96 Young Eagle Flight flown Year to Date

November 2019

Home of the "Panhandle Pelicans"

Squawk 485

EAA 485

VMC Club 0830-0930

Monthly Meeting Ferguson 82J
Saturday November 9th @ 1000
Details

President
John McKiernan
rockyjs7jm@gmail.com
Cell - (850) 291-4134

Hello Everyone,

We had a busy chapter meeting on October 12th. The **VMC Club** met at 0830 before the normal meeting with 12 chapter members present. We had a good discussion over the presented material and many in attendance shared stories of their experience flying. We also decided at the meeting time before our meetings was convenient and for now it will be the "chosen time" 0830-0930. It was a good experience and a great small group environment. It's not too late to join and basically all you need to do is show up. Donna and DeWitt did a great job putting this together.

We'll look at the level of interest to running an IFR Club sometime next year.

New Members

Chapter 485 would like to welcome new member **Drew Cardon**. Andrew is currently working towards his PPL and also with a friend is looking at building an Experimental Aircraft leaning towards a Van RV-8 Thanks Drew and **Welcome Aboard**!

Chapter Elections

Once again we're approaching elections without a single nomination for chapter officers. Ruth and I have several commitments for the coming year and will be out of the country multiple times as well as entertaining at least two families coming from Germany. I'm just not going to be able to devote as much time to the chapter. We really need 4 people to step forward and help out the chapter. It's time for new leadership for Chapter 485, We're on a roll so please help us out.

October 12th Chapter 485 Meeting

1005: Meeting called to order by Pres John McKiernan

Pledge, 25 attendees

Discussion of VMC club and future dates and times, November and December meetings will be at 0830 on our regular meeting day. This mornings initial VMC club event was very well executed by Donna and DeWitt Barker and attended by 12 Chapter members.

Visitors and guests introduced

Ray Scholarship recipient Congratulated for timely award of PPL certificate,
Well Done Nick!

Brian Harris introduced as next Ray Scholarship recipient. **Congratulations Brian!**

Bill Diaz briefed the current status of 485 Ray Scholarship activities. We have one full scholarship awarded to Brian Harris and one more in the works, pending candidate interviews which came about as a result of an extremely generous $5K anonymous contribution from one of our chapter members, and matching funds from Ray Scholarship/EAA. Motion made and approved to award Nick Hanssen $439.38 additional funds from the chapter to close out his Ray award.

Nick Hanssen briefed the chapter on his Ray flight training experience and the Chapter Young Eagles Facebook page

Bruce Newman briefed the chapter on SERFI at Evergreen AL the weekend of 18-20 October.

Craig Spoke briefed the Chapter on our 26 October Young Eagle day and on line sign up procedures. Go To youngeaglesday.org

Project updates, John McKiernan briefed his

Remember Our Vets Pensacola FL

RV7 avionics journey.
1055: Meeting adjourned for another Ermer special Luncheon.
Respectfully submitted, Mark Rogers, Sec/ Treas.

Young Eagles Rally (Nov 2nd)

Coordinator Ralph Moser

Well, mother nature wiped out our first attempt on Oct. 26th, but we had a beautiful fall day a week later and on Nov. 2nd, we flew 29 Young Eagles. The number was originally about 45 for Oct. 26th, the first date, so the weather delay cost some customers. But we ended up with plenty of help; 9 pilots and aircraft, and at least ten ground volunteers. I can't thank all of you enough – well done! I had at least three more potential pilots who couldn't fly that day, so the future of the program looks great.

Tied for top honors was Nick Hanssen, our Ray Scholar #1 and newest private pilot, with 5 Young Eagles flown. Nick even managed to successfully evade a deer on the runway during one of his takeoffs!

Pilots	Ground
Nick Hanssen	Craig Spoke
Ralph Moser	Bill Diaz
Donna Barker	DeWitt Barker
Mark Watson	Scott Swanson
Jose Martinez	Mark Rogers
Vern Head	Cheri Hanssen
Christian Kidder	David Hanssen
David Lacey	(Nick's Parents)
John McKiernan	Doug Francisco
	Website/photographer

I apologize to those whose names I have forgotten.

Particular thanks to Craig and Bill, who did the real dirty work of registration, record-keeping and follow-on reporting to EAA.

That's 96 Young Eagles for the year for our chapter. Not shabby! Doug has updated the chapter website with a nice 52 photo slideshow of the event. Check it out!

Looking forward, I like the idea of continuing a spring and fall rally, as well as the Chappie James Flight Academy graduates in June. I think that is a reasonable pace, without busting our butts.

Statistically, EAA research says 20,000 current pilots indicate that a Young Eagle flight got them started. That's 3.3% of the current 600,000 pilots in the USA; a significant number.

And a special thanks to Chapter Mascot

Arlie

Chapter Dues

According to our records, we still have 20 members that haven't paid their dues for 2019-2020. This is a significant percentage of our members. Our dues year is May 1st through April 30th. In late December we will be contacting you personally if we haven't heard from you before then. If your not sure whether you paid or not please contact :

Mark Rogers
(251) 228-0356

Thanks John

RAY AVIATION SCHOLARSHIP UPDATE

Ralph Moser, Chapter 485 Coordinator
Ray Aviation Scholarship Update

A few minor developments in our Ray program over the last month. We were notified that due to an adjustment for flight hours already flown, Brian Harris' scholarship will be for $9000, not $10,000 as originally announced. Oh well... The national coordinator, David Leiting, has been busy developing the 2020 program. As a result, he has not yet mailed us Brian's first check. He says we can expect it next week. So, out of due diligence, I am waiting for the "check in the mail" to start Brian's training.

Brian is further along in the Sporty's online ground school (80% complete) than Nick was, so Christian and Brian are coming up with the best ground school plan to finish that off and prepare Brian for the written. The scholarship does not pay for ground school, so the chapter can expect to kick in a few hundred dollars to complete that for Brian. The ground school option they select will affect whether Brian starts flying soon, or around end of year. Luckily for us, Brian already has a headset, flight bag, whiz wheel and plotter.

Bill Diaz, Craig Spoke, Christian Kidder, Nick, Brian and myself had a productive "lessons learned" meeting recently. Areas reviewed from all users perspectives were Planning/Syllabus/ Ground School, Flight School Admin Support, Aircraft/CFI scheduling system, Aircraft Availability, and CFI availability. It was agreed that the Wrong Brothers Flight Training School did a fine overall job. Christian Kidder was very helpful throughout giving us 'bang for our buck', as well as excellent flight and ground instruction. Scott Swanson and David Meredith, the other two flight instructors involved with Nick's training, also were commendable.

We covered all aspects of Nick's training and support, with the view of doing it even better with Brian. All parties are raring to go with Ray Scholar #2!

As far as the 2020 program, your Ray committee will attend an EAA webinar on Nov. 12th to learn all the details, time frames, etc. I'll fill you in on that next month.

Thatcher

We're moving ahead with our tilting canopy on the CX-4. We'll be temping some small hinge brackets and wedge pieces in to canopy side rails. I found some 5/8" x..063 4130 tube and used Bill Miles metal lathe to reduce it so it would slide into the EMT tubing to act as a stanchion for the canopy bows. Here is the 4130 fitting nicely inside the galvanized EMT.

These will be cut into 2" lengths and brazed on to a piece of .10" 4130 plate at a slight angle equal to the canopy bows. Then the 4130 plate will be riveted to the canopy rails. We'll also experiment with brazing the 4130 and EMT eliminating the need for a small bolt. A small AN3 bolt might be better than brazing in the event of a change so the actual canopy could be detached from the rails.

We're also looking into a canopy locking device. Initial thinking is to drill a 1/4" or 3/8" hole through the canopy bow and the front bow which is fixed for the windshield. On the rear a hole through the bow and F7 bulkhead reinforced. Then, designing articulating rods that will engage both the front and rear holes on the left side of the pilot.

We'll See! John

Glareshield Lighting Made Simple

General Aircraft lighting is inadequate in my opinion. I've actually flown commercial aircraft that had poor lighting. For the majority of us flying, it's not a big issue since many of us do not fly at night. But for those that do it becomes problematic.

On later commercial aircraft there are a multitude of rheostats to properly illuminate the panel. In GA aircraft we may have a few or only a single one installed. As bulbs age they lose their lumens of output. Since they don't all dim at the same rate there are some instruments that appear much brighter or dimmer. Glass panels have the advantage of self dimming and individual brightness controls so they can be comfortably set.

On my RV-7 I originally installed an early (2008) LED light strip under the glareshield. It worked OK and I placed it on a dimmer. The dimmer never worked well and had a severely restricted range.

Since I had an all glass panel I was set for flight and engine instrumentation, but areas of the panel also needed some light. Most of my switches are all located at the top of the panel. I did this to protect them from people not paying attention getting in the aircraft and possibly getting a tow on a low mounted panel switch. The glareshield mounted LED strip illuminates the switches nicely.

The original LED strip failed and I lived with it. Recently during my avionics upgrade I decided to replace it and did some research. It seemed that many people had good results with an upgraded 12 vdc strip 5050 LED light. They come in multi-colors but studies show that white or green are best for aviation. I purchased white since I have white panel labels. The white light of the LEDs enhance the same color they illuminate.

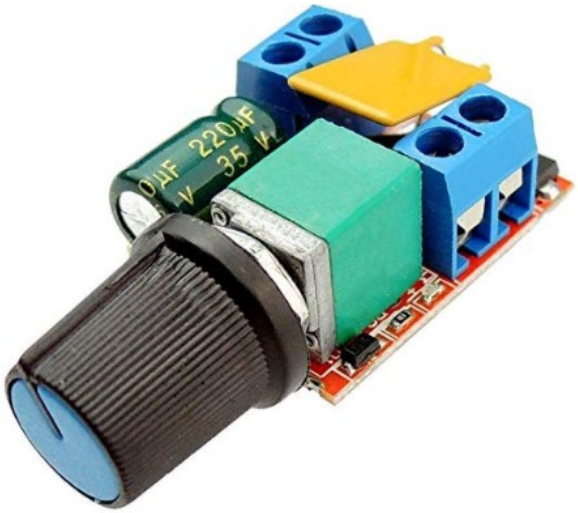
The lights are packaged on what looks like the old large 8mm movie reels. The best deal I found was a 5 meter strip, enough length for about 5 glareshields. The light strip can be trimmed every 3 LED chips making it convenient for an easy fit. There are pigtail leads that can be purchased that are inserted in the strip to supply power to what ever you need to aluminate. The cost for the 5M roll $9.99.
Here is the roll and the link to Amazon.

https://www.amazon.com/gp/product/B075R4X1XL/ref=ppx_yo_dt_b_asin_title_o00_s00?ie=UTF8&psc=1

You need to be careful to forward bias the LED lights and not damage them. It's pretty obvious . If you look closely at the picture you can see where to cut the strip by the little scissor imprint. Pretty simple.

LED lights come in different flavors. Some are dimmable and others aren't.. These are dimmable but do require a special rheostat.. Several years ago these cost about $35 but with the widespread use of LEDs the price has come down. My old dimmer really didn't control the intensity very well and was more of an on-off with a little variance. This small range made it difficult to set the lights for the existing conditions.

Here is the switch I went with



https://www.amazon.com/gp/product/B01AY6NUJW/ref=ppx_yo_dt_b_asin_title_o01_s00?ie=UTF8&psc=1

It's actually called a PWM used to control a small DC motor up to 35 volts and 5 amps. Its linear dimmability is nearly flawless and it also has an OFF detent built into the switch. My old potentiometer didn't have an off and it also buzzed a bit. This one is virtually silent. Even better it accepts bare stripped wires that are clamped.in a connector with small set screws.

Installation

The installation is very straight forward. The led strip has a bit of rigidity to it and has a self-adhesive backing. I used some mini-clamps initially to hold the strip in place to determine the proper length and position needed for the glareshield. Then I found the nearest cut marking and used scissors to cut the strip. Next I ran the electric leads through a small tube conduit I had previously installed in my canopy and connected my electrical wires to the strip leads with butt connectors. I connected those leads to the "Motor" side + / - and the aircraft electrical wires to the supply side + / -. I didn't install the switch in the panel until I was certain everything worked as it should.

Daylight in my hangar full bright

The lights are very nice. They influence the camera picture with some additional glare. What's better is with the RV tip-up canopy open the lights illuminate the entire cockpit and baggage area. They are also helpful turned up to illuminate the floor up front when searching for that lost pen..

Canopy closed. Picture taken through aft window

Conclusion

The LED lights are probably the most bang for the buck of any single item in the RV. When you consider the entire system cost around $18 and I have about 4 meters of leftover strip. What a deal and they are super efficient.

In closing if your looking for an easy source in anything on a 12 volt system check these out. They are also waterproof which is a big plus. As an example, my motorhome has some mini fluorescent 12 volt light fixtures in it. The individual bulbs cost around $15 and generate a lot of heat. I've converted one with an LED strip by removing the ballast and internals. These might be a little too daylight color intense, however they are either on or off, controlled by a small rocker switch in each fixture. I'm going to see if a dimming control switch can be adapted to the fixture in place of the toggle. John

Young Eagle Flights Nov 2 2019

29 Young Eagles Flown

Young Eagle Flights Nov 2 2019

9 Pilots 10 Ground Crew

EAA 485 news

History of Veterans Day

World War I – known at the time as "The Great War" - officially ended when the Treaty of Versailles was signed on June 28, 1919, in the Palace of Versailles outside the town of Versailles, France. However, fighting ceased seven months earlier when an armistice, or temporary cessation of hostilities, between the Allied nations and Germany went into effect on the eleventh hour of the eleventh day of the eleventh month. For that reason, November 11, 1918, is generally regarded as the end of "the war to end all wars."

Soldiers of the 353rd Infantry near a church at Stenay, Meuse in France, wait for the end of hostilities. This photo was taken at 10:58 a.m., on November 11, 1918, two minutes before the armistice ending World War I went into effect

In November 1919, President Wilson proclaimed November 11 as the first commemoration of Armistice Day with the following words: "To us in America, the reflections of Armistice Day will be filled with solemn pride in the heroism of those who died in the country's service and with gratitude for the victory, both because of the thing from which it has freed us and because of the opportunity it has given America to show her sympathy with peace and justice in the councils of the nations…"

The original concept for the celebration was for a day observed with parades and public meetings and a brief suspension of business beginning at 11:00 a.m.

The United States Congress officially recognized the end of World War I when it passed a concurrent resolution on June 4, 1926, with these words:

Whereas the 11th of November 1918, marked the cessation of the most destructive, sanguinary, and far reaching war in human annals and the resumption by the people of the United States of peaceful relations with other nations, which we hope may never again be severed, and

Whereas it is fitting that the recurring anniversary of this date should be commemorated with thanksgiving and prayer and exercises designed to perpetuate peace through good will and mutual understanding between nations; and

Whereas the legislatures of twenty-seven of our States have already declared November 11 to be a legal holiday: Therefore be it Resolved by the Senate (the House of Representatives concurring), that the President of the United States is requested to issue a proclamation calling upon the officials to display the flag of the United States on all Government buildings on November 11 and inviting the people of the United States to observe the day in schools and churches, or other suitable places, with appropriate ceremonies of friendly relations with all other peoples.

An Act (52 Stat. 351; 5 U. S. Code, Sec. 87a) approved May 13, 1938, made the 11th of November in each year a legal holiday—a day to be dedicated to the cause of world peace and to be thereafter celebrated and known as "Armistice Day." Armistice Day was primarily a day set aside to honor veterans of World War I, but in 1954, after World War II had required the greatest mobilization of soldiers, sailors, Marines and airmen in the Nation's history; after American forces had fought aggression in Korea, the 83rd Congress, at the urging of the veterans service organizations, amended the Act of 1938 by striking out the word "Armistice" and inserting in its place the word "Veterans." With the approval of this legislation (Public Law 380) on June 1, 1954, November 11th became a day to honor American veterans of all wars.

Later that same year, on October 8th, President Dwight D. Eisenhower issued the first "Veterans Day Proclamation" which stated:

"In order to insure proper and widespread observance of this anniversary, all veterans, all veterans' organizations, and the entire citizenry will wish to join hands in the common purpose. Toward this end, I am designating the Administrator of Veterans' Affairs as Chairman of a Veterans Day National Committee, which shall include such other persons as the Chairman may select, and which will coordinate at the national level necessary planning for the observance. I am also requesting the heads of all departments and agencies of the Executive branch of the Government to assist the National Committee in every way possible."

President Eisenhower signing HR7786, changing Armistice Day to Veterans Day. From left: Alvin J. King, Wayne Richards, Arthur J. Connell, John T. Nation, Edward Rees, Richard L. Trombla, Howard W. Watts

On that same day, President Eisenhower sent a letter to the Honorable Harvey V. Higley, Administrator of Veterans' Affairs (VA), designating him as Chairman of the Veterans Day National Committee.

In 1958, the White House advised VA's General Counsel that the 1954 designation of the VA Administrator as Chairman of the Veterans Day National Committee applied to all subsequent VA Administrators. Since March 1989 when VA was elevated to a cabinet level department, the Secretary of Veterans Affairs has served as the committee's chairman.

The Uniform Holiday Bill (Public Law 90-363 (82 Stat. 250)) was signed on June 28, 1968, and was intended to ensure three-day weekends for Federal employees by celebrating four national holidays on Mondays: Washington's Birthday, Memorial Day, Veterans Day, and Columbus Day. It was thought that these extended weekends would encourage travel, recreational and cultural activities and stimulate greater industrial and commercial production. Many states did not agree with this decision and continued to celebrate the holidays on their original dates.

The first Veterans Day under the new law was observed with much confusion on October 25, 1971. It was quite apparent that the commemoration of this day was a matter of historic and patriotic significance to a great number of our citizens, and so on September 20th, 1975, President Gerald R. Ford signed Public Law 94-97 (89 Stat. 479), which returned the annual observance of Veterans Day to its original date of November 11, beginning in 1978. This action supported the desires of the overwhelming majority of state legislatures, all major veterans service organizations and the American people.

Veterans Day continues to be observed on November 11, regardless of what day of the week on which it falls. The restoration of the observance of Veterans Day to November 11 not only preserves the historical significance of the date, but helps focus attention on the important purpose of Veterans Day: A celebration to honor America's veterans for their patriotism, love of country, and willingness to serve and sacrifice for the common good.

All who have served, thank you for your service to our great nation

AIRCRAFT HARDWARE
What You Need To Know
By Ron Alexander

The following article was written by a legend in the aviation world, Ron Alexander. He was nicknamed the "Quiet Giant" of aviation. He wrote a vast library of instructional articles on everything about aviation.
Clicking on any of the highlighted links should take you to the actual manual

The quality of our workmanship in building an airplane is very important. We all take the needed time and spend the necessary money to ensure we have a high quality airplane. We want it to not only look attractive, but also to be safe. But what about the materials that hold the airplane together the aircraft hardware? Do we try to cut expenses by using questionable bolts or used nuts? Is it really necessary to spend money on high quality aircraft hardware, **Absolutely!**

The hardware used to assemble your airplane should be nothing but the best. Why take the time to build a perfect wing only to attach it to the fuselage with used hardware. It makes no sense. To quote *the Airframe and Powerplant Mechanics General Handbook* . . . "The importance of aircraft hardware is often overlooked because of its small size; however, the safe and efficient operation of any aircraft is greatly dependent upon the correct selection and use of aircraft hardware."

Very well stated. The same book also provides us with a very good definition of aircraft hardware. "Aircraft hardware is the term used to describe the various types of fasteners and miscellaneous small items used in the manufacture and repair of aircraft."

The subject of aircraft hardware can certainly be confusing. Thousands upon thousands of small items are used on a typical airplane. What does the custom aircraft builder really need to know about hardware? Where do you find the information? What reference is really the end authority on proper installation? What do all of those AN numbers mean and do I have to know them? What types of hardware should I really learn more about in order to build my own airplane?

These questions will be answered in this series of articles on aircraft hardware. I hope to eliminate some confusion over what type of hardware to use and how to properly install it. To begin our discussion, it is absolutely imperative that you use nothing but aircraft grade hardware. Commercial grade hardware found in hardware or automotive stores is legal to use on an experimental airplane **but should not be considered for even a moment.** Why? Let's look at bolts as an example.

Common steel bolts purchased from a hardware store are made of low carbon steel that has a low tensile strength usually in the neighborhood of 50,000 to 60,000 psi. They also bend easily and have little corrosion protection. In contrast, aircraft bolts are made from corrosion resistant steel and are heat treated to a strength in excess of 125,000 psi. The same comparison applies to most hardware items. So, **use only aircraft quality hardware** on your airplane. Save the other hardware for your tractor.

If aircraft hardware is special, then there must be a standard against which it should be measured and manufactured. That standard was actually developed prior to World War II, but became more definitive during that war. Each branch of the military originally had its own standard for hardware. As time went on these standards were consolidated and thus the term AN which means Air Force-Navy (some prefer the older term Army-Navy).

Later the standards were termed MS which means Military Standard and NAS which means National Aerospace Standards. Thus, the common terms AN, MS and NAS. Together they present a universally accepted method of identification and standards for aircraft hardware.

All fasteners are identified with a specification number and a series of letters and dashes identifying their size, type of material, etc. This system presents a relatively simple method of identifying and cataloging the thousands and thousands of pieces of hardware. Several pieces of hardware will have both an AN number and an MS number that are used interchangeably to identify the exact same piece. A cross reference exists

that compares these two numbers. So in the end, you are able to read your plans or assembly manual and identify, by number and letter, each piece of hardware on your airplane. You can then obtain that piece and properly install it in the right place. Imagine trying to do that without a system of numbers.

The specifications for each piece of hardware also define the strength, tolerance, dimensions, and finish that is applied. If you would like further information on this numbering system, you can contact the National Standards Association in Washington, DC.

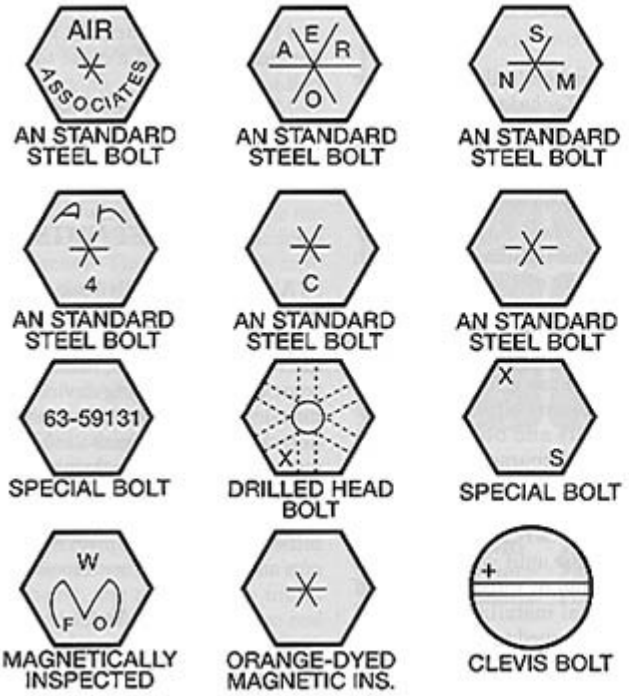


FIGURE 1

Out of all the thousands of hardware pieces manufactured, which ones are important to the custom aircraft builder? The following types and categories of hardware will be discussed:

- Bolts
- Nuts
- Washers
- Screws
- Cotter pins and safety wire
- Rivets
- Turnlock fasteners
- Miscellaneous items such as 0-rings, crush washers, etc.
- Control cable hardware
- Fluid lines and fittings

Electrical wiring and connectors

Where do you find information concerning aircraft hardware? Your aircraft plans or assembly manual should provide you with a general overview of hardware used on your project. Use the hardware the aircraft designer or kit manufacturer recommends. Do not substitute with your own ideas. This can be dangerous. The manufacturer has tested the design and its safety is dependent upon the proper pieces of hardware.

FAA Advisory Circular 43-13-IA is an excellent reference source. *The Airframe Mechanics General Handbook* also has a very good section on the selection and use of hardware. These two books are considered the primary authority on the proper use of hardware. In addition, I would recommend two other small reference books: the *Standard Aircraft Handbook* and the *Aviation Mechanic Handbook*. Both of these provide a good reference source. The Aircraft Spruce & Specialty catalog also contains good reference material on hardware. If you have any doubts about the quality of the aircraft hardware you are purchasing, request a copy of the manufacturer's specifications. These specifications along with a specific manufacturer's lot number should be available.

BOLTS

Bolts are used in aircraft construction in areas where high strength is needed. Where this strength is not necessary screws are substituted. Aircraft quality bolts are made from alloy steel, stainless or corrosion resistant steel, aluminum alloys and titanium. Within our industry the first two are the most common. Aircraft bolts will always have a marking on their head. If you see no markings at all on the head of a bolt, do not use it. It is probably a commercial grade bolt. The markings on bolts vary according to the manufacturer. You should see an "X" or an asterisk along with a name, etc. If you purchase a corrosion resistant (stainless steel) bolt, the head of that bolt should have one raised dash. An aluminum bolt will have two raised dashes on its head. Aluminum bolts have limited use. They should not be

used in tension applications or where they will be continuously removed for maintenance or inspection. A chart of typical bolt heads is presented in Figure 1.

NAS bolts have a higher tensile strength (usually about 160,000 psi) and can be identified by a cupped out head. Close tolerance bolts are machined more accurately than general purpose bolts and they are used in applications requiring a very tight fit. Close tolerance bolts can be either AN or NAS and typically have a head marking consisting of a raised or recessed triangle.

The standard bolts used in aircraft construction are AN3 through AN20. Each bolt typically has a hexagon shaped head and a shank that fits into the hole. The *shank* is threaded on the end and the unthreaded portion of the bolt is termed the *grip.* The diameter of a bolt is the width of the grip. The shank of a bolt will be either drilled to accept a cotter pin or undrilled. Another option is to purchase a bolt that has the head drilled for the purpose of accepting safety wire. Clevis bolts are manufactured with a slotted head and are used for control cable applications. The size, material, etc. of a bolt is identified by an AN number. A breakdown of a typical bolt AN number follows:

AN4-8A

AN means the bolt is manufactured according to Air Force-Navy specs.
4 identifies the diameter of the bolt shank in 1/16" increments
8 identifies the length of the shank in 1/8" increments
A means the shank of the bolt is undrilled (no letter here means a drilled shank)

So, this particular bolt is a 1/4 inch diameter AN bolt that is 1/2 inch long measured from just under the head to the tip of the shank. The bolt also has an undrilled shank which means it cannot accept a cotter pin. Also, bolt length may vary by +1/32" to -1/64". If the letter "C" follows the AN designation (ANC) that identifies a stainless steel bolt. The letter "H" after AN (ANH) identifies a drilled head bolt.

AN Bold Dimension Chart

In constructing you airplane, you will not encounter many bolts larger than an AN8 (1/2 inch diameter). To add a bit more confusion, if the dash number defining the length of the bolt has two digits, the first digit is the length in whole inches and the second number the length in additional 1/8" increments. In other words, an AN514 bolt would be I- 1/2 inches long.

Now that you are totally confused let me recommend a hand tool to simplify bolt selection and sizing. An AN bolt gauge is available that will assist you in identifying a bolt (see Figure 2).

If you need to determine the proper size of a bolt, the length must be sufficient to ensure no more than one thread will be inside the bolt hole. This is the *grip length* of the bolt and it is measured from the underneath portion of the head to the beginning of the threads (see Figure 3). The grip length should be equal to the material thickness that is being held by the bolt or slightly longer. A washer may be used if the bolt is slightly longer. A piece of welding rod or safety wire can be used to measure the length of the hole. In his book titled *Sportplane Construction Techniques,* Tony Bingelis shows a simple tool that can be made for this purpose.

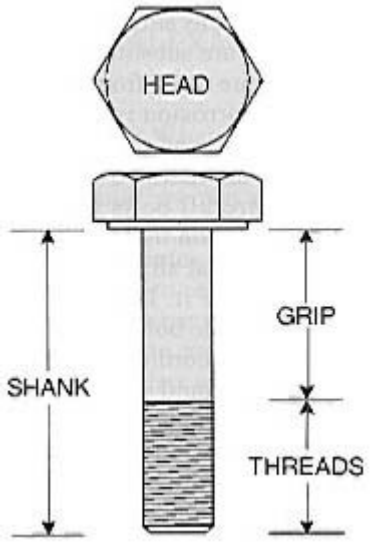


FIGURE 3

It is important that you do not "over tighten" or "under tighten" a bolt or the nut attached to a bolt. Under torque or under tightening results in excessive wear of the hardware as well as the

parts being held. Over tightening may cause too much stress on the bolt or nut. The best way to avoid this is to use a torque wrench. AC43-13 presents a table of torque values for nuts and bolts. It shows fine thread and coarse thread series with a minimum and maximum torque limit in inch pounds. I recommend using a torque wrench whenever possible, at least until you get an idea as to the amount of force required. Of course, critical installations should definitely be torqued to proper values. A torque wrench is not that expensive and will be a worthwhile investment for a custom builder.

Basics of Bolt Installation

Certain accepted practices prevail concerning the installation of hardware. A few of these regarding bolt installation follow:

- In determining proper bolt length - no more than one thread should be hidden inside the bolt hole.
- Whenever possible, bolts should be installed pointing aft and to the center of an airplane.
- Use a torque wrench whenever possible and determine torque values based on the size of bolt.
- Be sure bolt and nut threads are clean and dry.
- Use smooth, even pulls when tightening.
- Tighten the nut first - whenever possible.
- A typical installation includes a bolt, one washer and a nut.
- If the bolt is too long, a maximum of three washers may be used.
- If more than three threads are protruding from the nut, the bolt may be too long and could be bottoming out on the shank.
- Use undrilled bolts with fiber lock nuts. If you use a drilled bolt and fiber nut combination, be sure no burrs exist on the drilled hole that will cut the fiber.
- If the bolt does not fit snugly consider the use of a close tolerance bolt.
- Don't make a practice of cutting off a bolt that is too long to fit a hole. That can often weaken the bolt and allow corrosion in the area that is cut.

AIRCRAFT NUTS

Aircraft nuts usually have no identification on them but they are made from the same material as bolts. Due to the vibration of aircraft, nuts must have some form of a locking device to keep them in place. The most common ways of locking are cotter pins used in castle nuts, fiber inserts, lock washers, and safety wire. The aircraft nuts you will most likely encounter are castle nuts, self-locking nuts, and plain nuts. Wing nuts and anchor nuts are also used.

Castle Nuts

AN310 and AN320 castle nuts are the most commonly used (see Figure 4). Castle nuts are fabricated from steel and are cadmium plated. Corrosion resistant castle nuts are also manufactured (AN310C and AC320C - remember, when you encounter a "C" it will designate stainless). Castle nuts are used with drilled shank bolts, clevis bolts and eye bolts. The slots in the nut accommodate a cotter pin for safetying purposes. The thinner AN320 castellated shear nut has half the tensile strength of the AN310 and is used with clevis bolts which are subject to shear stress only. The dash number following the AN310 or AN320 indicates the size bolt that the nut fits. In other words, an AN310-4 would fit a 1/4 inch bolt.

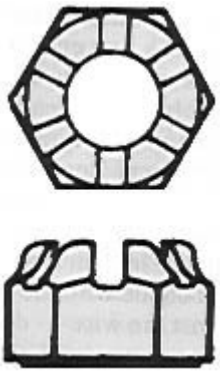


FIGURE 4

Self-Locking Nuts

Self-locking nuts, as the name implies, do not need a locking device. The most common method of locking is derived from a fiber insert. This insert has a smaller diameter than the nut itself so that when a bolt enters the nut it taps into the fiber insert producing a locking action. This fiber insert is temperature limited to 250-deg. F. The designation of these nuts is AN365 and AN364.

This brings us to an example of a cross-reference MS number. An AN365 is also termed MS20365 with the AN364 being MS20364. Both of these nuts are available in stainless. The AN364 is a shear nut not to be used in tension.
An all metal locking nut is used forward of the firewall and in other high temperature areas. In place of a fiber insert, the threads of a metal locking nut narrow slightly at one end to provide more friction. An AN363 is an example of this type of nut. It is capable of withstanding temperatures to 550-deg. F.
The dash number following self-locking nut defines the thread size. Self-locking nuts are very popular and easy to use. They should be used on undrilled bolts. They may be used on drilled bolts if you check the hole for burrs that would damage the fiber. One disadvantage, self-locking nuts should not be used on a bolt that is connecting a moving part. Am example might be a clevis bolt used in a control cable application.

Plain Aircraft Nuts

Plain nuts require a locking device such as a check nut or lockwasher. They are not widely used in most aircraft. AN315 is the designation used for a plain hex nut. These nuts are also manufactured with a right hand thread and a left hand thread. The check nut used to hold a plain nut in place is an AN316. If a lockwasher is used a **plain washer must be under the lockwasher** to prevent damage to the surface.

Other Aircraft Nuts

There are a number of other aircraft nuts available. Wing nuts (AN350) are commonly used on battery connections or hose clamps where proper tightness can be obtained by hand. Anchor nuts are widely used in areas where it is difficult to access a nut. Tinnerman nuts, instrument mounting nuts, pal nuts, cap nuts, etc. are all examples of other types that are used.

Basics of Aircraft Nut Installation

1. When using a castle nut, the cotter pin hole may not line up with the slots on the nut.
The *Mechanics General Handbook* states "except in cases of highly stressed engine parts, the nut may be over tightened to permit lining up the next slot with the cotter pin hole." Common sense should prevail. Do not over tighten to an extreme, instead, remove the nut and use a different washer and then try to line the holes again.
2. A fiber nut may be reused if you are unable to tighten by hand.
3. At least one thread should be projecting past the fiber on a fiber nut installation.
4. No self-locking nuts on moving part installations.
5. Do not use AN364 or AN365 fiber nuts in areas of high temperature - above 250' F.
6. Shear nuts are to be used only in shear loads (not tension).
7. Plain nuts require a locking device such as a lockwasher or a check nut.
8. When using a lockwasher, place a plain washer between the surface of the airplane part and the lockwasher.
9. Shear nuts and standard nuts have different torque values.

Use wing nuts only where hand tightness is adequate.

WASHERS

Finally, a hardware item that is simple. You are likely to encounter only a couple of different types of washers AN960 and AN970. The main purposes of a washer in aircraft installation are to provide a shim when needed, act as a smooth load bearing surface, and to adjust the position of castle nuts in relation to the drilled hole in a bolt. Also, remember that plain washers are used under a lockwasher to prevent damage to a surface.

AN960 washers are the most common. They are manufactured in a regular thickness and a thinner thickness (one half the thickness of regular). The dash number following the AN960 indicates the size bolt for which they are used. The system is different from others we have encountered. As an example, an AN960-616 is used with a 3/8" bolt. Yet another numbering system. If you see "L" after the dash number, that means it is a thin or "light" washer. An AN960C would be - yes, a stainless washer. I can tell you are getting more familiar with the system so I will throw another wrench into the equation - an AN970 washer has a totally different dash number system. I am not even going to tell you what it is. I will tell you that an AN970 is a larger area flat

washer used mainly for wood applications. The wider surface area protects the wood.

There are other types of washers. I mentioned lockwashers that are made several different ways. They are often split ring, they are sometimes internal tooth and even external tooth (see Figure 5). You will also find nylon washers and finishing washers that usually have a countersunk head. So, as you can see, washers are not quite as confusing as other hardware even though we can make ft difficult if we wish.

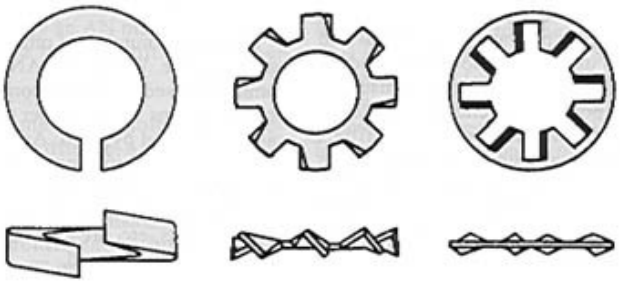


FIGURE 5

COTTER PINS AND SAFETY WIRE

The cotter pins mostly used on custom aircraft are AN380 and AN381. Cadmium plated cotter pins are AN380 and stainless are AN381. Cotter pins are used for safetying bolts, screws, nuts and other pins. You will normally use them with castle nuts. The MS number you may see is MS24665. The dash numbers indicate diameter and length of the pin. As an example, AN380-2-2 would be a cadmium plated pin 1/16" in diameter and 1/2" long. All supply companies will have charts showing the various sizes versus the reference number.

Safety wire is also widely used. The most used sizes in diameter are .020, .032 and .041 or small variations thereof. The material is usually stainless steel or brass. The easiest method of installation is acquired by using safety wire pliers (see Figure 6). The pliers are used to twist the wire. The wire is installed so that if the nut or bolt begins to loosen it will increase the tension on the wire. Be sure you do not overtwist the wire - doing so will weaken the safety wire. Leave about 36 twists and then cut off the excess wire and bend its end so you do not snag it with your hand at a later time.

FIGURE 6

I want to emphasize the major point of this article. **USE ONLY AIRCRAFT QUALITY HARDWARE.**

Do not assume the engineer role by using hardware types or sizes that are contrary to your plans or assembly manual. In future articles I will discuss the other hardware items including control cable installation, screws, rivets, turnlock fasteners, etc.

Editor: I knew Ron Alexander at Delta. At the time I knew he had some aviation business interests but had no idea the extent of it. I spent a few minutes in October 2008 talking with him at his SportAir facility in Griffin, GA where I built the tail pieces for my RV aircraft.

During the period of time from 1999 through 2004 Ron served as Chief Pilot on the Delta Air Lines DC-3. Ron flew it on a number of trips in addition to training other pilots. Sadly on November 17, 2016 Ron along with a passenger died in a Jenny crash. *RIP*

Click Here for Pics of the DC-3 Restoration

AN BOLT DIMENSIONS												
AN No.	AN3		AN4		AN5		AN6		AN7		AN8	
Diam.	3/16" (.186 - .189)		1/4" (.246 - .249)		5/16" (.309 - .312)		3/8" (.371 - .374)		7/16" (.433 - .437)		1/2" (.459 - .499)	
DASH NO.	GRIP +1/64 -1/64	LENGTH + 1/32 - 1/64	GRIP +1/64 -1/64	LENGTH + 1/32 - 1/64	GRIP +1/64 -1/64	LENGTH + 1/32 - 1/64	GRIP +1/64 -1/64	LENGTH + 1/32 - 1/64	GRIP +1/64 -1/64	LENGTH + 1/32 - 1/64	GRIP +1/64 -1/64	LENGTH + 1/32 - 1/64
3	1/16	15/32	1/16	15/32								
4	1/8	17/32	1/16	17/32	1/16	19/32						
5	1/4	21/32	3/16	21/32	3/16	23/32	1/16	45/64	1/16	23/32		
6	3/8	25/32	5/16	25/32	5/16	27/32	3/16	53/64	3/16	27/32	1/16	27/32
7	1/2	29/32	7/16	29/32	7/16	31/32	5/16	61/64	5/16	31/32	3/16	31/32
10	5/8	1-1/32	9/16	1-1/32	9/16	1-3/32	7/16	1-5/64	7/16	1-3/32	5/16	1-3/32
11	3/4	1-5/32	11/16	1-5/32	11/16	1-7/32	9/16	1-13/64	9/16	1-7/32	7/16	1-7/32
12	7/8	1-9/32	13/16	1-9/32	13/16	1-11/32	11/16	1-21/64	11/16	1-11/32	9/16	1-11/32
13	1	1-13/32	15/16	1-13/32	15/16	1-15/32	13/16	1-29/64	13/16	1-15/32	11/16	1-15/32
14	1-1/8	1-17/32	1-1/16	1-17/32	1-1/16	1-19/32	15/16	1-37/64	15/16	1-19/32	13/16	1-19/32
15	1-1/4	1-21/32	1-3/16	1-21/32	1-3/16	1-23/32	1-1/16	1-45/64	1-1/16	1-23/32	15/16	1-23/32
16	1-3/8	1-25/32	1-5/16	1-25/32	1-5/16	1-27/32	1-3/16	1-53/64	1-3/16	1-27/32	1-1/16	1-27/32
17	1-1/2	1-29/32	1-7/16	1-29/32	1-7/16	1-31/32	1-5/16	1-61/64	1-5/16	1-31/32	1-3/16	1-31/32
20	1-5/8	2-1/32	1-9/16	2-1/32	1-9/16	2-3/32	1-7/16	2-5/64	1-7/16	2-3/32	1-5/16	2-3/32
21	1-3/4	2-5/32	1-11/16	2-5/32	1-11/16	2-7/32	1-9/16	2-13/64	1-9/16	2-7/32	1-7/16	2-7/32
22	1-7/8	2-9/32	1-13/16	2-9/32	1-13/16	2-11/32	1-11/16	2-21/64	1-11/16	2-11/32	1-9/16	2-11/32
23	2	2-13/32	1-15/16	2-13/32	1-15/16	2-15/32	1-13/16	2-29/64	1-13/16	2-15/32	1-11/16	2-15/32
24	2-1/8	2-17/32	2-1/16	2-17/32	2-1/16	2-19/32	1-15/16	2-37/64	1-15/16	2-19/32	1-13/16	2-19/32
25	2-1/4	2-21/32	2-3/16	2-21/32	2-3/16	2-23/32	2-1/16	2-45/64	2-1/16	2-23/32	1-15/16	2-23/32
26	2-3/8	2-25/32	2-5/16	2-25/32	2-5/16	2-27/32	2-3/16	2-53/64	2-3/16	2-27/32	2-1/16	2-27/32
27	2-1/2	2-29/32	2-7/16	2-29/32	2-7/16	2-31/32	2-5/16	2-61/64	2-5/16	2-31/32	2-3/16	2-31/32
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32	2-7/8	3-9/32	2-13/16	3-9/32	2-13/16	3-11/32	2-11/16	3-21/64	2-11/16	3-11/32	2-9/16	3-11/32
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34	3-1/8	3-17/32	3-1/16	3-17/32	3-1/16	3-19/32	2-15/16	3-37/64	2-15/16	3-19/32	2-13/16	3-19/32
35	3-1/4	3-21/32	3-3/16	3-21/32	3-3/16	3-23/32	3-1/16	3-45/64	3-1/16	3-23/32	2-15/16	3-23/32
36	3-3/8	3-25/32	3-5/16	3-25/32	3-5/16	3-27/32	3-3/16	3-53/64	3-3/16	3-27/32	3-1/16	3-27/32
37	3-1/2	3-29/32	3-7/16	3-29/32	3-7/16	3-31/32	3-5/16	3-61/64	3-5/16	3-31/32	3-3/16	3-31/32
40	3-5/8	4-1/32	3-9/16	4-1/32	3-9/16	4-3/32	3-7/16	4-5/64	3-7/16	4-3/32	3-5/16	4-3/32

EAA 485 news

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Barin OLF ASOS 251 970-2469

Normally meetings will be held at Ferguson Airport (82J) (Uni **122.8**) on the **Second Saturday** of each month at 10:00 AM unless otherwise posted. Please check the if flying in for important info.

Go past the main airport entrance and take the next left. Go thru the gate and make a left on the gravel road. Make a right past the T hangar you'll see our building down on the left side. Anyone interested in general aviation and building or restoring aircraft are welcome.

For more info contact:

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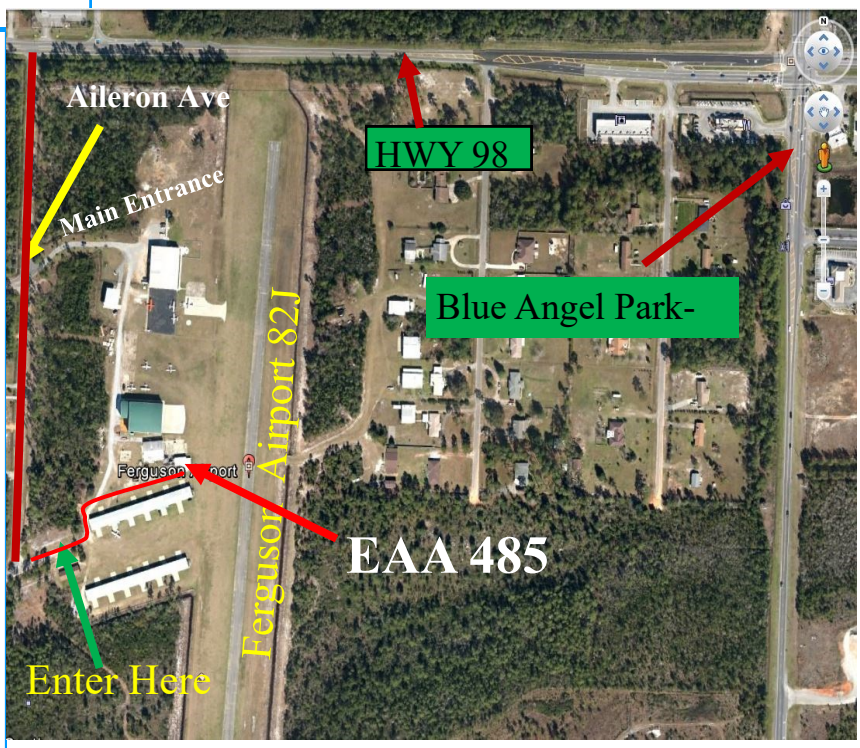

Home Of The
PANHANDLE PELICANS

EAA 485 Pensacola, FL

2019 82J Monthly Pancake Breakfast Sched
Nov 16th, Dec 21st.

Send email changes and bad newsletter links to John rockyjs7jm@gmail.com

Famous Aviation Quotes
"With a night engine out, conserve your battery. Just prior to landing turn your landing light **ON**. If you don't like what you see, turn the landing light **OFF**."

Clubhouse Update
Since we're conducting our Young Eagle flights from the clubhouse we are updating some things such as replacing the fluorescent lights in the bathroom. Amazing what a difference We'll be having a field day early next year that will update the paint and a few other things as well as Rusty.

2019 Events Calendar

Saturday Nov 9th, 1000
Place: EAA 485 Clubhouse

- **Pledge**
- **Introductions**
- **Guests**
- **Elections**
- **December Chapter Meeting**
- **Clubhouse Field Day**
- **Social Director/Continental Tour & Airbus**
- **Job Assignments Sign Up sheets**
- **Member aircraft/project update**
- **New Business**
- **NOV Chapter Video**

Lunch $5 suggested donation

Calendar

Future Meeting Dates:
Dec 14th
Jan 11th
Feb 8th NAS Museum ?

Fly Ins:

Blue Angels Homecoming Nov 8-9

2004 RV8A Total Time 400 hours airframe and engine since major overhaul $85K

Lycoming IO-360 180 HP Sensenich fixed pitch prop
Well built and maintained aircraft. Complete engine and airplane logs. Condition inspection August 2019 - Will be sold with new annual.
New PC680 battery
Complete Dynon 10" Skyview System:

- Full EMS system (CHTs & EGTs, Fuel Flow, RPM, MAP, Oil Press , Oil Temp, Fuel Press, OAT
- Dual axis autopilots with electric elevator trim
- SV Knobs Panel
- SV Autopilot Panel
- Dynon SV-472 ADS-B-In Dual Channel Receiver

Stratus ESG ADSB-Out transponder Installed September 2017
Microair Com #1
Garmin 300XL GPS/Comm #2 (enroute and non-precision IFR certified)
Garmin GMA 240 Audio Panel.
No Nav at present however tail VOR antenna and coax cable run to instrument panel
Great Instrument panel setup
2 ¼" backup Airspeed , Altimeter, Vertical Speed
Separate Lift Control pneumatic stall indicating system.
Rear seat rudder pedals. (currently uninstalled)
Ram mount for tablet.

This is a sweet flying economical aircraft at 8500' leaned it flies 150 kts TAS @ 8.0 gph

Contact: John McKiernan 850 291-4134 rockyjs7jm@gmail.com