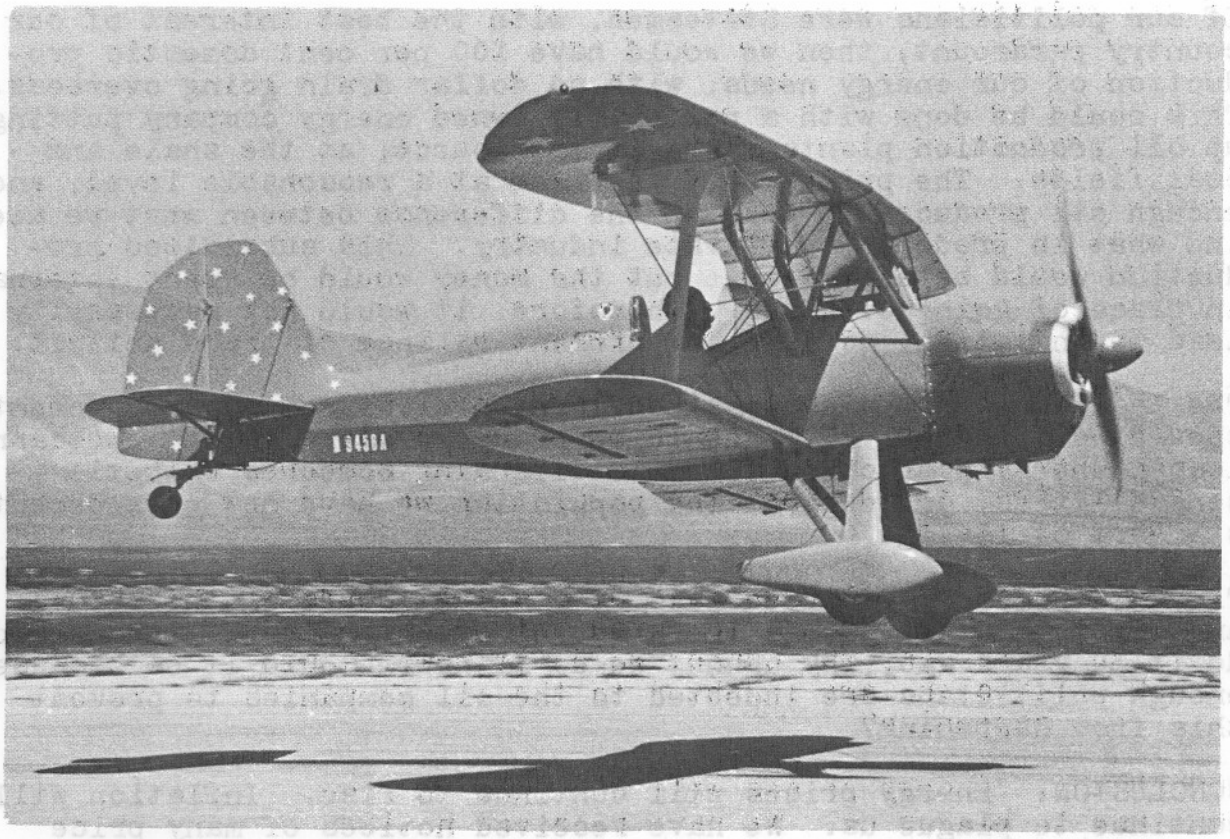
THE

Stardust er

APRIL 1979

MAGAZINE

DEDICATED TO THE ACTIVE HOMEBUILDER



OIL, INFLATION, AND BUILDING AIRPLANES

FACT- We have an oil shortage today, due to our dependence on oil imported from countries with unstable governments. We can expect more oil shortages in the future.

FACT- During this oil shortage, prices have risen drastically. We can expect more price increases. The profits of oil companies have also risen drastically. In fact the higher OPEC prices go, the greater profit oil companies derive from a standard markup, and they make MUCH greater profits from the more cheaply produced domestic oil.

FACT- The oil companies are no longer American companies. They are INTERNATIONAL companies. They feel no particular responsibility to America.

FACT- The president of Standard Oil, Ohio, said over TV that the price of gasoline must rise to $1.50 per gallon before producing oil from coal and shale would be profitable.

FACT- The production of oil, in many places, (Santa Barbara channel) is hampered by enviornmentalists. So is the production of oil from shale and coal. So is the production of nuclear energy.

If our politicians were Statesmen, with the best interest of our country paramount, then we would have 100 per cent domestic production of our energy needs, with no dollar drain going overseas. This could be done with a nationally owned energy company putting up oil production plants right at the source; at the shale and coal fields. The price would be fixed at a reasonable level, and enough oil produced to make up the difference between what we need and what is produced by private industry. This subsidized production would be expensive, but the money would be spent internally in place of going overseas. Therefore, it would not necessarily lead to inflation, as does our present balance of trade deficit.

The influence of professional enviornmentalists on our government should be lessened. Oil should be produced where found. We cannot lessen energy production to avoid offending someones esthetic sensibilities, and support the population we have now on a decent standard of living.

THOUGHT- Germany produced most of its fuel needs in the 1930's and right thru WW2 from a low grade of brown coal. If they could do it 50 years ago, why cannot we do it now? Could it be because enough politicians are indebted to the oil companies to prevent this from happening?

CONCLUSION: Energy prices will continue to rise. Inflation will continue to plague us. We have received notices of many price increases in the past few months. (Lycoming engines go up on June 15th.) Now is the time to build an airplane. Prices will never be cheaper. Todays prices are the bargains you will look back on tomorrow.

APRIL 1979

THE STARDUSTER MAGAZINE- DEDICATED TO THE PROPOSITION THAT THE ULTIMATE IN SPORT AIRCRAFT WAS REACHED WITH THE DESIGN AND DEVELOPMENT OF THE OPEN COCKPIT, TAILDRAGGING BIPLANE--- AND THAT EVERYTHING ELSE HAS BEEN DOWNHILL----EVER SINCE.

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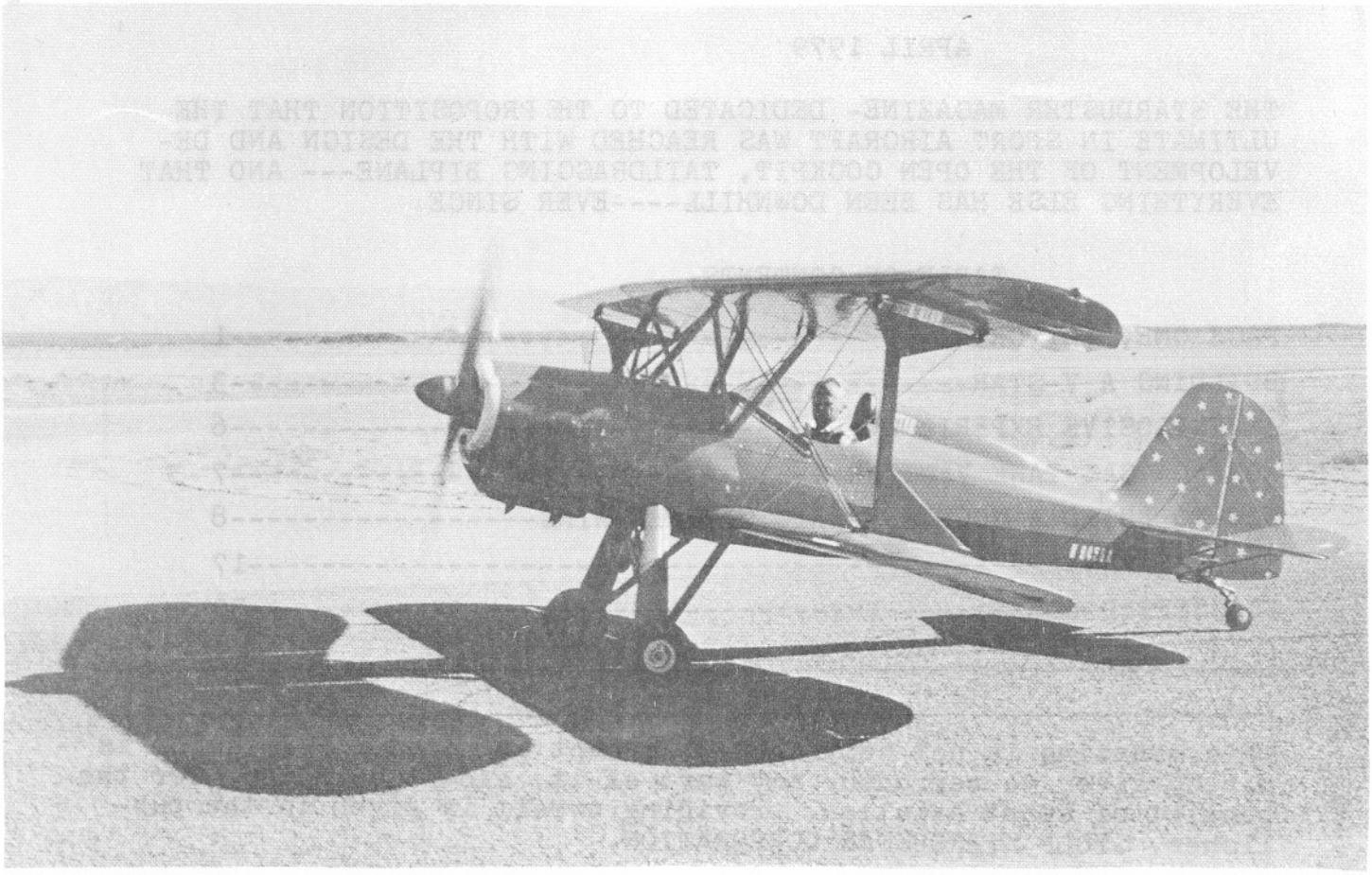
Our front cover shows a beautiful picture of Danny Sanders flying low in his new V-Star. A gorgeous airplane and a very good action photo. Thanks, Danny.

On our back cover is featured the brand new Starduster Too that was built and is owned by Dennis Merritt, of Las Vegas, Nevada. It is white, with blue trim, and is a superlative machine, both to look at, and to fly. It has a 180 H.P. Lycoming engine, with a Hartzell C/S prop. Congratulations, Dennis.

OUR TWO INFLATION FIGHTING POLICIES--

1. We give 3-5 pounds of short length tubing free, with each substantial tubing order. Suitable for welding practice only. Sorry. No size selections will be made.

2. A discount of 10 per cent will be given to walkin customers who select thier own tubing from our short lengths rack, providing no cutting is done. If cutting is provided, regular prices will prevail.



Dear Jim

BUILDING A V-STAR

by Danny Sanders

I started my V-Star in November, 1972. The obvious question is, why? I think biplane is a flying machine that has something special about it no other airplane can offer. The first time I saw L. Stolp's V-Star in Sport Aviation I knew I had to have it no matter what or how long it would take to build. A description of the aircraft characteristics made me feel certain this would be the one. At this same time I had over one year of construction into another project, which I shelved and sold later on. My trip to Flabob, meeting you and the purchase of V-Star drawings followed. If I recall correctly, the fuselage and tail feathers were the only completed drawings. You promised to mail the other drawings as the drafting progressed.

I started construction of the fuselage first, then tail, cabanes and landing gear, center section, wings and I-struts. Tubing in the fuselage is all hand fitted, filing all contours and angles. Holes were drilled first and reamed after. I did not experience any difficulty with the drawings. Revisions for landing gear and I-struts were received during the construction. I made three changes from what the drawings called for. First, the horizontal stabilizer is 1½ inches narrower, because it would not fit the fuselage opening. Second, cabane strut bracing wires were replaced with welded streamline tubing. Third, the cabane struts were welded directly to the longerons.

The engine is a modified C75-12 Continental completely overhauled. The propeller is a Ray Hegy 70 diameter x 42 pitch, and the aircraft is covered with dacron, nitrate base and butyrate finish. All materials and hardware are aircraft quality.

With the help of two friends, at 11:00 P.M. on Friday, August 11, 1978, we started to load the aircraft on a two axle trailer and fixtured wings on the truck. By the time everything was secured and all support gear in the station wagon ready to depart for Mojave, it was 4:00 A.M. Saturday. To safely transport the wings I made special fixtures that proved to be time and effort well spent. Palmdale had very strong winds that day. We were lucky to reach the airport without' any damage.

We arrived at Mojave at 8:00 A.M. Assembly of the aircraft started immediately that morning. Joe Mason rigged the aircraft with a Master's Touch and proceeded with weight and balance and measurements of the V-Star. I would like to mention how Joe was able to direct three "dog-tired" men on a very hot day with such even temperament and good humor. I do not think I would have been able to complete this very important task without him.

The next day, Sunday morning, I drove back to Mojave to install the cotter pins and to complete other small items for final inspection. On Monday morning, I took a trip to the FAA, Van Nuys office with all the paperwork, hoping for an appointment within the next three weeks.

The FAA inspector was pleased with the paperwork and said to me, "We are going to Mojave Wednesday morning on other business, so we will stop by and inspect your aircraft." I had no idea that this could happen in two days.

V-Star received its papers with positive comments on the workmanship and general appearance. I was so nervous! The restricted time is 40 hours.

After driving home in the afternoon, I began to realize that the time to fly the V-Star is here, now. For the past three or four days it was so windy at Mojave I thought ... I will never fly my machine.

Saturday morning heading back to Mojave, I was thinking about many things -- wind, taxi-slow or fast, flying, how it will behave, what to do if this or that ... will it fly?

E. Schilling wrote something about flight testing a few years ago, and my plan was to stay with his idea, flying the aircraft instead of getting into trouble with high speed taxi routine.

Upon arrival at the airport, there was no wind at all and the time to show what you are made of was here. I started the engine (which had about three hours total time of short runs at home) and just taxied about 4 - 6 times on the taxiway, s-turns, brakes, temperature, oil pressure, everything was fine. I secured the aircraft wheels with chocks and tailwheel with rope and made a run up. Again, everything looked good and there was no excuse not to go.

I taxied over to the runway, lined up straight and with hardly half throttle I hesitated for a few seconds to advance the throttle fully and she started for the right side of the runway and not responding to the opposite rudder, I knew at once that my tail wheel springs were too weak. I did get back on the center of the runway

and advanced the throttle all the way and made a normal take off, kept the nose down and let her climb away. What a feeling and experience to fly your own homebuilt! When I reached pattern altitude and relaxed somewhat I looked at the instruments, and everything was fine but the airspeed. It was indicating 20 MPH. I tried not to be nervous because of the low airspeed reading and settle down, pay attention to where the nose was, the wings, and the feel of the controls.

The first flight duration was about twenty minutes. I did get in the air, now was the time to land. I am even with the numbers, carb. heat on, pulled the power, made base, on final for 9,000 foot runway and I was short (biplanes sink faster) so I applied some power and I was over the concrete, power back, stick back, hold, I made my first landing, which was a greaser. All my landings since were not like the first one, but I am working on it.

I think the V-Star is a nice easy machine to fly, even for low-time taildragger experienced pilots like myself. Joe Mason flew the V-Star when I had about six hours on it and his comment was,

"It is a very nice machine." Fitz Fulton from NASA had taken his turn with ten hours on it, his comment being "Outstanding." I am very happy the way the project turned out.

I do not have very much performance data to talk about yet. Climb is 750 FPM, and 2,000 RPM will produce 80 - 90 indicated, on final I like to keep it 65.

To look back on the project today, I must say it was worth all the struggle. To build and fly your own airplane in this country can be accomplished without any red tape at all. I think we should be thankful we can live in a country where some of our dreams can still come true.

Sincerely yours,

Danny Sanders

P.S. If I can be of any help to other builders, do not hesitate to contact me.

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DIANE ABRAMSON, A & P MECHANIC FOR FLYING TIGER AIRLINES AND ACRODUSTER TOO BUILDER, WAS RECENTLY INVITED TO BE ONE OF SIX MEMBERS OF A PANEL ON "WOMEN IN AEROSPACE" AT THE NATIONAL CONGRESS ON AEROSPACE EDUCATION, IN ATLANTA, GEORGIA. SHE ACHIEVED THIS HONOR BECAUSE SHE IS ACTIVE IN AIRCRAFT MAINTENANCE AND BUILDING HER OWN AIRPLANE. CONGRATULATIONS, DIANE.

AN EXPLOSIVE EXPERIENCE

by Eric Shilling

Several months ago I was trying to develop what I call a Gas Gun, operated by an oxygen-acetylene mixture. It was installed on our Nieuport 28, which we are using in Air Shows.

This Nieuport is used against Jim Appleby and his Fokker Triplane in a mock dog fight. Last season we were using recorded gun fire over the P.A. system. This left a lot to be desired.

Appleby had made two gas guns. However, each time the guns were fired the initial explosion was quite loud, with only small pops thereafter.

My theory was to locate the spark furthur away from the incoming gas mixture, which would allow more gas buildup before ignition. I assumed I would be able to obtain a series of explosions of more equal intensity.

During the experiment, things were progressing, to a limited extent. I was using an old car battery which became discharged to the point where it would no longer supply enough voltage to the coil to produce a spark. I put away the equipment I was using, and placed the battery on charge after removing the caps.

The next day the battery was fully charged, so I disconnected the charger and replaced the caps. I put the gas gun in the vise and conncected all the wiring except for one BIG mistake. The battery was not in the circuit, as I intended to place the wire on the terminal to produce the spark. I turned the oxy-acetylene mixture on, and then completed the connections to fire the gun by placing the probe onto the battery terminal. One hell of an explosion resulted.

My left hand was blown away from the battery. It was numb from the force of the explosion. The entire top of the battery, and one side had been blown off. Acid was all over the garage, even dripping from the ceiling. My hand was completely covered with acid, as well as my face and clothing. I was very fortunate in that I had on my glasses, which had been splattered, but acid did not get into my eyes. My son Ricky, standing behind me, was sprinkled with acid, but I took the full force.

Of all the darn fool things I had done wrong,I fortunately had done something right. Whenever I do any welding in the garage, I connect the water hose, install a pistol grip nozzle, and turn the water on. I only had to go three steps to obtain lots of water. I aimed the hose toward my face, pulled the trigger, and received a welcome shower of cold water. I literally took a bath with the hose, from head to foot, stripping off clothing with my free hand, down to my shorts. All this occurred in the cold winter weather on my front driveway. I had washed Rickys face after washing mine before the complete bath. He was not so bad off as he had been shielded by me during the explosion.

After I was decontaminated I proceeded to wash down the rest of the shop. Ceiling, engine, tools, work bench, etc.

I then ran into the house to dry off and put on some dry clothing. I then mixed up some baking soda and water, put on some rubber gloves, and sprayed everything, neutralizing the acid. After that, I again washed everything with water.

Needless to say, our clothes, as well as the battery, was ruined. My hand stung like the devil from the force of the explosion.

I consider myself very fortunate. Things could have been much worse. I could have been disfigured, or lost my sight. This applies to my son as well.

My advice is to treat a lead-acid battery like a stick of dynamite. IT IS. Take all recommended precautions literally.

Did I ever learn from this experience.

MORE ON GAS TANK VENTING by Jim Osborne

We have received several reports from aerobatic pilots to the effect that even though a vent tube (usually the top one) is partially facing into the wind, gas is siphoning out.

A pilot with an inverted gas system is facing a problem which never arises with a conventional gas tank. A standard tank has only one vent, and one outlet, which is to the engine. An aerobatic tank has the outlet to the engine, plus an upright vent, PLUS an inverted vent.

Therefore, it is necessary that the air pressure put into the tank by the two vents be very close to equal. Otherwise gas will flow out the vent where the least pressure exists.

As a frinstance, suppose your inverted vent comes out near the top of your cabane strut and faces at a 45 degree angle into the wind. Suppose your upright vent runs out the bottom of your engine cowl and faces at a 45 degree angle into the wind. Due to the shape of the cowling, the nearest of the bottom vent hole to structure, and being more nearly in the prop blast, the bottom vent hole will have the highest pressure. This high pressure will force gas up the inverted vent line and out the vent opening, even though it too is pointing into the wind. The pressures must be balanced. If you are losing gas thru one vent line, either increase the pressure in that vent by facing more squarely into the windstream, or decrease the pressure in the other vent by a little straightneing operation.

REMEMBER--VENT PRESSURES MUST BALANCE EACH OTHER.

HOW TO BUILD A WOODEN, FABRIC COVERED WING (2nd Installment.

After all drag truss tubes are cut and fitted and plugged in each end with a wood dowel, remove them. Clean and finish with Zinc Chromate. Reinstall, and this time tighten nuts to give a tight snug fit. Do not overtighten.

Line up your ribs with straight edges. Position them correctly and glue them in place, using the corner block. If you are using weldwood glue, use three cement coated nails per block. This will give adequate clamping pressure.

Next, cut, fit and glue in place your nailing strips. These run between ribs, top and bottom on the front spars. They should fit snugly between ribs, but not too tightly. An easy push fit is ideal. Nail in place for clamping pressure, spacing nails about an inch apart. On rear spars they are restricted to aileron area.

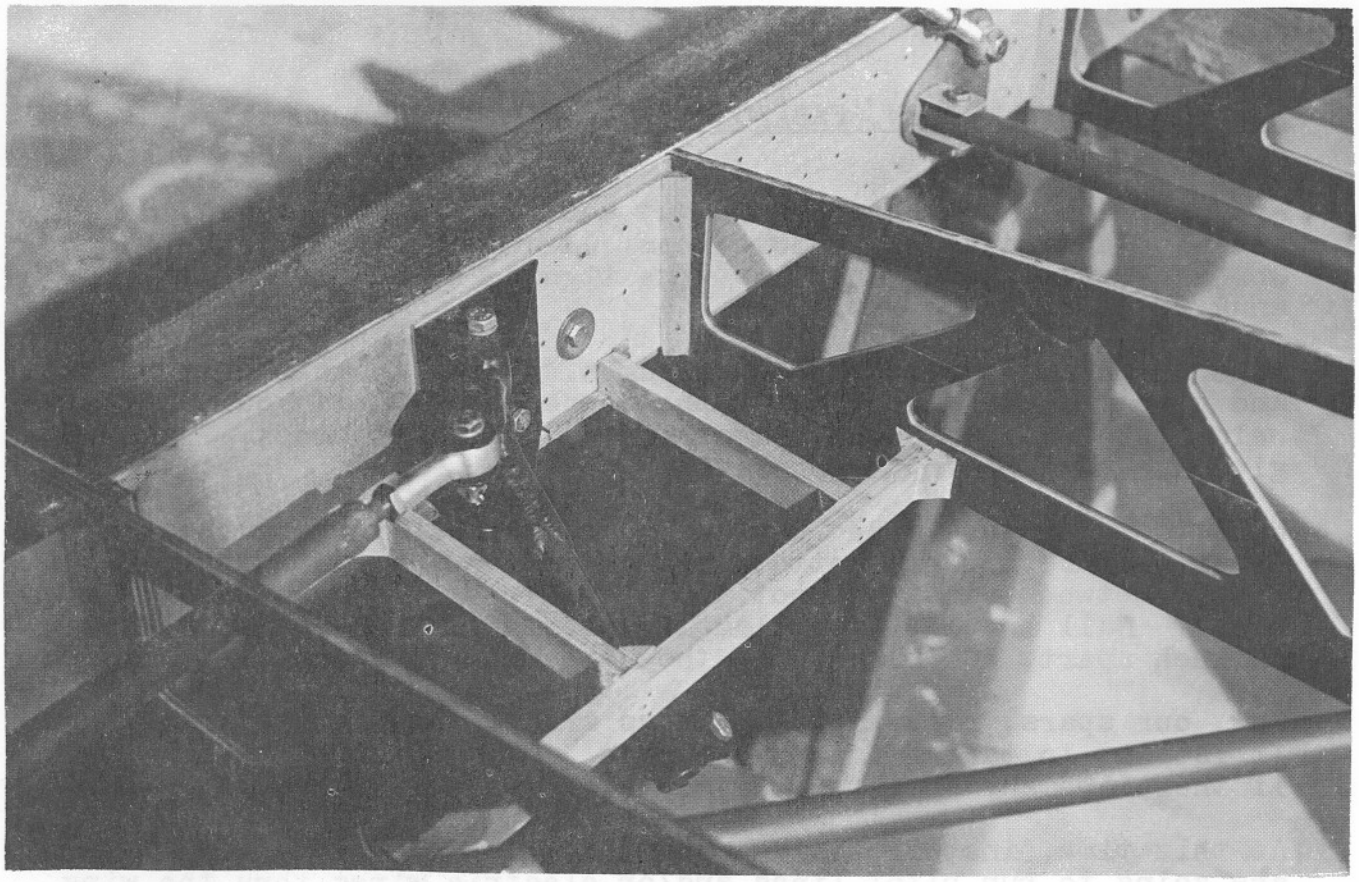
Now, our spars, ribs and drag truss are finished and assembled. It is time to take a break, look the job over carefully, and see if there are any special jobs to be done.

At this time, install tie down fittings on lower wings. If you are going to run pitot lines and/or electric wires thru the wing now is a good time to install them. Install aileron bell cranks. Install rear I-bolt fitting on rear spar of Starduster too wings. This I-bolt is attaching point for I-strut. Install wooden walk ways and diagonal braces where required.

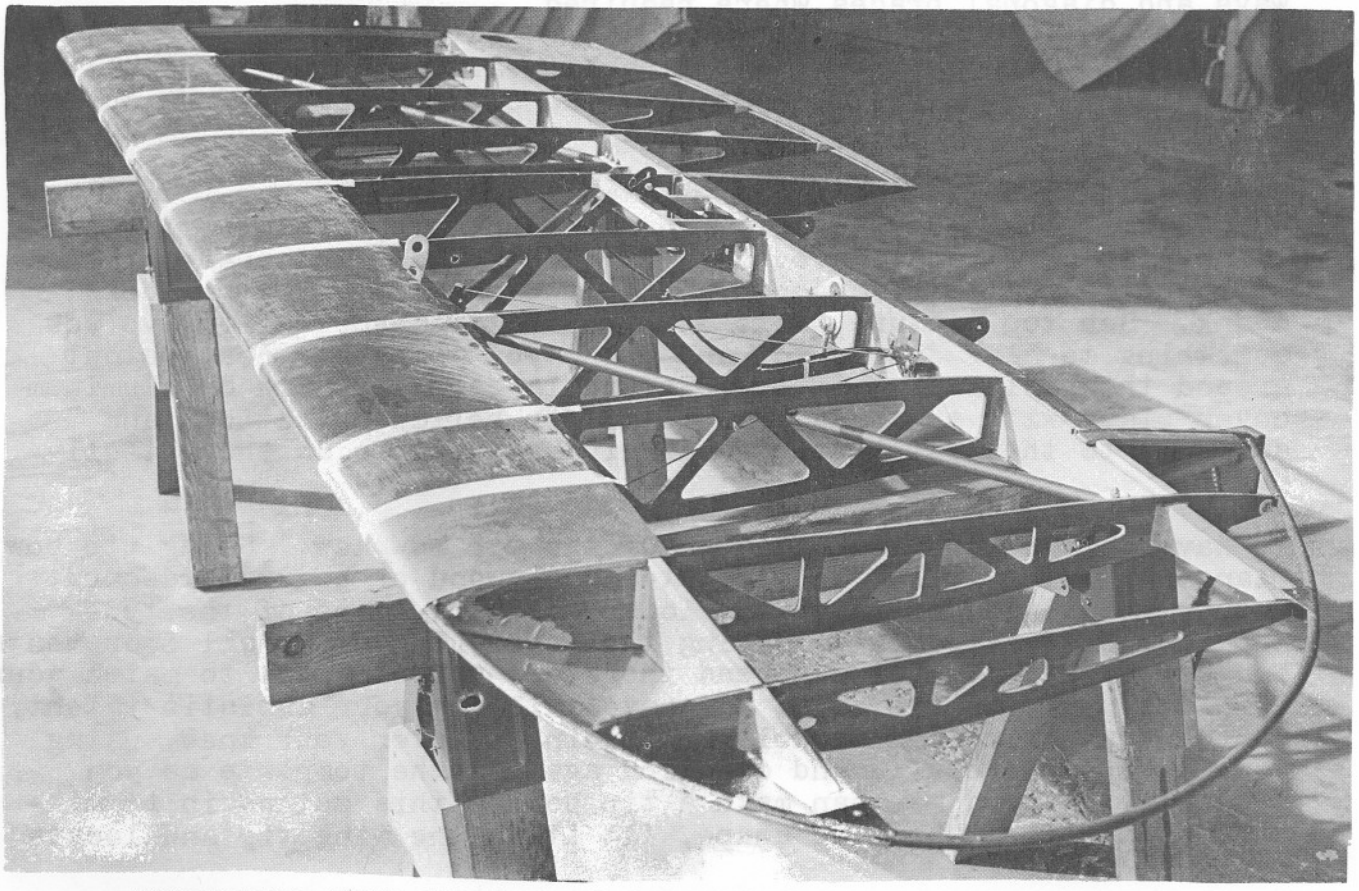
Many people like to hide the VOR rabbit-ears antenna by installing it inside the wing. Our experience has been favorable. We suggest that you do this.

One problem you will be faced with when covering is how to get a good cover job and still allow the aileron bell crank the freedom to move which it must have. On a Starduster too, the best solution is to build a little wooden frame around the action of the bell crank. See top picture, next page. This framework will give you something to glue fabric to, and allow you to make a neat cutout around the bellcrank. After covering is complete make an aluminum cover plate with a curved slot in it for bellcrank action, and screw it to the neat little wooden frame that you so thoughtfully built.

We have reached the installation of the tip bow now. Using tip bow plans lay out a full size template on plywood or heavy cardboard. Secure a tube bender from your local hardware store of the type used for bending conduit. Using the bender in very small increments, and being patient, you can bend the steel tube tip bow to match your template. If you are bold, and have faith in your artistic talent, you can save time and trouble by bending it over your knee, using your mark one eyeball, and checking against the template as you progress. A good man can make a tip bow by this method in 15 minutes. After it is bent to shape, fit it to the wing tip and locate



SHOWING WOODEN FRAME BUILT AROUND AILERON BELL CRANK OF A STARDUSTER TOO. A SUGGESTED EXTRA.



COMPLETED WING PANEL OF A STARDUSTER TOO. SHOWS WOODEN FRAME, INTERNAL INSTALLATION OF VOR ANTENNA, AND ALUMINUM LEADING EDGE IN PLACE, AND TAPED FOR COVERING.

your attaching steel tabs. Tack weld in place, taking care to shield the wood from the welding flame with asbestos, wet cloth or a sheet of aluminum.

Remove tip bows and finish weld tabs on the bench. Now refit tip bows to wing and bolt or screw in place as required.

We leave the trailing edge off the wing panels. After all wing panels are otherwise complete, then build the ailerons. Start with the spar assembly. Cut spar to correct length and add end taper, if required. Add spar plates. Carefully locate all spar fittings, including hinge fittings, and drill holes in spar. Drill full size. Do not ream in wood.

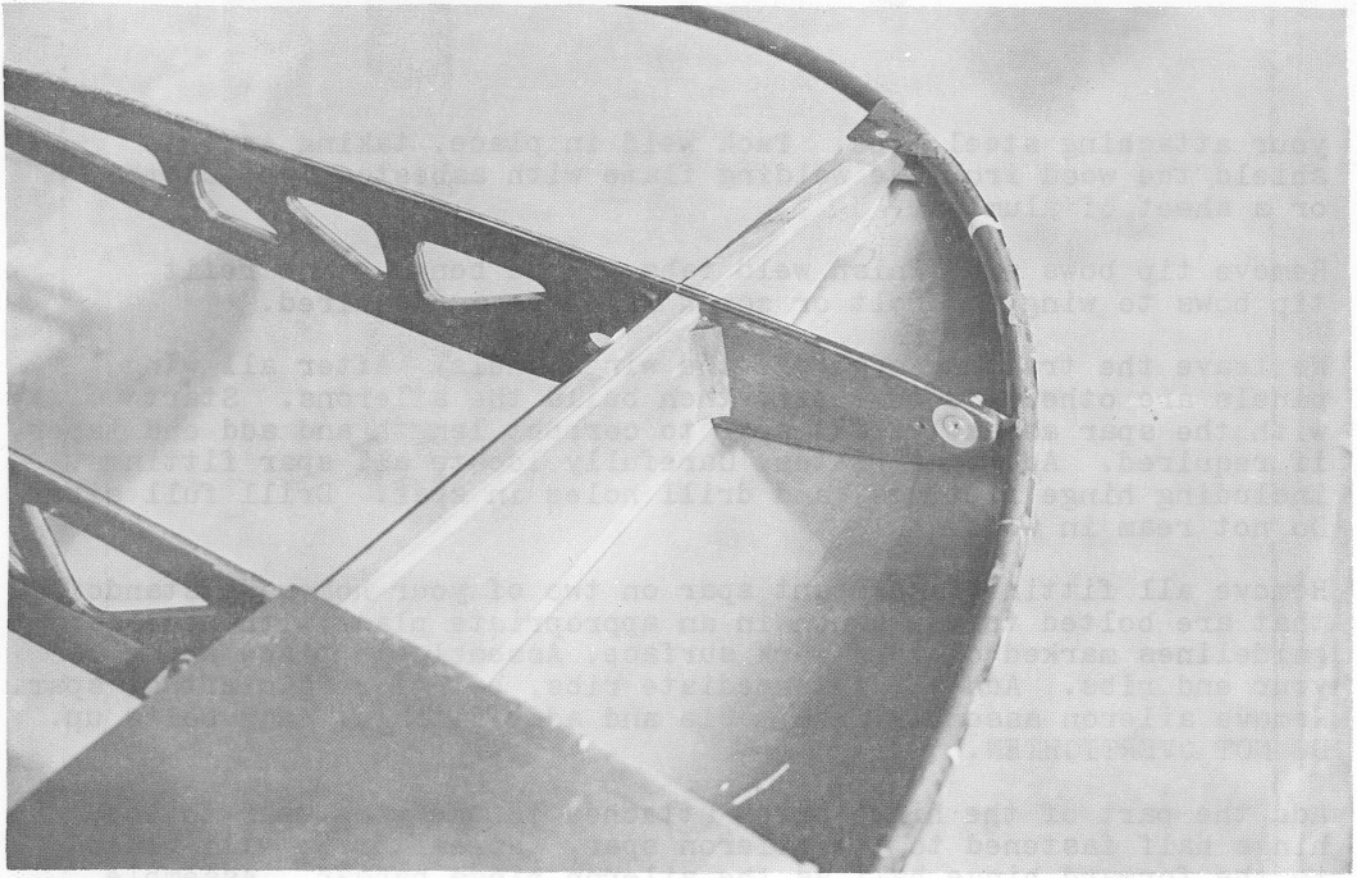
Remove all fittings and mount spar on two of your homemade standoffs that are bolted to the bench in an appropriate place with necessary guidelines marked on your work surface. Assemble in place and glue your end ribs. Add all intermediate ribs, both fore and aft of spar. Remove aileron assembly from table and add fittings. Smug bolts up. DO NOT OVERTIGHTEN.

Add the part of the hinge which attaches to the wing spar to the hinge half fastened to the aileron spar. Hereafter we will refer to the forward hinge half as the aileron hinge hangar. Assemble the hinges with clevis pins, and do not lock with cotter pins. This is only a temporary assembly.

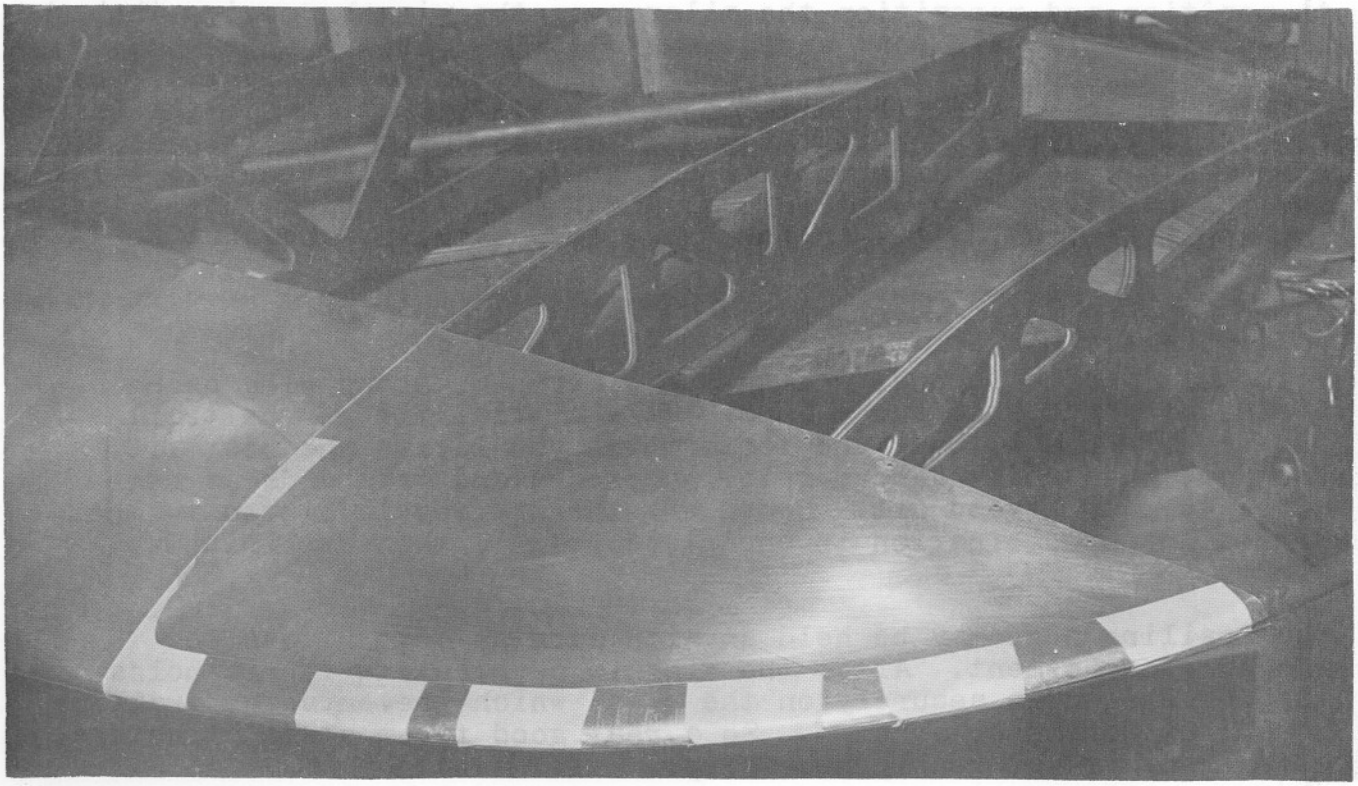
You will remember that you did NOT drill the mounting bolt holes for the hinge hangars on the wing rear spar. Therefore, you are free to position and reposition the aileron on the wing by moving the hinge hangars up and down and back and forth. Hold the hangars, (and the aileron) in temporary positions with clamps. Do not over tighten clamps. When the aileron is perfectly centered in the wing cutout, and is not too high nor too low, then pull your hinge pins and remove the aileron, leaving the hangars clamped into thier perfect position. Now drill your hangar mounting holes. Bolt them into position, using the proper large area washers, and just snugging up the bolts.

Reinstall your ailerons. Align the aileron with the wing using pieces of scrap wood and clamps. Make a trial fit of the trailing edge. Move it back and forth until you locate the best fit. Then cut the trailing edge into two pieces and trim ends as required to make a good fit. Remember, the tr. edgeis fitted to the wing-aileron combination in one piece. It is then cut into two pieces.

The trailing edge may be held on with screws, soft rivets, or a good epoxy cement. After the wing is covered the fabric holds the trailing edge securely on the ribs, which prevents the trailing edge from moving up or down. So a real good first class structural attachment is not really necessary.



Starduster Too wing tip, showing how aluminum tip covering is done in top and bottom pieces. Wing is upside down. Tip aluminum covering is on top of wing. Note also tip bow attachment.



Starduster Too tip covered both top and bottom with aluminum sheet. Partially taped . Seams will be completely taped before covering. Wing is right side up.

We are now ready to assemble the center section. Start with the spars. Cut to correct length. Glue on full length spar plates. In the case of the Starduster Too the long spar plates may not be long enough. The finnish birch plywood we use for spar plates does not come in long enough lengths. Therefore, position the long plate in the center, leaving a few inches on each end of the spar that is not covered by the plate. Now splice in a short length of plate to cover up these few inches. Use a butt splice. Now install the end plates. These end plates will cover up the splice joint on each end.

After all plates are on, drill spars and install fittings. As usual, you do not run a reamer thru wood, and you do varnish the wood wherever you install a fitting. Twice.

The center section is unique in that it is best assembled upside down. This may requiresome readjustment of your reference lines on your standoffs in the case of the Starduster Too, or any airplane with unsymmetrical wings. In the case of the Acrodusters, or steen Skybolt, or any airplane with symmetrical wings, it shouldn't make any difference.

Before assembly, we make the compression struts. Unless you have checked everything with great precision I recommend that you leave off the forward extruded angle of each compression strut.

Bolt compression struts to end ribs. With the spars in place and upside down, install the end ribs. Mate each top wing panel (upside down) to the center section spars, and make certain they will fit together properly. Now install front angle clip onto compression rib. Ribs must be removed for riveting on angle and then reinstalled to end ribs and spars. We are now reasonably sure that the top wing panels and the center section will fit together properly.

The spars, fittings, end ribs, and compression struts are now all together. Now add the bottom plywood panel. This bottom panel is 1/4" thick. On relatively flat bottomed wings like the Starduster Too it should go on with little trouble. On a symmetrical airfoil, with considerably more curvature, getting it to bend properly can be a real chore. If all else fails, it is permissable to put four or five grooves on the inside of the plywood, runnimg from side to side. These grooves should not be more than 3/32" deep and should penetrate only two of the five plies. Spaced at 1-1/2" to 2" intervals at the area of greatest curvature, they make an otherwise extremely difficult job feasible.

Add remaining nose and tail ribs. Assemble and install hand hold on rear spar. Cover tail ribs with the plywood called for on plans. Check nose ribs for alignment. They must be in near perfect alignment inorder for you to do a good job installing the aluminum L.E. Install neoprene padding on tank support fittings. Make a trial installation of tank. Check to see that tank holdown straps have adequate clearance so that you can properly install top cover. Drill 1/4" drain holes in bottom plywood cover, one in each corner, just forward of the main spar, and one in each corner, just forward of the trailing edge piece.

Your basic wing structure is now complete. Thruout this article I have cautioned against overtightening. Next to overtightening, the next worst thing is undertightening of bolts. You should stop tightening just short of damaging the wood by compression. I suggest you practice on some scrap wood and develop a feel for the torque you need to apply to get the bolts to the right tightness. Now go back and recheck all bolts and nuts for proper tightness. Check also to see that at least 1-1/2 threads protrude from the nut. Check to see that the nut is not bottomed out and therefore not really doing its job.

When installing nuts and bolts thru wood, be sure and use large area washers. You are required to use also a washer under the end of the bolt nut combination that turns. Therefore you are required to always have at least one washer per nut-bolt combination. Two, one at each end, is perfectly permissable, and, in my opinion, usually preferable. If the bolt is too long you are allowed to install an extra washer under one end. The maximum number of washers allowed is three. If more are required, you must get a shorter bolt.

After a carefull inspection to check that everything is on and as it should be, your wings should be ready for varnishing. Use a good spar varnish or urethane varnish. Use a spray gun if at all possible. Spray everything, including all wood, drag truss, fittings, and all hardware. It will be an additional protective coating over the zinc chromate on the metal. Apply at least two coats. Apply until you get a shiny finish, impervious to moisture. We usually apply three or four coats.

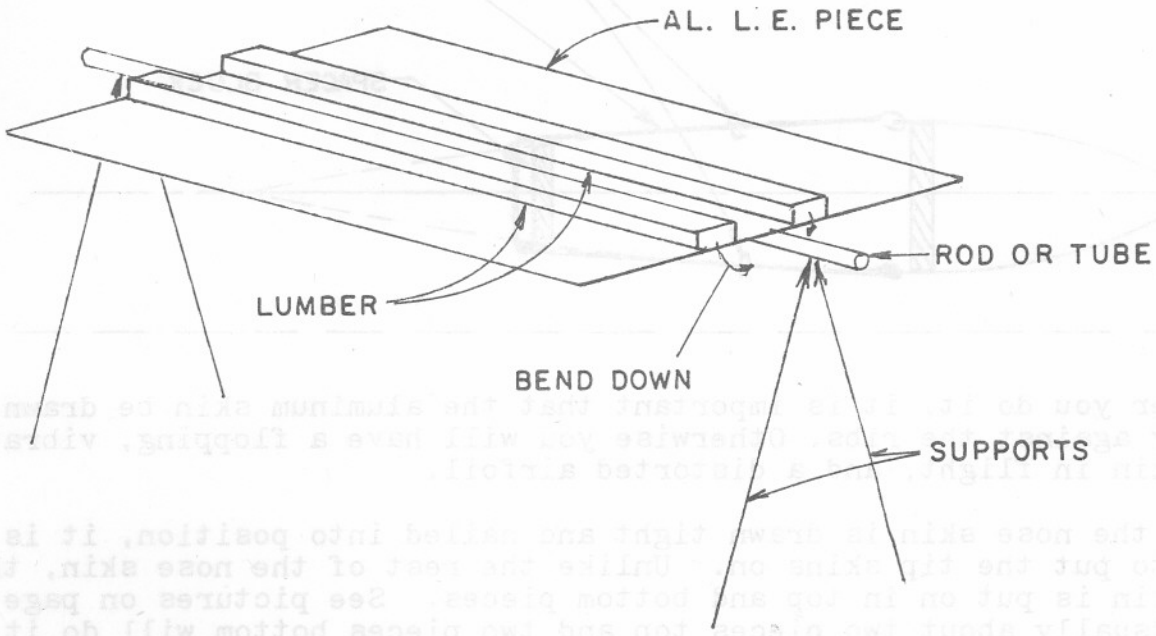
Now you are ready to call the friendly feds for your precover inspection. Since they are usually very busy it is considerate of you to wait until your entire airframe is ready for a precover inspection. While you are awaiting the inspection it is a good idea to ask for a dry run from your local EAA designee. He can look your work over and help insure that it is of the quality that the FAA is looking for.

After your precover inspection you are ready to putthe aluminum on the wings. Start by deciding the spacing of your aluminum panels. DO NOT make the leading adge cover full length, one-piece. Temperature changes have a much greater effect on the dimensions of aluminum than they do on wood. This means that a full length aluminum leading edge will buckle whem the sun gets hot. Put the leading edge on in two or three pieces, not counting the tip bow part of L.E. Roger Rourke, 1977 grand champion winner at Oshkosh, put his L.E. on in segments that only reached from rib to rib. All his joints were butt joints. The aluminum was cut and fit so precisely that the butt joints were exactly centered over each rib. Roger had also tried a foam leading edge, but he had so many problems with it that he gave up and went back to aluminum. His ultra precise way of installing a L.E. is recommended for show planes, but is not worth the trouble for most builders.

So, make your L.E. aluminum piece long enough to cover three or four rib bays, and wide enough to completely wrap around the front

ribs, from top of front spar, to bottom of front spar. The aluminum should project approximately 1/4" behind each spar.

The aluminum must be bent at the L.E. To do this, support a round rod or tube on sawhorses, or other supports, so that the L.E. skin is shorter than the distance between supports. Mark the center of the L.E. on each end of the aluminum. Place the aluminum on the rod so that the center of the L.E. is directly above the center of the rod. Put a stout piece of lumber (a 2 x 4 is recommended) on the aluminum, on each side of the rod. Use four hands. Push down vigerously and simultaneously. The result will be a bent up L.E. piece of aluminum that can now be installed on the wing. See sketch below.



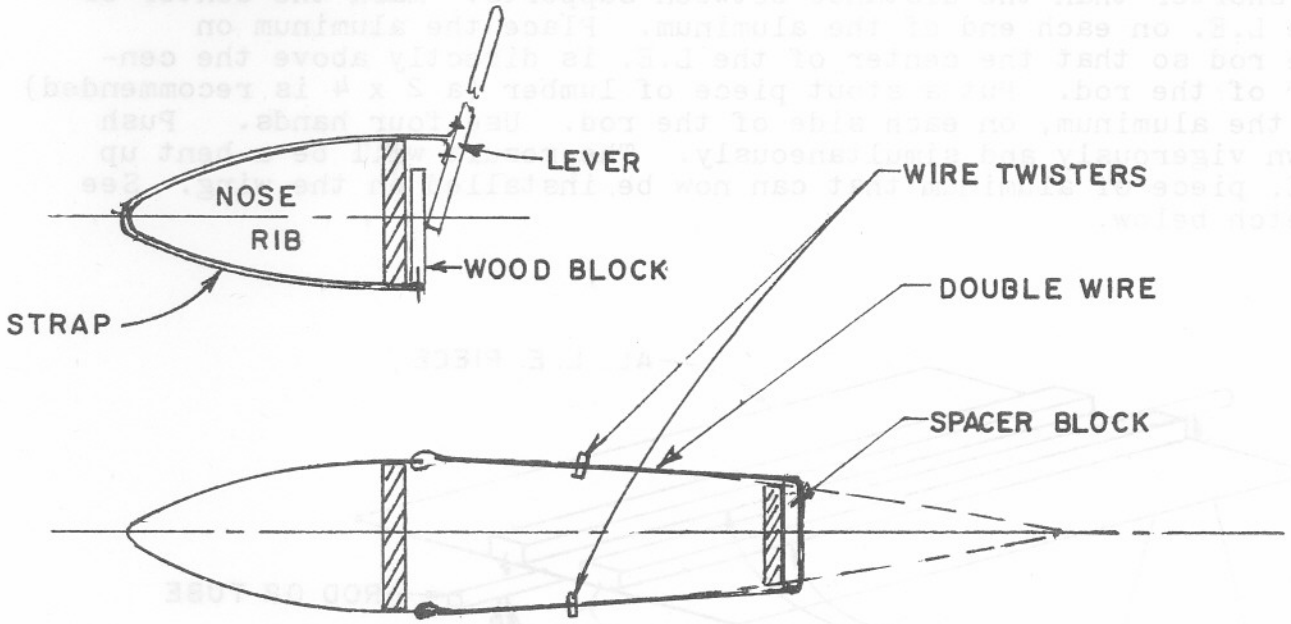
The rod or tube, over which the aluminum is bent, should be smaller than the leading edge bend diameter. This is to allow for springback in the metal. Thru trial and error we have found that 1-1/4" diameter is right for a Starduster Too. For either the Acroduster One or Too, we use 1.349 x .571 streamline tubing.

After your L.E. is cut to shape and bent it should be installed. It should be pulled tight around the ribs and nailed in place thru the nailing strip on top and bottom of spar. Do not nail thru the ribs, or thru the leading edge nose piece. Nail only thru the nailing strips on top and bottom of spar. Use 5/8 or 3/4 nails, cement coated, and space them about 1" apart.

Your lap joints should overlap approximately 1/2", and the overlap should be directly over a rib.

Your hardest job is going to be pulling the L.E. skin tight over

the ribs, and holding it tight while you do the nailing. It really takes pull, to accomplish this job right. Adjacent to every rib you should install a puller, of some kind. Wrap straps of thin metal or canvas around the L.E. and attach to a puller. Or drill 1/16" holes in edge of metal, attach wire, and twist, to exert tension. Or use the heavy elastic straps used as tiedowns in light trucks. See sketches below.



However you do it, it is important that the aluminum skin be drawn snugly against the ribs. Otherwise you will have a flopping, vibrating skin in flight, and a distorted airfoil.

After the nose skin is drawn tight and nailed into position, it is time to put the tip skins on. Unlike the rest of the nose skin, the tip skin is put on in top and bottom pieces. See pictures on page 11. Usually about two pieces top and two pieces bottom will do it. It helps to get a good fit if the leading edge of the skin, where it contacts the tip bow, is slightly shrunk. One of our metal shrinkers comes in very handy here. If you don't have a shrinker, rounded notches may be put in L. E. Make them small, and make them rounded. Use 3/32 steel pop rivets to hold the skin to the tip bow. After both top and bottom skins have been installed, use tape to smooth the edges. Any kind of tape. Masking tape will do.

Tape over, also, all overlapping joints in L.E. skin.

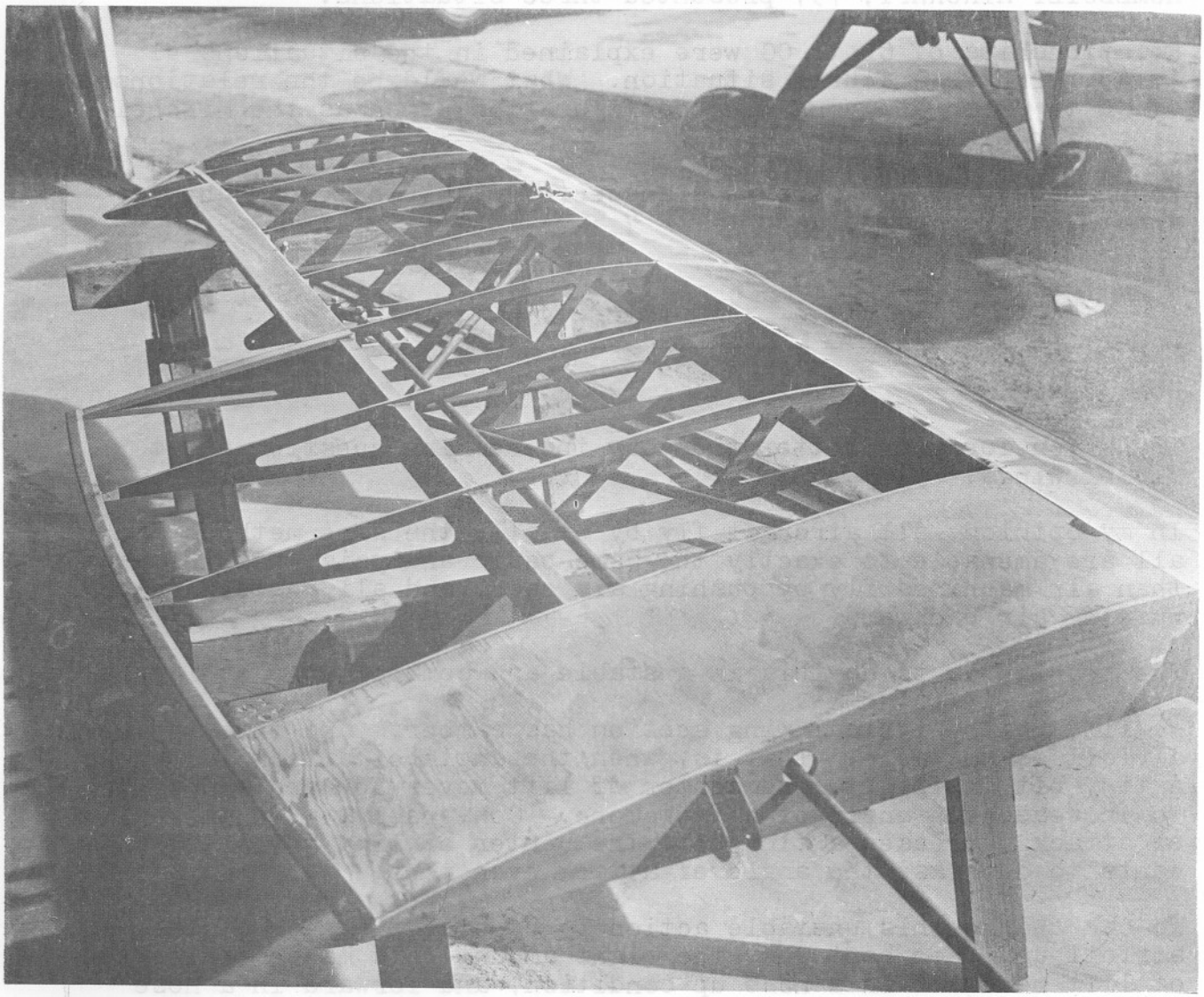
Now take a handle of a hammer, or a large round dowel, and push down on the slightly projecting aft edges of the skins. These aft edges stick back of the front spar slightly. Bend them down, between ribs, so that they will not wear holes in your fabric.

Cover the L.E. of the Ailerons and center section an a similar manner. Install your aileron slots. If Starduster Too, you are probably using fiberglas slot covers, purchased ready made. Nail them to the rear spar only. No nails thru ribs. Sand smooth.

If your aileron slot covers are made of aluminum, make templates of heavy paper, or light cardboard. Use these as patterns to cut aluminum. After the aluminum is cut, it must be bent. Do this in a brake. If you take it to your local sheet metal shop for bending, stay right there and make sure they bend it using the proper size radius block. Otherwise you may have some cracked and useless aluminum on your hands.

Install the aluminum slot covers also by nailing thru the nailing strips on rear spar. Tape over joints and nails.

Your wings are now structurally complete, and ready for mating to the fuselage, and cabane struts. Congratulations.



A STRUCTURALLY COMPLETE WING PANEL, WITH AILERON CONTROLS INSTALLED. IT HAS BEEN MATED TO FUSELAGE, AND IS NOW READY FOR COVER.

PIREP'S PAGE

Recently, in HOMEBUILT AIRCRAFT magazine, an article of mine pertaining to weight and balance was published. This article first appeared in the STARDUSTER MAGAZINE three years ago, in the April 1976 issue.

HOMEBUILT AIRCRAFT magazine received some interesting mail pertaining to that article. I am reprinting two of the letters received, together with my comments on them. Jim Osborne

---

CRAIG APOLINARIO
203 S. Main Street
Acushnet, Mass, 02743

Dear Editor,

The article, weight and balance, By Jim Osborne, in May issue of HOMEBUILT AIRCRAFT,'79, presented three situations.

Relationships of CL to CG were explained in the situations #1 to #3. I have a fourth situation. What would be the relationship of CL to CG in a flying wing configuration, such as the Mitchell Wing, for example.

Your answer, or Jim Osborne's answer(if possible), would be greatly appreciated.

Thank you,
CRAIG APOLINARIO

- -

Dear Craig,

Thank you for your letter and your interesting question about flying wings.

In my opinion, all aircraft fly by exactly the same methods and all are amenable to exactly the same basic analysis. All heavier than air machines fly by pushing air down, and all go forward by pushing air backward.

The problem is to do this in a stable and controllable configuration.

We find that a typical wing section has camber. And this typical airfoil is unstable. That is, when the angle of attack increases a tiny bit in flight, the center of lift moves forward and wants to increase the angle of attack more. Conversely, when the angle of attack decreases a tiny bit, the center of lift moves aft and wants to decrease the angle of attack even more.

We can change this unstable action by bending the rear of the airfoil up. When bent just the right amount this makes the center of lift move aft in a nose up condition, and forward in a nose down condition.

If the C.G. is placed just forward of where the C.L. would be IF THE TRAILING EDGE WERE NOT BENT UP, and the trailing edge is then bent up enough to move the C.L. forward to where it exactly coincides with the C.G., we have a stable flying wing.

Since flying wings have a very short moment arm (distance between the C.L. and the upswept trailing edge) thier stability is usually rather marginal and the allowable C.G. travel is small.

If we consider all airplanes,(Conventional, canards, flying wings, and lifting bodies), just as lifting bodies, we find that the aft end of the lifting surface(s) fly at a lesser angle of attack than do the forward lifting surface(s). This is true, even though the tail on a conventional configuration may have more incidence than the wing(s). The tail may be flying in the wing(s) downwash.

Also, the forgoing discussion does not mean that the conventional configuration necessarily has a download on the tail. Many conventional configurations DO fly with a tail download, and they are very stable, but they can still be very stable and perform better when the tail is lifting.

Yours sincerely,

JIM OSBORNE

- -

March 27, 1979

Don Dwiggins/Editor
Homebuilt Aircraft Magazine
606 Wilshire Blvd
Santa Monica, California
90401

Dear Sir:

It's getting to be an accererating activity to make an effort to refute the flim-flam and boondoggles that somehow get past a busy editor and his staff. I gripped to replicai r's ed. for promoting an Oshkosh perennial, with variations; viz., Davis Acfts's "YF-80 Cold Jet". To wit: "...without high-pressure, thermodynamic gradients, "unreal" tip-speeds--weight and wing-loading aside--claims are patently false."

Glenn Gauger, replica Fighter Association contributor and corporate pilot agrees. Seignor Campani would not be amused by the comparison. The-Caproni flew in '40.

Just received, May's Homebuilt "Weight and Balance" article--my bailiwick-- alarmingly unprofessional, considering the source.. and the responsibility owed homebuilding movement.
To respond categorically:

1) All structures presenting horiz. or oblique angles to relative-wind develop a force normal,i.e., at rt. angles to it, opposite, or both.

2) There is <u>no</u> center of lift of an airplane, only of an airfoil and its more-or-less migrating center-of-pressure.

3) Usually, the C.G. is located & variable aft of the aerodynamic center (1/4 chord) so as to balance the wing/tail forces at an optimum angle-of-attack...because airfoils generally have negative, nose-down Moment-Coefficients(Cm). Axiom: The cambered airfoil is an unstable airfoil.

4) It is obvious, or should be, to the proprietor of an aircraft design business that performance parameters are determined fundamentally by wing-&power-loadings. To assert that a forward c.g. increases stall-speed and lowers climb and cruise speeds should raise serious questions in the minds of thoughtful readers, about certifying judgements. Cf "Catastropic instability," CAA Bulletin No. 26, 1940

5) "In order to fly straight-'n'-level, at constant speed in <u>any</u> machine, the longitudinal <u>moments</u> (Force x Arm) must balance... about the center-of-gravity; also, Lift=Weight, Thrust=Drag. Whereas conventional designs are balanced (C.G. aft of lift force) but unstable without tailplane, the canard and evidently the "Starduster Too" too, are stable but <u>un</u>balanced without auxiliary surfaces; the c.g. being fwd of lift force, i.e., a nose-down moment (negative) occurs.

6) The contention that canards are inherently 'nose-heavy' is singularly unpersuasive in the light of the "Vari-Eze" performance.

7) A porpoising bird is about as unsettling as a "Squirrely" one; A ground looping rascal.

Sincerely,
DONALD E. JOHNERSON
615 Talmadge Street
Eau Claire, Wi, 54701

- -

Dear Donald,

Thank you for your comments and professional opinions. Although I have worked around and in aviation all my life I am more of a "Generalist" than a specialist, and therefore constructive criticism from a Specialist such as yourself is more than welcome.

To reply to your statements in the same order as above:

1) Agreed.

2) Disagree. Furthurmore, your statement 2 is in direct contridiction to your statement 1. Since we have already agreed that all aircraft structure except vertical members develop positive or negative lift (develop a force normal,i.e., at rt. angles to it) then it is perfectly feasible to mathematically determine the center of all these normal forces.

3) The Aerodynamic center is an artificial consideration, arbitrarily placed at 1/4 chord, in order to make certain aerodynamic calculations easier. If it were placed somewhere else, the Moment-Coefficients (Cm) would be different. Your axiom is correct. The cambered airfoil <u>is</u> an unstable airfoil.

4) Many aerodynamic formulas are only approximately correct. They are simplified, idealized, and thus made practical to use. If you really believe that C.G. location does not affect performance I suggest that you have let your technical education warp and overshadow your common sense.

The wing usually supports the weight of the airplane, plus or minus the tail load, as the case may be. If the tail is lifting three hundred pounds then the wings supports three hundred pounds less than it otherwise would. If the tail is downloaded three hundred pounds (not an unusual situation) the the wings support the weight of the airplane plus three hundred pounds. If you do not think this makes a difference in performance, I suggest you try it.

Aft loading for increased performance is an old trick known to many pilots. Eric Shilling tells me that loading to the aft C.G. limit in place of the forward C.G. limit on a propdriven transport would make at least ten miles an hour difference in cruise speed. I have also been told by old time race pilots that that was one of the speed tricks they used. And lastly, most aerobatic pilots insist on an aft C.G. airplane for maximum performance.

5) No airplane (Lifting body) that I know of, including the canard and the Starduster Too is stable unless the longitudinal moments all balance out.

6) I have never claimed that the canard is inherently nose heavey.

7) My article had nothing to do with groundlooping.

Sincerely,
JIM OSBORNE

EAA DIRECTOR BILL TURNER AND TWO OF HIS TOYS.

HE HAS MORE.

Geoffrey Norcross
P. O. Box 563
Berlin, Md. 21811

Dear Eric,

This past winter I installed the new spring aluminum landing gear, which was completed and flown in early March. Ground handling is much more positive and responsive. I expected landings to have a tendency toward bouncing, but find the new gear firm and predictable on both hard surface and grass.

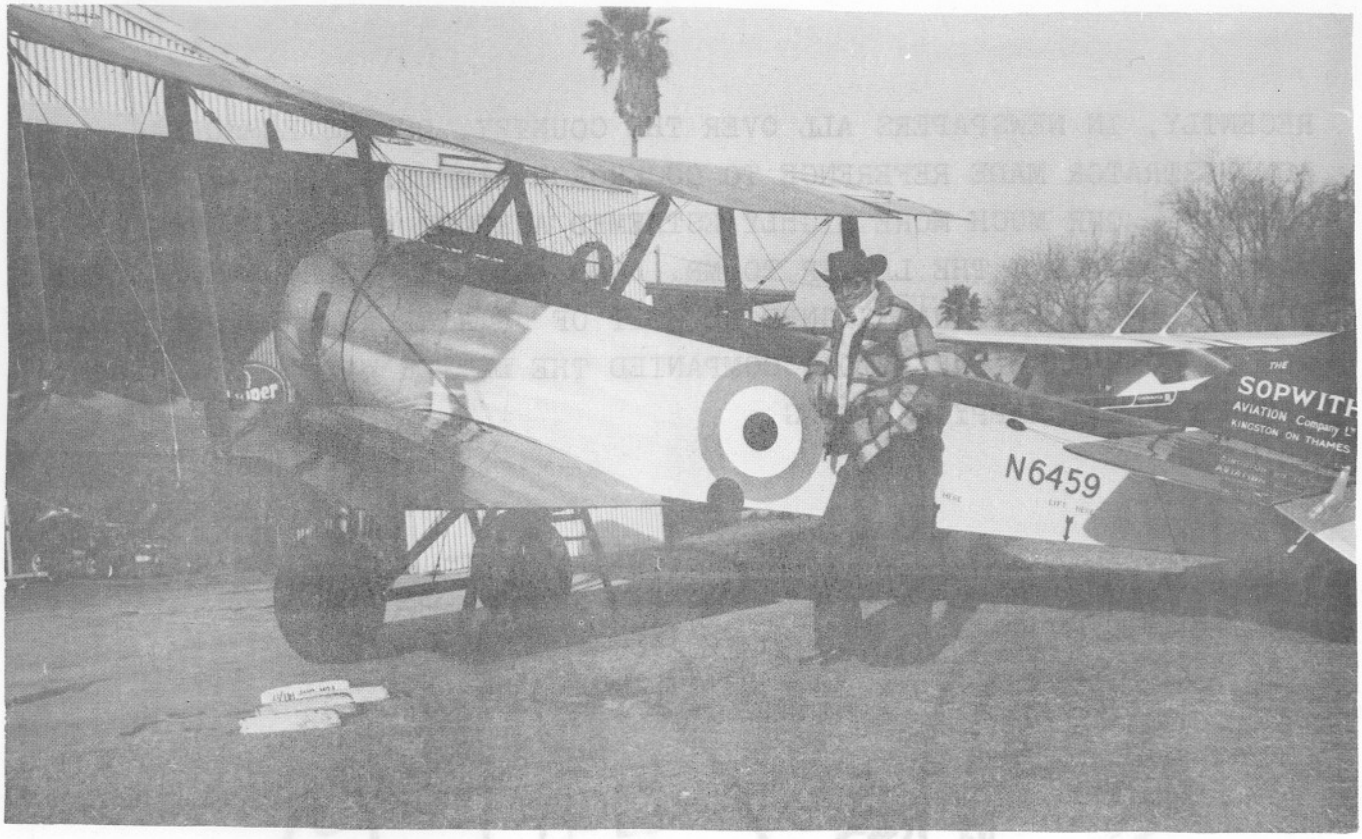
I cannot provide any information on air speed improvement, because I also installed a new aeromatic Aeromatic propeller, new windshields, and changed the wingtips to install new nav-strobe lights. It is true that speed has improved approximately 3-4 mph, but it is hard to credit the improvement to any one item.

I have enclosed two pictures of N4316. These are landing lights recessed into the inlet air baffle.

Thank you for sending the information I had requested by phone, and for your interest in how the new gear worked out.

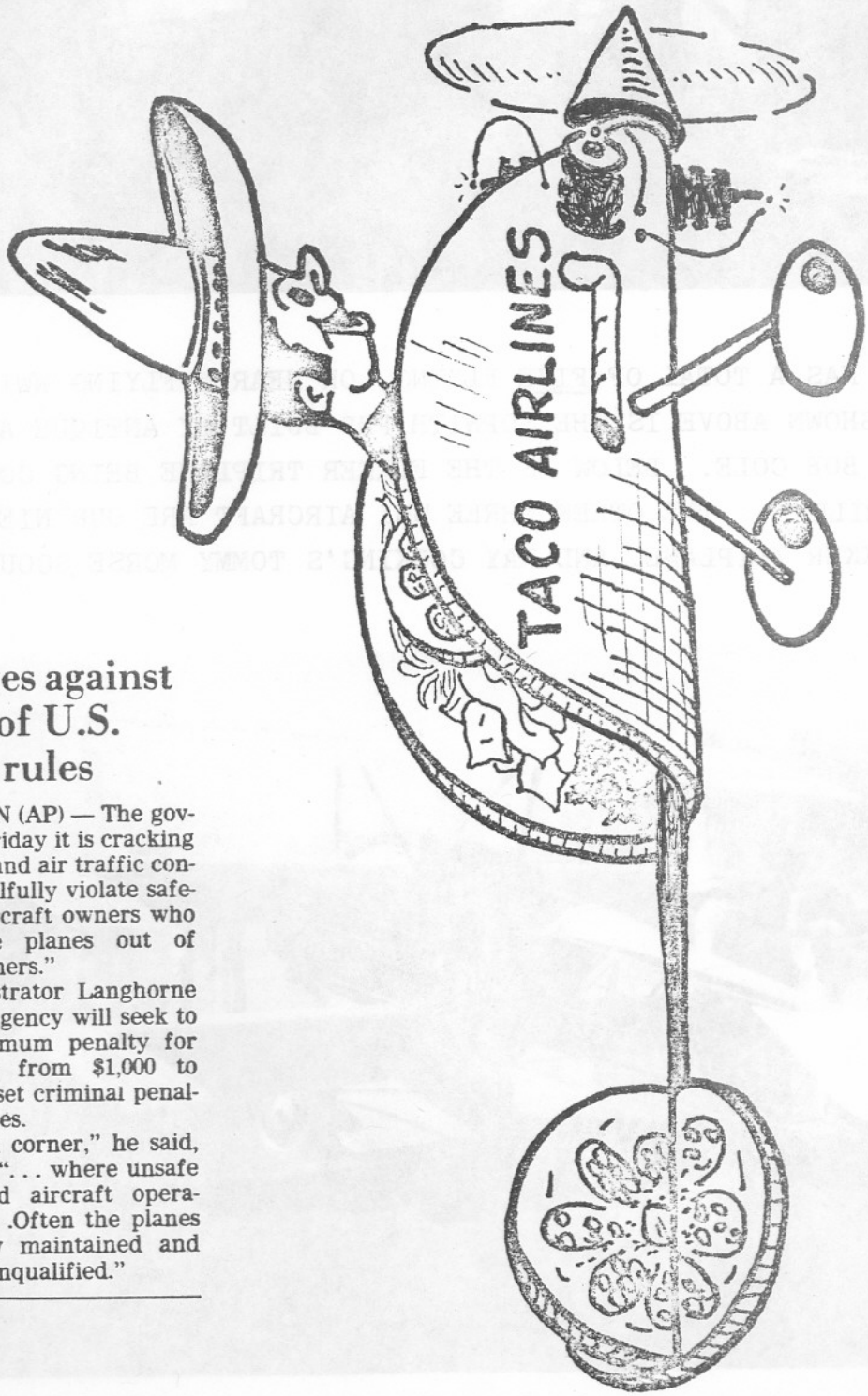
Sincerely,

Geoffrey Norcross



FLABOB HAS A TOTAL OF FIVE FLYING, OR NEARLY FLYING WWI AIRPLANES. SHOWN ABOVE IS THE SOPWITH PUP BUILT BY ANTIQUE AERO AND OWNED BY BOB COLE. BELOW IS THE FOKKER TRIPLANE BEING COMPLETED BY R. H. MCRILEY. THE OTHER THREE WWI AIRCRAFT ARE OUR NIEUPORT, APPLEBY'S FOKKER TRIPLANE, AND RAY COCKING'S TOMMY MORSE SCOUT.

RECENTLY, IN NEWSPAPERS ALL OVER THE COUNTRY, OUR ESTEEMED FAA ADMINISTRATOR MADE REFERENCE TO COCKROACH AIRPORTS ALL OVER THE COUNTRY. OUR MUCH MORE HIGHLY ESTEEMED AIRPORT OWNER, FLAVIO MADARIAGA, WROTE THE LETTER TO MR. BOND WHICH IS REPRODUCED ON THE OPPOSITE PAGE. IT WAS SIGNED BY MOST OF US AIRPORT BUMS WHO CALL FLABOB HOME BASE. FLAVIO ACCOMPANIED THE LETTER WITH THE CARTOON SHOWN BELOW. HAPPY LAUGHING.



FAA moves against violators of U.S. air safety rules

WASHINGTON (AP) — The government said Friday it is cracking down on pilots and air traffic controllers who willfully violate safety rules and aircraft owners who operate unsafe planes out of "cockroach corners."

FAA Administrator Langhorne Bond said the agency will seek to raise the maximum penalty for civil violations from $1,000 to $25,000, and to set criminal penalties in some cases.

A "cockroach corner," he said, was an airport ". . . where unsafe and uncertified aircraft operations thrive. . . .Often the planes are improperly maintained and the pilots are unqualified."

FLABOB * TEL 714 683-2309

4130 MENNES ST. RIVERSIDE CAL 92509

*COCKROACH AIRPORT*1 USA

April 3, 1979

Federal Aviation Administration
800 Independence Avenue, SW
Washington, D. C. 20591

Attention: Mr. Langhorne Bond, Administrator

Dear Sir,

Your subtle use of the term "Cockroach Airport" is very catchy and really bugs us pilots at Flabob. It is a warm and friendly way of showing your unique and genuine affection for general aviation. As an accomplishment in public relations, it is outstanding. Along this same line, we are certain that Flabob must be the "Cockroach Airport" of the USA if not the world. We would consider it the greatest possible honor if your outstanding federal agency would grant Flabob the official title of:

COCKROACH AIRPORT #1 OF THE USA

cc: AOPA
EAA
ACORDE, Inc.
Misc. Magazines

Most sincerely,

Flavio Madariaga

Flavio "El Cucaracha" Madariaga 59054
CHIEF COCKROACH, FLABOB AIRPORT

Wm E. Sargent C-183143

John A. Cland

James S. Appleby Chief ANTIQUE

Jim Osborne N 750X

Charles M. Kimmy 50591

Warren D. Pepiot - Airborne Forecaster

Edgar A. Carroll N 95689

Bill Turner

Charles Webber, Plaintiff

Marty Keller C-1133621 N-6841K

Raymond D. Ecking N 1137-T.M.

R. Hoffman

A. Marquart

Bill

John Kepfletcher

Gardar Gislason
TANNLÆKNIR
Háaleitisbraut 68 (Austurveri, 2. hæð) - Sími 84835
105 Reykjavik, Iceland.

Reykjavík,
April 8. 1979

STOLP STARDUSTER CORP.
Attention: Mr. Jim Osborne
4301 Twining, Flabob Airport
Riverside, Ca., 92509

Dear Sir,

First, I like to thank you for the article in the Starduster magazine about building the wings. It will be of much help to us builders.

I am building Acroduster Too wings from a kit from you, and am about assembling the drag truss. What worries me is that the drawing calls for a U-channel AND 10137-1207, but in the kit I got a thinner U-channel with different numbers on it. I did not write down the numbers until after I cut it, but it reads something like this:
OA1-000-ALCOA 2024-T3511 (A sample is enclosed.)

This extrusion is thinner, and has more sharp inner corners than AND 10137-1207 2024-T3.

The question is, may I proceed with the building using this material, or do I have to use what the drawing calls for?

Hope to hear from you very soon.

Sincerely yours,

Gardar Gislason

April 17, 1979

Dear Garder,

Thank you for your letter of April 8th. The U-channel you received is the correct one to use. It is an improved substitute for AND 10137-1207.

The reason I originally specified AND 10137-1207 was because it was the only U-channel aluminum extrusion I could get that had the correct inside distance between flanges. It was tremendously overstrength, and therefore on the heavy side. As soon as I could locate some lighter thinner stock, I started using that. I am sorry I have not got around to updating the plans.

Good luck on your project,
Cordially,

JIM OSBORNE

Robert C. Collins
Vice President
Engineering

UNITED AIRLINES

March 30,1979

Mr. Clark E. Luther
Sr. Vice President
Flight Operations Div.
United Airlines
P.O.Box 66100
Chicago, Illinois 60666

Dear Clark,

On February 28 while attending a meeting at NASA-Ames, I was given some advance information concerning a report being developed by NASA on near misses. The data, collected by Charlie Billings as part of the NASA safety reporting system, shows clearly that the liklihood of a near miss increases with the amount of air traffic control. The report has not yet been released, but Aviation Week, in its March 26 issue, published some partial information which I have tabulated below:

Control Status	Near Misses per Million Operations
TCAl	25.6
TCAll	22.7
TRSA	17.4
Uncontrolled Airports	8.0
Altitude	
Below 10,000 feet	9.3
10,000-13,000 feet	2.3
13,000-18,000 feet	1.9
Above 18,000 feet	3.0

This is the only information that I have ever seen which shows the relative risk of near misses as a function of level of air traffic control. As can been seen, as traffic control increases, so does the risk of near miss. Charlie Billings tells me that they have tried to cut this information many different ways and no matter how they do it, all the other variables wash out. Whatever the reason, aircraft are more likely to experience a near miss as the degree of air traffic control increases.

Following the San Diego accident, the FAA has come out with a proposal to create more controlled airspace by lowering the floor of the continental control area and adding more TCA's and TRSA's. As you are aware, United, through the ATA, has supported this idea of more controlled airspace. Obviously, the reason behind our support is to provide a safer operating enviornment for transport airplanes.

I suggest that we withdraw our support of the FAA proposal to increase controlled airspace until there is some real evidence to show that increased air traffic control actually reduces the risk of near miss, and therefore mid-air collision. The only evidence

available to date, as shown above, indicates that we have been wrong in assuming that increased traffic control means increased safety.

I would appreciate hearing your views.

Sincerely,

Bob C.

Robert C. Collins

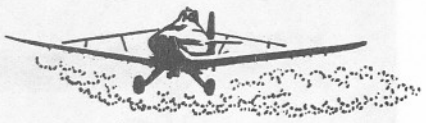
Editor's Note: Bob Collins is not only Vice President of Engineering at United Airlines, but he is also a Starduster builder.

We feel that the data he has collected and forwarded to Mr Luther is some of the most pertinent data yet gathered and should be in the hands of our lawmakers in Washington.

We are sending a copy of this magazine to Mr. Luther and asking for his comments. Hopefully they will be in the next issue.

A STARDUSTER TOO FROM THE UNITED KINGDOM. BUILT AND FLOWN BY DR. PETER LEGGO. Pete is a professor at Cambridge University. He keeps his airplane based at Pampisford Airfield, near Cambridge

Mayer Aero-Spray
CHUCK MAYER



826-8647 • HALLAM, NEBR. 68368

April 26, 1979

Lou Stolp
Stolp Starduster Corp.
4301 Twining, Flabob Airport
Riverside, Calif., 92509

Dear Lou,

Woweeee; What an airplane. We have about six hours on 4CA (Charlies Angel), which we just completed. Have now flown it enough to relax a little. Just took it up and did stalls in it. Man, straight and true, and so very, very gentle. I had no idea what would happen but suspected they might be very docile because it was so easy to land. I had never flown an open cockpit plane, so was a little apprehensive on the first flight, but now it is becoming real fun.

I have never been so excited about anything in my life. I get so hopped up I can't sleep at night dreaming about the next tests to fly in it.

We are sending you an order for wheel pants with check enclosed. I have added $10.00 for freight. I don't know if this is enough but whatever it is you can bill me or let me know.

I am also enclosing a newspaper article on the aircrafts first flight, plus a picture taken of it on the first landing. Lou, I don't know how you did it, but this aircraft has got to be a Sportsman's dream. The 180 Lycoming is a perfect match for the craft. It climbs 2000 FPM without going to full power. I don't know how fast it will climb when I get ready to push it.

We got rid of the tendency for the aircraft to roll to the right by putting the left wing down, and the right wing up, lower wings. It now flys hands off with very little rudder pressure necessary for straight and level going.

I have never flown an airplane this responsive. All my time has been in Ag planes, super cubs and small multi-engine craft. All you have to do is think about a maneuver in this plane and it has it done already.

Due to the fact that we don't have enough money to keep the airplane we are going to offer it for sale after the 40 hours are flown off. But we are going to start building another one immediately, and the only change will be wifening the back cockpit to make it a less tight fit for my 300 pound frame. I have flown the plane with as much as 200 pounds in the front cockpit without any bad characteristics showing up. What a machine.

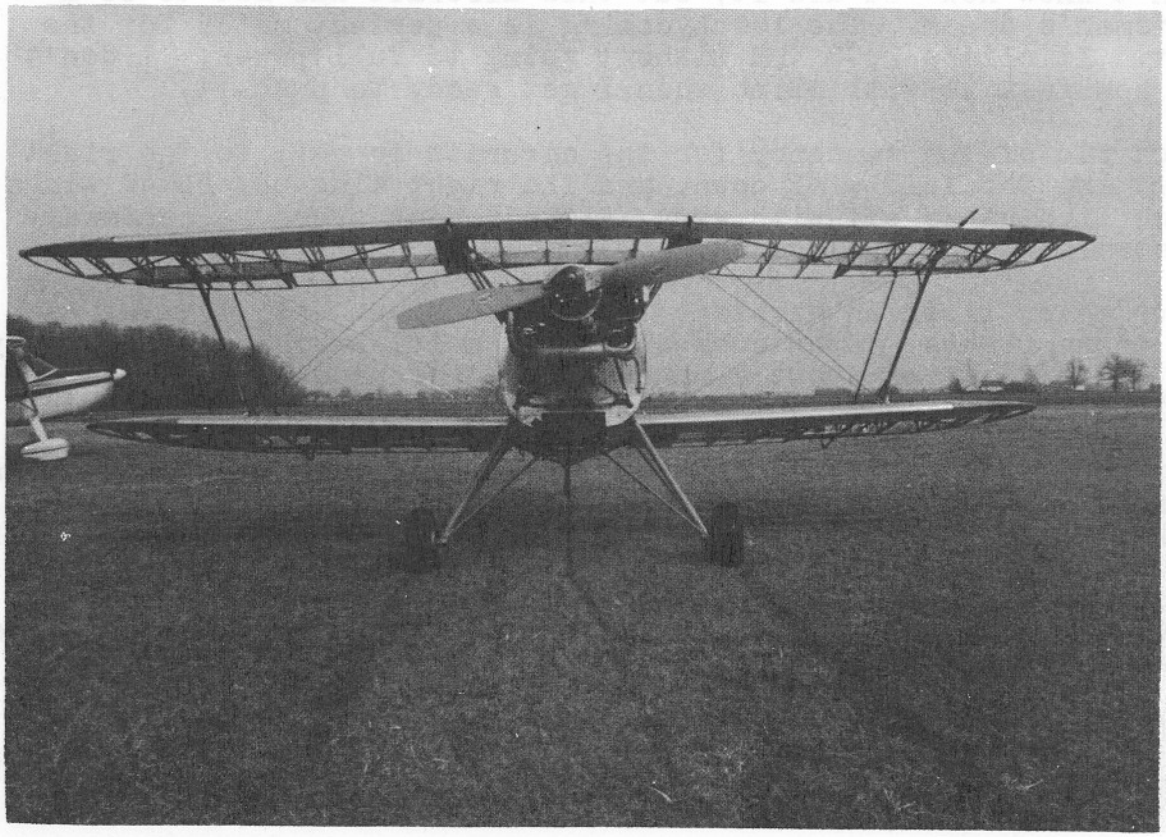
I hope this finds all of you at Stolp busy and showing a profit. We will probably have the plane at Oshkosh this summer if the time is flown off by then, which I am sure it will be.

Thanks again for a beautifully designed airplane. It was the greatest thrill of my life to complete this project and actually fly it.

SINCERELY,

CHUCK MAYER

CHUCK MAYER'S BEAUTIFUL NEW BIRD



STARDUSTER TOO UNDER CONSTRUCTION BY LES ZEHR, OF FORT WAYND, IN.

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COFFEE MUG--HI QUALITY COLOR PICTURE OF ANY OF OUR AIRPLANES ON IT, TOGETHER WITH YOUR FIRST NAME AND THE "N" NUMBER OF YOUR AIRPLANE-- SEND $5.95 TO "STARDUSTER".

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