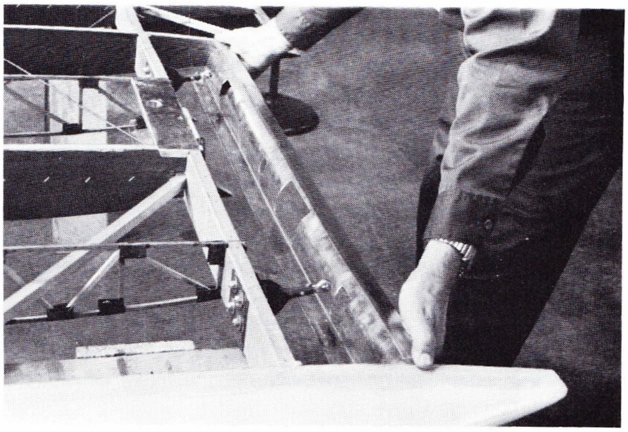
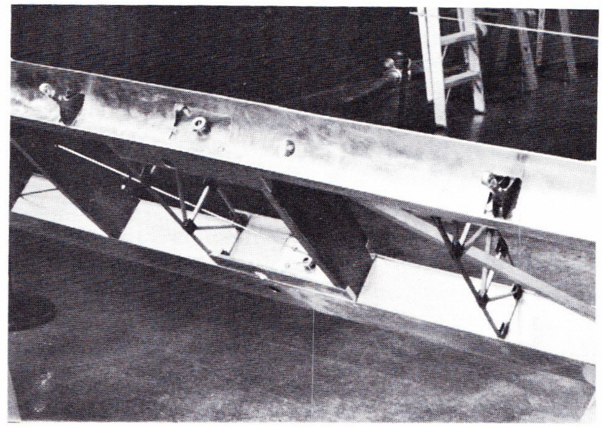
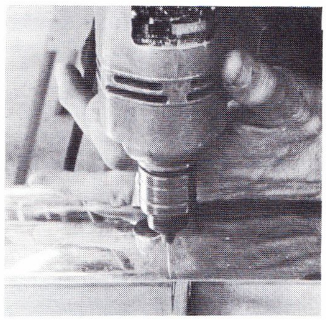
Installing wing aileron trailing edge.



Curved aluminum fitted to short wing ribs on wing — note aileron fittings.



A fine drill is used to drill hole in aluminum prior to nailing.



Bob Ladd nails pre-formed leading edge in position. Note adjustable straps that hold aluminum leading edge tightly in position.

of each member is chosen to have just the right leverage to produce a good feel in the control stick when in flight. The bell crank, which operates both the lower ailerons, is given its particular angle to create the proper deflection and you will note that on the lower wings the idler type bell crank is located midway between the aileron and the root rib. This allows for smaller diameter push-pull tubes and less flexing or supporting of the push-pull tubes than if it were constructed in one piece. You will note that all aileron push-pull tubes are ballbearing actuated and are adjustable. Note that the aileron hinges are firmly attached to the rear wing spar having ballbearing attachments which adds to the lightness of aileron control on the Acro Sport.

Aileron construction generally follows that for the wings. Note the dimensions and materials shown in the drawings and avoid anything that would obviously increase the weight of those hinged members. A full size aileron jig drawing is provided.

Wing leading edges are covered with sheet aluminum to give a true airfoil shape and support the covering fabric against air pressure. The aluminum leading edge must be preformed and fitted accurately against the leading edge wing rib nose blocks. ¼″ x ½″ spruce strips are glued between the wing ribs — both on top and bottom of the front spar. This allows for a firm and smooth fitting of the trailing edges of the aluminum which are nailed to these capstrips. The aluminum leading edge should be measured so as to pass at least ¼″ to ⅜″ behind the capstrips on top and bottom of the spar. The aluminum should then be bent inward at least at a 33° angle so that when the fabric is placed upon the wing a sharp edge will not provide a cutting action against the fabric. I must remind you that it is desirable to hold the aluminum leading edge as closely and as uniformly as possible in the interest of good safe airfoil behavior in flight. One way to bend new aluminum is to place two planks on edge between horses with a gap of two inches or so between them. Lay the metal over the gap, place a length of iron pipe of suitable diameter on it and above the gap, press the pipe down forcing the metal to bend down between the planks. It will spring back some when pulled out but the leading edge radius will be there and just right. It is not necessary that the leading edge wing skins be in one piece. Two or even three pieces can be used, however, care should be taken that each section is overlapped by at least one inch — the overlaps being made at a wing rib.

I would again like to remind you that a ¼" x ½" spruce filler strip is nailed to top and bottom surfaces of the front spar as well as the top and bottom of the rear spar in the area of the aileron. Aircraft quality nails of ½" by 20 gauge are recommended.

Nail the aluminum to the spars bottom edge with the nails going through both metal and the filler strip. Push the metal down firmly against the leading edge wood nose rib blocks, wrapping the metal around these so it can be nailed to the top of the spar cap, smooth and free of ripples.

After the first section of metal is on, wrap a piece of fabric cloth around the wing to see how the metal affects the fabric surfaces. Try particularly to avoid a ridge running along the top surface of the wing at the rearward edge of the material which will be just behind the front spar. That would cause premature separation of the airflow from the wings upper surface and produce poor flight characteristics.

The trailing edge is merely a strip of aluminum bent to a V-shape on a break and with the raw edges turned inward so that they will not chafe the fabric. The bend also adds strength.

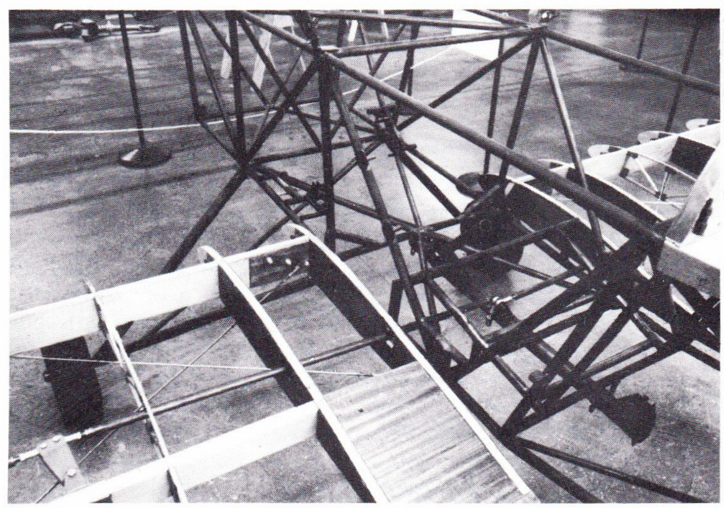
Fiber-glass wing tips for the Acro Sport were developed and furnished by Wag-Aero, Lyons, Wisconsin. Check SPORT AVIATION for advertisers offering similar wing tips for the Acro Sport.

The wings of this airplane are quite conventional in design and construction and if you have studied the plans well and read the "How-To" literature provided by EAA, the job should pose few difficulties.

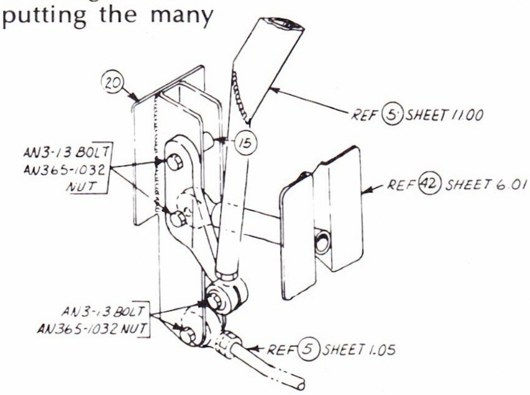
I would like to mention that no set of aircraft drawings can be readily picked up by the amateur and, without any degree of study, immediately be used to build an airplane. One's first glimpse at a good set of aircraft quality drawings may bring confusion and a "where do I begin" look. Self-education is a key factor in putting the many and varied details of aircraft drawings into their prospective positions, referencing from one sheet to the next, a cross check into manuals and even discussions with others.

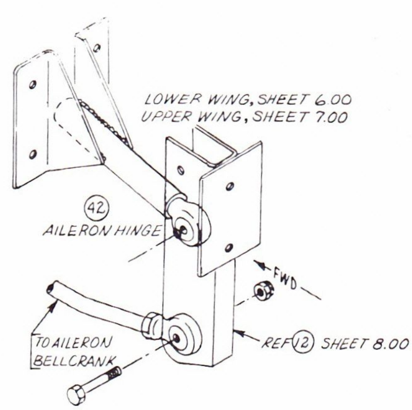
It always has been encouraging to see the reaction of an individual or group of individuals who, after first looking at a set of aircraft drawings, wonder "where do we begin" and then, speaking with these people two or three weeks later, we are encouraged to learn that the many bits and pieces of information have been jelled into a progressive program with an understanding of what it might take to build an airplane.

We would like to state that the EAA Acro Sport is an effort in both self-education as well as providing educational information on the construction of a typical light aircraft of the biplane configuration. This educational material can be used as a homework shop project or for schools, providing the individual with the many and various talents and skills necessary in the design and construction of an aircraft of his own imagination. The EAA Acro Sport has been constructed to provide the basis for this educational information and to develop one's own talent.

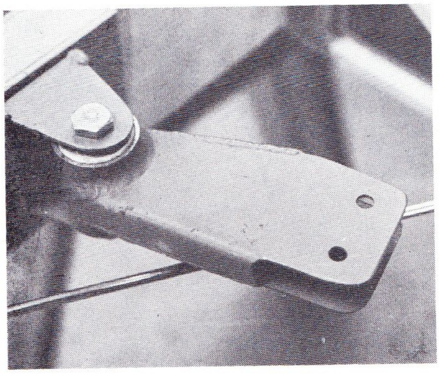


Lower wings temporarily fitted into position to ensure clearance of aileron torque tubes.

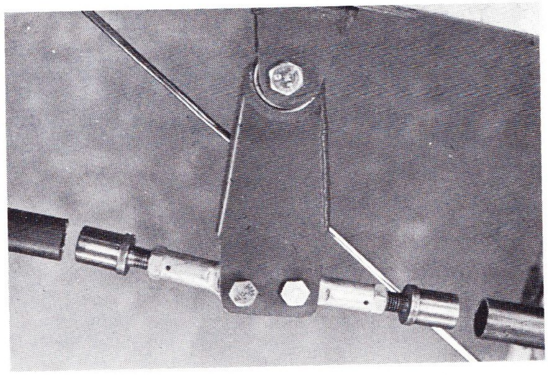




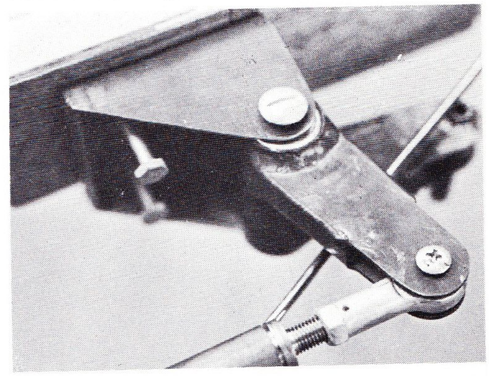
Aileron Idler. Insure angles permit proper clearance of wing anti-drag wires with bolts and nuts installed.

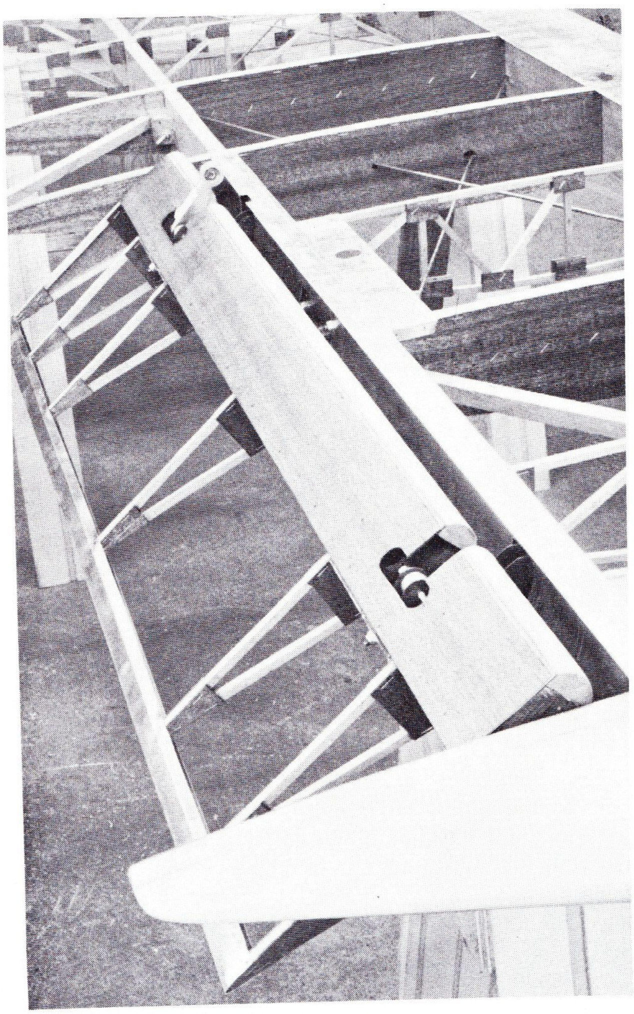


Aileron idler showing rod end bearings fitted into position, prior to welding to aileron push-pull tubes. A small fish mouth or V cut must be made in tube end prior to welding.

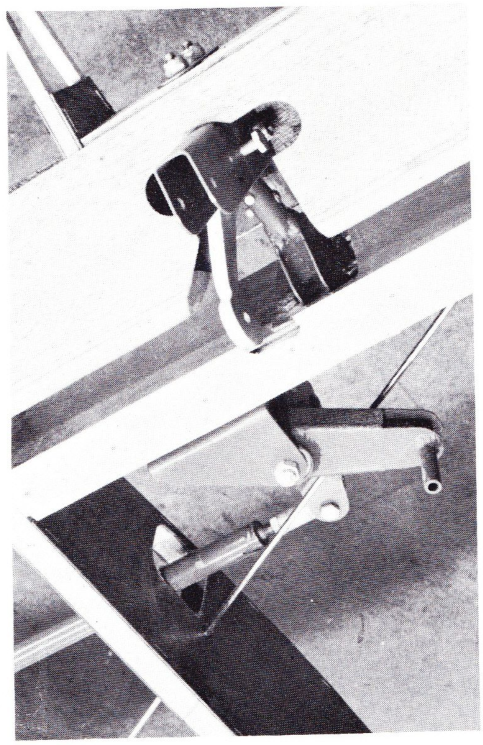


Aileron bell crank temporarily fitted into position to check final alignment and clearances.

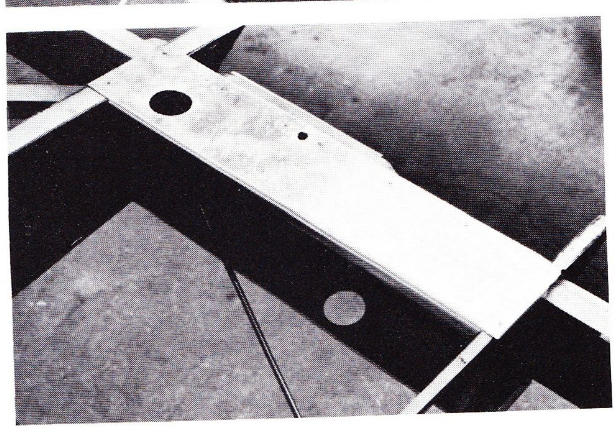




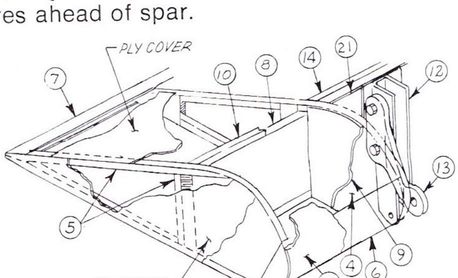
Aileron fitted into position. Note aluminum plate mounted between 2 ribs with hole which permits smooth fairing for installation of flying wires ahead of spar.



Aileron bellcrank assembly less inter-connect rod.

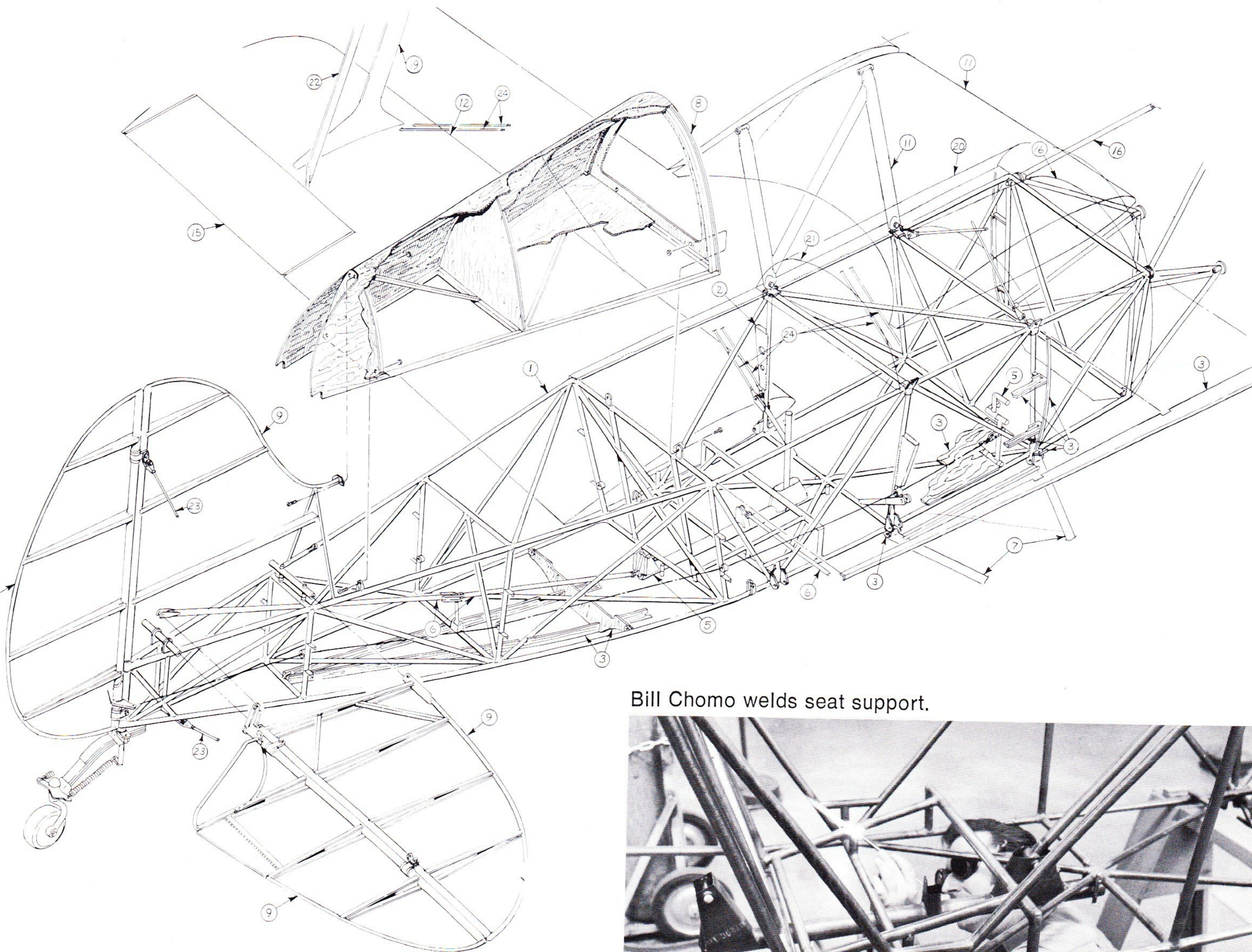


Aluminum plate over landing wire fitting. Wire goes through hole.

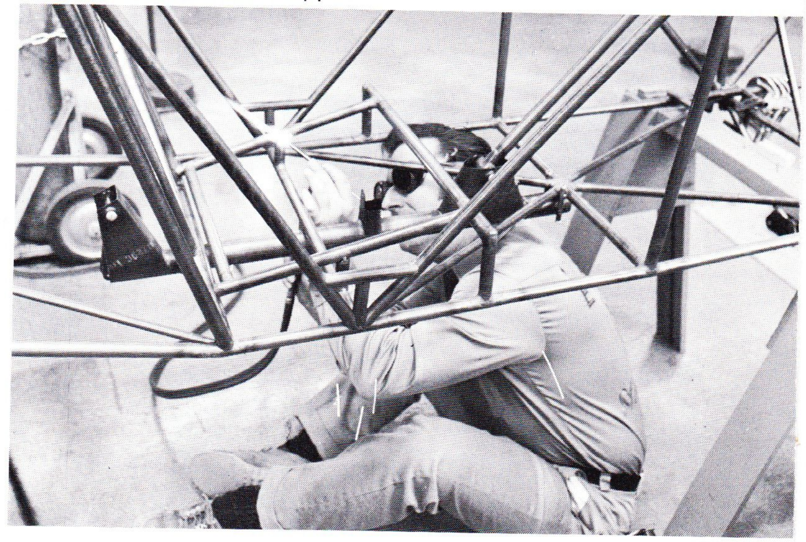


Aileron cut-away.

fuselage/tail



Bill Chomo welds seat support.



group

The fuselage and tail group of your sport biplane are made of welded steel tubing, a form of construction well adapted to special purpose and limited production airplanes. It is readily formed into an infinite variety of shapes with simple tools and hand work. Joints and fittings are simple to make and to attach and the result is a strong, durable safe structure. Probably its only disadvantage for the amateur is that a certain amount of skill is required in gas welding. The trick in gas welding is to learn to adjust the flame and manipulate the torch in such a way that while the thin walled tubing is always kept hot enough to make a secure weld, it is never heated so much as to burn a hole through it, and to manipulate the torch and welding rod so as to produce a uniform, smooth bead.

Some amateurs solve the problem by learning to weld either under the supervision of veteran airplane mechanics or by enrolling at a night trade school. With diligent practice one can learn to weld in a few weeks and we have found many individuals have learned to handle the torch in relatively short times in the same manner as a veteran.

A midway solution to the problem has been found by many amateurs. They learn in a few hours how to do tack welding — dabbing just enough weld metal onto joined parts to hold them securely in place. An entire fuselage or tail group assembly can be tack welded.

The real time-consumer in a steel tube fuselage is doing the accurate layout jigging and cutting metal to fit. A tack welded fuselage can be turned over to a more expert welder who can then do the skilled final welding in perhaps one or two days time. If you have joined an EAA Chapter, finding an expert welder should be easy. In fact, since the birth of EAA some 20 years ago, the availability of experienced welders in the U.S. and Canada has been greatly enhanced.

Most government licensed airplane mechanics do only a small amount of welding in everyday aircraft maintenance work and are glad to gain experience and practice involved in welding up a complete fuselage. Consequently, they may offer to do it in their spare time or give you guidance in what is considered quality welding.

Quite often we are asked if it is wise to take aircraft components in need of final welding to structural and machine shops. We would advise that most of these shops are accustomed to welding thick metals and comparatively large torches are used and they will need quite some practice on thin walled tubing to get the knack of it.

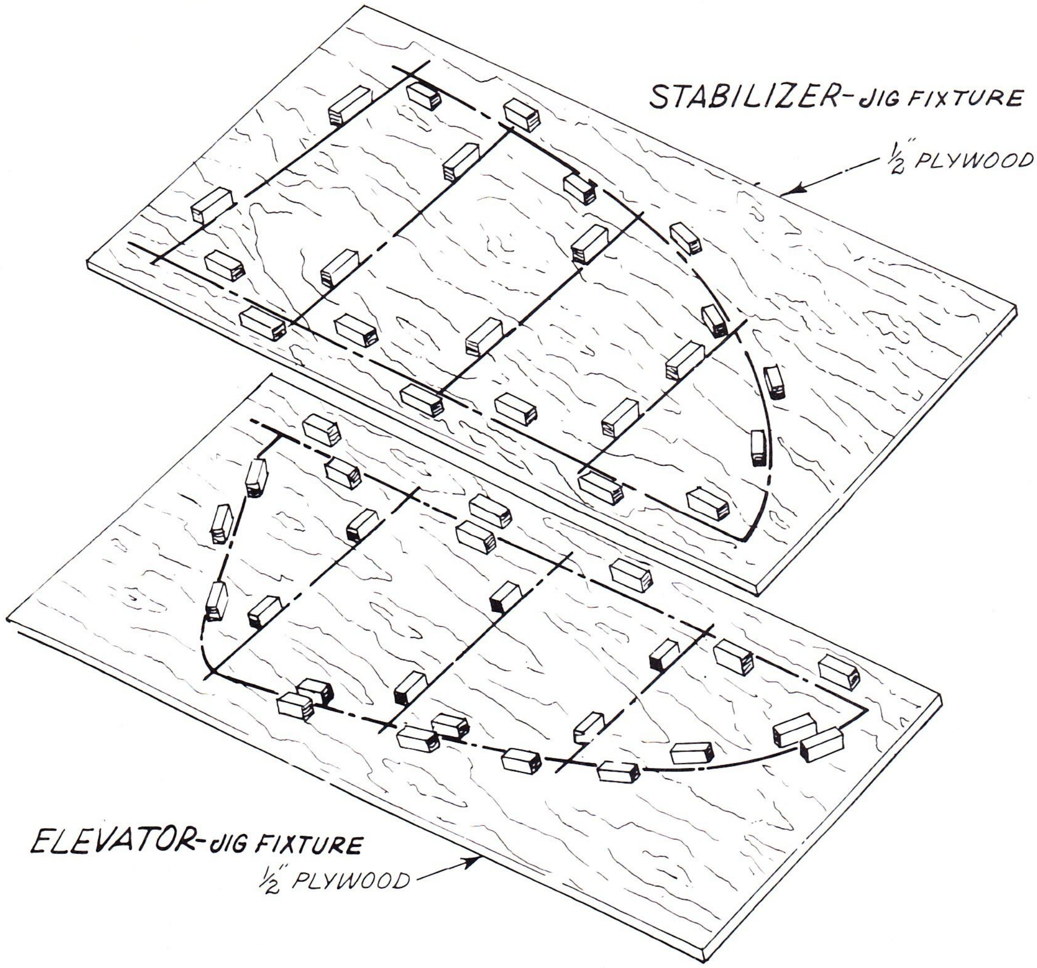
Gas welding is used in small airplane work largely because heat can be controlled and altered more rapidly as you work around a cluster joint. Heat is drawn away from the weld at varying rates. Frequent slight flame adjustments are needed and are quickly made with the torch valves.

Before tackling the fuselage which is a big job and a costly one if botched, it might be well to start by making the tail surfaces. It gives practice and if any one of the five components turn out to be unairworthy, making another one is far cheaper.

You will note the illustrations in your drawing and in your book regarding fuselage and tail group jigs which are made on a sheet of utility plywood at least ⅜″ thick or, preferably, ½″ or more to use as a base. It is recommended that the plywood be fixed to a 2 x 4 frame so as to maintain a level and accurate as possible jig. The jig can then be placed on sawhorses making sure it is flat, level and steady. Lay out the tail surface outlines by means of squares and draw up a full size tail group plan on the wood. After the full size tail group center lines are completed and tubing size determined, jig blocks of 1″ square by at least 3″ can be nailed into position allowing sufficient room either side of the center line for a snug fit of the appropriate size tubing. For example, the rear stabilizer spar or rudder post is a ¾″ diameter tubing. Measurement of ⅜″ on either side of the center line will give you the distance on either side of the center line and will measure out to the size of the appropriate tubing or ¾″.

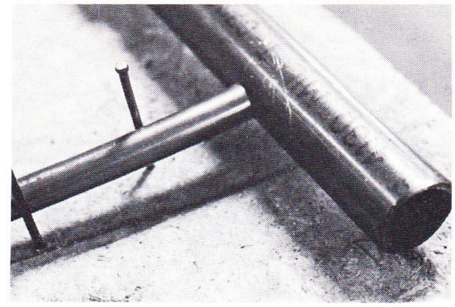
Some use the appropriate size tubing to establish accurate nailing of the blocks, placing the tubing directly over the center line, while others will obtain a piece of plastic of the proper width scribing a center line down the plastic and placing it over the center line of the full size jig drawing. The plastic enables one to easily and visually match up the centers and the outer edges of the plastic determining the appropriate distances from the center lines that the jig blocks must be attached to.

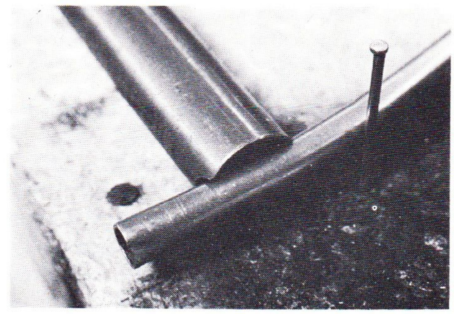
The tubing, leading edges and trailing edges of the tail group can be bent in different ways. Tube bending machines used in production work operate on the principal of three rollers where feeding a tube through results in it being bent into a circle. Expert workmen can adjust these rollers to get a variety of bend radii and with practice could turn out smoothly bent tubing of non-uniform radius. You

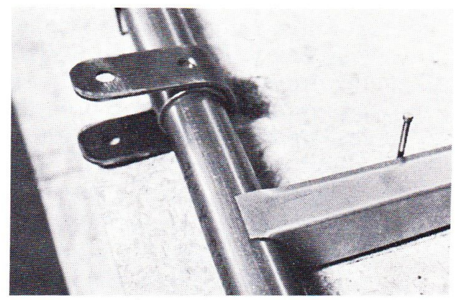


Elevator and stabilizer jigs with spar and ribs in place. Trailing edge to be formed and tack welded into place.

Wooden jigs are built to hold all components in place during welding. Control hinges must be slipped into position before tack welding.



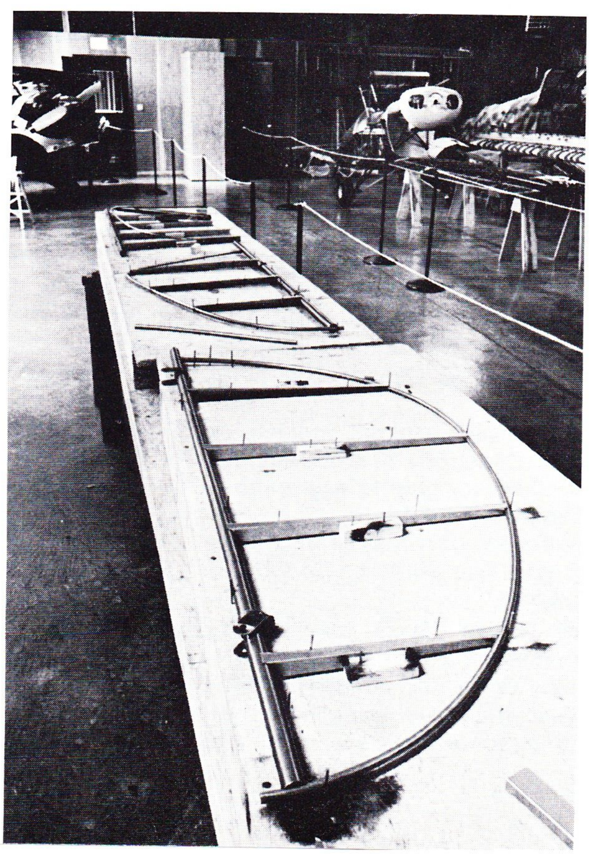


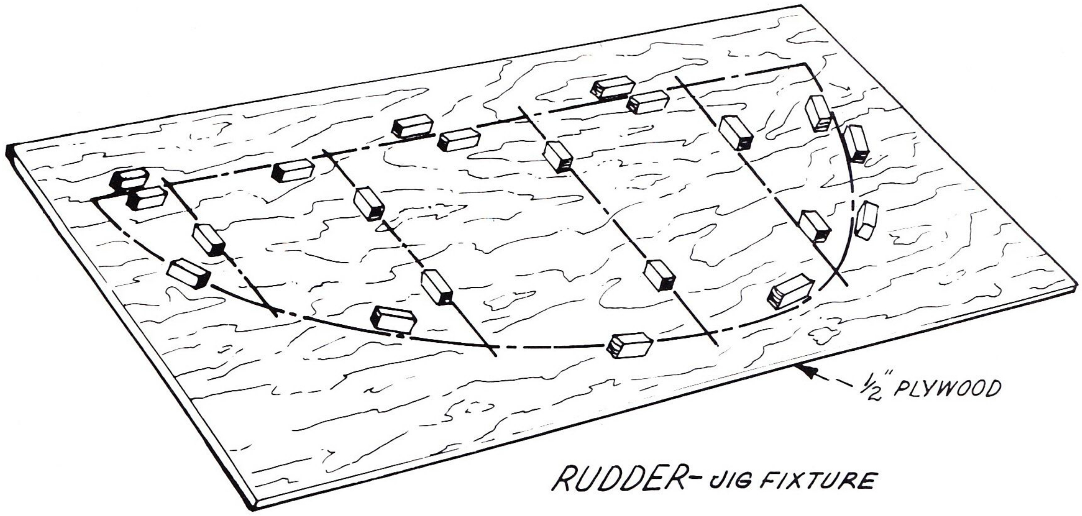


TOP — Elevator trailing edge tube is centered on spar prior to tack welding into position.

CENTER — Elevator trailing edge is fitted into outboard end of elevator spar tube. After tack welding, heat and bend end of spar tube flush with trailing edge. Excess material is cut off after completed welding.

BOTTOM — Aileron rib fitted to rudder and elevator tubes. Hinges must be slid on spar prior to assembly.





can glue blocks to your plywood base along the outline and then bend the tubing around them — or full size tail group components can be laid out on ½" plywood and the tubing bent around the outer edges to the proper radius.

Some builders have grooved the plywood so as to get a better fit or attached the tubing to be bent at various points to hold it uniformly around the radius. It is recommended that when bending radii the extension of 8 to 10 inches be extended past the intial point to be bent so as to give greater leverage and make bending much easier. The extra length can always be cut off prior to attaching and welding to the tube elevator or stabilizer spars.

Heating by welding torch can also be used to aid ease of bending, however, care must be given so as not to concentrate heat in one particular area which could cause kinking or deformity. It is also possible to bend free hand, and many have been able to do a very fine job by using the back of a vise or a section of 6 or 8 inch pipe or even junked auto wheels or the corrugated parts of oil drums, old automobile brake drums, etc.

In making forming blocks remember that steel tubing will always spring back a little after being bent. This is overcome by blocking the tubing onto the work board securely right over the pencil lines.

After ribs and tubing are welded together, the bent leading edges and trailing edges will retain their desired shape.

After having gotten the desired smooth contour of both the leading and trailing edges of your tail group, check the bent tubing to be sure it is straight and not crooked in the edge view. If any variations are noted, lay it on a flat surface, place a hard wood block against the tubing and carefully hammer it into alignment.

The tapered ribs of the fin, stabilizer and rudder are bent on a metal worker's brake. Check your drawing for appropriate material as well as dimensions and bending radii. In bending metal always be careful that the radii are not sharp as this will have a tendency to tear or crack the metal. Bending can also be accomplished over your own hard wood blocks.

When jigging up these surfaces note that there is a size difference between front, center and rear edges of the tubes. You will have to shim up the slimmer ones toward the trailing edge as needed to get everything to lie flat and true prior to tack welding.

To prevent the wood from burning and smoking while welding on the plywood work base, place a square of sheet asbestos or sheet metal under the welding area.

In fitting the stabilizer, elevator and aileron ribs into the jig, measurements from the center of the leading and trailing edges must be taken. A rat-tail file sized to the tubing that the ribs must fit will give a very form-fitting surface. For example, the stabilizer, elevator and rudder spars are of ¾" tubing. A ¾" rat-tail file will give you a ¾" half-round surface and a very snug and fine fit. Care should be given in not filing too much. Constant fitting and refitting can save ribs from the scrap heap.

When cutting 4130 aircraft steel tubing or sheet steel, use a high quality hack saw blade. Cheap ones will shed teeth after a few strokes. Use small-tooth blades because if the space between the tooth points is greater than the tube wall thickness, teeth will catch and break.

In fitting tubing for your tail group ribs a bench grinder can also be used to get the proper curves. And as said before, this in conjunction with a few round files, will enable the tubing to be shaped to fit snuggly against one another.

When fitting tubing avoid gaps of 1/16" or 1/8" and if your filing and grinding puts feather edges on parts of a tube, file them off as they will burn prematurely as welding heat reaches them. A very important point is to tack weld all joints before making completed welds on any one joint.

When assembling your elevators and rudder, both the elevator and rudder hinges, straps and bearing guides must be slipped on to the spars prior to tack welding your ribs and other parts into posi-

Always wear safety shield or safety glasses when grinding metal fittings.

tion. After final welding of the tail group, it is recommended that the tail group be attached to the fuselage, jigged into proper position and elevator and stabilizer hinge points be brought into position and tack welded so as to gain the best possible accuracy and alignment.

It is recommended that throughout the aircraft, final welding be delayed until all major components such as tail group, landing gear, and other major fittings can be mated so as to maintain accuracy and ease of final fitting. Many a builder has found that when his parts, such as landing gear, fitted nicely to the fuselage when only tack welded that upon final welding attempts to reassemble it to the fuselage, was met with discouragement after finding that final welding changed measurements up to ¼". Final welding of fitted parts must be jigged into position to maintain accurate dimensions and prevent contraction of the metals. Do not alter lengths or angles in the control surface forms or anywhere else in the control system.

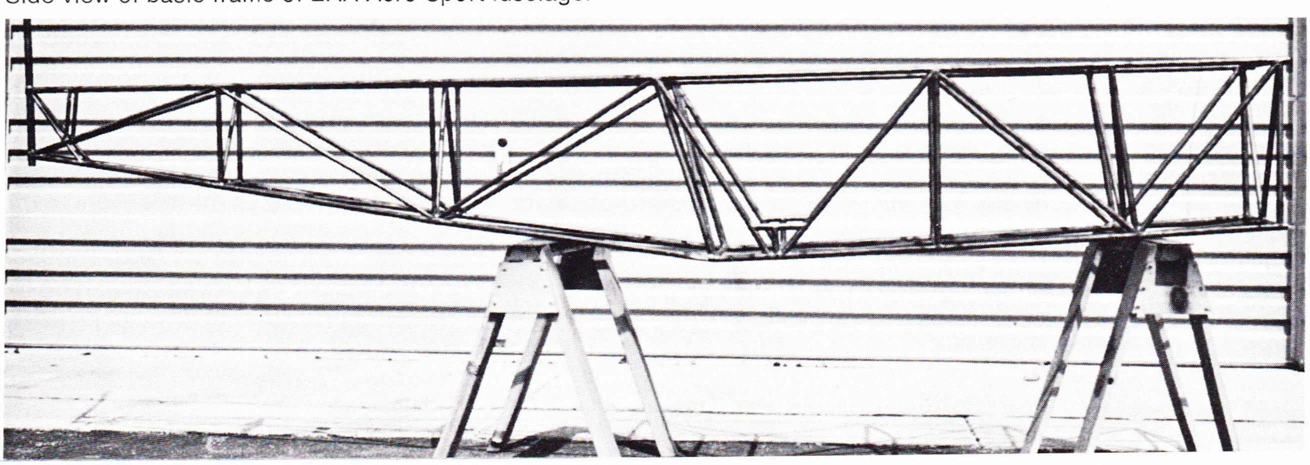
The EAA Acro Sport is using a push-pull elevator control system. The idler mounted in the lower section of the fuselage enables smaller diameter tubing to be used while at the same time offering great strength. These push-pull tubes are adjustable to give proper elevator up and down travel. The control system has been designed to give the right leverage for proper control feel. The rudder is actuated by ⅛" aircraft control cable mounted on adjustable plates to the rudder pedals and are strung through fair-leads to give proper clearance past tubing to the rudder horn.

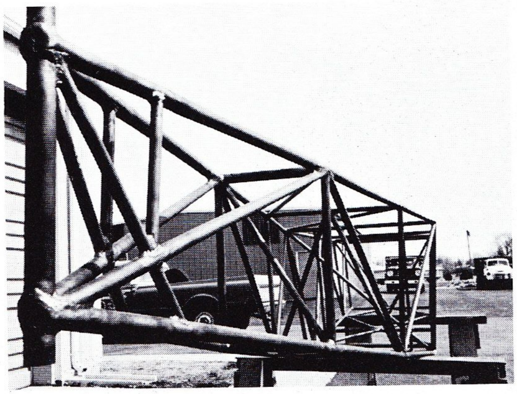
Start the fuselage by making a full size drawing on a rigid flat plywood work surface such as is illustrated on the aircraft drawings. Use the top longeron as a reference line, measuring from the center line of the upper longeron downward toward the lower longeron, complete all the vertical lines except the tail post. Then very carefully connect the lower longeron lines with the line that generally parallels the upper longeron. The diagonals then can be drawn in which will complete the full size fuselage side drawing, Be very careful about measurements and after a drawing is done, recheck all your measurements and lines against your drawings. We would like to add that it has been a rare occasion that aircraft drawings of any type have been error free and great care must be taken to insure that any errors are caught prior to cutting tubing. Mistakes are easy to correct now but not later.

Note that many fittings are not put on until after the basic framework has been finished. You will note that your plans contain artist drawings of the fuselage side and upright jigs. The tubing is held into position in the same manner as your tail group, 1" x 1" x 3" blocks being nailed securely into place the appropriate distance on each side of the center line for the appropriate size tubing. Asbestos and a piece of metal slipped under the tubing to be tack welded will prevent burning or scorching of your jig board.

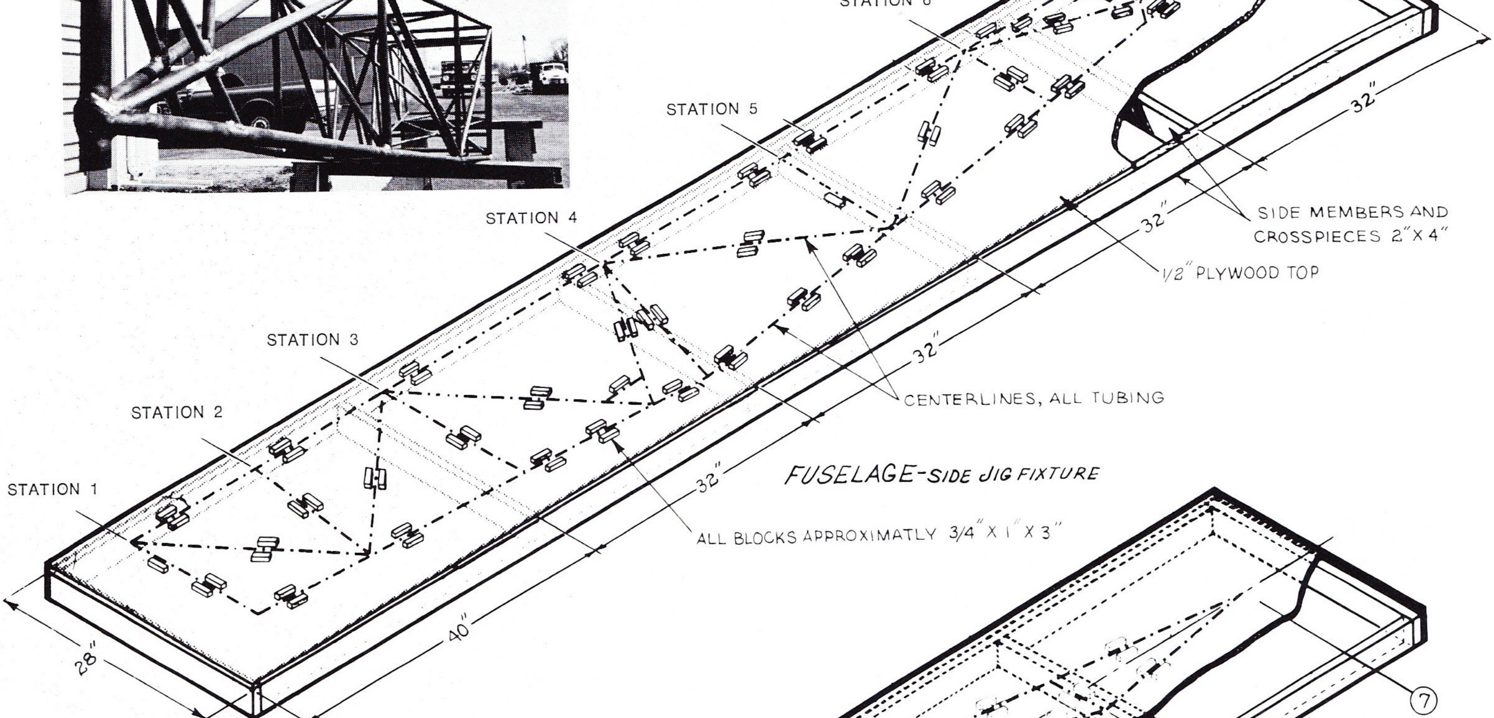
When measuring for upright, diagonals and cross pieces, measure from the center line of the top longeron to the center line of the lower one and cut the tubing to that length. A word of caution — many builders have learned an expensive lesson by taking their measurements from the bottom side of the upper longeron and the top side of the lower longeron which does not allow material for form fitting of the tubes with the appropriate size rat-tail file or grinding wheel. The ends must be shaped

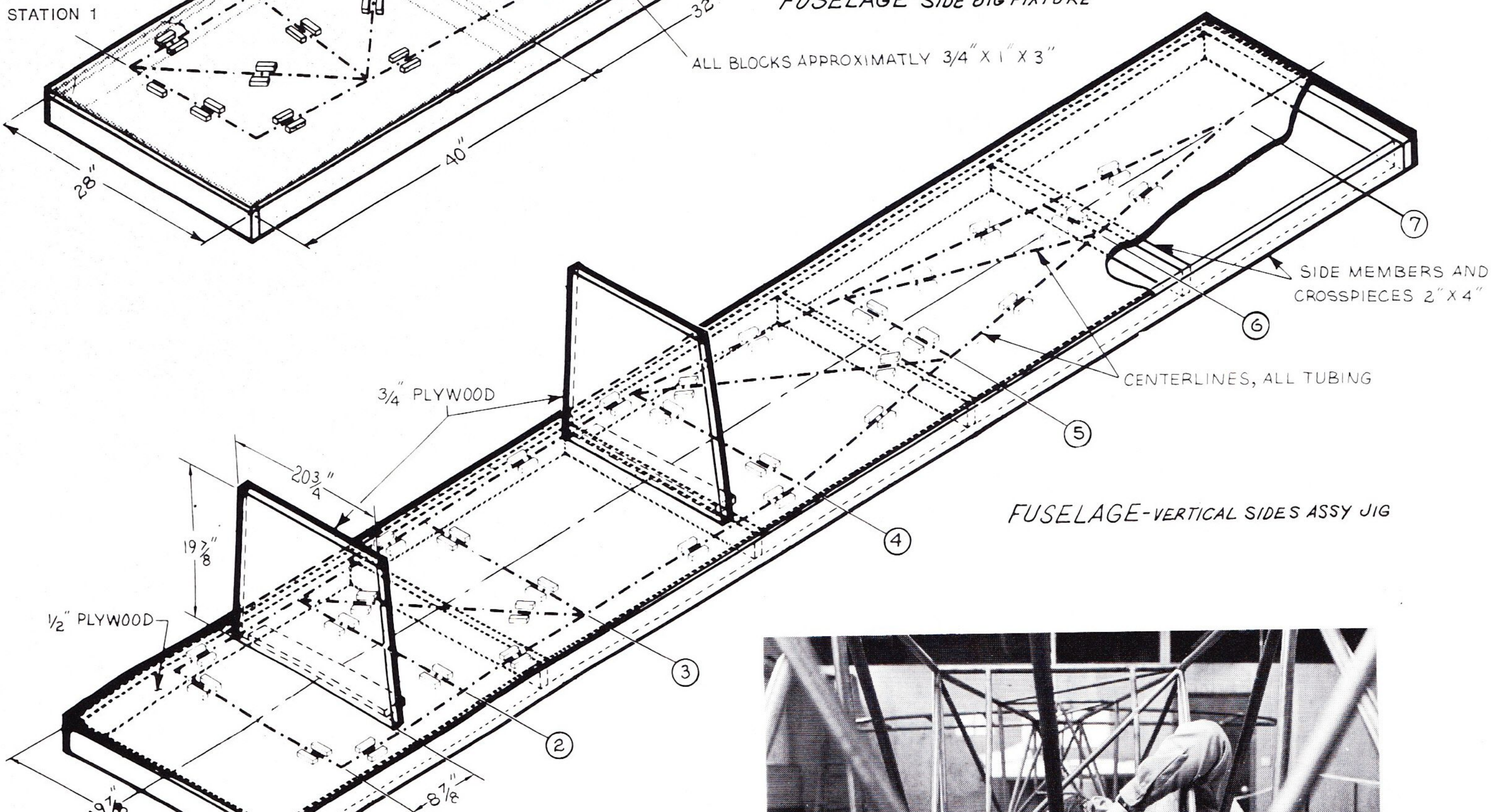
Side view of basic frame of EAA Acro Sport fuselage.



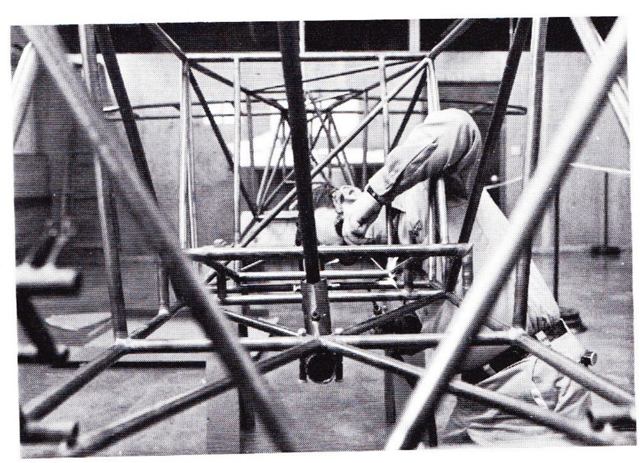


Fuselage tailpost must be vertical for proper rudder alignment.

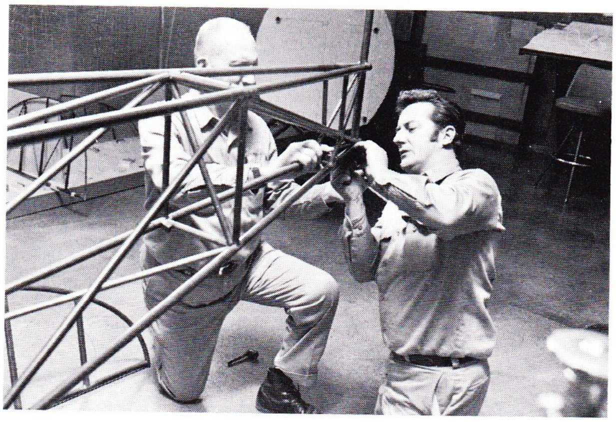


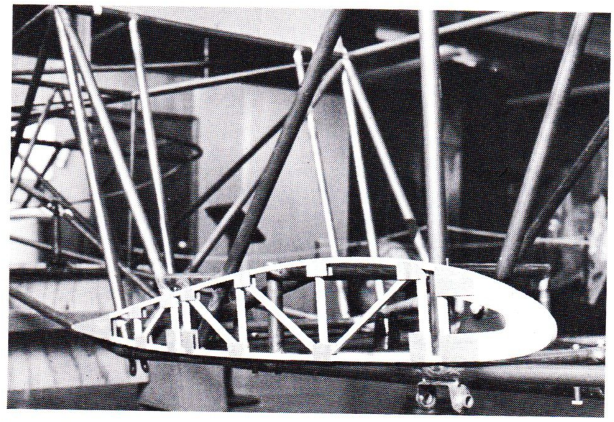


Looking from fuselage Station 1 rearward.

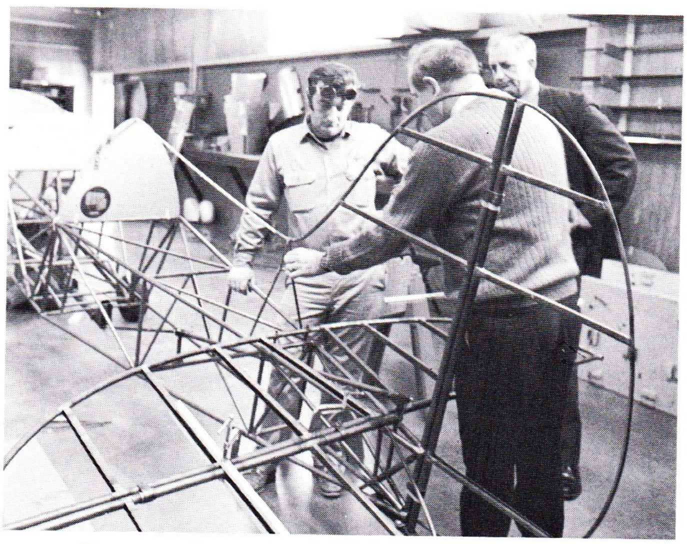


Fitting the fuselage and vertical fin tail post. Final alignment of rudder depends on accuracy of installation of this tube.

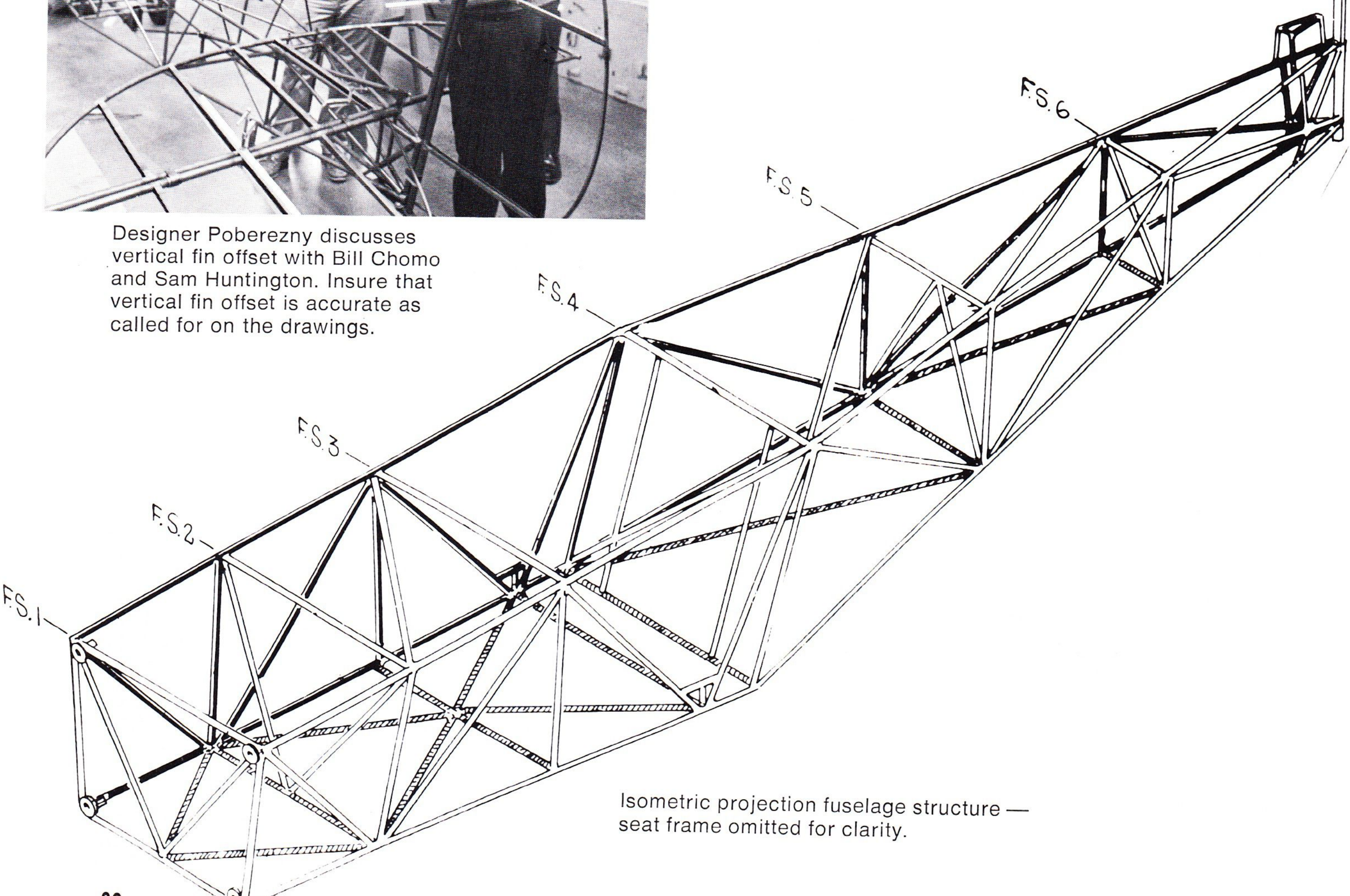




Acro Sport M6 airfoil placed into position prior to tack welding front and rear wing fittings into place.



Designer Poberezny discusses vertical fin offset with Bill Chomo and Sam Huntington. Insure that vertical fin offset is accurate as called for on the drawings.



Isometric projection fuselage structure — seat frame omitted for clarity.

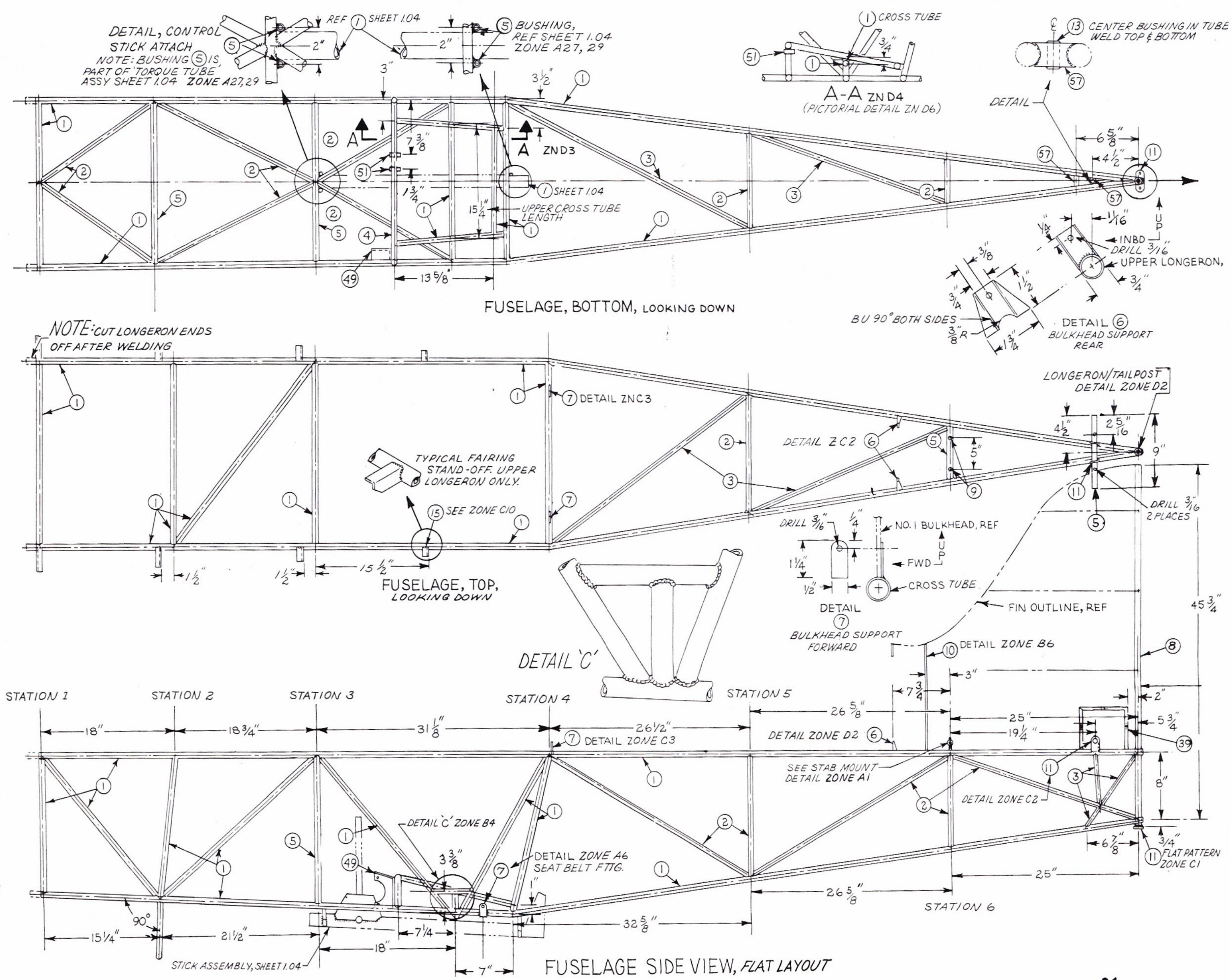
to fit nicely against the longeron and it is well to consider leaving a little play in the tubing as this small amount of play accommodates expansion during welding and thus prevents pushing the opposite longeron out of position when one end is being welded.

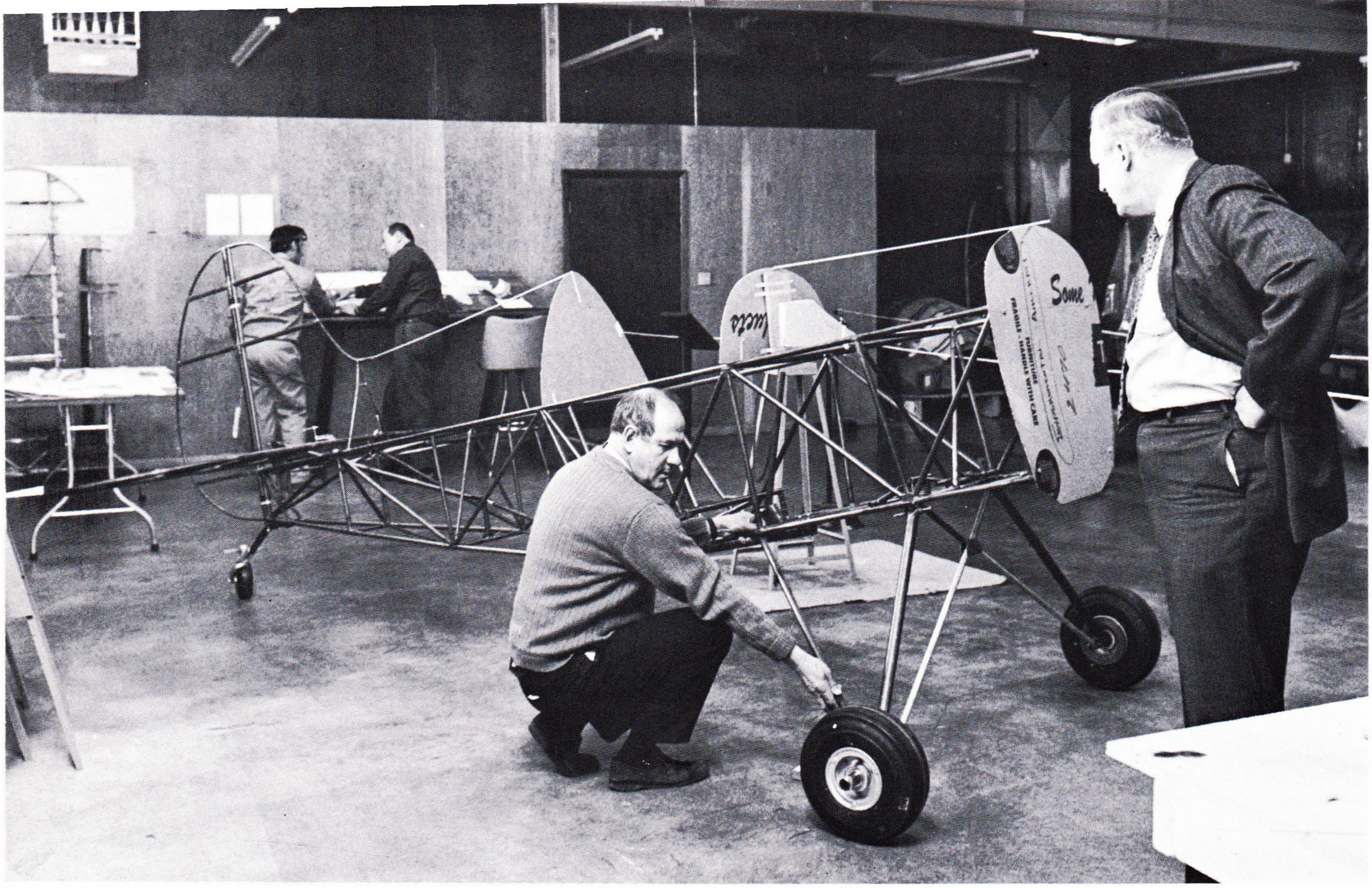
The lower fuselage longeron has a bend in it. To make this bend without harming the tubing, place the forward section in the fuselage jig between the blocks and with a heating torch and with the help of another aviation enthusiast, slowly applv heat in the area of the bend at the inside surface of the tube, heating it to almost a cherry red, making the bend very slowly so as to avoid putting a kink into it. This bend is not too sharp and one should not encounter too much difficulty in getting it to lay snuggly into the jig blocks.

The upper and lower longerons should extend at least 3 or 4 inches past Station 1 or at the firewall. The same measurement should be maintained at the tail post. This additional tubing will allow for better welds and fitting and prevent welding burn-away when clusters are welded together at these key positions. After the fuselage is completely welded, the four pieces of tubing at Station 1 at the firewall can be cut off with a hack saw prior to fitting and welding in the fuselage engine mount attachments.

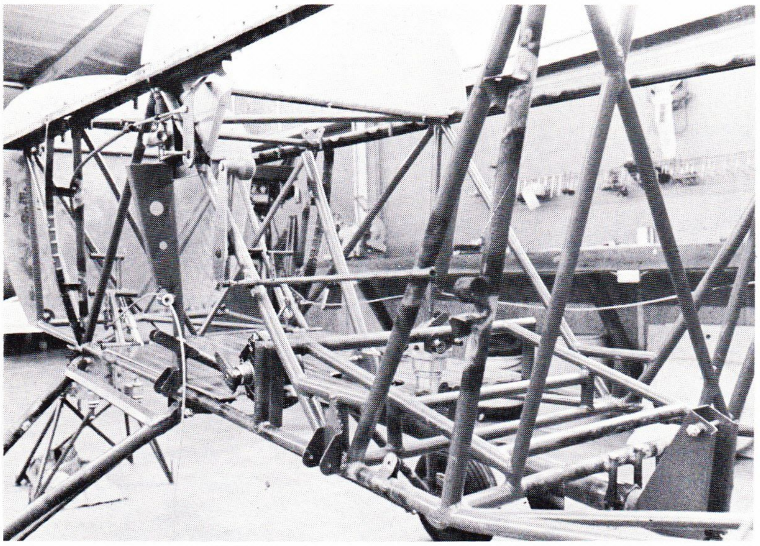
Build up a fuselage side on the jig leaving out the tail post. Each tube should be firmly tack welded into position. Do not attempt to weld any more than is needed to secure each tube. After both fuselage sides have been completed draw the top view of the fuselage on a flat plywood work surface or jig. A suitable and typical jig is shown in the plans of the Acro Sport.

A center line representing the thrust line is drawn on the jig board. The top side of the fuselage when fitting in the normal position is transposed





Airline captain, Sam Huntington watches Paul fit the rear landing gear tube. Sam later had the opportunity to fly the completed airplane. He stands 6' 5" and weighs 240 lbs.



Left side of Acro Sport fuselage showing wire fittings, trim tab control, rudder cable fair-leads and other details.

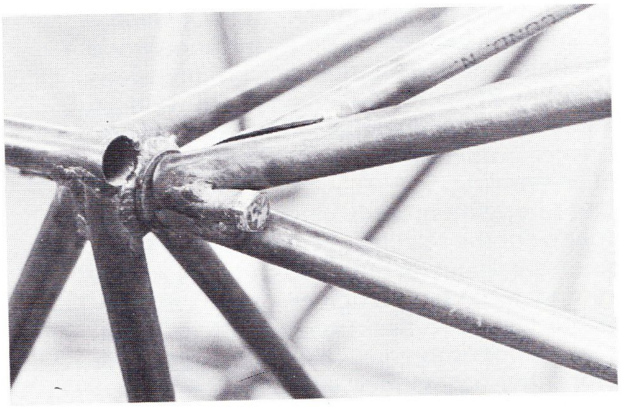
from the measurements on your drawing. Using the center line and splitting the total dimension, the outside line of the upper side of the fuselage can easily be connected starting with Station 1 and going back to the tail post. You will note that when the fuselage longerons behind the cockpit are pulled together this bending inward will cause a slight shortening and change in the dimensions as called out on the drawings from a side view. This is normal.

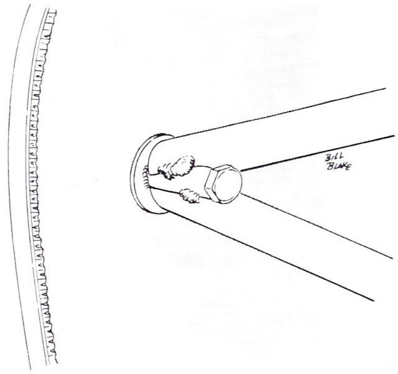
You will note that the lower longerons are closer together than the upper longerons. This was done to allow greater shoulder room in the cockpit for the bigger pilot. The two jig plates shown on the illustration, when cut accurately and placed accurately over the center line, will hold the appropriate spacing between upper and lower longerons. When drawing the longerons together behind the cockpit, it will be necessary to heat the tubing sufficiently to allow for the bend, being very careful not to put a crimp or buckle in the tubing.

The longerons, both upper and lower in the area of the tail post, can be held together with wire until the fuselage has taken a permanent set from tack welding and after being removed from the jig the vertical fin and tail post can be fitted and welded into position.

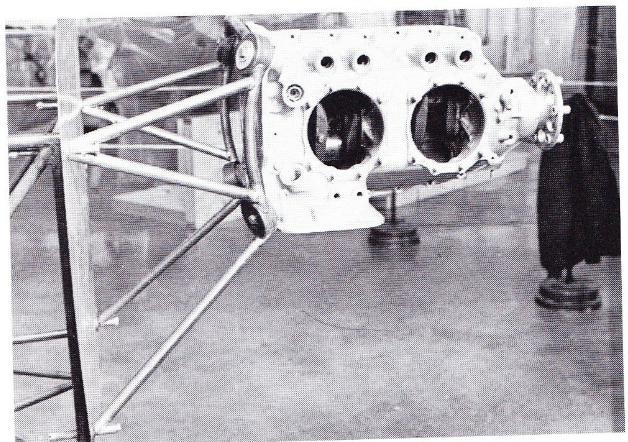
Because of the concave curve ground or filed into the cross-member tube ends to make them fit

Engine mount bolted to fuselage at station one, firewall removed. Open end of longerons are closed to keep moisture out by welding small .035 metal discs over ends.

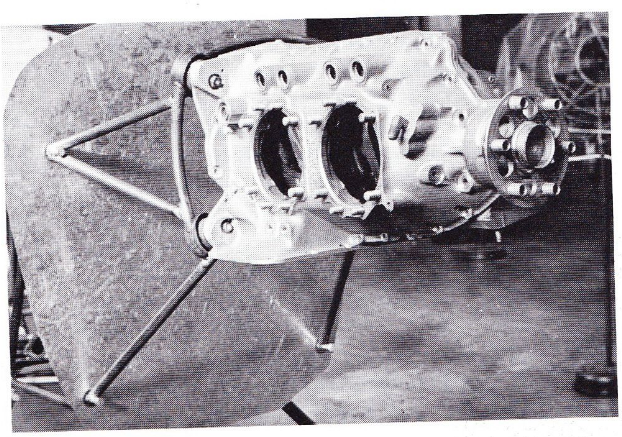


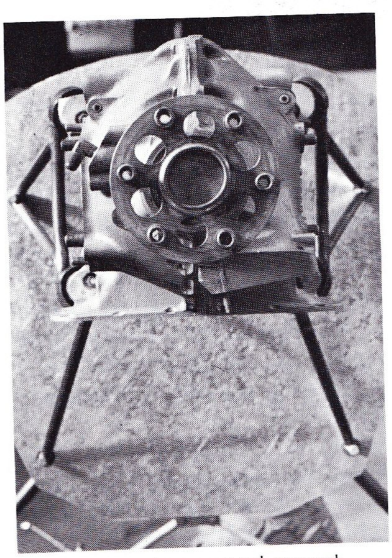


Engine mount tubing tack welded to bushing at fire wall. Final welding to be completed later. **Center points** must be maintained during final welding to insure proper fit.



The engine mount was developed using a crankcase which allowed ease of alignment and fitting of tubes.



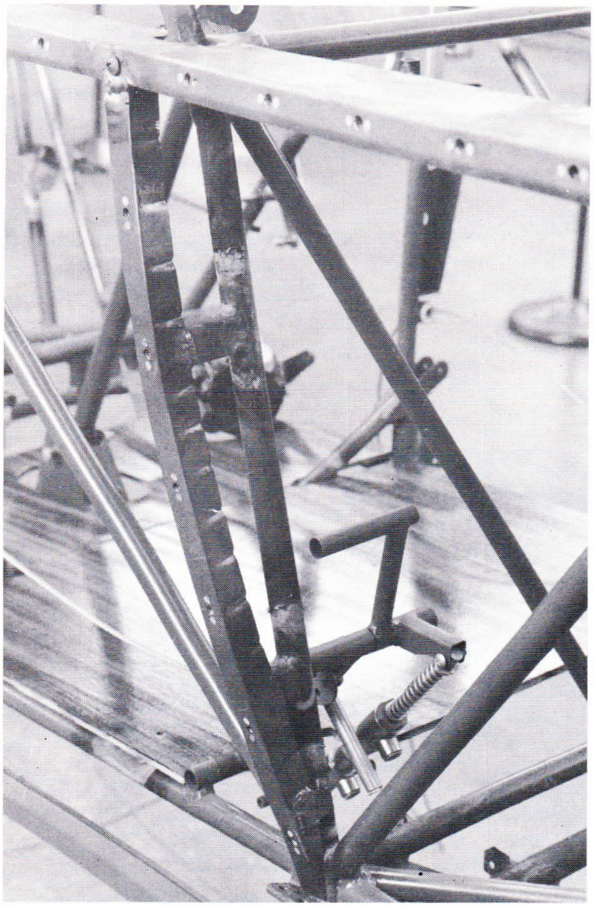


Engine crankcase and mount looking rearward during construction.

together, it will be quite hard to put the diagonals into place after cross tubes are done. So put in the diagonals as you progress from cross piece to cross piece. At each point the center lines of all tubes should meet at a common point to meet eccentric loads on the longerons.

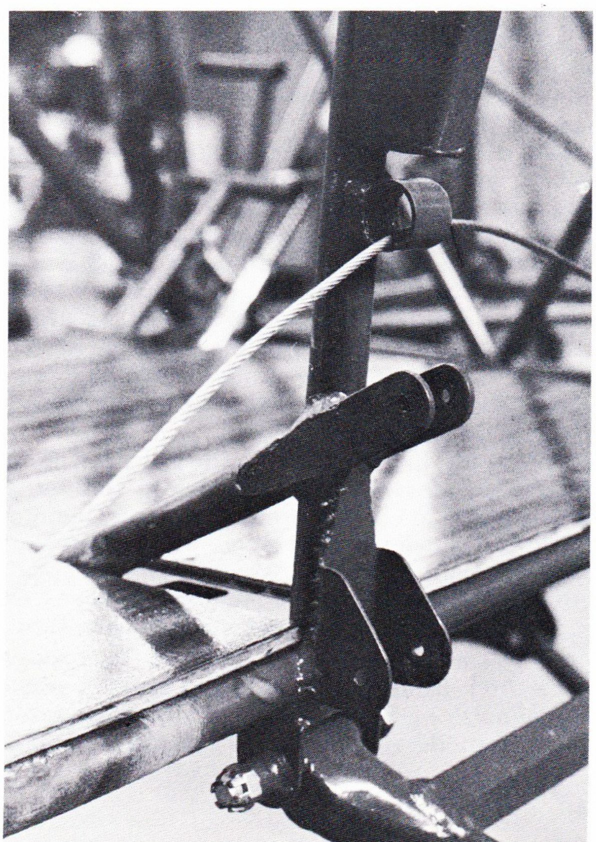
When the fuselage is all tacked together final welding can be done. A word of caution — do not do all welds along one longeron and then tackle the ones on the other side for this will result in a warped fuselage. One can either start from Station 1 at the firewall or at the tail post, starting at one cluster and then rotating to the next all around the station, then moving back to the next station completing all welds, etc. This method will equalize and balance the various tensions created by welding so that little warpage will occur.

Before the final welding of the tail post, insure that the tail post is at right angles to the vertical members at Station 1 or firewall. Any misalignment of the vertical tail post will create problems for rudder attachment as well as overall alignment for the vertical fin and rudder. It sometimes happens that longerons will bow in between stations from shrinkage of the weld metal at the joints. If this happens play a torch flame for a few inches to each side of the station along the outside part of the tube getting the metal moderately red hot. This softening on the



Fuselage former and front center section fittings, looking rearward.

Right front dual flying wire fittings depicted here. Rudder cable fair-leads less plastic guide.



outside will usually let the longeron spring back true. Sometimes a rubber mallet used very cautiously so as not to bend, mar or flatten tubing can be used to take care of minor bends.

The engine mount attaches to four fuselage engine mount fittings at the forward end of the fuselage. These must be located perfectly to mate with the mount and must be placed accurately into the fuselage so that when the engine mount is attached to the fuselage a perfect mating of the mount and bolts occur. Many homebuilders, after tack welding their mount up in a jig, will attach the tack welded mount to the fuselage and using a sturdy plywood base with holes drilled at the exact dimensions as the mounting holes on the engine, will weld up the complete mount while attached to the fuselage. This will insure proper mating and ease of mounting at time of assembling.

Welding of engine mounts must be of excellent quality to prevent the starting of cracks by vibration. Engine mounts will vary in length depending on the type, size and weights of engines used. The prototype of the EAA Acro Sport uses a 180 hp dynafocal mount Lycoming engine. The starter, generator and several other accessories were not used, thus lightening the basic engine weight. However, as the EAA Acro Sport has a full inverted oil system and fuel system as well as an air show smoke system, different weights and modifications for this purpose will vary from those building an aircraft just for straight and level fun flying. A new weight and balance must be worked out for different weight and horsepower engines depending on the use of starters, steel propellers, generators, batteries, etc. Due consideration must be given this matter as a perfectly balanced aircraft insures safe and enjoyable flight.

During the work of welding up the basic fuselage frame make liberal use of carpenter squares, levels, plumb bobs and taut wires to keep things in true alignment. While the fuselage will have to be taken off the plywood work base to get at the welds near the wood, the frame should be left on the jig or temporarily drilled into position as much as possible to hold it in alignment. The tack welds should be generous enough so there is little chance of their pulling loose from warpage or strains as welding progresses.

Many builders use wires — criss-crossing in an X-manner between the top and bottom longerons — to maintain exact centers until they are assured true alignment of the fuselage. Considerable care should be used in making, bending, drilling and welding the various fittings to obtain accuracy. At all times be sure that 4130 fittings bent at 90° angles do not have tears or cracks in them. A magnifying glass will be of great aid in determining quality of your fittings.

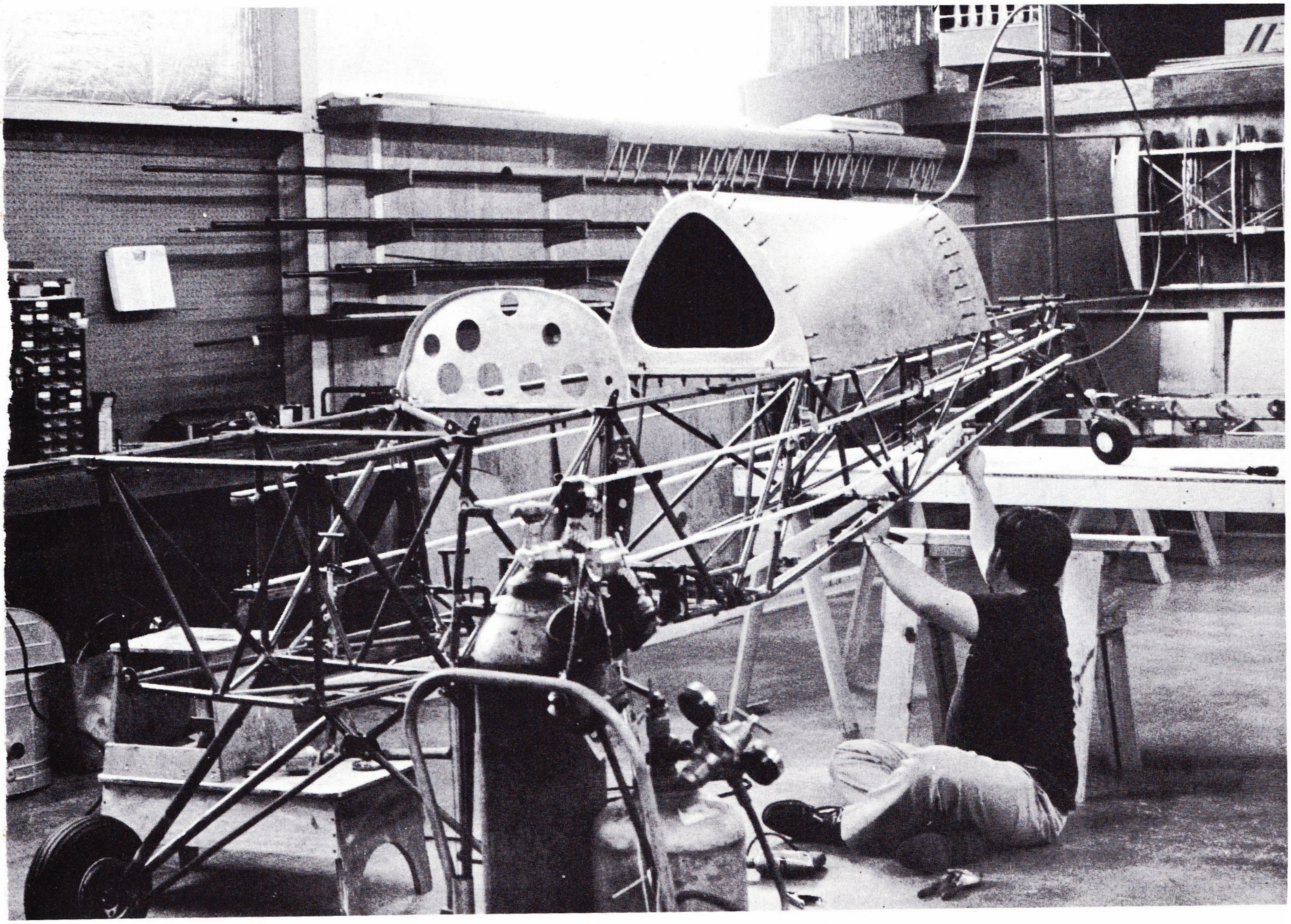
The wing root fittings on the lower longerons, for example, are designed so that when completed the wings will be held on at the proper angles for good flight characteristics. If one fuselage wing attach fitting was either lower or higher than the other, an aileron or rolling affect in flight would be noticeable.

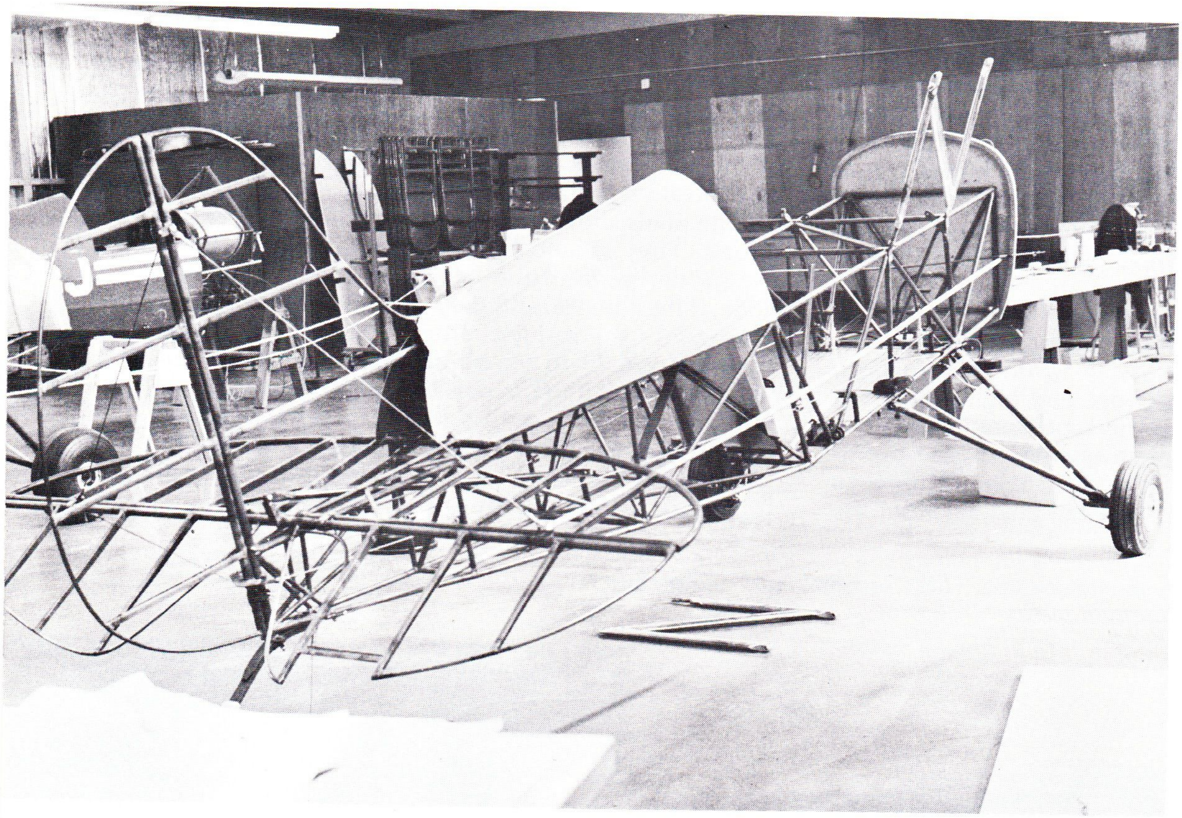
Fittings for struts and wires are designed to transmit loads straight through with no bending forces arriving from eccentricity. Note that stops are provided to limit the range of motion of controls. These are important to safety. When control surfaces are moved too far in flight, the air loads can over stress the structure. Also there is a point in the motion of any control surface where its drag begins to greatly exceed its lift. Any more movement builds up so much drag that the plane responds badly. Stops are also necessary to prevent damage to control systems and controls being blown violently around by winds while on the ground.

When all welding has been done, it is a very wise step to coat the inside of the longerons with a rust preventative. One way to do it is to prop the fuselage up with the front end higher than the other. Before closing up the longerons on the forward end, pour a moderate quantity of rust proofing fluid down into each longeron. It will flow to the low end in the area of the tail post, far from the welding heat at the high end. Run a stick and cloth down each longeron to wipe out the fluid on the tubing near the weld to prevent smoking. Weld up the forward ends of the tubes and when the metal is thoroughly cool, rock the fuselage to distribute the fluid over all longeron interiors. Then drill small holes at the rear end of the longerons to allow the excess fluid to drain off, and seal the holes with self tapping or driven in screws. The entire exterior of the framework is sprayed with a zinc chromate or equivalent rust resisting primer.

The plans show coil return springs on the rudder pedals. They should be only stiff enough to keep the rudder pedals from falling backwards onto the floor. If they are too stiff they will induce a confusing feeling into the rudder control while in flight. It is vitally important to remember that the cables running from the rudder pedals to the rudder horn must not rub or touch any of the vertical or diagonal members of the fuselage. The cables are guided by fair leads, a plastic material mounted into pieces of tubing to insure long life and proper routing.

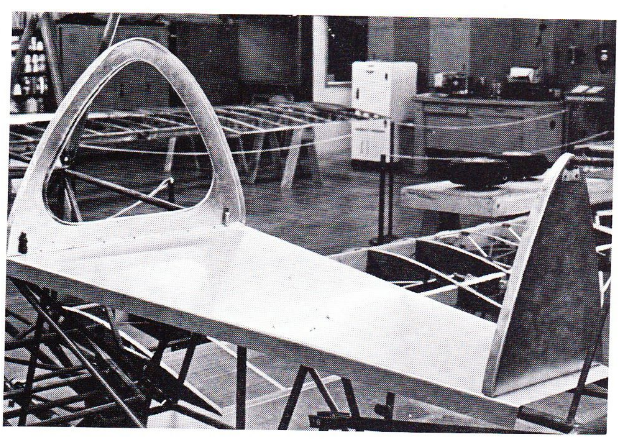
Fitting the two belly stringers into position. These are laminated and preformed according to drawings for proper curve.



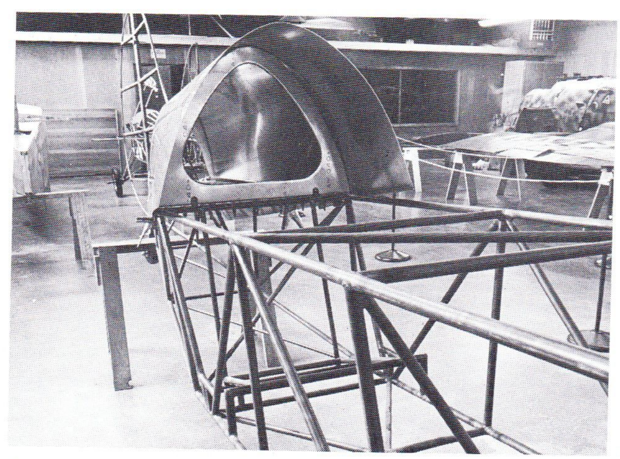


The Acro was developed using both the plywood and metal turtle deck. Here is shown the plywood method. The plywood is soaked with water at the sharp radius (top) and then held by straps around the bulkheads to form and dry. Care should be taken not to split the plywood.

turtle deck



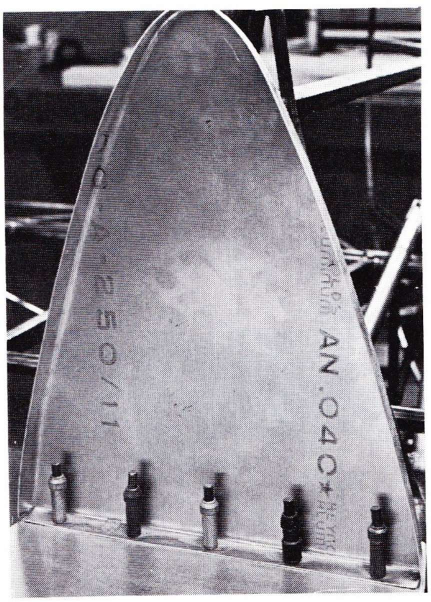
Aluminum fuselage turtle deck prior to covering and riveting.

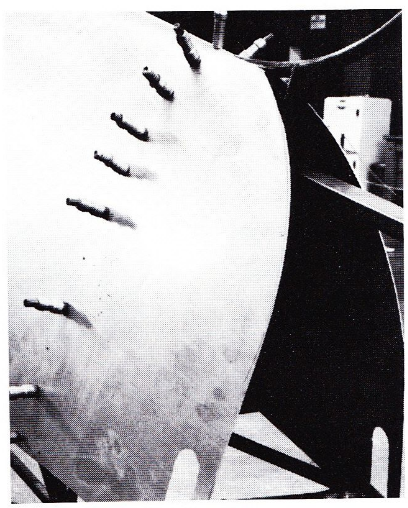


Aluminum turtledeck with wrap around sheet metal being formed into position.

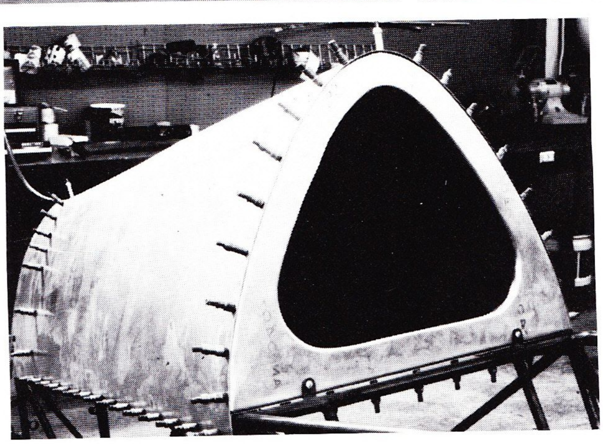
Koston Photo

Rear aluminum turtle deck former held into place with sheet metal fasteners prior to riveting.





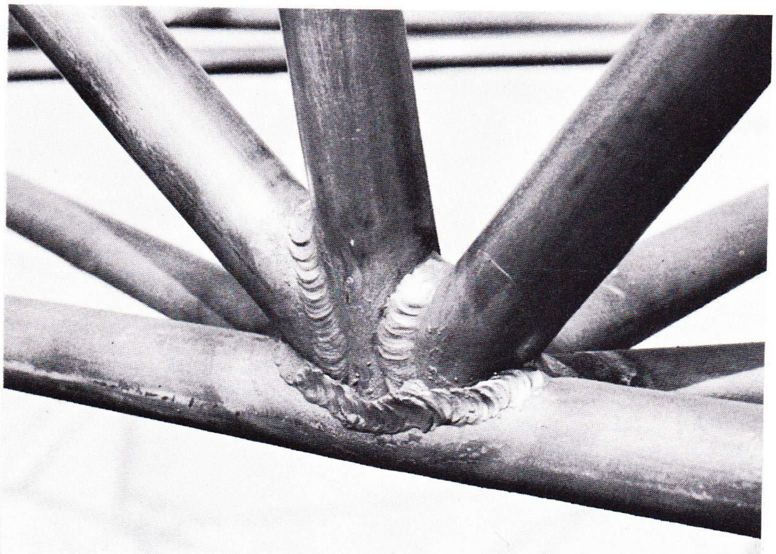
The prototype Acro Sport is covered with Grade A fabric, although other materials may be used according to manufacturer's instructions. The Acro Sport final finish was done by Earl J. McEntire of Aircraft Paint, Smith Field, Ft. Wayne, Ind., who also arranged upholstery through Ted's Upholstery Service there.



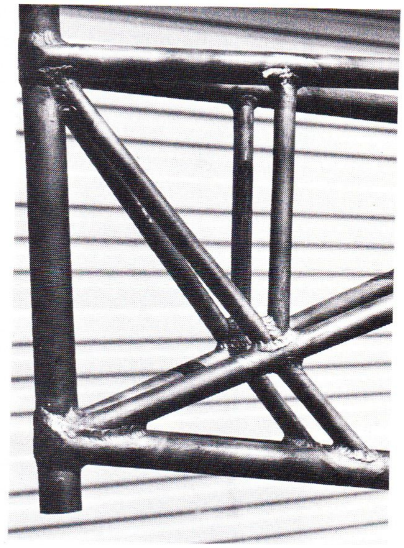
The aft portion of the turtle deck is faired into the vertical fin to give smooth fabric lines when covered. This is the metal version.

"Cleco's" (sheet metal fasteners) hold the aluminum into place prior to riveting. Note large baggage space.

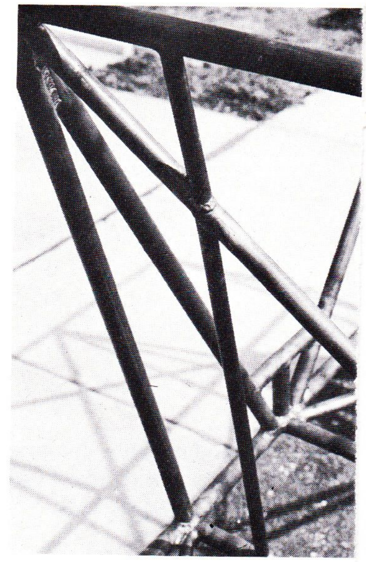
Typical fuselage weld prior to being wire brushed.

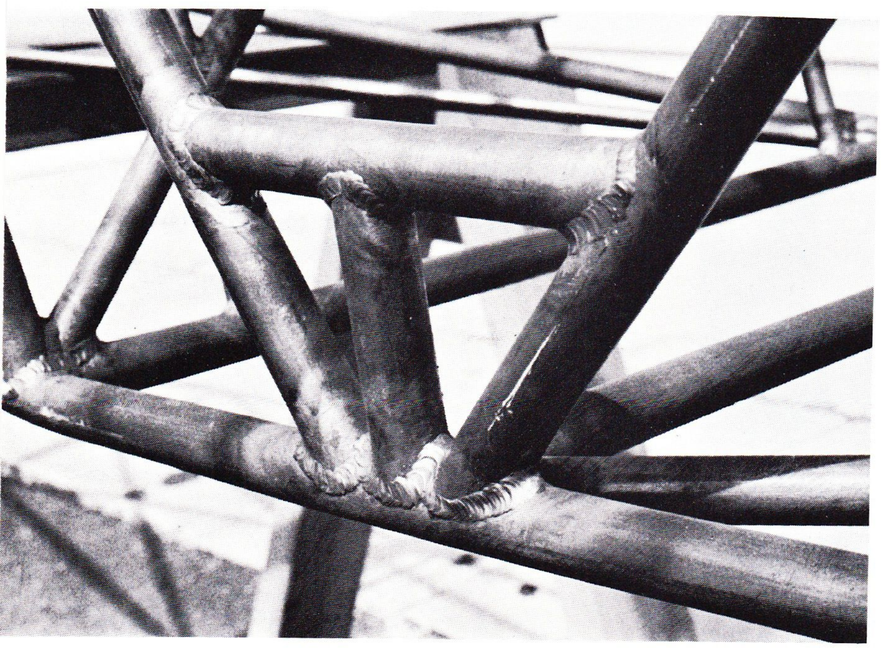


Tail post and tail spring trussing.



Seat back and more welding.





Rear wing strut fitting and second seat belt tube.

fittings

Minimum Inside Bend Radius:
4130 "N" Steel

Thickness	Min. Inside Bend Radius
.025	.06
.032	.09
.049-.050	.16
.063-.065	.19
.090	.28
.25	.38

Aluminum 1100-0

.050	.06

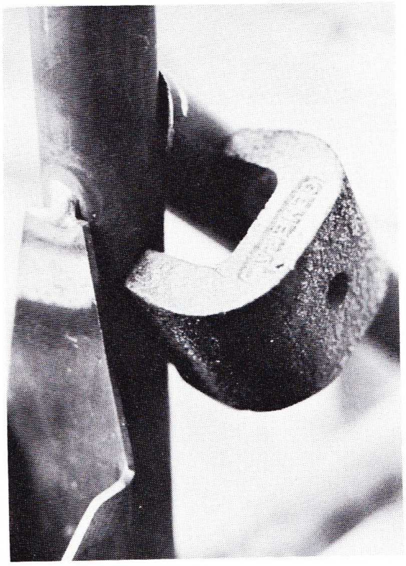
Aluminum 2024Ts

Thickness	Min. Inside Bend Radius
.020	.06
.025	.09
.032	.12
.040	.16
.063	.22
.090	.38
.250	1.12

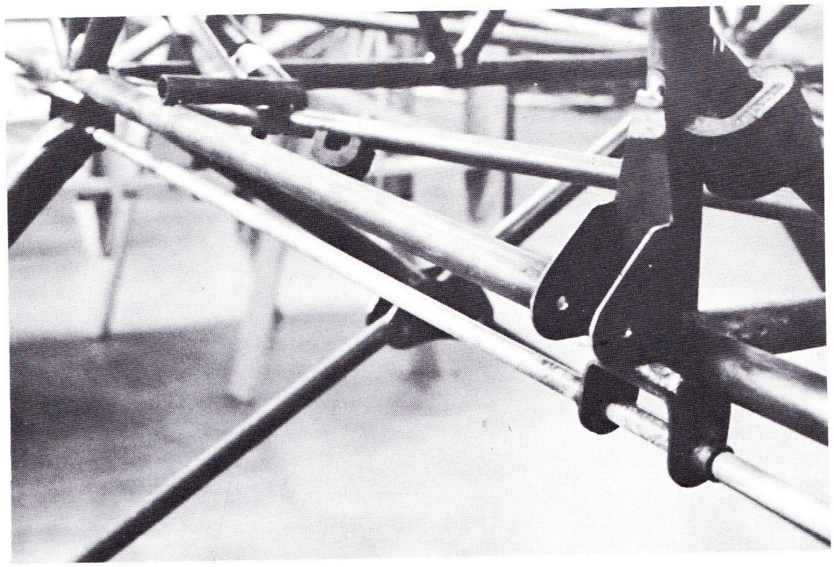
Aluminum 6061-T3

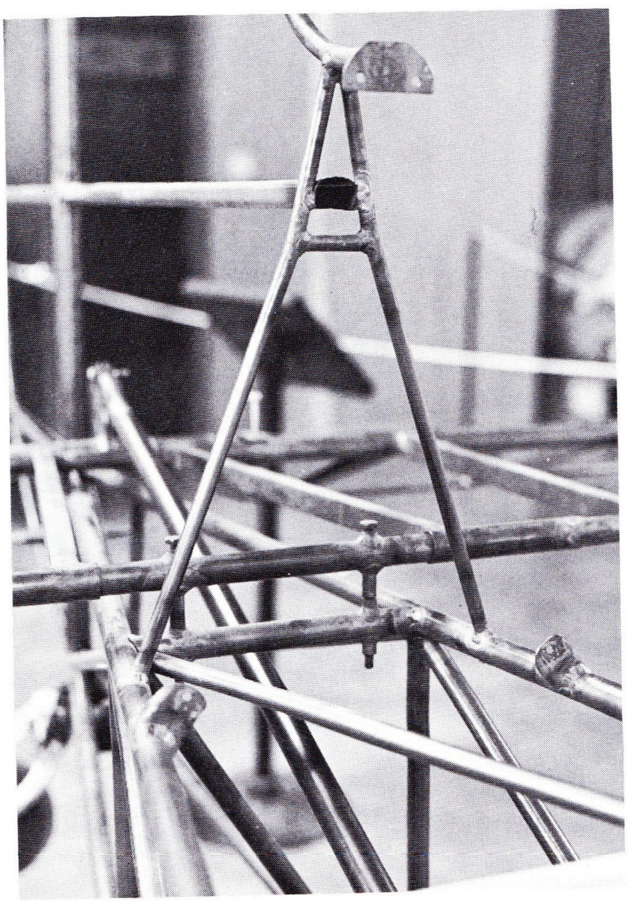
.063	.12

Magnet used to hold tubing into position while tack welding.

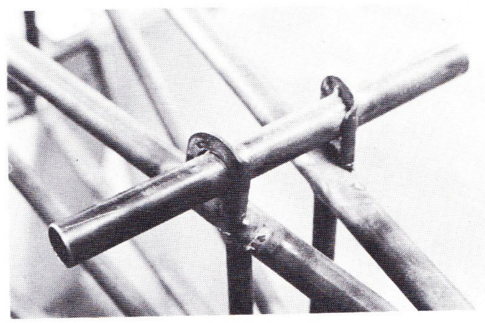


Note drill rod used for landing gear fitting alignment.

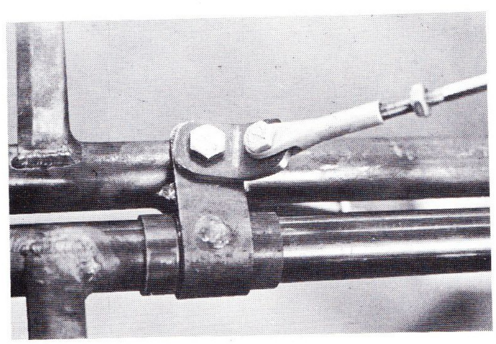




Vertical fin structure.



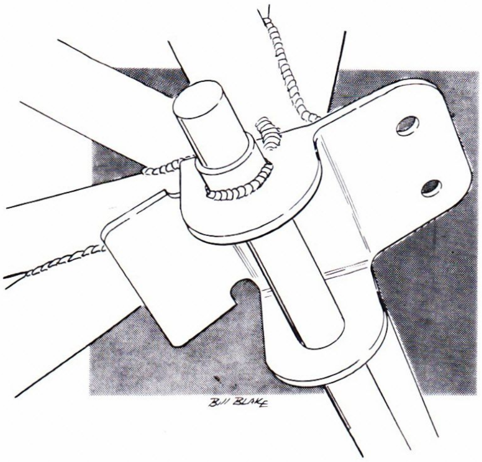
Rear stabilizer-fuselage attach fitting.



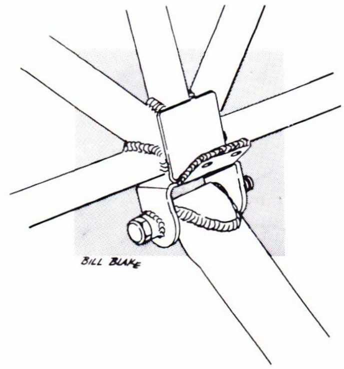
Elevator-stabilizer hinge attach fitting. Note tail brace lug and wire attachment.

Rudder horn and cable temporarily placed into position.

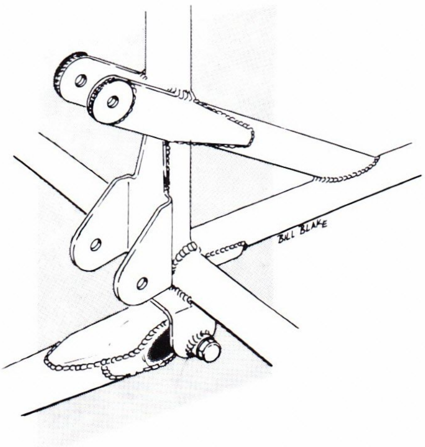
The front and rear landing gear fitting is shown tacked intc position. Note the drill rod which passes through both front and rear fittings to provide proper alignment during welding.

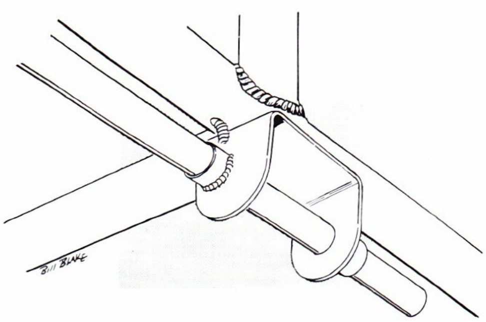


Join and fit landing gear and flying wire fittings prior to forming around the tube and welding.

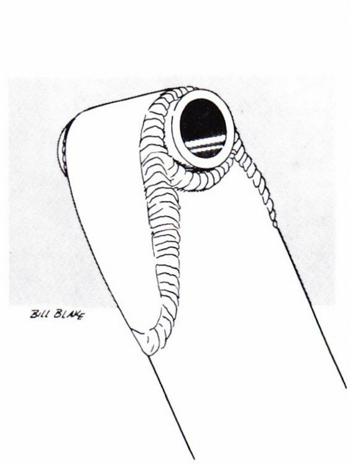


Shown are rear landing gear and wing fittings, as well as rear flying wire fittings.

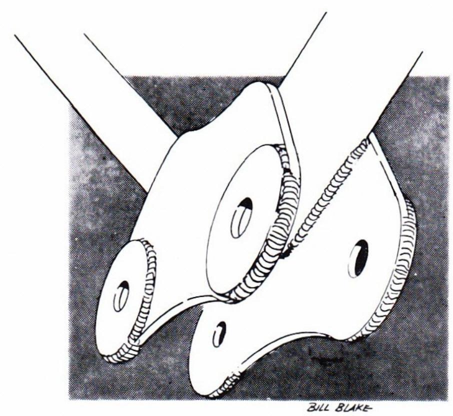




Drill rod used to align front and rear landing gear fittings while tacking into position.



Upper end of front landing gear strut. This end should be completed prior to lower end being jig fitted to axle. A bolt mounted vertically through the bushing will provide accuracy while in the jig.



Fuselage shock strut fitting on fuselage cabane. The placement and alignment of this fitting is critical. Discrepancy will cause difference in landing gear shock strut position or a wing low condition.