AN Hardware Basics

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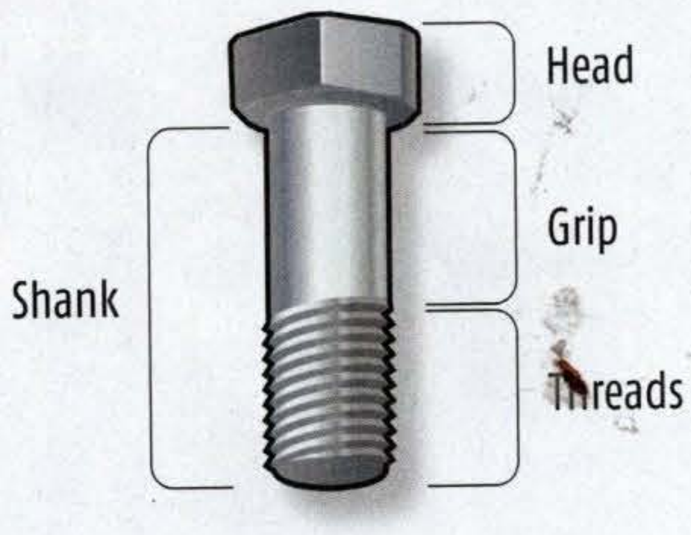
Editor's note: This is adapted from a hint that first ran in the March 2010 issue of EAA Sport Aviation *magazine.*

YOU WON'T HANG AROUND a group of homebuilders or aircraft restorers for long before you start hearing about AN hardware. AN bolts and their accompanying nuts and washers are the focus of this hint.

AN stands for Army-Navy, the standards to which the hardware is manufactured and tested. Although the AN standard is being replaced by the mil (military) spec (MS) standard for some hardware items, AN is still the most commonly referred to standard among homebuilders. All AN hardware is identified by a code made up of numbers and letters that identify the item.

A bolt may look simple, but did you know it has several different sections? At the top of the bolt is the head, where you'll place the wrench upon installation. Beneath the head is the shank, which in turn is made up of the grip and the threads. Bolts come in different diameters and lengths to meet the requirements of the job at hand, and they are called out by numbers and letters so that we can get the size we need. For example, if your plans call for an AN4-12A bolt, what size is that? Well, the number after the "AN" indicates the diameter of the bolt shank in sixteenths of an inch. An AN4 bolt is 4/16 — or 1/4 inch in diameter.



The number after the dash indicates the total length of the bolt's shank in eighths of an inch, or inches and eighths for bolts more than 1 inch long. In this case, the 12 indicates 1 inch plus 2/8, or a total of 1 and 1/4-inch long. An AN4-24 bolt would be a 1/4-inch diameter bolt that is 2 inches plus 4/8-inch long — or 2 and 1/2 inches. The "A" at the end of our AN4-12A bolt mentioned above indicates that the bolt does not have a hole drilled in the shank for a cotter pin. The absence of the A would indicate a drilled bolt.

But how long of a bolt do you need? You want the grip of the bolt (that part of the shank that is unthreaded) to equal the thickness of the materials being joined. Sometimes you can't get an exact match, so in a pinch you can go a bit longer with the grip and take up the extra length with extra washers (up to three maximum). A normal bolt installation would include the bolt, one washer, and the nut. With a drilled bolt, use a castellated nut and cotter pin. With an undrilled bolt, use a self-locking nut. The washer should go under the nut to protect the base material from abrasion when the nut is torqued. If possible, always torque by turning the nut rather than the bolt. This will give you a more accurate torque reading and avoid wearing the plating off the bolt shank, which may lead to corrosion or loosening of the bolt in the hole.

If you are installing a bolt in a location that requires you to torque the bolt head, then put the washer under the head of the bolt.

As a general rule, bolts should be installed with the head up or forward. The logic is that gravity or slipstream will hold the bolt in if the nut comes off. In actuality, in many installations, the items being connected will come apart regardless of how the bolt is put in, so sometimes it's not going to matter. In other instances, restricted access will require a bolt to be put in "backward" or "upside down." Do what you have to do, but it's always good to follow the head up or forward convention if possible.

The accompanying chart will help you find the correct washers, nuts, and cotter pins for the popular size AN bolts used on most aircraft. Information on identifying bolts using the markings on the bolt head is also included. With this information, you should be able to select the proper hardware for your project and talk the talk when the AN hardware discussion starts.

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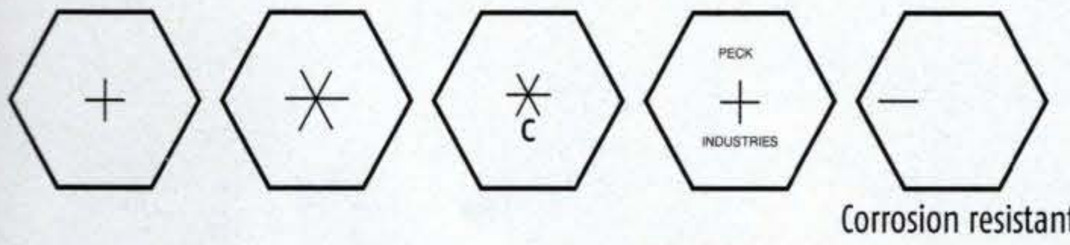
ILLUSTRATIONS BY **GARY COX**

BOLT BASICS

Standard Steel Bolt Head Markings



Corrosion resistant

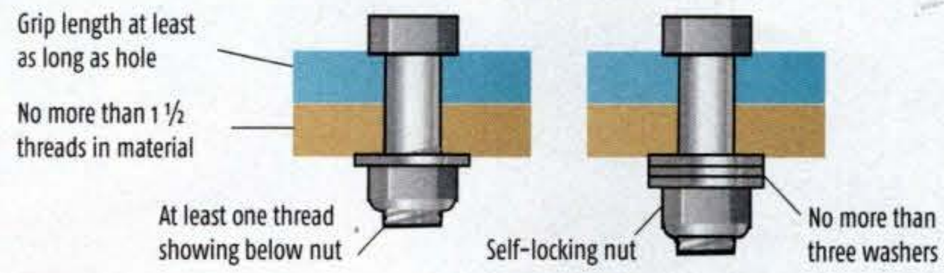
Close tolerance

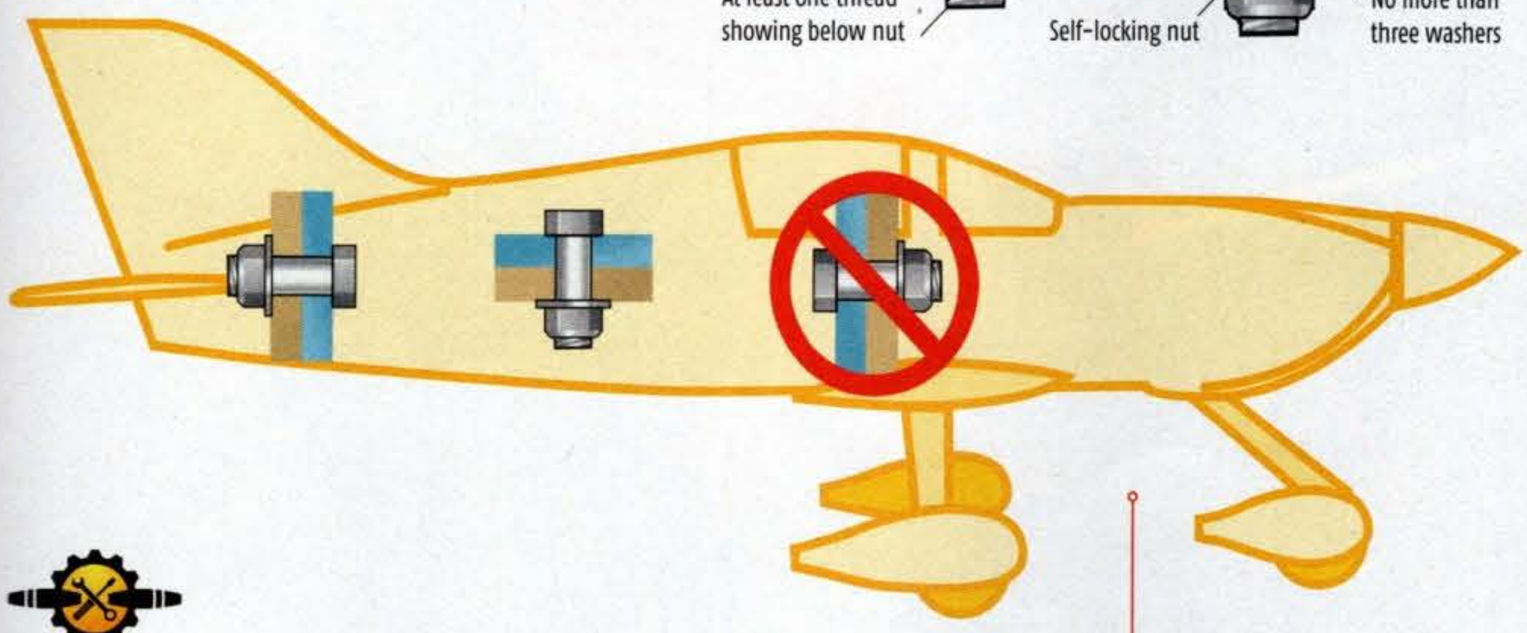
High strength

SUB-STRENGTH BOLTS

Aluminum

Non-AN (not for aircraft use)





Bolt Installation

Bolts should be installed with the head forward, upward, or outward to the extent possible. Bolts typically are not installed with the head toward the rear, bottom, or inside – except where clearance or access issues require such installation or when directed to do so by manufacturer's instructions.

APPROXIMATE SHANK LENGTH

Bolt	Wrench Size	Nut (Ny-Lock)	Nut (Castle)	Washer, Standard	Washer, Large	Cotter Pin	Torque Recommended	Torque Max.
AN 3	3/8"	AN365-1032	AN310-3	AN960-10	AN970-3	MS24665-132	20-25 in. lbs.	40 in. lbs.
AN 4	7/16"	AN365-428	AN310-4	AN960-416	AN970-4	MS24665-132	50-70 in. lbs.	100 in. lbs.
AN 5	1/2"	AN365-524	AN310-5	AN960-516	AN970-5	MS24665-134	100-140 in. lbs.	225 in. lbs.
AN 6	9/16"	AN365-624	AN310-6	AN960-616	AN970-6	MS24665-283	160-190 in. lbs.	390 in. lbs.