DESIGNEE NEWSLETTER

THE PUBLICATION OF THE EAA DESIGNEE PROGRAM

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The DESIGNEE NEWSLETTER is a forum for the exchange of information and ideas of interest to aircraft and ultralight builders, restorers, and flyers. The sources of the materials published are EAA Designees, readers, Chapter newsletters, and other publications. Readers are encouraged to submit manuscripts, drawings, and black/white photos for consideration. Every effort is made to select accurate materials of interest to a majority of readers. Opinions expressed and responsibility for accuracy rests entirely with the contributor. All materials submitted become the property of EAA - no remuneration will be made. Materials should be sent to Chuck Larsen, EAA Designee Director.

CONTENTS

Volume 15, Number 9 September, 1984

DESIGNEE TIP

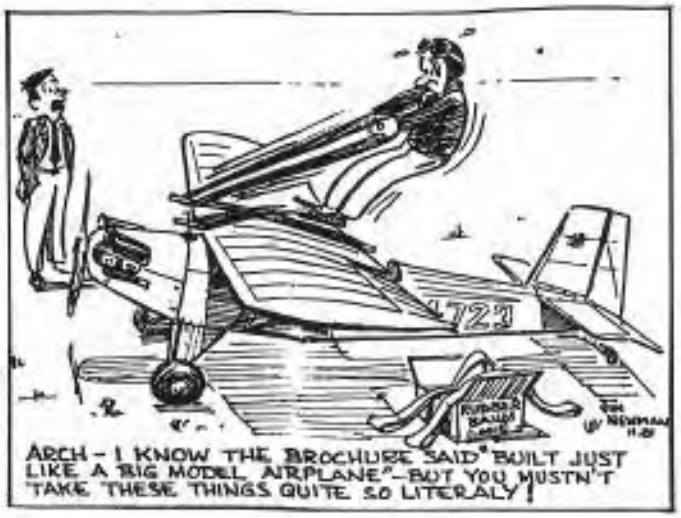
From Glen Dunn, EAA 134646, D/N 1440
From the New Orleans, Louisiana EAA Chapter 777 Newsletter

While thumbing through a catalog the other day, I chanced upon a little item which I believe will interest at least some of the builders. It's a thread repair insert that can be installed without special tools and can be used in almost any material. Following are the general parameters:

1. The inserts can be used in magnesium, aluminum, cast iron, copper, masonite, plastic — for load bearing threads in any material. They will not back out or vibrate loose as they have a nylon locking element in the external thread. Bolts and screws can be inserted and removed without insert movement.
2. The insert can be installed in 3 steps:
   a. Drill with standard drill. Countersink slightly.
   b. Tap hole with standard tip.
   c. Turn insert into place with a bolt and locknut.
3. They come in two materials; cad-plated steel and Stainless steel; also in UNC and UNF threads.

A catalog with ordering information and prices is available from:

Northwestern Tools, Inc.
3130 Valleywood Drive
Dayton, OH 45429
(513) 298-9994



ENGINE WEIGHTS

From the Chapter 617 Newsletter

Questions often arise regarding engine weights, since these weights are important considerations in relation to aircraft performance. The listings below are from the manuals and the variations in each engine are due to different accessories.

LYCOMING	HP	RPM	Weights	CONTINENTAL	HP	RPM	Weights
O-235	100	2450	209/222	O-200	100	2750	190
O-235	108	2600	"	C-115	115	2350	257
O-235	115	2600	"	C-125	125	2550	257
O-290	125	2450	230/247	C-145	145	2700	268
O-290B	125	2600	"	O-300	145	2700	268
O-290D2	135	2600	"	E-165	165	2700	351
O-320A	150	2700	243/251	E-185	185	2700	351
O-320B	160	2700	"	Our thanks to EAA Chapter 617			
O-320C	150	2700	"	in Bend, Oregon for sharing this			
O-320D	160	2700	"	information.			
O-320E	150	2700	"				

WITTMAN AIRFIELD JULY 28-AUG. 4

Designees and Subscribers:

OSHKOSH '84 is being entered into the record books as a memorable experience for all of the EAAers and enthusiasts who attended. What words describe our annual convention? The answer, none! There are no words or even photos that adequately describe OSHKOSH. The only way to fully appreciate OSHKOSH is by experiencing it. OSHKOSH '84 continued to reflect EAA's more than 30 year reputation of quality aviation activity as each day's events unfolded.

As always, the airplanes were the big attraction but many other events including the air shows, exhibits, workshops, forums, the EAA Air Academy and renewed EAA friendships made 1984 a milestone for convention goers.

The hundreds of volunteers who worked hours, days and even the entire event are to be commended for their dedication and labor in support of EAA, the EAA Aviation Foundation and our annual convention. A special word of thanks for those who participated in our Designee activities and in the Technical Information Center. Your participation will bear fruit as you return to your homes and disseminate to others what you have learned. Thanks again to those taking part in OSHKOSH '84.

Chuck Larsen, Designee Director

LETTERS 'N SHOP TALK

TIPS FROM BOB'S HANGAR

From Ann Arbor, Michigan Chapter 333 Newsletter

1. When you're welding rod sticks, twist it instead of pulling it, pulling on it usually moves something out of place.
2. Polish your handsaws. To make a perfect 90 degree cut, simply look at the reflection of the stock in the blade. When it looks like one straight continuous line it's gotta be straight.
3. One square foot of dope finish (9 coats) weighs 1 ounce. A 14 coat finish on both sides of a pair of J-3 panels looks like this:
   5' × 35' = 175 sq. ft.
   2 sides = 350 sq. ft.
   350 × 14/9 = 544 oz.
   544 oz. = 35 lb. 4 oz.
   Ballpark figures, of course, but at least they give you a basis for estimation. Since 80% of dope is volatile, you can expect to apply 177 pounds of the stuff, or about 20 gallons.
4. Two coats of varnish provides a more fire-resistant finish than once or three. One leaves wood fuzz which ignites easily. Three runs into inflammable puddles when heated and quickly reaches a high enough temperature to spread. Two coats requires substantial heating to ignite and extinguish easily.
5. Solder a neck from a drygas can onto a dope can lid after cutting a 2" hole. Now you can pour out small quantities for patching jobs without exposing the whole gallon to drying air.
6. When you have to sew canvas seatbacks, tents, etc., reshape the needle to a long conical point with a whetstone. If your machine will handle 2 layers before the modification it should now make 6 to 8.

PROPELLER BUBBLE BALANCER

From Jim Newman, EAA 109981

Faced with the prospect of refinishing and balancing the propeller of the Fournier RF4D (which I am able to fly through a very generous arrangement with its owner, Frank Garcher of Midwest Products - a name well known to modelers) - I was most concerned with the balancing aspect. I discounted the knife edge method due to the modest size of my workshop. However, watching a mechanic balance the wheels of my car inspired the idea of the bubble balancer, since this was obviously a simple and very compact device which would occupy meager space on my model workbench. A quick sketch and a few words of explanation were sufficient for good friend and superb machinist, Gene "Ol' Micrometer Fingers" Johnson, to produce the balancer shown here in cut-away illustration. No dimensions are given since it can be machined from any suitable metals found in the odds and ends bin. The only critical areas are where it is necessary to ensure that the 90 degree angles are maintained because the face to which the bull's eye level is attached must be parallel with the face on which the back of the propeller hub rests. Also - the tube must be a snug push fit into the propeller center hole.

On our version the flange and base are ¼" thick, 4" diameter mild steel plate. The hollow boss is a section of thick wall pipe with a slight shoulder machined on one end which is then pressed into the flange. Likewise, the top plug is also press fitted into the tube. The tapped hole for the cone pointed set screw is done in the lathe to ensure concentricity. The set screw is locked in place with Loc Tite or cyanoacrylate glue from your hobby store. The pointed pin is also press fitted into the base plate after which a two dollar, hardware store, bull's eye spirit level is glued to the top with a couple of spots of cyanacrylate glue. Since this tool will spend a great deal of its life sitting on the shelf, it is worth protecting with a spray coat of zinc chromate. Sitting on the shelf or not - you will wonder how you ever got along without one because you will find that, with a little patience, you will be able to balance your propeller to closer tolerances than the factory, since **you** don't have to worry about the economics.

ALUMINUM ANODIZING AT HOME

From the EAA Chapter 527 Newsletter

For those of us living near the coast, here are some instructions on anodizing fittings to prevent corrosion. All you need are:

A gallon plastic jug cut off to make a bucket.
A gallon of H2SO4 (battery acid) at a specific gravity of 1.10.
A lead plate larger than the parts to be anodized.
A 12 volt battery charger (6 amps is best).
Pure, soft aluminum wire
Trisodium Phosphate (TSP) available at hardware stores, diluted to .8 ounces/gallon of water

Cleanliness is very important, use wooden tongs to handle parts after cleaning and proceed as follows. **To degrease parts,** heat TSP to boiling, cool slightly and immerse parts for 3 minutes. Water rinse and avoid touching the parts.

To anodize —

Positive lead to the work (parts).
Negative lead to the lead plate. Use the aluminum wire. A good contact is the secret to success.
Immerse in acid.
Gas bubbles evolving from the lead plate proves that anodizing is occurring.
Leave parts in the anodize process for 25-30 minutes.
Water rinse.
Boil parts for 10 minutes in clean water to seal the anodizing.

Remember the acid (even though mild, is acid) can burn. Wash spills thoroughly.

EXPLOSAFE: CRASH PROTECTION IN YOUR TANK

From the Newsletter of EAA Chapter 246

EXPLOSAFE! WHAT IS IT? How does it work? How much fuel does it displace? How heavy it is? What does it cost? Can I put it in my tanks? The Vulcan factory has been inundated with thousands of questions like these since the TV program "That's Incredible," where two automobile fuel tanks were filled with gasoline and ignited from a safe distance. One tank exploded and created a raging inferno all around the car, while the other burned harmlessly at the filler opening and could be snuffed out with a gloved hand. "Explosafe" made the incredible difference.

Explosafe is an expanded aluminum honeycomb mesh that acts as a heat sink that transfers the heat away so rapidly that the fuel does not reach its flash point, and the rising pressure front is physically baffled as it tries to pass through the cellular maze.

The tremendous surface area of the foil allows a high rate of evaporation, which increases the vapor-air ratio, shifting the mixture out of the flammable range; all this occurs with only one percent fuel displacement and a weight of 2.3 pounds for every seven gallons of fuel. It also works well for other types of flammable liquids.

Escaping fuel will burn at the puncture site, but there will be no explosion. In the event of an airplane crash, the fuel tank would be safe from an internal explosion in the same manner. Fuel tanks can even be welded or brazed without purging. Besides, the explosive suppressant action, there are other benefits; the tank is internally grounded so that there is no static electrical charge built up by a rapid fuel flow, and the slosh attenuation of the mesh eliminates the need for baffles, unless they are required for the structural integrity of the tank itself.

Explosafe provides a slosh attenuation by a factor of 40, besides providing a tremendous safety factor in the event of fire.

Explosafe batts are manufactured by Vulcan Industrial Packaging, Explosafe Division, 414 Attwell Drive, Rexdale, Ontario, Canada M9W5C3, and is available to homebuilders through Explosafe, 1310 Idylwild Drive, Lincoln, NE 68503.

TECHNICAL TOPICS

EVERYTHING YOU WANTED TO KNOW ABOUT ANTENNA BUT WERE AFRAID TO ASK!

From the El Paso, Texas Chapter 125 Newsletter

It is most distressing to go out and purchase some fine avionics, install it in your airplane and receive nothing but static. It's most likely the radios are fine but your antenna (the most important link in the system) is on the frits! In this article, I shall try to explain some of the fundamentals of antenna design and installation.

The first topic we need to discuss is the concept of "Wavelength". We all know when we listen to EL PASO TOWER we turn our radios to 118.3 megahertz. This frequency has its own particular wavelength which we can determine by the following equation:

$$\text{Wavelength (Meters)} = \frac{300}{\text{Frequency (Megahertz)}}$$

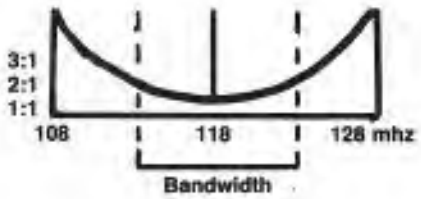
So we can see that 118.3 megahertz has a wavelength of 2.5 meters. We know the wavelength; but what good does this do? A bit more explanation is in order. The wavelength refers to the distance in space that a single cycle of the radio wave occupies.

1 Wavelength

Antennas come in all types of configurations, but the most common aircraft communication antenna is the ¼ wave vertical antenna. Voila! . . . Now we are getting somewhere! We know that the wavelength of 118.3 megahertz is 2.5 meters, so our antenna should be ¼ of that wavelength, about .663 meters. But, why do we use ¼ of the wavelength? The next topic we'll talk about is "Impedence". Impedence is a fancy word for the resistance of the antenna and we use the units of resistance (OHMS) to describe it. A ¼ wavelength antenna has an Impedence of about 40 to 70 Ohms, at resonance. Resonance is another fancy word; but we'll come back to that later.

What we need to know now is why an impedence of 40 to 70 Ohms important. The reason is that the radio is designed to operate at a center impedence (Usually, 52 Ohms). At this point we can also state that the antenna cable also has an Impedence of 52 Ohms. If the radio's Impedence is 52 Ohms, the cables impedence is 52 Ohms, and the antennas Impedence is 52 Ohms, we can say we have a good match in the system, and virtually all the power from the transmitter will reach the antenna and be radiated into space. This is what the term "S W R" (Standing Wave Ratio) refers to. The ratios of forward radiated power to reflected power. Reflected power is the power that will not be radiated from the antenna, but is reflected back to the transmitter. When we have a high S W R (that is, most of the power being reflected back to the transmitter) we will have two problems. 1. The power is not available to the antenna to be transmitted; and 2. the power reflected back to the transmitter may damage it. Okay, now remember the word "Resonance"? We said that an antenna is resonant at only one frequency. But, we use more than one frequency in our airplanes. Now, this can cause some other problems. If we look at a simplified equation we can see that: Impedence = Resistance + Reactance.

At Resonance, the Reactance = 0, so the Impedence is purely resistive. But, at other frequencies the reactance will change the Impedence, and therefore, change the S W R. This introduces the idea of "Bandwidth", which is the useable range of frequencies for a particular antenna. Bandwidth is defined as the range of frequencies a given antenna can be used and still present a S W R that is usable. It is easy to see this relationship with the following diagram:



Resonant Frequency (Example 118.3)

For this reason an antenna is cut to be resonant at the Frequency which is at the center of the range of frequencies it will be used (in the case of Aircraft Comm Antennas, the range of frequencies is 118.0 to 135.0 mhz. The center frequency is 127.0 mhz). This all sounds like a lot of work just to decide how long to cut an antenna; but the preceeding discussion should give you some idea of why it is done this way. We now know our antenna length (about 2 feet for our aircraft band).

CONTROL FLUTTER

By Ramon Navarro, EAA 203330, from the Grand Rapids, Michigan FAA-GADO Grapevine

In the past I have noticed while giving flight tests that most pilots don't seem to know the difference between dynamic balance control surfaces and static balance control surfaces of an aircraft. My concern here is primarily the lack of knowledge and understanding of static balances on control surfaces; in particular, the static balance used on controlsurfaces of Cessna type aircraft such as the ones used in the Cessna 172, 150, and 152 where they have the lead weights on the ailerons.

First let me explain that the way the static balance is installed on control surfaces on most airplanes is by putting the control surface in an enclosed room where you have no drafts and attaching the control surface to a fixed object by its hinge points. Without this static balance, the control surface will droop, such as the trailing edge of the ailerons hanging down from the hinge point. Then the weight, which is the static balance, is added forward of the hinge points. When the control surface lies completely horizontal it is known to be 100% statically balanced.

The purpose of this static balance is not to help or aid the pilot in flying the aircraft or manipulating the controls. It is simply to eliminate flutter, so, if the control surface is 100% statically balanced you can easily see that any additional weights that may be added to a surface will upset or cancel the static balancing. In particular, if you have packed snow that is trapped inside an aileron on the previously mentioned aircraft, the weight of the snow will cancel out the static balance and therefore the possibility of getting control surface flutter will exist.

Once the control surface starts to flutter, the rivets on the trailing edge will begin to pop. Once the first rivet pops then the rest of them will follow just like a zipper resulting in the surface opening up completely in both directions. If this happens to the ailerons the pilot will be unable to control the aircraft, as lateral control will be lost, and the aircraft will roll continuously.

Pilots should understand the purpose of static balance, and emphasize during the winter the necessity for checking for packed ice or snow inside the control surfaces. Although I have used the Cessna 172, 150, and 152 type ailerons to describe the importance of checking for ice and snow in the control surfaces during the winter, this procedure should not be restricted to this particular type of aircraft as it applies to all aircraft. Even a slight layer ice on the external surface of a control surface can cancel static balance of that particular surface and will incr possibility of getting control flutter while in flight.

DESIGNEE VISITS

One of the important services provided by our DESIGNEES is visiting aircraft building/restoration projects to discuss and offer suggestions about them. The DESIGNEES in the following listing are to be commended for their efforts in helping to make sport aviation a safer activity by providing this service. Comments for publication are selected for the purpose of providing guidance or assistance to builders and the DESIGNEES visiting them. DESIGNEES are requested to note problems or procedures observed in their project visits in the comment's section of the Designee Visit Report.

Donovan Gregory #1520
Granada Hills, California
(818) 891-2621
*Steen Skybolt
*Powered Sail Plane

Richard Desmond #1523
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(617) 585-7377
*LongEZ

Daniel L. Benstrom #1557
Gwinn, Michigan
(906) 346-3567
*Pazmany

Doug Martin #1563
Carmel Valley, California
(408) 375-2959
*Firefly

Dave Bristol #1560
Torrance, California
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*Looper

Gilbert S. Wagner #1581
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Paul F. Thompson #1598
Montrose, Colorado
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