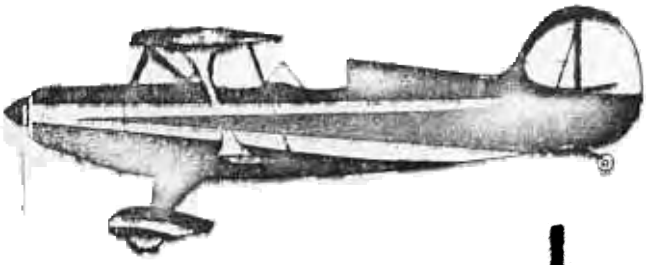


SKYBOLT NEWS

910 S. HoHoKam DR. BLDG. 107
TEMPE, ARIZ. 85281
602-968-2556

SERIES #4, VOL.#1

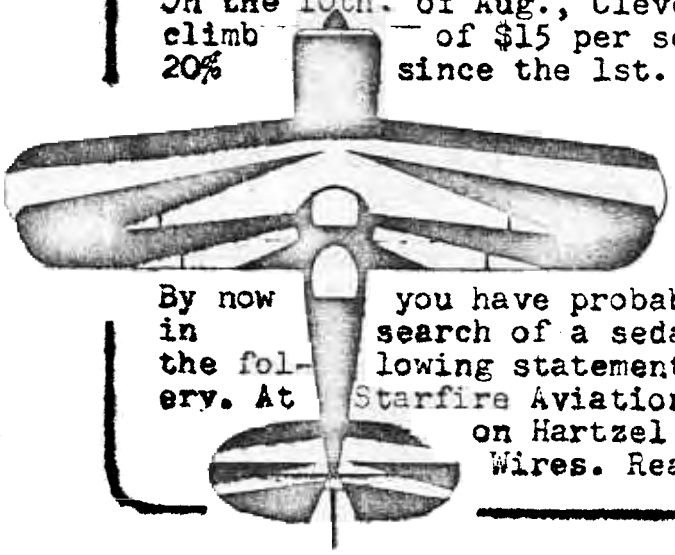
FIRST CLASS MAIL

TO:

HANGAR FLYING with MAC

The " Purple Shaft Monster " has been at it again. Price increases have appeared during the past 60 days that are almost un-believable. Streamline 4130 Tubing leads the list. On July 31, 1978 the list price of "I" Strut material (3.372 x 1.429 x .049) went to $18.68 per foot in less than 25 ft. quantities. The previous price in the same quantities was $10.89 per ft.

On the 10th. of Aug., Cleveland Wheels and brakes took another climb of $15 per set. So far, they have gone up approx 20% since the 1st. of the year.



Lycoming Engines have also gone up. In next months issue of the Skybolt News I will print the list price of several models.

By now you have probably laid down the "News" and are off in search of a sedative. Along with the sedative and the following statement, you may come close to full recovery. At Starfire Aviation I can help you with some discounts on Hartzel Props, Lyc. Engines and Macwhyte Wires. Read further in this issue regarding

Macwhyte Wires. The discounts mentioned are for current subscribers of the Skybolt News ONLY. Let me know your needs and I will get you the price.

FLYING AND LANDING WIRES

In days of yore when there were wire braced birds galore, there also appeared on the scene, several Mfgr's. of streamline wire and tie rods. Today it boils down to one Mfg. That one Mfg. is Macwhyte. If you order direct, you pay full list price. If you order through a dealer such as ourselves, you can most likely get a discount. In either case, you still pay the freight charges from Kenosha, Wisc. Full list price for a set of 10 wing wires with 20 terminal forks, clevis pins, washers and cotter pins is $377.42 F.O.B. Kenosha,WI. The tail group tie rods cost$221.46 for 8 rods and 16 terminal fork sets. Locknuts are also included with the above. Your price is a basic discount of 15% and 4% of the balance or a total F.O.B. price of $488.69
NORMAL DELIVERY TIME IS NOW 18 TO 20 WEEKS FROM MACWHYTE

As soon as you have rigged the wings and tail group you should order your wires. I am not an advocate of ordering wires at a moments notice from a dealer who happens to have them in stock. Many is the letter that has crossed the desk of this author in which the writer has lamented that the wires he purchased did not fit properly. In many cases, the wires had screw thread length that just barely permitted insertion and pass a pinhole check. This is a case where it leaves nothing for re-adjustment when it is necessary to re-rig the wings. Why not play it cool and get the proper length wires. In FIG. #1 and FIG. #2 we show you how to measure the length required. FIG. #1 deals with Pin Hole to Pin Hole lengths for wing wires. FIG.#2 deals with the proper measurement for those of you who are using the Pitts type fittings in the wings. CAUTION, FIG.#1 and FIG. #2 DEAL ONLY WITH FLYING AND LANDING WIRES FOR THE WINGS. FIG.#3 deals with the pin hole to pin hole measurements for the tail group Tie Rods.

Before we proceed, it is in order that I say something about wire size and AN665 Terminal Forks. Wire size is based on the diameter of the threaded portion of the wire and not the flattened section of the streamline portion. In the Skybolt we use Type 2, Polished Stainless, Streamline Tie Rods. The "AN" number is AN675AC-(length in inches & hundreths). This is 5/16" wire. The "AN" number is

the wire size and type specs., while the Dash number in the Rod Length. Example. AN675AC-12525 would be the full number for a 5/15" wire that is 125¼" long.

AN675AC Streamline Tie Rods have a strength in pounds of 6,900. The weakest link in the system is the AN665-46 Terminal Fork that we must use on the Skybolt. It has a rated strength of 4,600 pounds. My intent at this point is to enlighten you and not try to scare you. 4,600 pounds is more than enough integrity in the wing bracing department. The reason that we are forced to use the AN665-46 Terminal Fork is due to the design of the Flying Wire Fitting at Station #13 on the Fuselage. There is not enough room between clevis pin holes to use a 3/8" Clevis Pin and the stronger AN665-61 Terminal Fork which has a rated strength of 6,900 pounds.

Regarding the threaded portions of a AN675AC Streamline Tie Rod, 1 end has 5/16 - 24 left hand threads while the other end has 5/16" right hand threads. The threaded length of the Left Hand portion is ½" shorter in length than the Right Hand threaded portion. Threaded Length is as follows. Left Hand is 1.75" and the Right Hand is 2.25" in threaded length. While we are on the subject of Right Hand and Left Hand Threads, I suggest that when you install the Streamline Rods on the aircraft that you put all of the Left Hand threaded ends towards the fuselage or vice-versa. In other words do not mix the rods so as to have 1 Left Hand threaded end at the fuselage (say the flying wire fitting) and the next wire to it a Right Hand Thread. It is sure to confuse you during the rigging process.

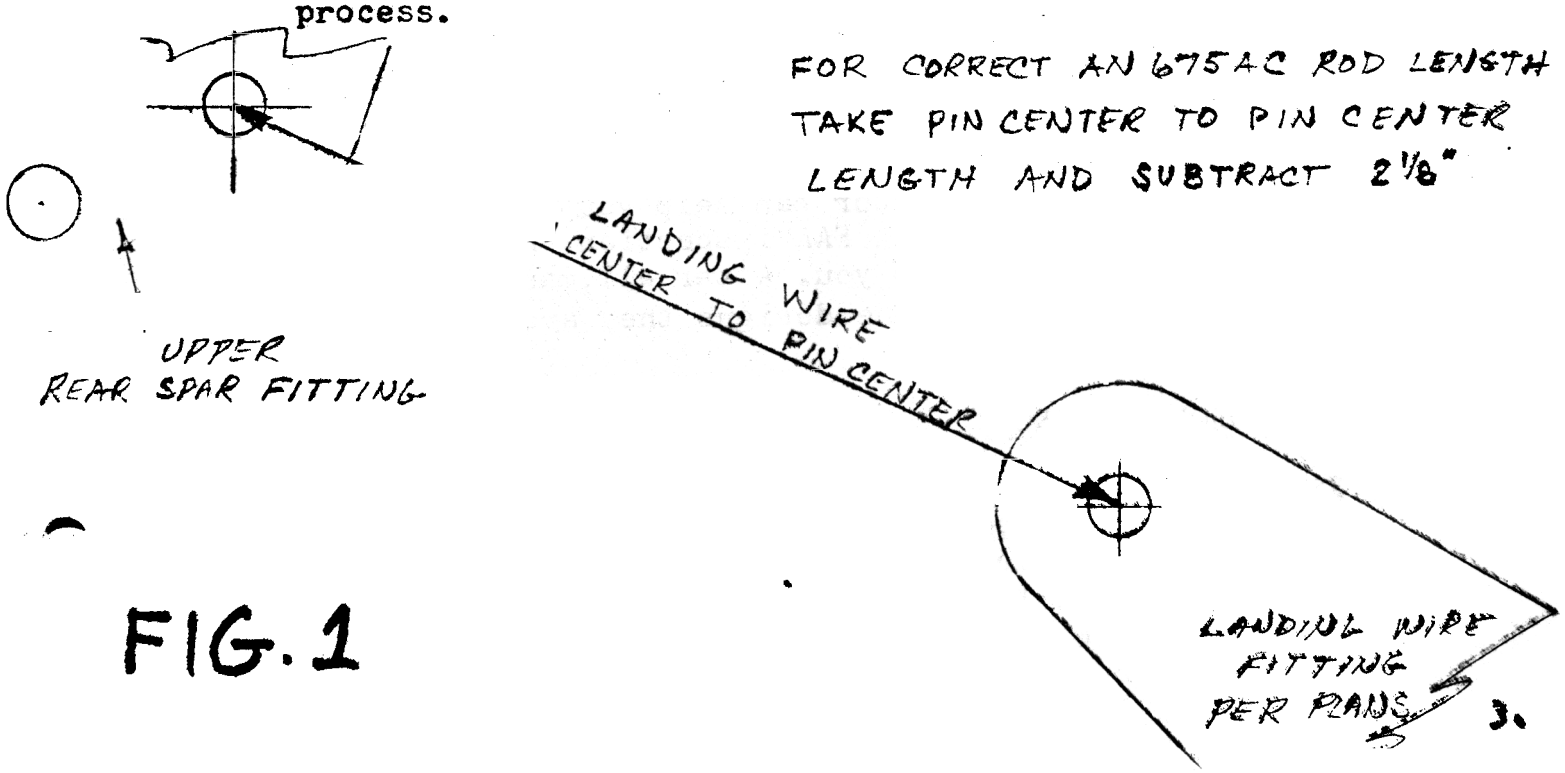


FIG. 1

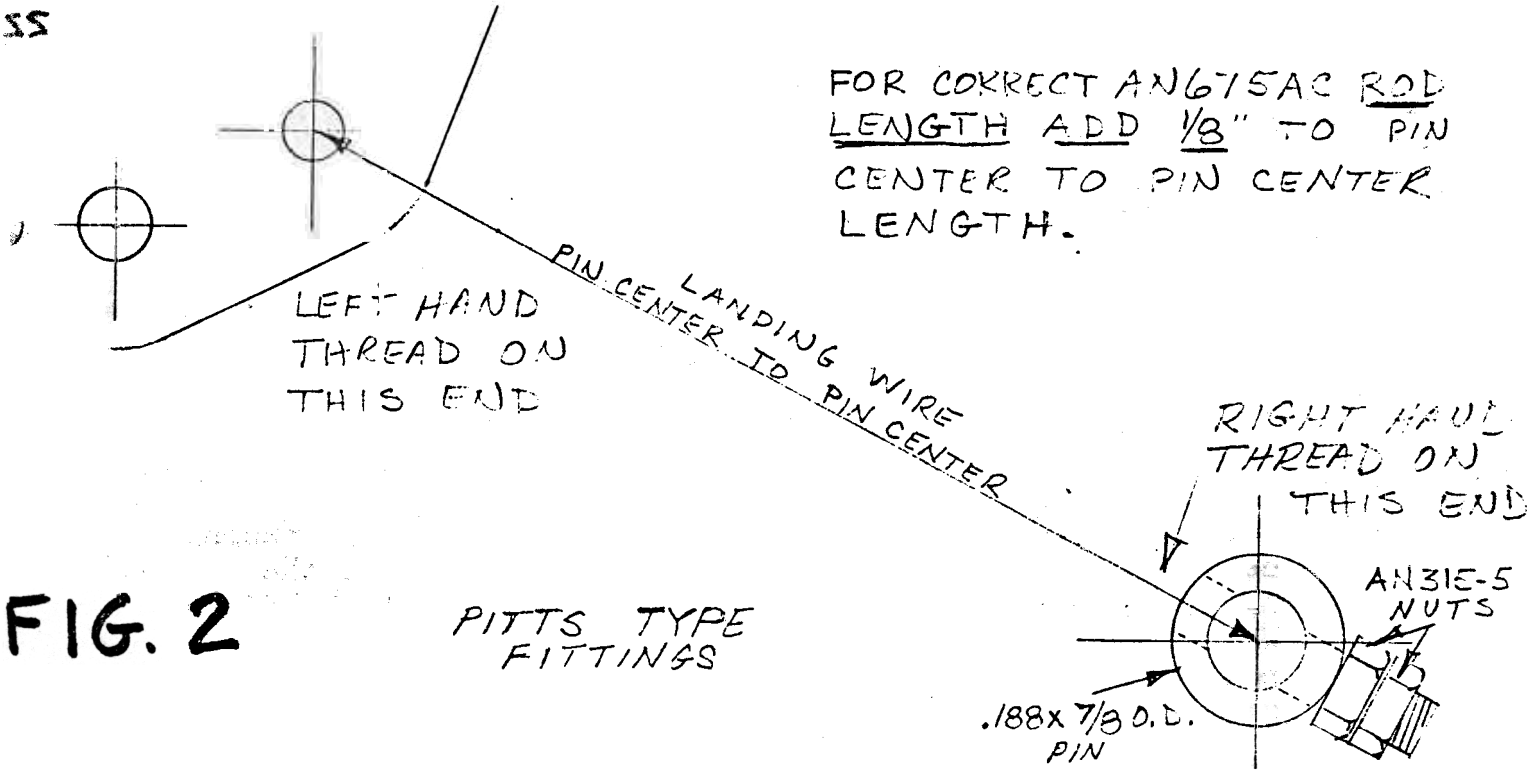


FIG. 2 PITTS TYPE FITTINGS

As shown in FIG.#2, the Streamline Tie Rod is attached to the tubular pin by an AN315-5 Nut and locked with another AN315-5 Nut acting as a jamb nut.

HOW TIGHT SHOULD WE TIGHTEN THE FLYING AND LANDING WIRES?

Tensiometers are very expensive and seldom available to the Skybolt builder when he is ready to rig the aircraft for the last time before test flight. Up to this point, I have never been fortunate enough to have a Tensiometer in my tool box. Therefore I can only give you the rule of thumb that I follow. I tighten Flying and Landing wires just tight enough so they won't vibrate in flight. Naturally, the wires themselves must be streamlined to the airflow. Excessive tightening only results in high compression loads on the spars. If you have a Tensiometer handy, it will probably read in the 600 to 750 pound range. Tail group wires will read in the 260 to 320 pound range. If a tensiometer is not available and you have never installed a set of wires before please seek out an EAA Designee or an oldtimer who have the experience, to help you. Very possibly yourFAA inspector can help you to make this determination during final FAA inspection. Don't be floored if he is unable to help you. After all,many inspectors are much younger than the designs they are called apon to inspect.

TAIL GROUP TIE RODS

Fig.#3 shows you how to figure the proper Streamline Tie Rod length after you have measured the pin hole center to pin hole center length. On the Skybolt we use .190 dia. rods which have 10-32 threads on each end. Here again, I suggest that you use the Left Hand threaded ends against the fuselage and vertical fin and the Right Hand threads

at the Stabilizer fittings. This keeps the entire aircraft set of wires in the same orientation, threadwise. The "AN" number for the Tail Group Tie Rods is AN673AC- The Dash numbers will specify inches and hundreths. A tie rod that is 44 3/8" long would be written as follows. AN673AC-4437 The Terminal Fork that we use is an AN665-21. All AN665 Terminal Forks have the letter"L" or the letter "R" following the Dash Number. Either of these letters denotes the screw thread direstion, "L" being Left Hand and "R" being Right Hand. AN673AC Tie Rods have a difference in threaded lengths as follows. The L.H. threaded portion is 1 3/8" in length and the R.H. threaded portion is 1 7/8" in length. The clevis pin diameter of the AN665-21 terminals is 3/16".

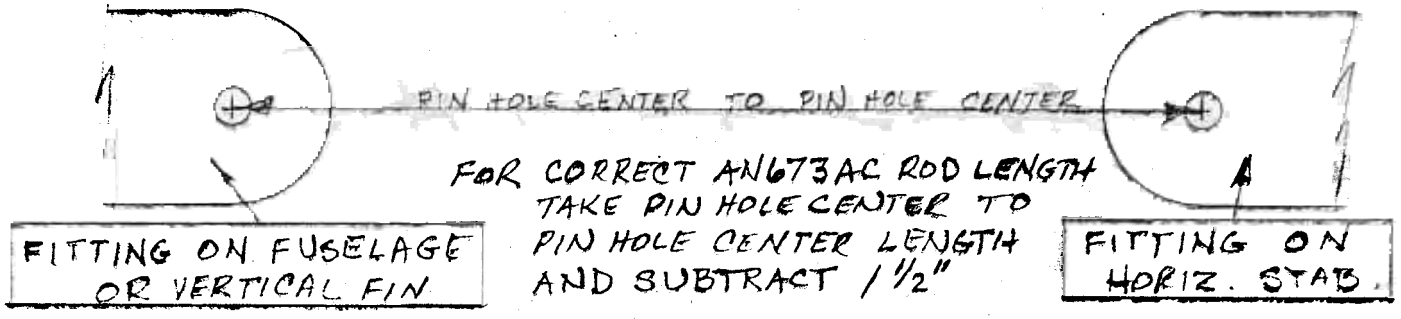


FIG. 3

DON'T LET THE FICKLE FINGER CATCH YOU ASLEEP IN THE EXHAUST STACK DEPARTMENT

I have recently received a letter from a "Bolt Builder" in Florida about some exhaust stacks that he purchased from a well known midwestern firm. After you have read this notice, you may want to make an immediate inspection of your exhaust stacks, UNLESS, you know them from the inside out.

This builder ordered a set of 180 Lyc. stacks and was shipped a mixed set of 180 and 200 Lyc. stacks. He returned the wrong piece and was sent a new one that also did not fit. Both sides hit the firewall rather than the exhaust deflector opening. This poor fitting set of stacks proved to be a blessing in disguise. Since neither side would fit, he cut off the header portion just aft of the point at which the pipe from the rear cylinder is welded to the stack assembly. This is when he discovered the serious construction error. See FIG. #4 and I'll say no more.

THIS IS A DANGEROUS SITUATION WHICH COULD LEAD TO EARLY EXHAUST VALVE FAILURE

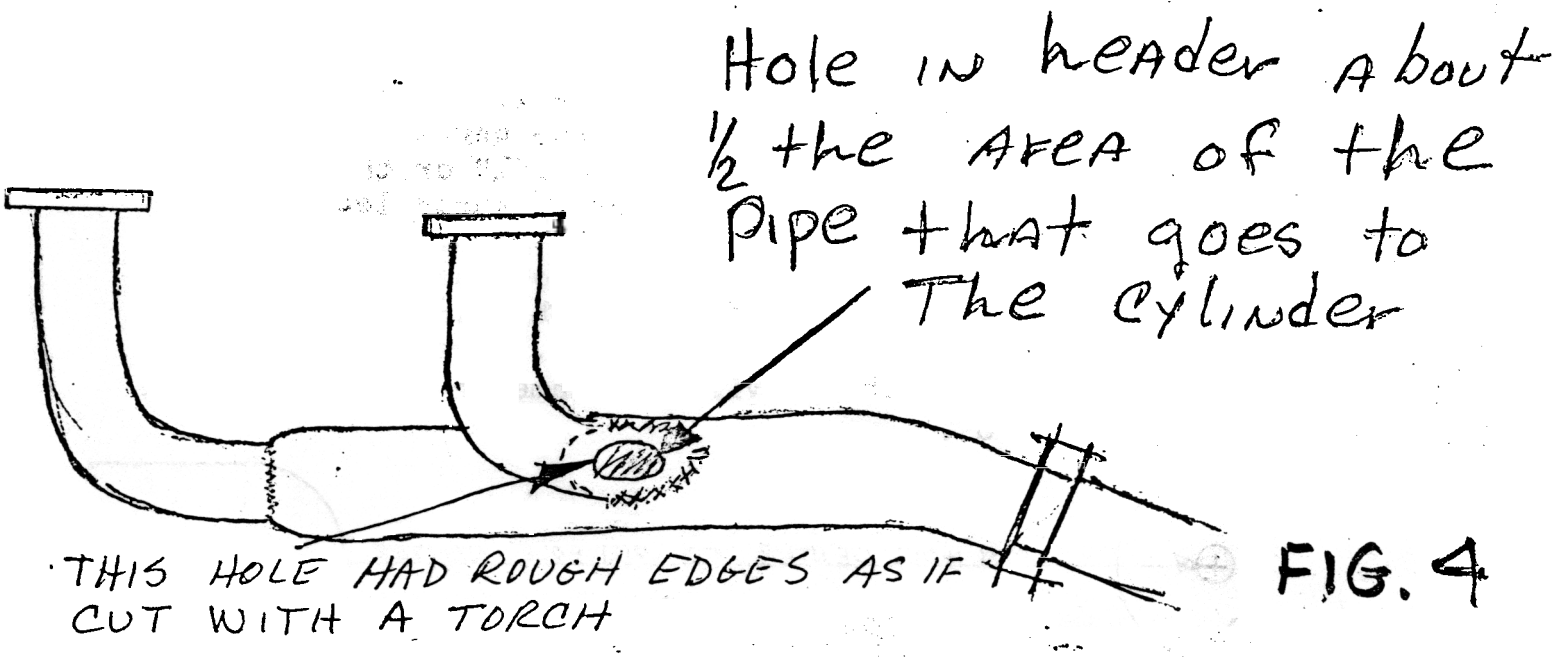


FIG. 4

HOFFMAN FIXED PITCH PROPS are beautiful but, present special prob

If you have been thinking about a Hoffman Prop, fixed pitch (Made in W. Germany) you may wish to consider the following before you actually shell out the dough and I do mean, SHELL OUT. I can't tell you what the fixed pitch price is but the Hoffman 3-Blade that I want for the SUN DEVIL is approx. $2800 compared to the full list price for a comparable Hartzell at $1850. The Hoffman Prop is so light and beautiful, you almost hate to put it in service. Hoffman makes composite props which are much lighter than anything we have in this country. The 3 blade that I am going to use weighs only 55 pounds. This is less than 2 blade Hartzell Constant Speeds.

The real problems are not in the Constant Speed models but are associated with the fixed pitch versions. They are so light that idle speed for the engine must be set to approx. 1000 rpm for anything that resembles a smooth idling engine. They offer practically no "Flywheel Effect" and hence the higher idle speeds.

The next problem also relates to the near zero Flywheel

Effect", and that is the tendency to violently "Kick Back" if the engine fails to start at the moment of magneto impulse. This problem has led to 3 broken Starter Drive Assemblies on one Skybolt that I know of. When this happens, it's a costly repair.

The next big advantage of the Hoffman composite prop in addition to lightness of weight is it's vibration absorbing ability that is almost the equivalent of wooden props. When compared to metal props, the Hoffman does not have the fatigue problems.

In view of the foregoing information I would personally stay away from the Hoffman fixed pitch prop but certainly advocate it's use when a constant speed prop is required.

I remember vividly the instructions from the late Walt Tubbs when I gave him a prop on his Pitts one day at a local airport (Walt didn't have an elec. system). "Don't curl your fingers over the edge of the prop. It kicks back like a mule". How right he was.

SINGLE PLACE CANOPY INSTALLATION (PART 2)

What started out as fairly well cut and dried as far as design is concerned has turned out to be a ball of worms due to the Canopy Bubble that we received from Gee-Bee in Seattle, Washington. This bubble is a revamped Pitts bubble and definitely does not have enough height to allow me to install the sliding rails along the top of the longerons. I have therefore raised the track assemblies approx. 2" higher than that which was shown in the last issue of the Skybolt News. FIG. #5 shows the layout of the mounting bracket at the Headrest as it was being checked for fit. FIG. #6 and #7 show what the modification of the Headrest Former looks like after the bracket was made and installed. FIG. #8 is a view of the same bracket at an isometric angle.

Before we get the horse before the cart, take a look at FIG. #9 where I have the Bubble sitting in place to determine the necessary height of the tracks. You can readily see what I mean when I say that I was disappointed in the height of the bubble. I am now in the process of designing a new bubble for the future. For the present however, I will continue this article based

PSS

on the bubble that is shown. A big drawback to a canopy of this height is that your view of the ground is restricted when looking directly downward. It will be necessary to slightly roll the aircraft in flight to get a better downward view.

In FIG. #10 Tim "Firewall" Sommer is shown marking the cut off line on the bottom edge of the bubble so as to take advantage of as much useable height as is possible. When we received the Canopy it still had the wide clamping flange on the bottom that was used during it's forming. In FIG. #10 only the flange had been trimmed off on the bandsaw. When the bubble is trimmed to final height there will be a band of very poor optical quality approx. 3/4" wide running around the bottom edge but this will be covered by the skirt and mounting frame assembly so it will not show.

In FIG. #11 you will see the tracks as I have them positioned in place to determine the size and angle of the front mounting brackets. The tracks are being held in place so that they are absolutely paralell with each other and the centerline of the fuselage.

In FIG. #12 you will notice a band of masking tape going up over the aft end of the bubble. This will be the cut off line. Not shown in this photo is the cut-off line for the windshield. This will be shown in a photo in Part 3 of the Canopy Installation. Also to be shown in Part 3 will be the slot that I have cut in the Turtledeck to allow the inner portion of the track to slide back.

FIG. 6

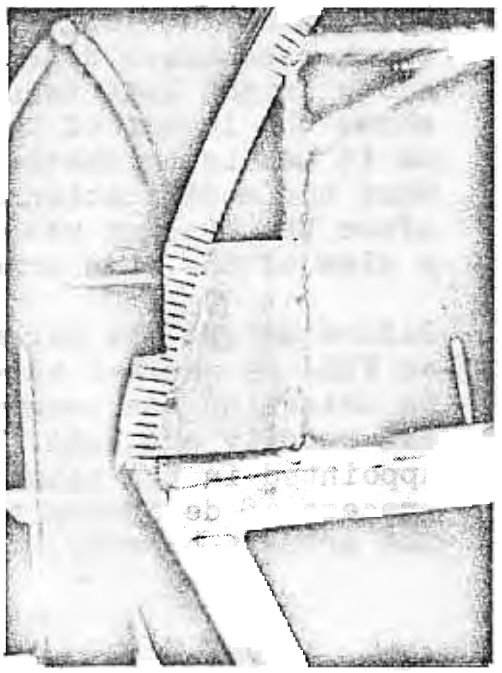


FIG. 7

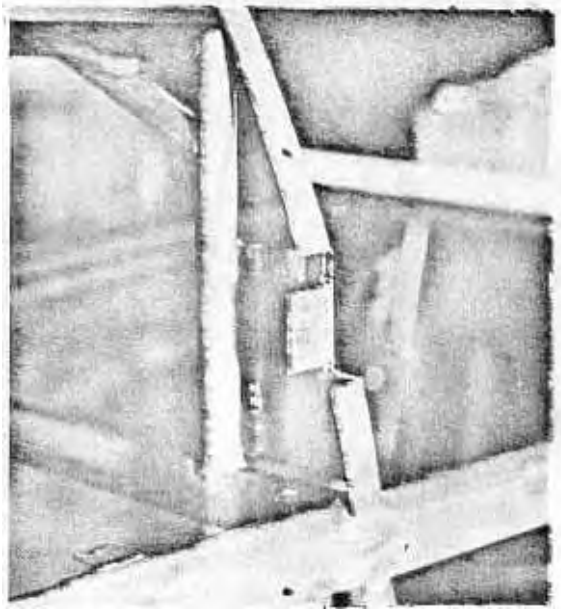


FIG 8

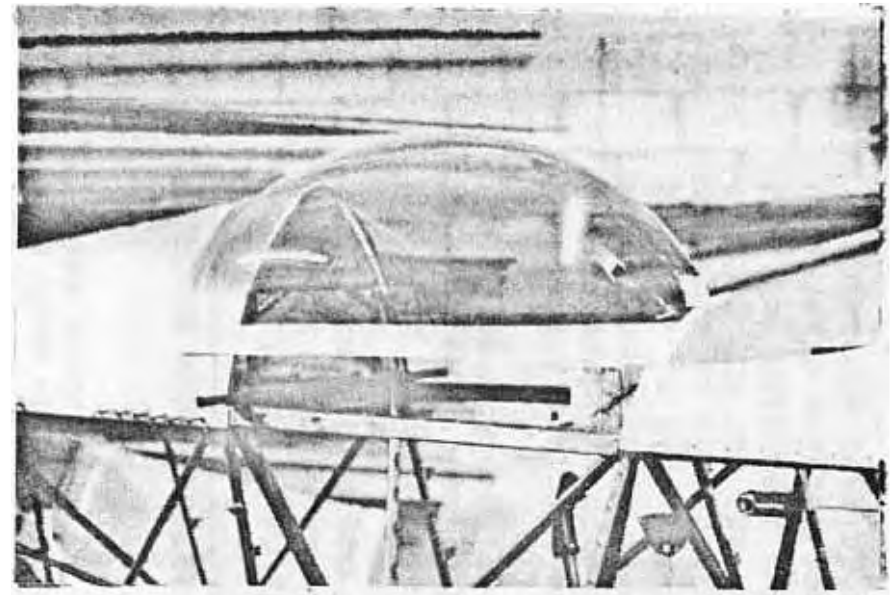


FIG. 9

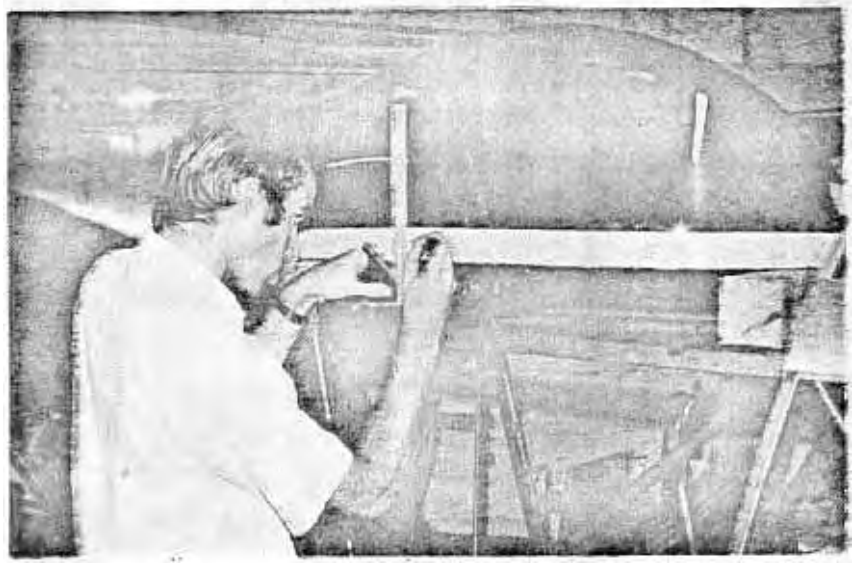


FIG 10

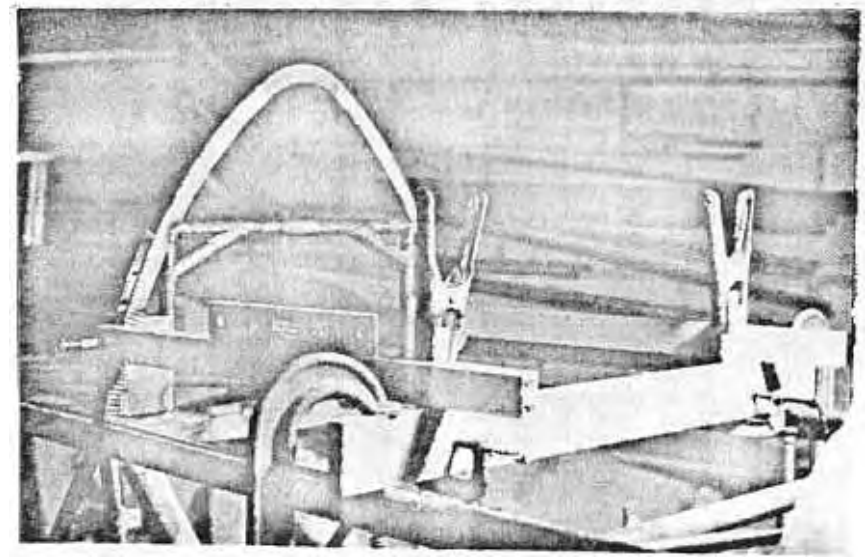


FIG 1

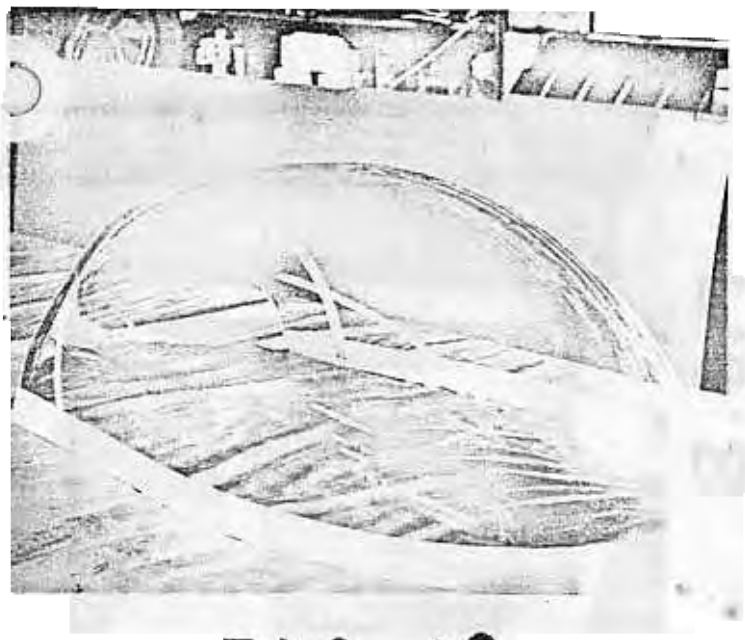


FIG. 12

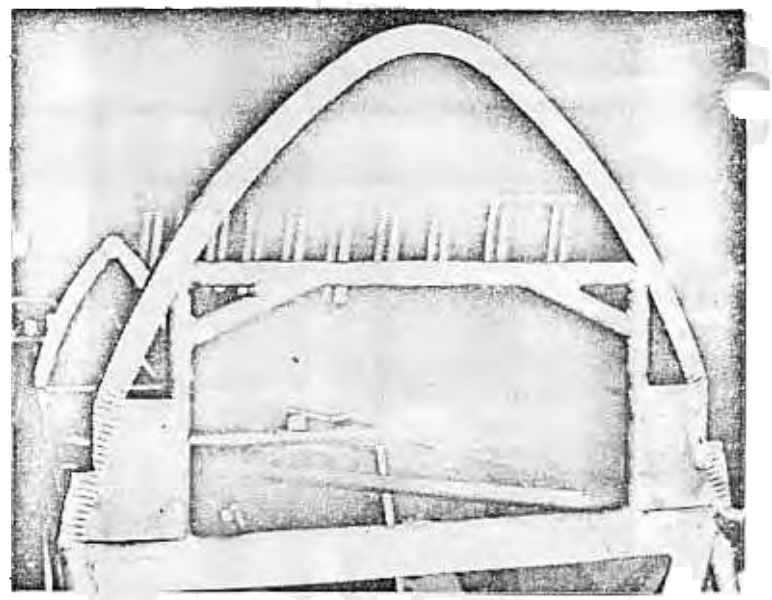


FIG. 13

During the set up of the bubble and installing the tracks, the fuselage was in level flying position. In FIG. #10 we are using a piece of rectangular tubing across the top longerons as a movable point of reference from which to measure the bottom cut off line of the bubble.

FUSELAGE CONSTRUCTION (Part 2)

When we left off in the last issue of the Skybolt News, you were fitting all of the sidewall frame members in the fixture that you had built.

Now that the sidewall members are in place, it's time to tack weld them to hold them together so we can remove the sidewall frame assembly from the fixture.

There is a definite proceedure that I use in tack welding to equalize stresses as much as possible and to minimize in-accuracy of tubing alignment during the welding process. In FIG. #14 we see a drawing of the intersection of 2 pieces of tubing. I have shown with the letters "A" "B" "C" "D" the sequence that I employ during tacking. For thin wall tubing such as ours I use a #2 tip in a Smith welding torch. The Filler Rod is Oxweld #7. The pressure regulators are set to 5 lbs. on both Oxygen

and Acetylene. The inner cone of the flame is adj. for a length of approx. 5/16" and the flame is neutral. I make all tack welds as small as possible, within reason, (approx. 1/8" in diameter) so as to keep the temperature rise of the surrounding area as low as possible. Where more than 2 tubes meet each other in a cluster, the sequence of tack welding is as shown in FIG. #15

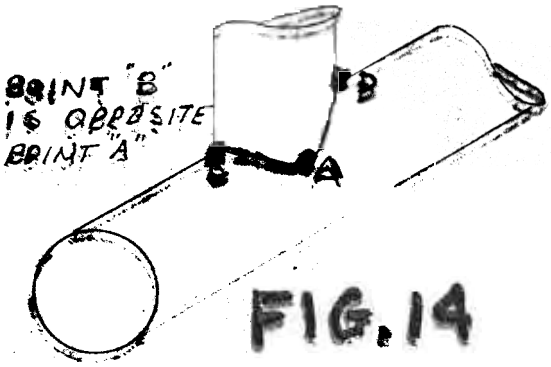


FIG. 14

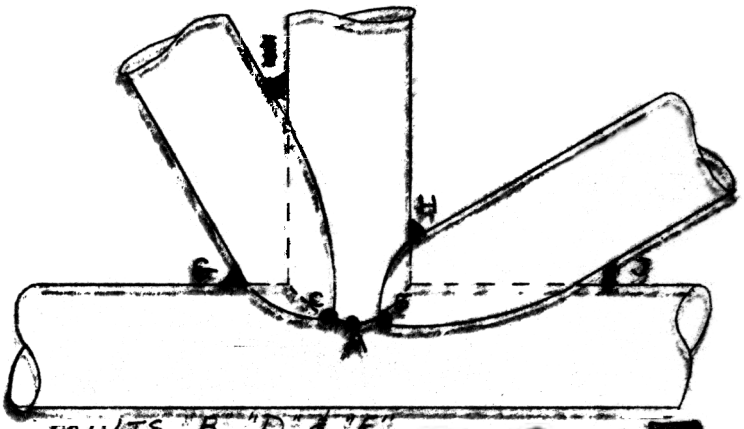


FIG. 15

In FIG. #15 the sequence cannot be fully shown in the drawing but goes as follows, A then B on the opposite side, C then D on the opposite side, E then F on the opposite side, then G, H, I and J. You will notice that where you have a long angle we make a tack bridge as shown at I and J.

The welding sequence of FIG. #15 will be from E to H to F. Then from C to G to D. Then from C to I to D. Then from D to B to F to J to E to A and ending at C. In this way we are welding the short runs first so as to give as much pull as possible against the longer runs where the heating is greatest and the distortion greatest.

In Fig. #14 the welding sequence is as follows, from A to C then from B to D to A. Then from C to B. This sequence will result in minimum distortion and stress.

When the welding of a cluster has been completed and the cluster is still hot, evenly heat the entire cluster to a Dark to Medium Cherry Red (1075 to 1250 degrees) and let it cool in still air. This will stress relieve the cluster with minimum use of Oxygen and Acetylene.

Many times I have heard builders say, " I sure wish that I could put the fuselage in an oven and stress relieve the entire fuselage evenly and all at one time." To do this would necessitate a huge thick steel fixture to hold the fuselage in alignment otherwise it would probably come out of the furnace looking like a corkscrew.
In next months issue we will put in the intercostals and explain the welding sequence of the entire fuselage.