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.

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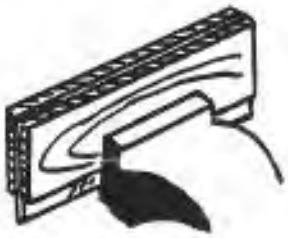
Volume 15, Number 10 — October, 1984

SHEET METAL SANDWICH



When cutting thin sheet metal with a hacksaw you can get a truer cut with less bending by sandwiching the sheet metal between two pieces of scrap wood and sawing through all three pieces.

DRILL LUBRICATION

You can increase the life of high-speed drill bits many times over with proper lubrication. A short length of loose-fitting plastic or rubber hose placed over the drill in use, allows lubrication to be applied through the tubing. Oil that is normally thrown off the drill by centrifugal force drains down the tubing directly to the work point where it does the most good.

1985 DESIGNEE REVALIDATION

(Revalidation does not apply to subscribers)

Designees and Subscribers,

October brings us not only the changing of the seasons, but also the time of the year when all EAA Designees must complete a revalidation reaffirming their interest and commitment to this vital program. Those Designees not revalidated on the form in this month's DESIGNEE NEWSLETTER or on their Chapter's 1985 Status Report by January 1, 1985 will be considered inactive and no longer receive the DESIGNEE NEWSLETTER or associated materials.

Please take the time necessary to complete each blank on the Designee Revalidation form including the review of Designee activities for 1984. This information will not only help us to know you better but will provide valuable input for the review and ongoing changes in the Designee program and DESIGNEE NEWSLETTER. Comments and recommendations for both the Designee program and DESIGNEE NEWSLETTER will be sincerely appreciated. Please attach your comments to the form if the space provided is not sufficient.

We look with great anticipation to the coming year. Your participation, as an EAA Designee, can provide a significant contribution to our ongoing sport aviation activities. Designees have been recognized by FAA and thousands of successful experimental aircraft builders as an essential ingredient for the safe completion and testing of these aircraft. As an EAA Designee offering advice of providing guidance in the selection, construction or restoration of fellow EAAers projects, you are to be applauded for your involvement and accomplishments. We look forward to your revalidating for the coming year.

Chuck Larsen, Designee Director

LETTERS 'N SHOP TALK

ARE THERE JACK POINTS ON YOUR AIRCRAFT?

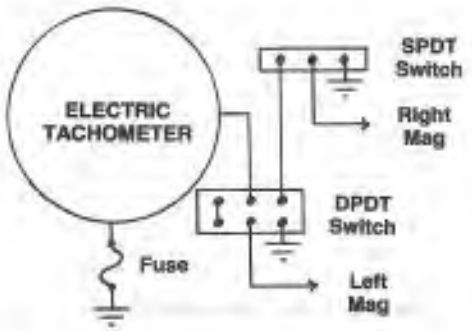
From the Frederick, Maryland EAA Chapter 524 Newsletter, "The Frederick Flyer"

In the process of recovering our Starduster Too, we decided there were a number of improvements we had to make — things we should have done when the airplane was originally constructed. It seems that one of the easiest things to overlook is the installation of jack points. Naturally, the first consideration is the center of gravity. The points must be located so the aircraft is STABLE when on the jacks. The second consideration is that of structural integrity. The jack points must be located so that the installed fitting will take the weight of the entire aircraft. On a taildragger, (that's 'conventional gear' to you tricycle riders) elevation of the tail is easily accomplished using the tail spring mounting bolt head. On our Starduster, I welded a threaded fitting in the fuselage cluster at the firewall adjacent to the engine mount fitting. That area was selected so that one can change (remove and replace) bungee shock cords on the landing gear, not worrying about the stability of the airplane while stretching those cords. Greasing wheel bearings, changing tires, brake pads . . . all require getting those wheels safely off the ground. Tricycle gear aircraft most certainly need jack points — especially retractable types whose gear must be cycled ensuring form, fit and function.

A bottle jack (1 or 2 ton variety) makes a dandy hydraulic jack if mounted on a suitable base. It can be used without modification if you provide a socket for the jack pad to fit in. A double cup-like affair will work to ensure a good mating — or if you have a lathe you can turn the bolt head to a point and bore a mating recess in the top of your jack pad on the bottle jack and still use it on the family car.

DUAL ELECTRIC TACH SWITCHING

Nat Puffer of Chapter 587 reports a problem with an electric tachometer. He first hooked both P leads (grounds) thru the tach which resulted in rough running and occasional cut-out under full power. So if you use toggle switches for your mags, make one a DPDT type and wire it so that when both mags are on, only one goes thru the tach but when either mag is off, the other feeds the tach. Just follow the schematic:



STRIPPING PAINT FROM HIGH HEAT TREAT STEEL

From the Macon, Georgia Chapter 38 Newsletter, The SLIPSTREAM.

The center section "carry-through" structure for the lower wings on the D17S (staggerwing Beech, N69H) I'm restoring is made of 4130 steel tubing heat treated to 180,000-200,000 psi. It was made as a separate subassembly, heat treated, and welded to the frame, (which is not treated) via short stub tubes so as not to destroy the heat treatment of the carry-through truss subassembly.

4130 heat treated to this range is subject to a phenomenon known as hydrogen embrittlement (H.E.). This mechanism results from contact with highly acidic or alkaline compounds whereby hydrogen is liberated and infiltrates the grain boundaries in the steel. This hydrogen intrusion causes extreme embrittlement and results in the formation of microscopic cracks which link up, grow, and can result in failure of the component whether under load or not.

Fortunately, the circumstances leading to initiation of H.E. (hydrogen embrittlement) in 4130 heat treated to 180,000 psi and above are not normally encountered in aircraft service. Except, that is, when stripping such items for repaint. Since this is just what I'm doing in restoring N69H, I researched the subject in depth.

For such a seemingly simple task, wherein lies the danger? Well, most strippers contain ammonium hydroxide or sodium hydroxide which will cause H.E. However, since this characteristic is recognized, the stripper manufacturers add an inhibiting agent to their products qualified for use on steel susceptible to H.E.

Two such strippers are:

a. INTEX 857
from Intex Products, Inc.
P.O. box 6648
Greenville, SC 29606

b. B & B 1776
from B & B Chemical Co., Inc.
P.O. Box 796
Miami, FL 33166

But — like everything else, there are a couple of catches. The inhibitor has a nine month shelf-life after which its effectiveness begins to fall off. Also, the strippers are hygroscopic (they will absorb moisture from the air each time the container is opened). Additional compounds are thus formed which further reduce the inhibitors' power.

How about the strippers containing methyline chloride and alcohol which do not cause H.E.? Fine, but (another catch) the poorer grades of these strippers may have some hydrochloric acid impurity which would cause H.E. and most of these strippers have no inhibitors. In the face of the "howevers", qualifications, cautions, and shelf-life problems associated with the chemical strippers, I gave up and resorted to mechanical means for removing the paint from the heat treated areas. (The rationalization was that N69H was one day going to tote 'ol Number One's can around and "One" can't be too safe.)

One of the old wing walkway non-skid coverings was the cloth-backed abrasive type. I tore this into long narrow strips and with a back and forth motion (like polishing shoes) removed the old paint and surface rust. I was careful, of course, not to excessively abrade the metal itself (remember, this is thin wall tubing). I had to resort to solvent cleaning and wire brushing the tube cluster joints. This scheme worked very well and without the danger of H.E. Being proud of my achievement, I related it to the chemical engineering friend who had provided the original advice on strippers. He replied, "It's good you didn't use a carbon abrasive." It seems carbon materials will cause corrosion. He recommended using a silica or aluminum oxide abrasive. I breathed a sign of relief — the non-skid I used was of the latter material. Well, some days it just doesn't pay to get out of bed.

TECHNICAL TOPICS

WINDSHIELDS, WINDOWS, CANOPIES AND OTHER THINGS YOU ARE SUPPOSED TO SEE THROUGH . . .

By Jim Patterson, EAA 108687, as published in HANGAR ECHOS, Dallas, Texas Chapter 168's Newsletter.

In the interest of saving time and money on my Barracuda project, I decided to form my own windshield and canopy sections. To give you the punch line now, I saved neither, but did get at least a Basic Education in working with the thermoplastic materials common to these components. My reasoning was sound for "doing it" myself with the following goals:

a. I will save shipping time and the aggravating wait for "mail order" deliveries;
b. I will build the molds (forms) right on the airplane itself, **so I know** the parts will fair correctly;
c. Dallas is full of plastic supply houses and I can buy the materials cheap;
d. While I'm forming the parts, I'll form some extras to save for future use in case I ever need to replace one; and,
e. It will all be fun.

I built the forms. Total time, **two weeks.** The single curvature pieces were relatively easy, being artist's illustration board laminated over ribs made from templates produced right off the airframe. The double (complex) curved canopy sections forms were built by constructing a ribbed form of ¼" plywood, screen wire on the back side and infilling with plaster. Then the plaster was worked down to the ribs profile with a carpenter's rasp, and sanded. They all looked pretty good.

MAJOR DECISION NO. 1

I decided to form everything out of ⅛" Lexan. I wanted the windshield to be tough. It should be able to withstand a collision with a ten pound bird at 500 knots. It should also withstand a 500 pound bird at 1 knot.

CONCLUSION ABOUT LEXAN — DON'T USE IT.

These things (the various pieces) are too big to get into your household oven. Both acrylic and lexan require forming temperature in the range of 300 degrees Farenheit to 350 degrees Farenheit. I cast around for a solution to this problem. Several commercial ovens were suggested, but for one reason or another they wouldn't quite work.

MAJOR DECISION NO. 2

I built an oven. Total time invested in oven, **three weeks.** The oven is a convection affair, built out of an old restaurant vent hood (which I happened to have handy). It stands about 5 ft. square and is about 18 inches deep. A four foot square door opens on the front. I used an old charcoal broiler for a heat box, which is ducted directly into the oven. A vent pipe on the top of the oven controls heat transfer and there are two thermometers on the front. The plastic sheets hang from hooks at the top of the oven. We hauled it to the house in a pickup and erected it in the back yard. I decided to fire it with charcoal, since I wasn't planning to go into production, just form a few pieces.

A few days before Thanksgiving Holidays, I fired the oven up. It worked super. In fact it worked so good it ran right up to 600 degrees Farenheit before I could get it slowed down and destroyed one of the thermometers. I replaced the thermometer, making a mental note of how much heat energy is contained in twenty pounds of charcoal with a 350 cfm draft across it.

CONCLUSION ABOUT OVENS — DON'T BUILD ONE . . . BORROW ONE.

I planned to form all of the pieces over the Four Day Thanksgiving Holidays.

The ambient temperature never got above 50 degrees Farenheit during that time, and this cut the working time of the heated sheets way down. I was able to get acceptable pieces formed after a few false starts. I ruined the first blank, because of a "hot spot" in the oven. I ruined the second blank. The third blank was formed properly after the third attempt. (If you do not distort the material, you can reheat and reform it numerous times.)

I formed all day Thursday and into the night. I formed all day Friday and into the night. Friday night, and two-hundred pounds of charcoal later, I had one of the rear windows successfully completed. Saturday morning I called Glen Breitsprecher in Seattle (Mr. "GeeBee" who has been making canopies for ten years). Glen laughed. He **vacuum forms** all his canopies, and told me that he had tried to "stretch form" the T-18 canopies but had never been able to successfully do it. He also had never been able to successfully form Lexan.

I worked at forming the rest of Saturday and all day Sunday. By Sunday night I had the two windshield sections and the two rear windows (all flat curves) successfully completed. I also had a lot of funny looking things made out of material that cost me $5.73 a square foot, that I haven't found a use for yet. Late Sunday afternoon, just for fun, I took a piece of ⅜" Plexiglas, heated it up to 310 degrees Farenheit for ten minutes, pulled it out of the oven and formed an absolutely perfect, no-distortion, windshield with about one-minute of working time to spare.

CONCLUSIONS ABOUT FORMING THERMOPLASTICS

1. Use Acrylic (Plexiglas). It is very easy to form, has good working times, is not extremely temperature critical, wears good, polishes good, and all the airplane manufacturers use it.
2. Don't use Lexan (polycarbonate resin). It is too soft, scratches easily, will drive you nuts trying to form it reason is the spread between Lexan forming temperature and the temperature at which it will bubble, melt and fall apart is around **5 degrees Farenheit.** It is **very** difficult to control the heat that accurately). It cost about twice as much as acrylic. It's only advantage that I can see is that you can hit it with a hammer, drill it, route it, sand it, saw it, or treat it like you would a piece of wood and it **will not crack.** Acrylic, of course, will split very easily and special care must be taken with drill-bits to work it.

Lexan can be cold-bent in thicknesses of ⅛", but definitely has a maximum bend radius beyond which it will develop stress cracks.

I was never (like Glen) able to successfully "stretch form" the compound pieces. The ⅛" material was simply too tough, and the 15 seconds of working time too little to do the job. If I had had four bull gorillas with lightening speed we could have done it.

I spent about twice as much time, and three times as much money "doing it myself" as I would have by ordering the whole mess in the first place. In fact, the only one of the original goals that I really reached was number "e" . . .

It was fun!!

A CASE OF THE BAFFLING BAFFLE

By W. Wolland Starchi, Designee 810, EAA Chapter 150, Rock City, 1263 Durham Dr., Chattanooga, TN 37421

It appears that a number of builders don't fully understand how necessary a good tight fitting baffle is to their engine. In order to get good service and long life out of an engine, it should operate within its temperature range.

A loose or poorly designed baffle will cause hot spots, high oil and cylinder temperatures. You have to have a high and low pressure side to your cowling. Refer to SPORT AVIATION October 1973 under "The Designee Corner".

For some examples, carburetor air filter not sealed and hole in cowling for exhaust pipes too big, caused one owner to put oil cooler on because oil temperature was too high. This indicates that the low pressure side of the cowling had been destroyed because of the air leaks (with probable high cylinder temperatures as well).

Another one was seen with a high pressure air box over the cylinder (like a J-3 Cub) that was housed within the cowling. This installation did not have any baffle between the cylinders (inter-cylinder baffle or deflectors). Also there had been no attempt to make a seal between the baffle and cowling air inlet.

So the Bottom line is "build'em tight and run'em cool!"

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 comments section of the Designee Visit Report.

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*Glassair SH-2
*Howard DGA

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