloy steel hex-head aircraft bolt
- G** AN103701-AN104600—Drilled-head aircraft bolt
- H** AN104601-AN105500—Corrosion resistant steel drilled-head aircraft bolt
- I** AN107301-AN108200—Corrosion resistant steel drilled-head aircraft bolt
- J** NAS464—Close-tolerance bolt
- K** NAS501—Corrosion resistant steel hex-head aircraft bolt
- L** NAS1103-NAS1112—Alloy steel hex-head aircraft bolt



## Flush-Head Bolts

Many modern aircraft applications require high-strength bolts with heads that can be flush with the outside skin of the aircraft.

Most bolts in the NAS and MS series have a 100° head, but some have an 82° head. These high-strength bolts are made of alloy steel and titanium and some have self-locking inserts in the threads.



### Head Recesses



Phillips



Hi-Torque



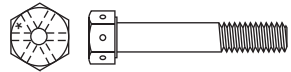
Torq-Set



Tri-Wing

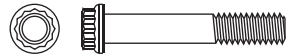
## Drilled-Head Bolts

Drilled-head airframe bolts are used in locations where a high tensile strength is required and where the bolt is safetied with safety wire. There is no hole in the shank for a cotter pin.



## Twelve-Point, Washer-Head Bolts

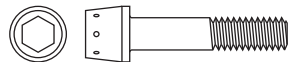
Designed for special high-strength and high-temperature airframe and powerplant applications; available in both NAS and MS series. The heads of many of these bolts are drilled for safety wire.



## Internal Wrenching Bolts

These are the typical high-strength alloy steel bolts used in special airframe applications where severe loads are imposed on the structure. They have a radius between the shank and the head, and a special chamfered, heat-treated steel washer (such as the NAS 143C) is used under the head to provide a bearing surface. Turned with a hex wrench which fits into the socket in the head.

NAS144, MS2004



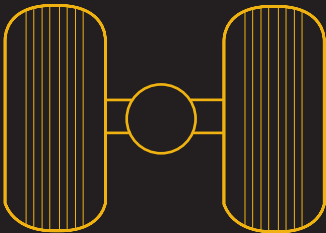
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