SKYBOLT NEWS

12026 South Tomi Drive
Phoenix,AZ. 85281

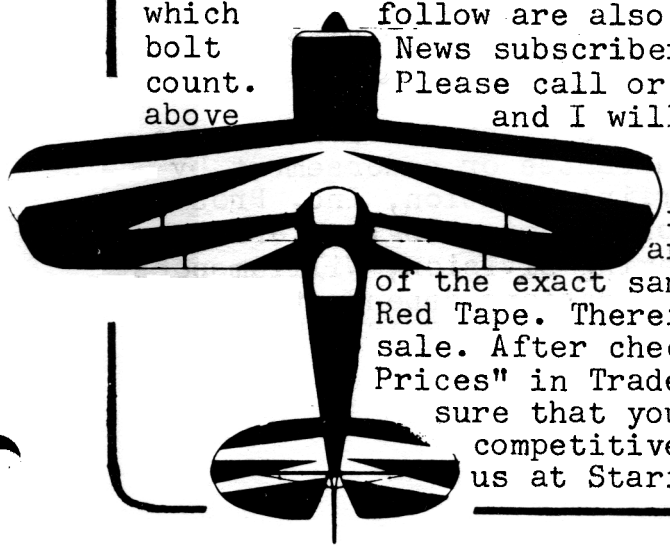
Series #4, Vol. #2

FIRST CLASS MAIL

HANGAR FLYING with MAC

At long last, the new price list is at the printers so that we can include it with this issue of the "News".

As promised in the last issue, here are some prices for the most widely used Lycoming Engines that we find in the Skybolt. They are anything but comforting to look at,but please save a little sumpathy for yours truly. The engine that I'm using in the proto-type Sun Devil is listed at $14924.00. The prices which follow are also full list price. As a current Skybolt News subscriber, you can expect a substantial discount. Please call or write to me at the address shown above and I will quote the F.O.B. price along with any other particulars. The price will be for outright sale. No trade ins. Factory Re-manufactured engines are sold on the basis of a trade-in of the exact same model and are subject to a lot of Red Tape. Therefore, we do not offer Re-Mans for sale. After checking some of the so called "Low,Low Prices" in Trade-A-Plane and other sources, I'm sure that you will find our price is more than competitive. Those of you who have bought from us at Starfire Aviation know that we offer



integrity and personal service in all transactions. It's our policy and the reason that our company is highly regarded in the aviation field.

Engine Prices, Full list, F.O.B. Williamsport, PA.

Model	Horsepower	Fuel Octane	Prop	Wt.	Price
O-320-A1A	150	80/87	C/S	244	$6888.00
O-320-B3B	160	100	C/S	255	6888.00
O-360-A1A	180	100	C/S	265	7668.00
* O-360-A2A	180	100	FIXED		7168.00
*** O-360-A4A	180	100	FIXED		7476.00
IO-360-B1B	180	100	C/S	270	8880.00
** IO-360-B4A	180	100	FIXED	270	8880.00
IO-360-A1A	200	100	C/S	323	9532.00
IO-360-A2A	200	100	FIXED	323	9532.00
AIO-360-AIA (Special Aerobatic)	200	100	C/S		11372.00

* Less Generator
** Solid Crankshaft
*** Solid Crankshaft / Less Generator

O-540-A1A5	250	100	C/S	375	10696.00
O-540-E4B5	260	100	C/S	398	10468.00
IO-540-D4A5	260	100	C/S	381	11948.00
IO-540-A1A5	290	100	C/S	412	14412.00
IO-540-G1B5	290	100	C/S	438	15008.00
IO-540-K1A5	300	100	C/S	438	14924.00

NOTE: Some engine weights shown above are without starter and generator. All weights are dry.

Prices include packing for standard domestic or export air shipment. For Special Long Term Storage Packing (Foam) add $150.00 to price.

Prices include Magnetos, ignition harness, carburetors or fuel injectors, spark plugs, starter, generator or alternator depending on model specs.

SPECIAL NOTICE: The above information is offered for reference only and is not a guarantee or endorsement by Skybolt News or Starfire Aviation, Inc. Prospective purchasers of Lycoming Engines are urged to contact AVCO Lycoming Division, Williamsport, PA. for EXACT specifications dependent on requirements of the user. ZIP CODE IS 17701

CONSTANT SPEED PROPS (Some thoughts about aerobatic usage)

Hartzell Constant Speed Props are made in 2 basic designs. Each of these designs are available in Counterweighted or Non-Counterweighted models.

Design #1 is the Steel Hub and due to it's higher weight should not be considered for the Skybolt. We already have enough nose heavy conditions inherent in the design of the airframe, so why contribute to the problem with a heavy prop.

Design #2 is known as the "Compact Hub" model and is denoted in the model number HC-C2YK which breaks down as follows.

"H" means Hartzell
"C" " Controllable
Dash
"C" " No Shaft Extension.(Any other Letter such as E,F,G,H,I,L,M, denotes the length of the shaft extension.) All letters denote basic design.
"2" " The number of blades
"Y" " Blade Shank Design
"K" " Flange Mounting, SAE No. 2, ½" Bolts, 4 Drive Bushings. (Other Letters such as F,L,N or R stand for the variations of flange mountings that are manufactured)

Steel Hub Models have a basic Number as follows. HC-8 or 9. They are also denoted as HC-A or B.

The "Compact" Hub models utilize aluminum alloy forgings for most of the parts. The hub shell is made in 2 parts and bolted together along the plane of rotation. The "Compact" models can only be installed on engines having flanged mounting provisions. They are produced in 2 and 3 blade models.

The next part of the design consideration is the operational mode of the prop and it's associated governor. In plain english, Do It Have Counterweights or Don't It ? If they Do, then what in hell do they do?

To tell whether a "Compact" model has counterweights or not lets look at the Hub Model number again. In design #2 above I gave you the number HC-C2YK. Now lets add a dash number after the letter K. There can be any of the following numbers.

Dash #1 means Non-feathering (no counterweights)
" #2 " Feathering
" #4 " Non-feathering (with counterweights)
" #7 " Non-feathering (reversing)

The "Dash"1 and"Dash" 4 models are the models of interest for our purposes.

Lets discuss the Dash #1 and it's mode of operation. It is Non-Counterweighted and utilizes governor oil pressure to move the blades into High Pitch. The centrifugal twisting ing moment of the blades tend to move them into Low Pitch (High RPM). If during flight, the oil pressure from the engine to the governor is lost the blades will tend to move into Low Pitch (High RPM).

Consistent with the Dash#4 design, the reverse of the above is true. In this, the counterweighted model, engine oil pressure to the governor is necessary to move the blades into Low Pitch (High RPM). If oil pressure is lost, the the counterweights force the blade into High Pitch (Low RPM).

Now that we have covered the mechanical design and operational modes involved, lets discuss the 3 basic philosophies of variable pitch control.

#1. This philosophy says, that in the case of oil pressure loss, the blades should go into High Pitch (Low RPM) to avoid overspeed.(Overspeed is the most critical condition to propeller life. The increase in centrifugal forces with the square of the RPM is extremely damaging.) Philosophy #1 is basically true. But what happens, if the oil pressure is coming back after a brief loss in a 90 degree bank or Zero "G" conditions? The governor is getting an "Underspeed" signal and the prop blades will be pushed against the Low Pitch Stops with the result of a momentary "Overspeed".

Another condition that exists in this philosophy is the possibility of engine detonation momentarily due to high power settings in some maneuvers when all of sudden the prop goes into high pitch.

Philosophy #1 is concerned with the Dash #4 counterweighted constant speed props.

#2 This philosophy says, use a lighter weight non- counter weighted prop and set the prop control in Low Pitch (High RPM) and fly it as though it was a Fixed Pitch Prop, thereby avoiding "Overspeed".

#3 This philosophy says, oil pressure within the propeller system has to be maintained at all times. Therefore,

the installation of an accumulator is recommended so that oil pressure within the propeller system can be provided for a certain time when in fact the engine oil pressure to the governor is lost momentarily.. In this case, non-counterweighted props can be flown at constant speed settings provided that 10% overspeed can be tolerated for a short moment. The Accumulator System can be used with success on both Counterweighted and Non-counterweighted propellers.

The Accumulator System is used on the Hoffmann Prop installation in the Zlin Z 50 L Aircraft wich uses the Lyc. AEIO-540-D4B5 Engine (260 hp.) Hoffmann states that the system could possibly further improved by using check valves to avoid oilflow back to the engine, or a larger volume accumulator or a similar accumulator installed directly into the engine lubrication system.

There you have it. The Pros and Cons of the various philosophies. You put the money down and you make the choice. Personally I prefer the #2 Philosophy with regard to weight, price and non-competitive aerobatics. Since I will be using a Hoffmann prop on the Sun Devil I will go the next step and install an accumulator with the Non-counterweighted version so that we can experiment with such a system.

In FIG. #1 shown below, we see a schematic of the Hoffmann Accumulator. The price range at this time, f.o.b. Germany, is $185 to $415 when ordered with the prop. Prices are higher when purchased separately.

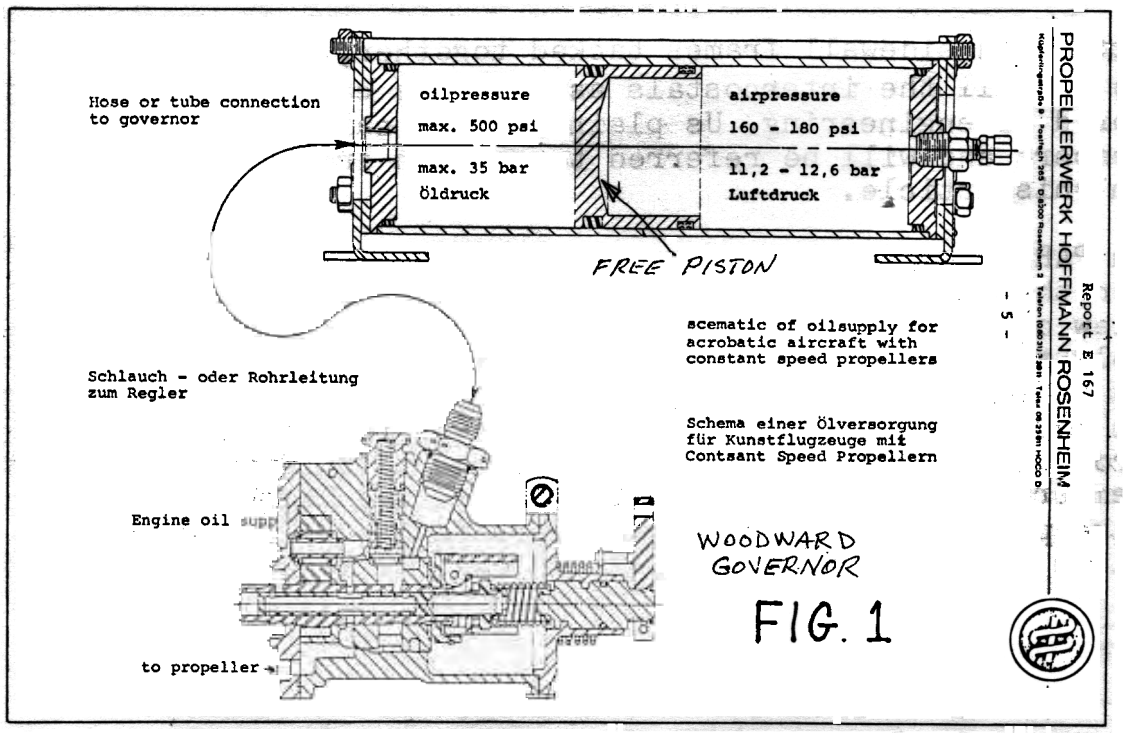


FIG. 1

FUSELAGE CONSTRUCTION (PART 3)

In the last episode we left off at the point where the builder was tacking together, the sidewall frames. At this point it is important to note that the diagonal that runs from the upper longeron at Sta.#137 down to the bottom of the tailpost at Sta.#168 is NOT tacked in place while the sidewall frame is fabricated. This member will be installed after the tailpost has been fitted (Not yet tacked) in place. By using this method we can remove the tailpost when the need arises during the actual fitting of the diagonal previously mentioned. For those of you who have our fuselage drawing #FAI-3A the tube involved is #19. Those who would like to purchase this drawing can do so by sending $2.00 to Skybolt News at the address on the front cover. Drawing #FAI-2 is 17"x22" and has all of the latest modifications shown. It also shows the layout of the trussing for the new cantilever gear as well as the bungee truss that is called for on the designers plans. Also shown are the seat frames and a note to modify the seat height in the event you are going to install a canopy. Included with the Drawing is an up to date tubing list showing individual lengths of pieces as well as the total amount of tubing. Each piece on the tubing list is numbered and refers to the same number on the drawing. The drawing and tubing list has been construction approved by several builders that say it saves lots of time and everything comes out just the way it should. In fact you can cut the tubing necessary without having a fixture built.

With both sidewall frames tacked together, we are ready to install the intercostals as they are called in the world of engineering. Us plain "Slobs" call them cross-members and will be referred to as such from hereafter in this article.

In PART 1 of this article, the fuselage fixture called for the layout of tube centerlines that depict the top view of the top truss. Using the small wooden blocks to hold the tubing in place on the fixture, we place them so as to hold the sidewall frames parallel to each other as far back as Sta. #51 where the bend in the top longerons will occur. Also install blocks to hold the cross members in place. NOTE: No bending of the longerons will take place until all cross members have been tacked in place as far back as Sta.#51 and Sta.#57 1/8.

At this point, we can place the sidewall frames on the fixture standing vertically (top longeron resting on the surface of the fixture). Using the SIDEWALL SPACING BRACES shown in FIG.#1 (Fuselage Fixture Drawing) of Series #3, Vol.#6 Skybolt News, we can proceed to clamp and brace the sidewall frames in place on the fixture. Here again, it is necessary that the surface of the fixture be perfectly level. Make sure that the "O" Sta. edges are aligned. Use a spirit level to ascertain that the sidewall frames are indeed standing perfectly vertical. Place an angle iron Sidewall Brace just aft of the "O" Sta. (approx 1"). Place the remaining Sidewall Braces just forward of Sta.#24, just aft of Sta.#30 and just forward of Sta.#51. You can now proceed to cut, fit & tack the cross members in place as far back as Sta.#51 in the top truss and Sta. #57 1/8 in the bottom truss. To the first time builder it may seem that the cross members present a difficult fitting problem but the reverse is actually true. FIG. #2 below show how to cut the ends of the cross members for easy fit. This method allows accurate spacing of the sidewall frames. Shown in FIG.#2 is the Sta. "O" cross member since this member presents an unusual problem due to the fact that the diameter is 1" O.D. and we are mating it with sidewall members that are 7/8" O.D.

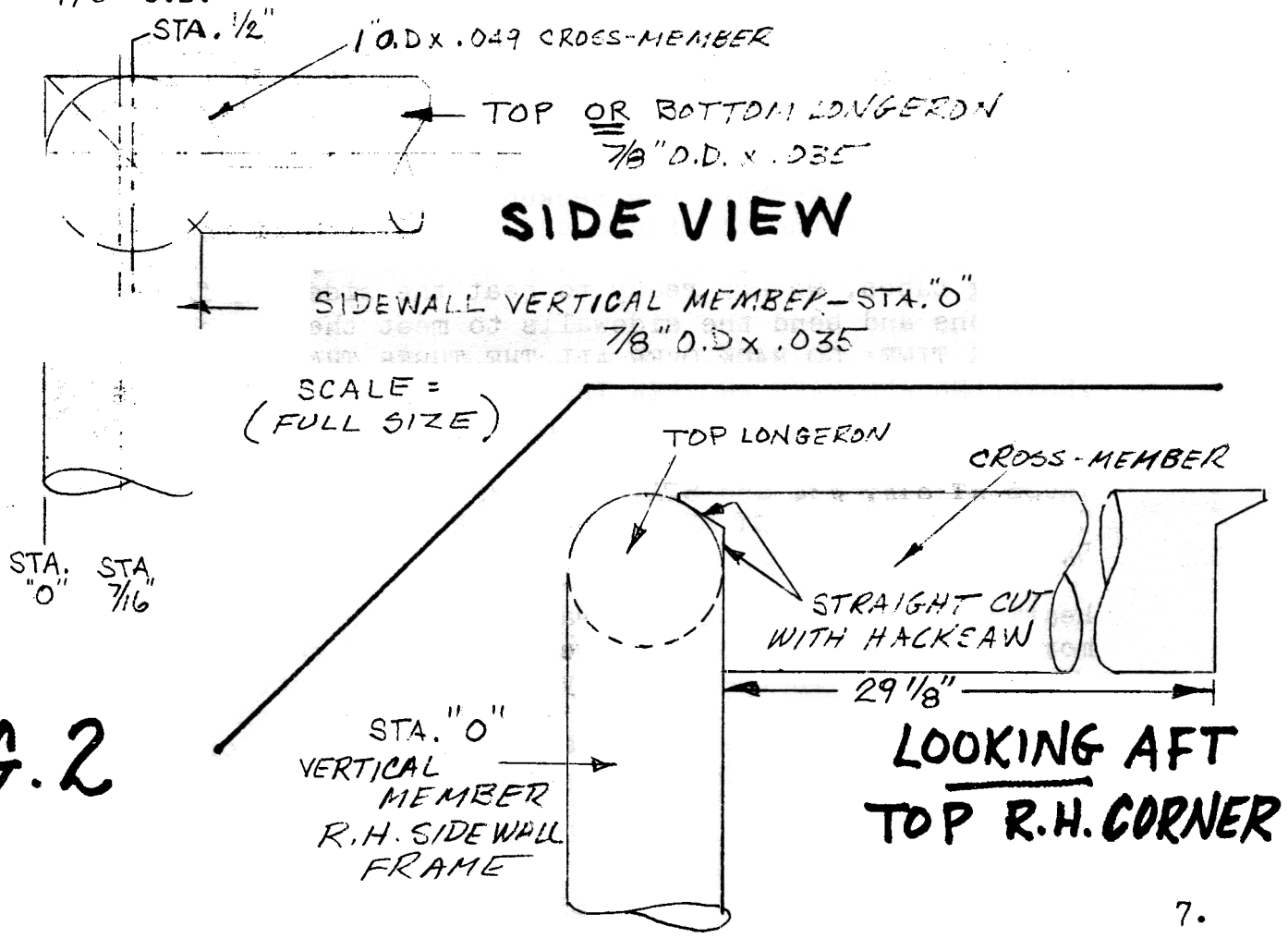


FIG. 2

After briefly studying FIG.#2 it becomes obvious that this is an easy fit to make. I suggest that you make the length of all cross members as accurate as possible (29 1/8") to eliminate staggering tolerances due to welding shrinkage. The effects of welding are inevitable and you will find that when you are finished welding the fuselage, the longeron centerline to longeron centerline width will be closer to 29 15/16" than the 30" width that is called out in the plans. This dis-crepancy is of little consequence. The major factor is keeping the fuselage square and in alignment.

The Sta. #13 cross-member (Bungee truss) is fabricated outside of the airframe and installed as a unit. The centerline of the major member of the truss should be installed in the airframe so that it coincides with the centerline of the lower longerons to which it gets welded. This is an extremely high stress area carrying landing gear loads as well as flying wire loads that are imposed. The cross-member of the truss can be cut for easy installation the same as the "0" Sta. cross member shown in FIG. #2 except that the lower edge of this member should be heated and formed to the lower longeron. This gives it the pinched look as shown in the plans.

If you are installing the new type cantilever landing gear, the Sta. #13 cross member is a single tube (1 1/8" O.D. x .049)and installed the same as the bungee truss described above.

When all cross-members are tacked in place as far back as Sta. #51 of the top truss and Sta. 57 1/8 of the bottom truss, including the the top truss Sta.#24 to Sta.#30 bracing tubes, we are ready to heat the sidewall frame longerons and bend the sidewalls to meet the tailpost. AT THIS TIME: GO BACK OVER ALL THE TUBES THAT YOU HAVE INSTALLED AND MAKE ANOTHER INSPECTION FOR DAMAGED TUBES, TUBES IN-CORRECTLY INSTALLED. ARE YOU SURE THAT YOU USED 7/8" O.D. x .049 FOR THE CROSS-MEMBERS IN THE BOTTOM TRUSS AT STA. #34 and STA. # 57 1/8 ? NOW IS THE TIME FOR DISCOVERY. DON'T LET MURPHY SNEAK UP ON YOU AT A LATER DATE.

Heating and bending the sidewall frames is not much more difficult than our earlier bending of the longerons. We go about it in the same way.The top and bottom longerons are each bent a little at a time until they line up with the lines that are drawn on the fixture or the centerline of the tailpost in the case of the bottom

longerons. Use caution in the heating of the longerons. Don't start the heating process on the centerlines of Sta. #51 and Sta. #57 1/8. DO START at the aft side of the cross -members at these stations. If you start right on the centerline you can easily stretch the metal of the longerons to a point where they crack. After the heating and forming project is over it is time to install the bracing blocks (Wood) for the rear section of the fuselage as shown by the lines on the surface of the fixture.

The excess length of the longerons can now be trimmed to fit the tailpost. Remember to fit the top longerons so that the centerlines of the longerons coincides with the outside edge or periphery of the tailpost. This is a must so that we insure enough room for the travel of the elevator horns. "Boxing Yourself In At The Tailpost" is an article on Page 5 of the Dec. '76 issue of the Skybolt News and shows a drawing of the fitting of the top longerons to the tailpost.

Before tacking the tailpost in place, be sure to fit and tack in the 5/8 O.D. x .035 diagonal from Sta.#137 to the tailpost, tube #19. This was mentioned earlier in this article. The taipost clamping block that is shown in the Fuselage Drawing, FIG.#1 of Series#3, Vol 6, will prove invaluable inpositioning the tailpost with maximum accuracy.

The rest of the cross-members can now be installed along with the diagonals in the floor of the bottom truss and the interior diagonals that run from lower Sta."0" to the cross-member and top longeron at Sta."24. The interior diagonals that form the rear seat back can also be tacked in place.

The fuselage is now ready for final welding. What will amaze you is the large amount of welding that can be done without removing the fuselage from the fixture. During welding, we leave the "Sidewall Spacing Braces" (angle iron "A" frames)clamped in place as long as possible.If it becomes necessary to move them, do so, but only move them enough so that you can easily work around them.

FUSELAGE WELDING SEQUENCE

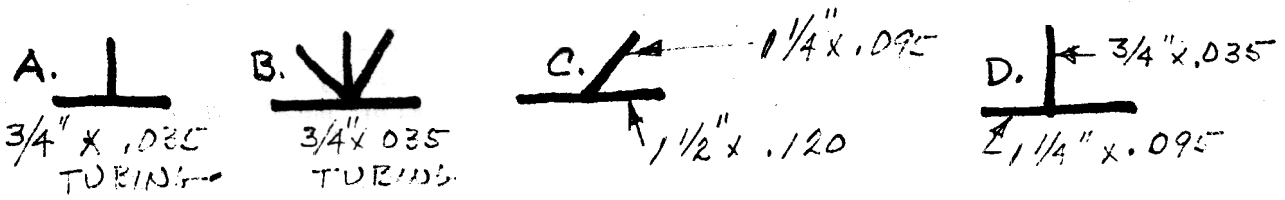
Since your future well being depends on the quality of your welding, I strongly urge you to consider the following suggestions.

1. Unless you are a qualified welder that knows aircraft requirements of welding excellence, it would be wise to submit samples of welding clusters to a such a person for analysis.

2. Take your samples to the F.A.A. for inspection and critique.

3. If there is a welding laboratory at a local college or University, take samples there for analysis.

4. If you are unable to find help in your area, you can send your samples to me and I will assess the quality of same. Be sure to send enough postage to cover the return of your samples and a self addressed stamped envelop for my written reply. A charge of $10 for this service should be sent in addition to the necessary postage to pay for the labor that is needed for assesment. Send your samples and check to H.G. McKenzie, 910 S. HoHoKam Dr. , Bldg.#107, Tempe, AZ. 85281. My analysis of your welding quality will be brutally frank. Samples sent should include the clusters shown here.



You will be surprized how many good "Free" sources there are in most areas of the country. In any event, be sure of yourself before you start the final welding of the fuselage. If there is anyone out in the audience that thinks I am laying it on a little heavy, let me dispell your thoughts with the following story. A true one backed with photos and observers with much aircraft savvy.

One bright sunny day at Fla-Bob Airport in Riverside, Calif. (The home of E.A.A. Chapter #1) a pretty little Smith Mini-plane touched down in an un-eventful landing. The roll-out was equally un-eventful, considering that Fla-Bob doesn't possess beautifully smooth runway surfaces. Actually when the runway is in it's best condition it's like a good mixture of cobblestones and cow pasture so you can imagine what the condition is in some areas between the runway and the taxi strip and thats where it all happened. The results of WHAT Happened were hillarious since the pilot was unhurt except for his pride. As he

turned off of the runway onto the grass area and started taxi toward the hangar, one wheel dropped into a small hole and the"HAPPENING" took place. The gear folded, the "I" struts broke in two where they had been butt welded to produce long enough pieces and then ground down smooth, the cabane struts gave way and whole airplane stopped in an abrupt heap that was almost reminiscent of the old airplane movie that shows an "Octaplane (I think) that starts to taxi and collapses in a heap. This aircraft had just been doing aerobatics prior to landing that day. This pilot has to be one of the worlds luckiest. All of what took place that sunny day can be attributed to welding quality. What is even more astounding, the F.A.A. inspector on this project gave the builder the OK to cover all of these mistakes, so don't look to the Feds as your saviour. After inspecting some of the projects that the FAA has given OK to cover I can tell you in all honesty that I would have advised some of the builders to scrap their project. If'Ole Loudmouth sounds like he's preaching again, so be it. I only hope that articles such as this will influence the homebuilder to accept nothing but aircraft quality. The monthly accident reports that I read involving homebuilts (12 to 15) are dis-couraging to say the least when I know that much of it could have been avoided.

Now that we have the need for quality welding established firmly in our minds, let's fire up the torch and get on with the job at hand.

In the welding sequence I prefer to start at the "O" Sta. and the top longeron and weld the cross-member in place. From there on it will be clearer if you will look at FIG.#3 which shows the fuselage as it lies on the fixture (Minus the fixture for clarity) and follow the sequence numerically as shown.

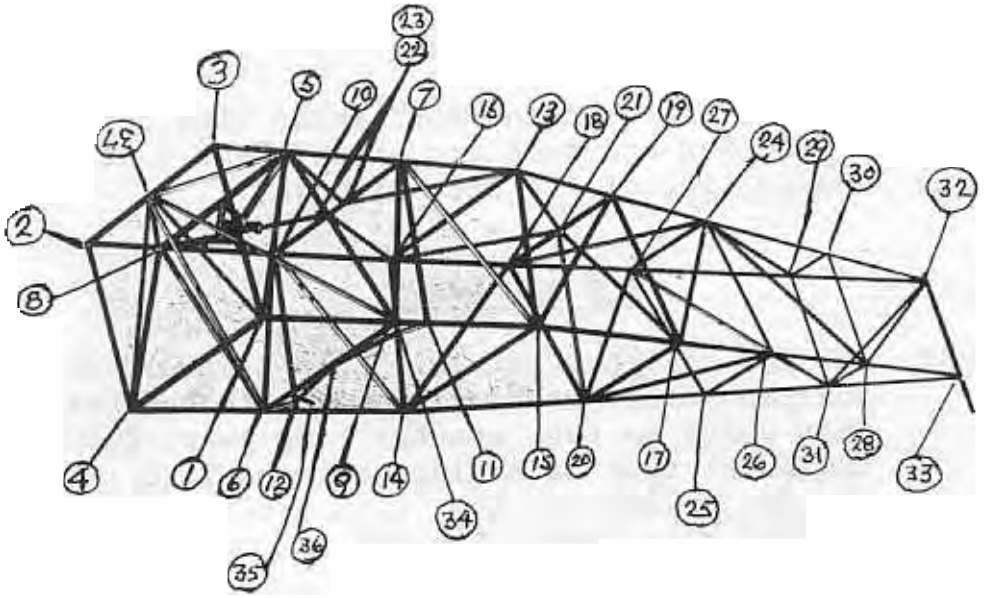


FIG.3

Since the top surface of your fixture has or should have a fuselage centerline drawn in pencil or fine chaulk line, it would be wise at this time, prior to welding, to mark the cross members with a silver pencil line that coincides with the centerline on the fixture. As we proceed with our welding we can use a plumb-bob from the centerline marks on the bottom truss to the centerline drawn on the fixture to keep check of our fuselage squareness.

OUT OF SQUARE FUSELAGES USUALLY ARE THE RESULT OF POOR TUBING FITS, TOO MUCH HEAT DURING THE WELDING PROCESS, IN-ACCURACIES IN THE FIXTURE (BUILT-IN OR DRAWN-IN), IMPROPER LEVELING OF THE FIXTURE, POOR ALIGNMENT OF THE SIDEWALL FRAMES AS THEY STAND ON THE FIXTURE READY FOR WELDING..OR..ANY COMBINATION OF THE ABOVE.

For those of you who wish to treat the inside of the fuselage tubing members with an Anti-Rust solution, we have in stock at Starfire Aviation a Stits product called "TUBESEAL". 1 quart will do an entire fuselage assembly. It is induced into the interior of the tubing through small drilled holes using a hypodermic needle. The drilled hole is then closed with a drive screw or a special size pop-rivet. Full instructions are on the can. This is the modern way to prevent internal rust in tubing. Tubeseal is not drained after injection. In-fact, it will eventually seal small welding pin holes. Tubeseal is F.A.A. approved.

SINGLE PLACE CANOPY INSTALLATION (PART 3)

Part 3 with more photos will be covered in the next issue of the"News".

CANTILEVER LANDING GEAR (PART 1)

This article will start in the next issue with photos of the leg construction and fuselage truss. Part 2 will deal with the construction of the Shock Struts.

ADS AND SWAPS

FOR SALE: NEW 12" polished Hartzell Prop Spinner for constant speed prop, complete with bulkhead that bolts to Lyc. starter ring gear. $100.00
COMMANCHE type fiberglass nose bowl for Lyc. 180 hp. or 260 hp. New. $50.00
CONTACT Mike Udall, Box 189, St. Johns, AZ. 85936