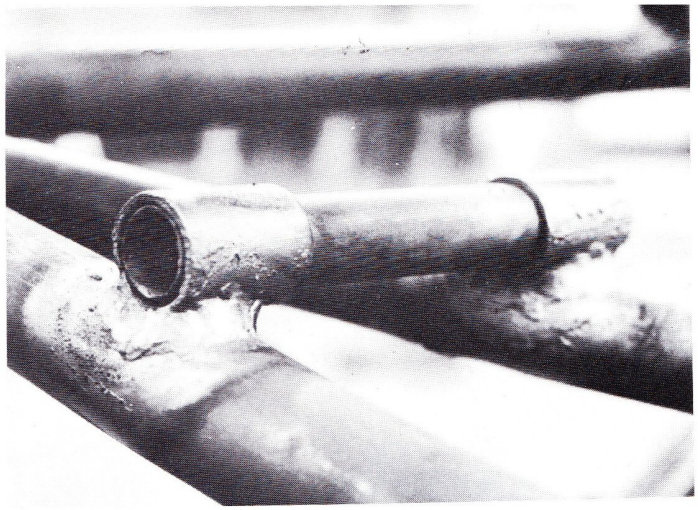
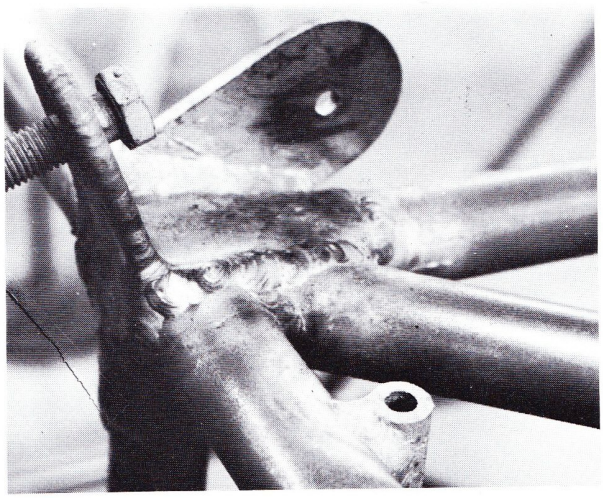
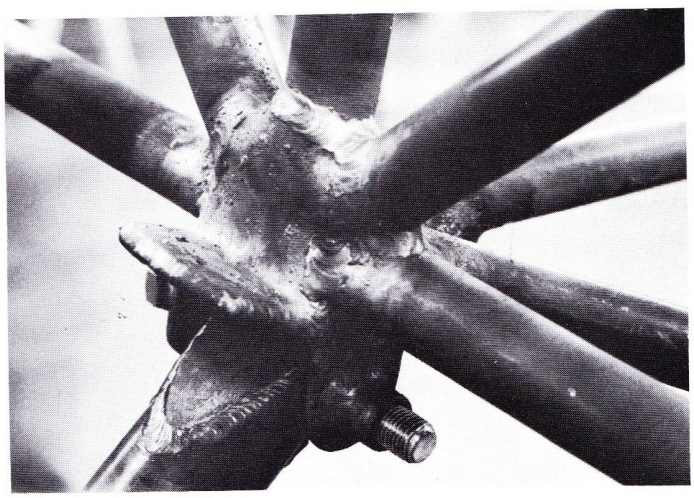
Rudder pedal bushings are welded to lower fuselage tubing.

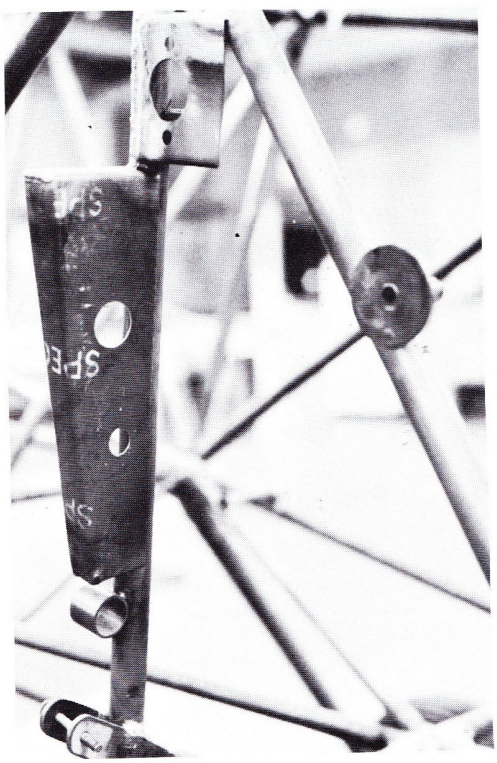


Viewed from above, center section fuselage strut fitting, "with bolt", center section roll wires attach lug. Bushing in foreground is smoke oil tank hold down strap attachment.

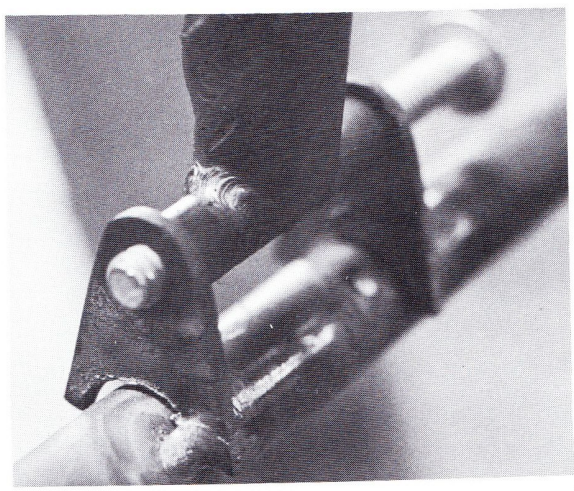


Front landing gear and double flying wires fitting offers sturdiness.

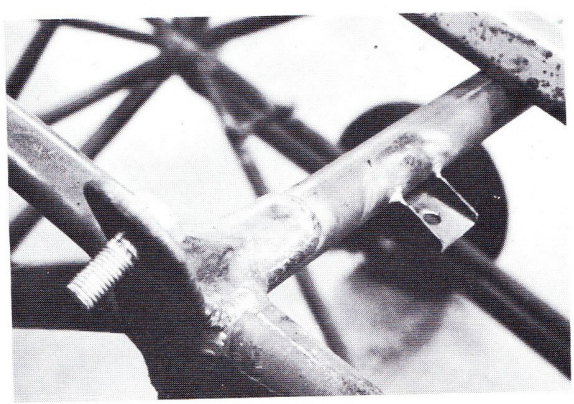




Ignition and mixture control bracket.



Elevator idler arm attach lugs, tacked into position.

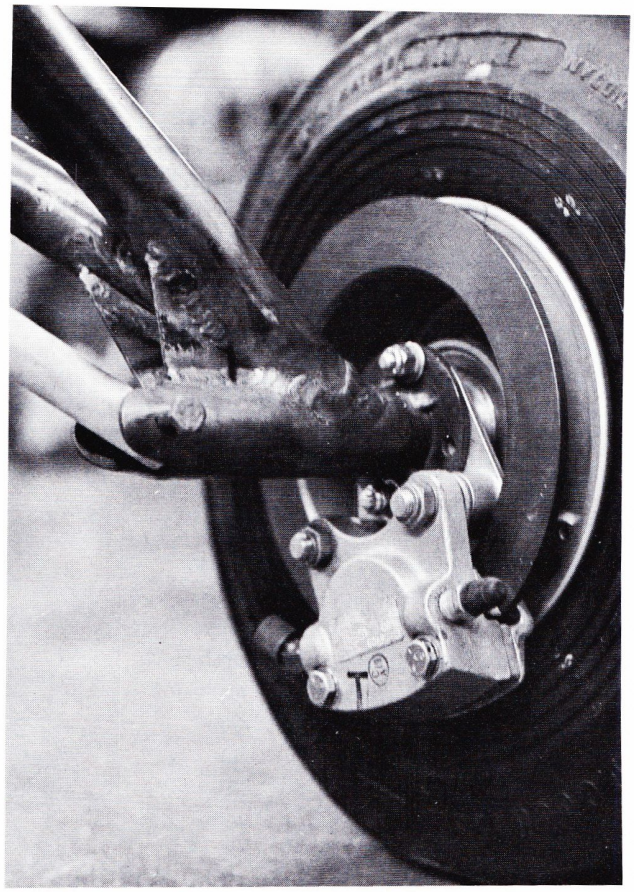


Rear left center section fuselage strut attach fitting.

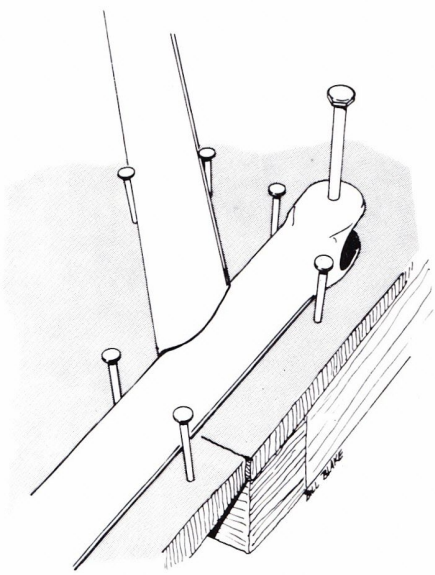
sub assemblies

The Acro Sport landing gear is made up of steel tubing very similar to the Piper J-3 or other light aircraft, using a shock absorber strut attached to the inside end of the axle and a fitting on the cabane strut just below the fuselage. Perfect wheel alignment is essential in an aircraft to avoid tire scuffing and insure good handling on the runway. It is also imperative that the fuselage be perfectly square at the areas of front and rear landing gear fittings; that the cabane below the fuselage and fittings attached to the cabane are in perfect alignment so that when your landing gear is attached, as well as shock strut, perfect alignment is maintained. If your fuselage bay is not square or one of your fittings or shock struts short or long, it will show up in a wing low condition. As a suggestion, it would be wise to attach all fittings to the fuselage, and after final welding begin to prepare your landing gear. It would be wise to cut the front leg of your landing gear, install the upper end fitting and wrap around strap. In making the full size jig, fit your axle and front landing gear strut into position so as to establish the proper angle. It will take filing and perfect fitting to attach the front strut to the landing gear axle. After tack welding the landing gear leg into position, fit and attach the upper end of the landing gear leg to the fuselage, blocking the aircraft into position so that a perfect alignment can be had without any weight resting on the landing gear — blocking the axle into the position it would normally be if the wheel and tire were in place.

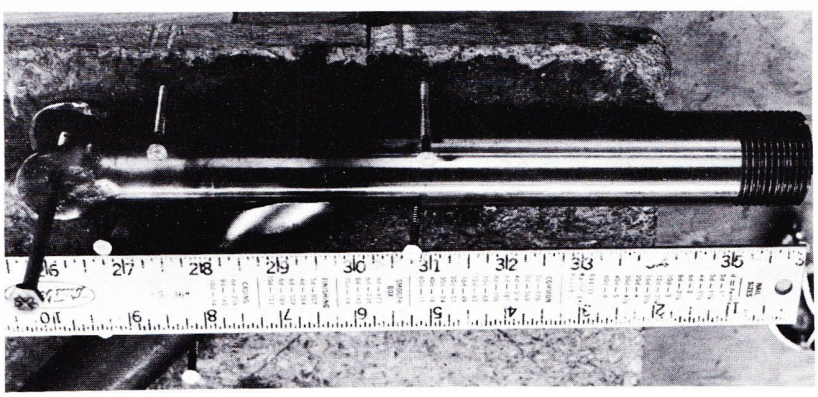
Your next step will be to prepare the rear landing gear strut, cutting it a little longer than normal and getting the right angle and fit at the axle and front tube area. Then, as per drawing, fit and tack weld the bushing in so that it fits properly at the rear landing gear fitting. It is imperative that one only tack weld all the tubing into place so that you have the flexibility of heating and repositioning. It should be noted that welding can cause a great deal of stress and moving of tubing and this technique of fitting the landing gear to the fuselage fittings is the same as using them as a jig. After all of the fittings have been tacked into posi-



Landing gear axle and brake assembly. 5:00 x 5 wheels are shown. Reinforcing straps on axle at shock strut attach have yet to be welded on.



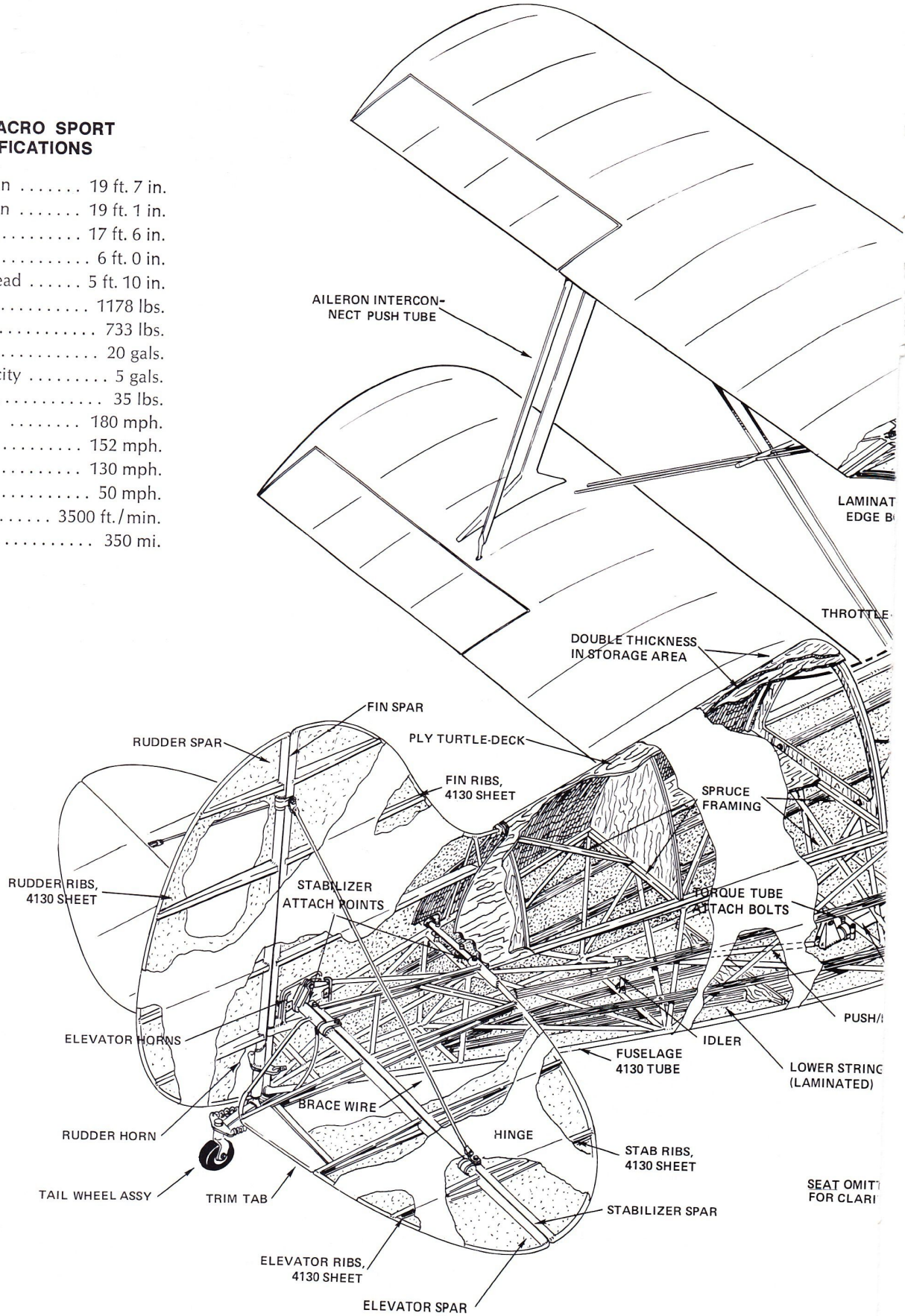
The wheel axle and front landing gear strut are fitted and jigged into place prior to tack welding. It is recommended that the upper end of the front landing strut be completed before fitting lower end to axle. Perfect alignment can then be made. Note bolt being used for alignment.



Jigging axle into position prior to tack welding.

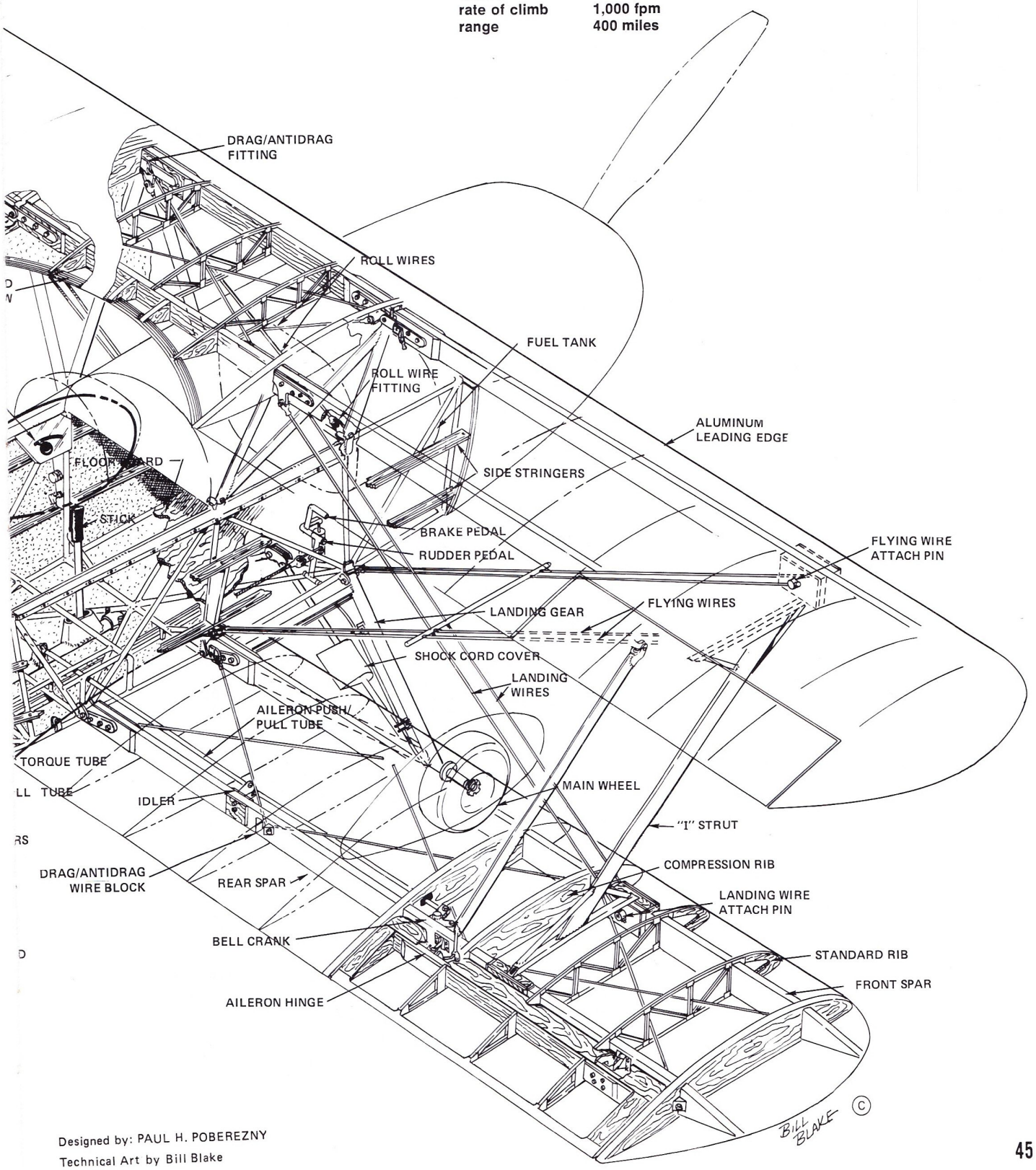
180 HP ACRO SPORT SPECIFICATIONS

Upper Wing Span	19 ft. 7 in.
Lower Wing Span	19 ft. 1 in.
Length	17 ft. 6 in.
Height	6 ft. 0 in.
Landing Gear Tread	5 ft. 10 in.
Gross Weight	1178 lbs.
Empty Weight	733 lbs.
Fuel Capacity	20 gals.
Smoke Oil Capacity	5 gals.
Baggage	35 lbs.
Maximum Speed	180 mph.
Top Speed	152 mph.
Cruising Speed	130 mph.
Stalling Speed	50 mph.
Rate of Climb	3500 ft./min.
Range	350 mi.



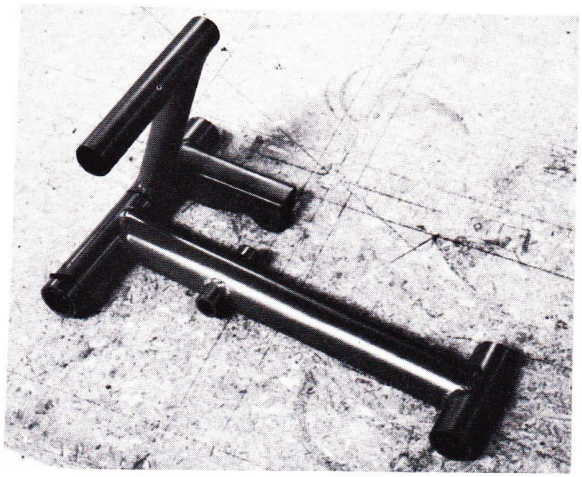
O-200 Teledyne Continental 100 HP includes electrical system, starter & battery.

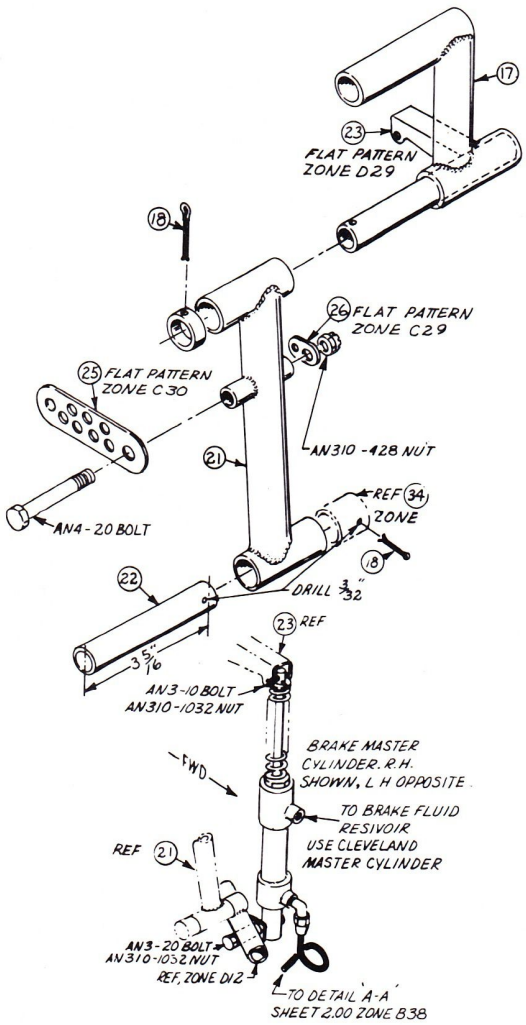
Empty Weight	**721 lbs.**
Maximum speed	**180 mph**
Top speed	**120 mph**
Cruise	**110 mph**
rate of climb	**1,000 fpm**
range	**400 miles**



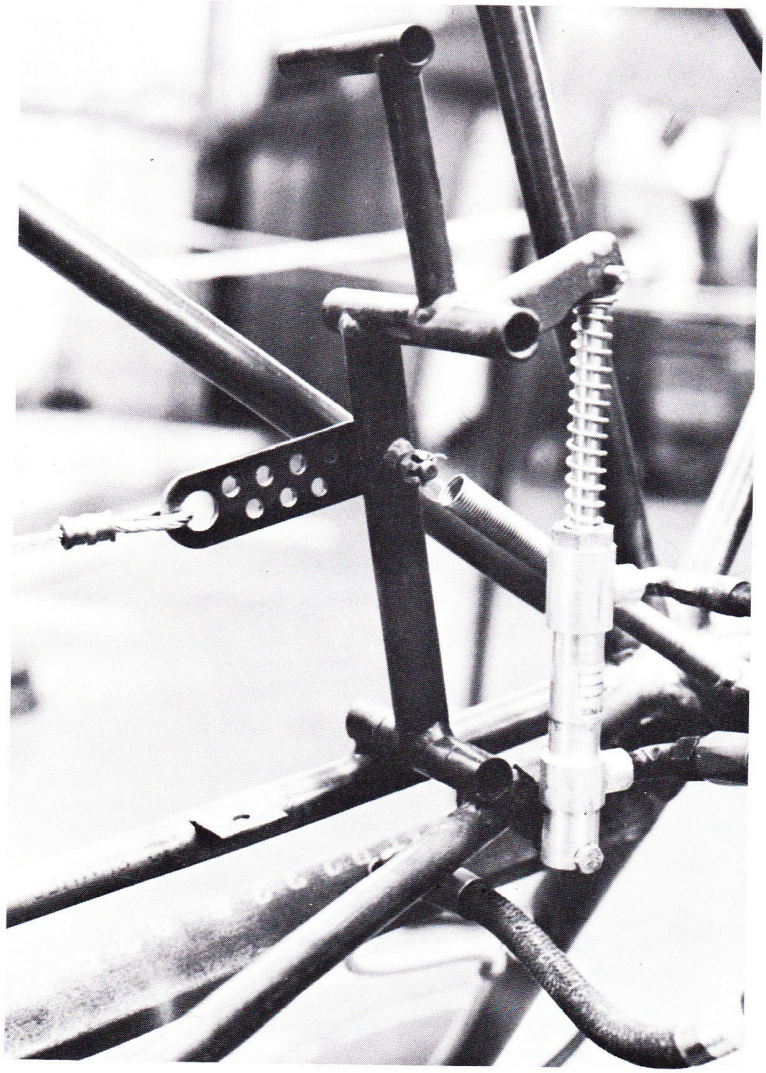
Designed by: PAUL H. POBEREZNY
Technical Art by Bill Blake

Rudder and brake pedal assembly.





Rudder and brake pedal with individual hydraulic brake cylinders are shown — note rudder cable with holes in attach fitting for rudder pedal adjustment — complete unit is of Pitts design.



Putting shock cord in place with landing gear shock strut.

tion securely, the cross section of fairing between the front and rear tubes of the landing gear near the upper fittings should be cut and fitted, and welded into position. This will not allow the spacing to differ so that later on when welding is completed, the heat will not distort or create variances in tolerance.

As per the drawings, lugs to hold fuel-vent lines (if inverted fuel system is used), and hydraulic lines are put into position.

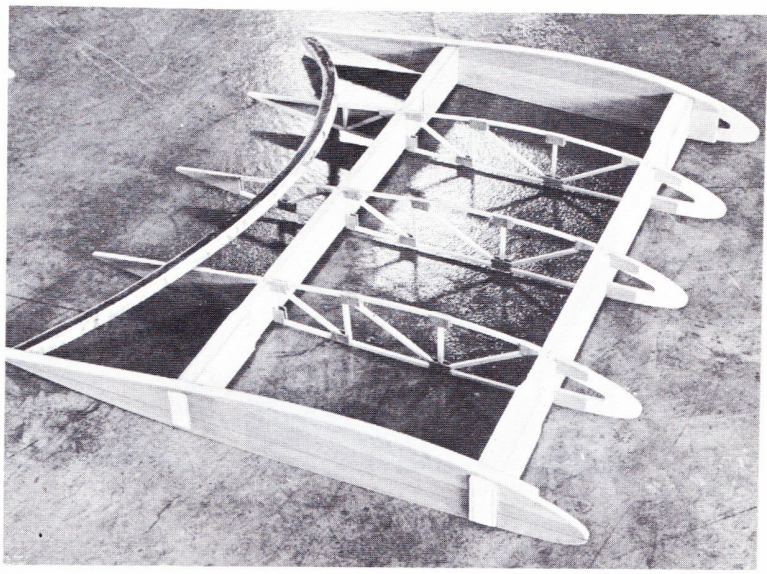
You will note that it will be a little bit more difficult in welding the lighter tubing to the heavy axle wall; great care should be taken so that the heat is distributed to the heavier walls and the lighter tubing is not burned away. It is advisable that the lower end of the shock struts and fittings going into the inboard side of the axles not be permanently welded until such time as the full weight of the airplane is on the gear. It is recognized that there will be variances in constructing the Acro Sport — no two being alike and small errors in dimensions can create fitting problems. This problem is even common when aircraft are built from the same jigs.

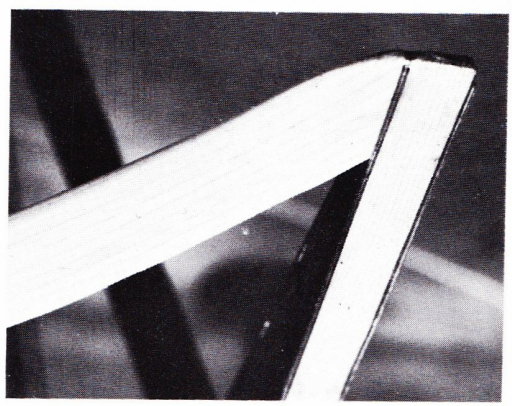
The brake attach washer must be welded into place as accurately as possible as called for on the drawings. The washer must be vertical, or ninety degrees to the axle so as to insure a true fit of the brake assembly to the wheel. The shock system on the Acro Sport is basically as used on the Piper J-3. In the flying of the Acro Sport we have found the shock system to be very adequate and the use of standard Piper Shock cords makes for easy availability and easy installation.

Regarding center section struts and outer "I" wing struts, we feel that the drawings and illustrations in the drawings of the Acro Sport are very adequate and if time is taken to study, they present a satisfactory picture for assembly. We would recommend, in this case, that all four wing panels be constructed as well as the center section. These items being used for jigs and for greater accuracy.

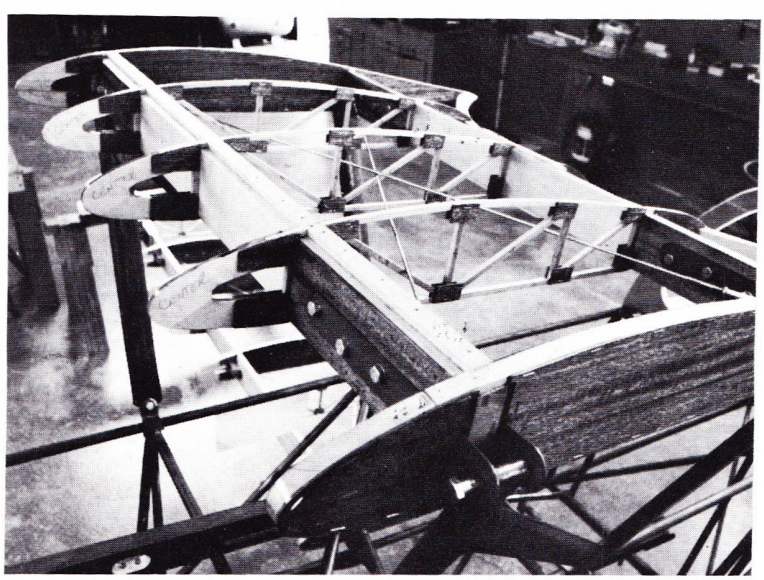
Many who have built biplanes have made a plywood jig box, resting the jig box on the top longerons in the proper location on the fuselage, so that the center section is accurately placed into position in accordance with dimensions shown on the drawings. With the center section in accurate position, front and rear struts are cut to length, fittings welded on the end and the N or diagonal struts are tacked into position, using the fuselage center section lugs on the top of the longeron and the center section strut fittings as the jig. The angle or the end of the strut is tacked into position while the jig box holds the proper dimension for angle of incidence. The center section struts can also be laid out in full size on a piece of plywood, making sure that accuracy of the drawings are followed. Again, I would like to stress that all work should be tack welded, final measurements taken to insure accuracy prior to final welding. One should note that during final welding the diagonal strut between the two upright struts will cause the upright struts to pull inward if not held firmly in place in a jig. If this is not done one

Center section wing ribs slipped on spars. Center section bow laid into position prior to cutting off of trailing edge ribs.



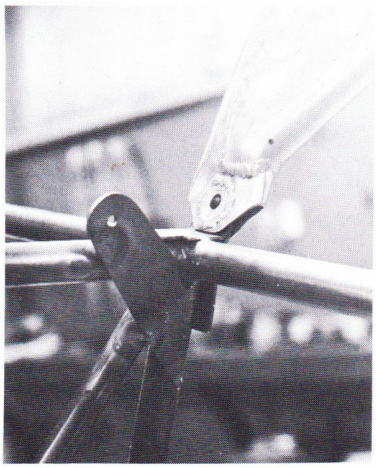


Trailing edge of center section bow attached to butt rib prior to gluing re-inforcing block into triangle.

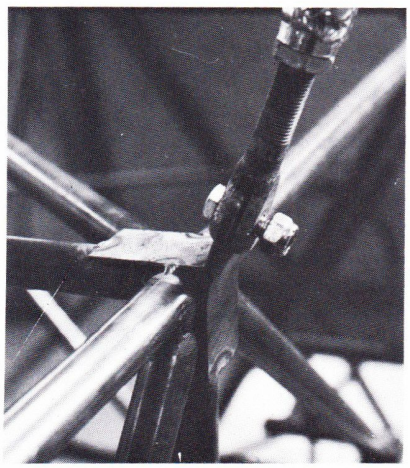


Wing center section held in place by center section struts.

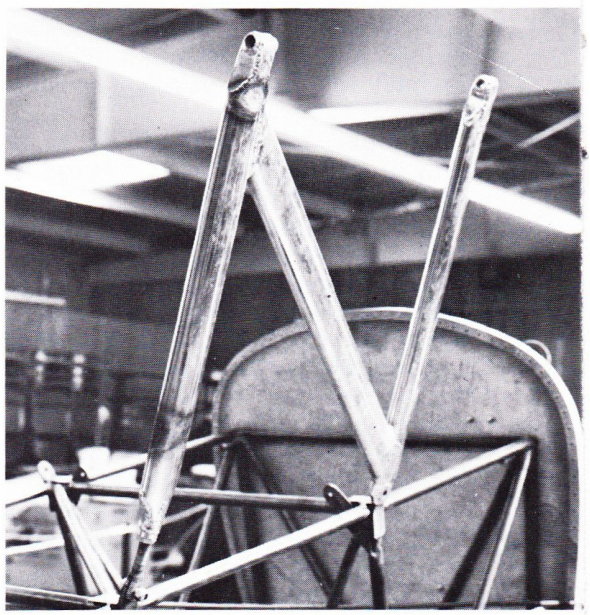
Center section roll wire attach fitting.



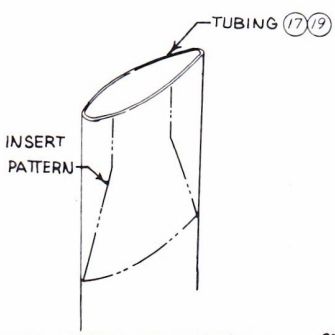
Rear fuselage center section attach fitting tacked into place, prior to heating, pre-forming and final welding.



Center section end strut placed into position.

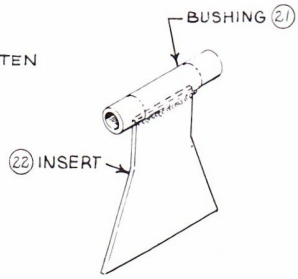


CABANE STRUT ENDS, UPPER

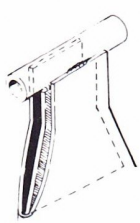


STEP 1. LAYOUT INSERT PATTERN ON STIFF PAPER AND TRACE ON TO TUBING.

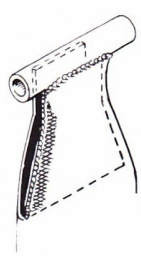
STEP 2. CUT OUT WITH HACKSAW AS SHOWN. FLATTEN TOP EDGES TO MATCH SIDES OF BUSHING.



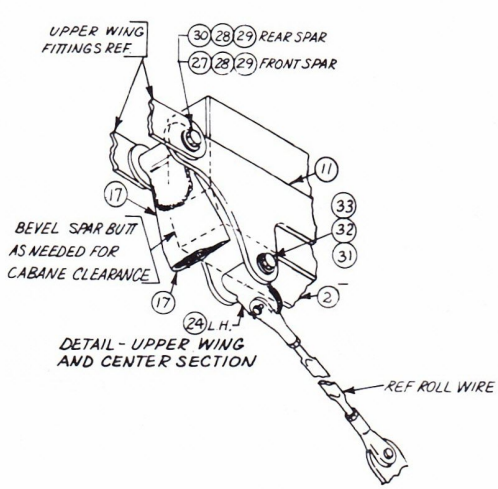
STEP 3. CUT INSERT TO SHAPE AND WELD TO BUSHING. LEAVE BUSHING EXTRA LONG.



STEP 4. PLACE INSERT IN CUTOUT AND TACK WELD BUSHING TO SIDES. WELD INSERT IN PLACE



STEP 5. HEAT SHADED PORTION OF TUBING CHERRY RED AND GENTLY FOLD EDGE OF CUTOUT OVER TO MEET INSERT. WELD JOINT AND REPEAT FOR OPPOSITE SIDE AND REAR OF STRUT.

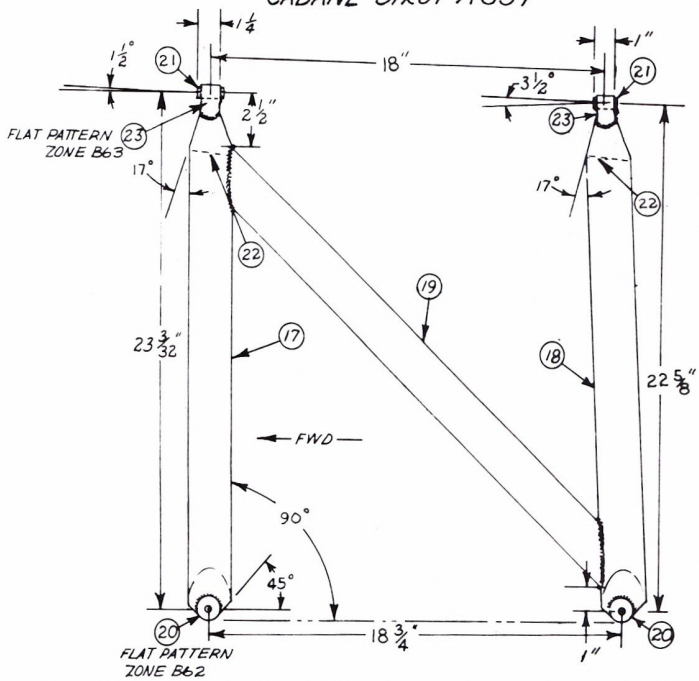


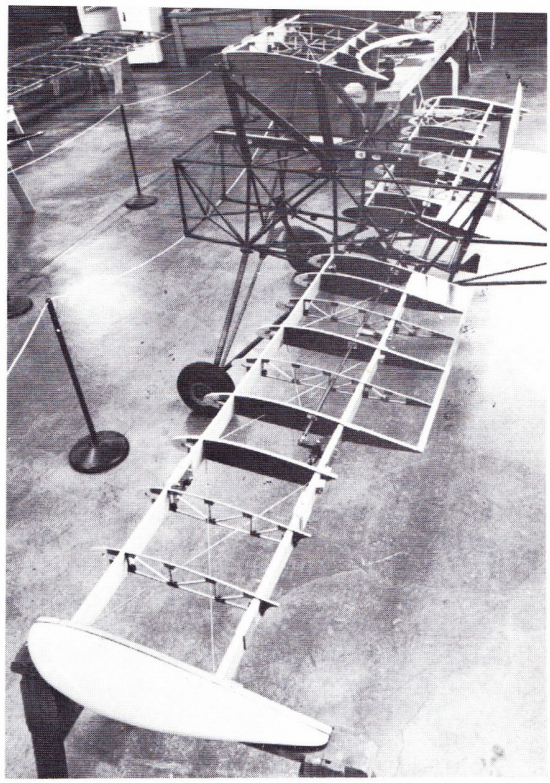
DETAIL - UPPER WING AND CENTER SECTION

Top end of center section end strut.

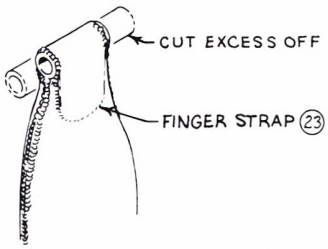
Welding center section end struts.

CABANE STRUT ASSY



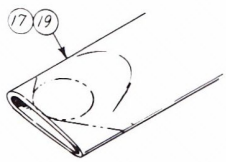


Lower wings and center section placed into position for alignment prior to final welding of fittings.

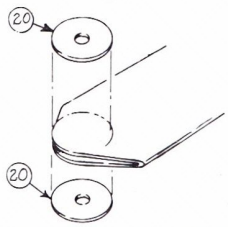


STEP 6. CUT OUT AND SHAPE FINGER STRAP, BEND OVER BUSHING AND WELD IN PLACE. FINISH WELD AROUND AND UNDER BUSHING. CUT BUSHING OFF TO CORRECT LENGTH.

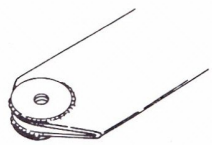
CABANE STRUT ENDS, LOWER



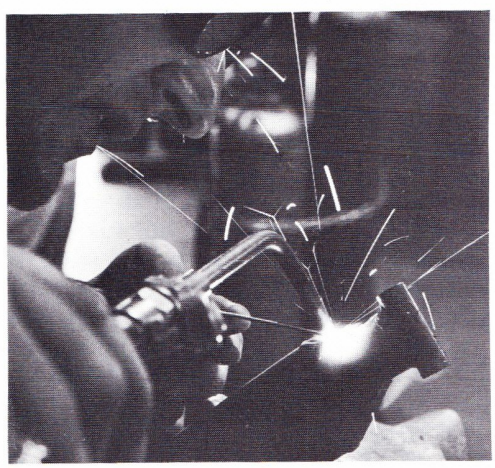
STEP 1. FLATTEN END OF TUBING. LAY WASHER ON CENTERLINE AND MARK OUTLINE AND 45° CUT.



STEP 2. CUT TO SHAPE AS SHOWN. CHECK WASHERS FOR CORRECT FIT.



STEP 3. WELD WASHERS TO TUBE AND EDGE WELD ON END



will find that attaching the struts to the fuselage or center section will not be possible due to warpage or heat shrinking from final welding.

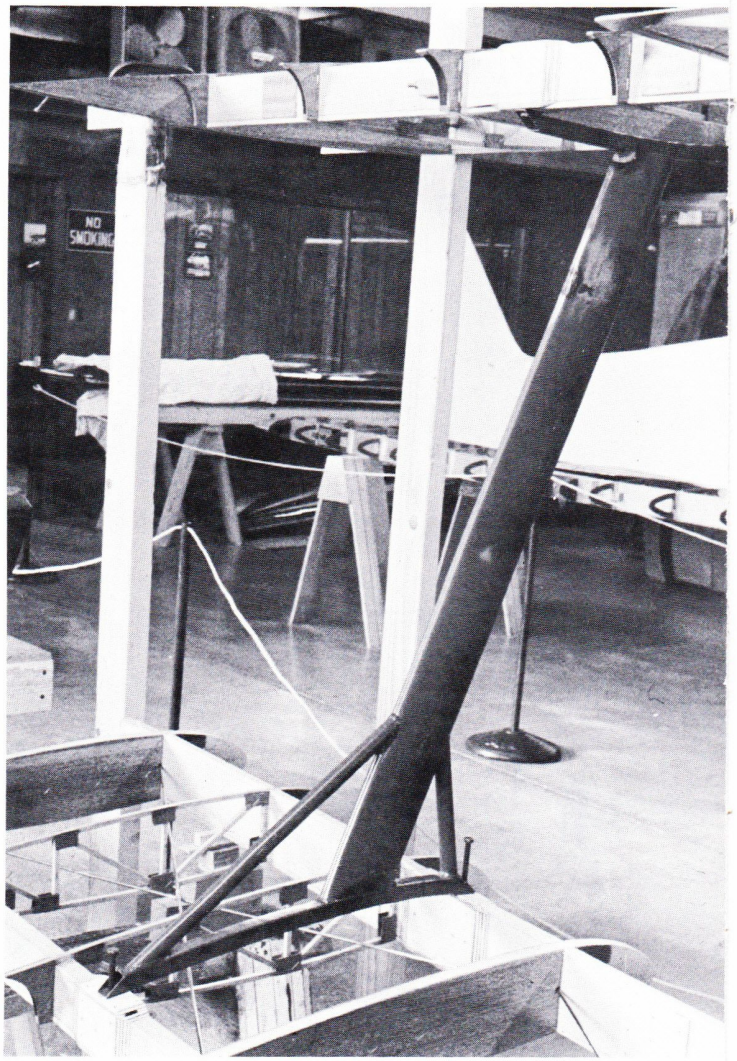
Upon completing the center section struts, attach a lower and upper wing panel into position, providing the correct amount of dihedral in the lower wing panels and no dihedral in the upper wing panels. Per drawing cut your main streamline tubing to size at the proper angle and the two pieces of square tubing for your two outer "I" wing struts.

The "I" strut carries loads fore and aft on front and rear spars equally. You will note the square tubing called for in the drawing should be curved sufficiently to follow the bottom airfoil line on the upper wing, and top airfoil line on the lower wing. These slight curves will permit clearance between the strut and fabric. It is recommended that the upper and lower square tubing that is to be welded to the streamline strut be attached into position on the bottom of the upper wing and top of the lower wing — reminding you again that the aircraft wings should be jigged into proper position prior to final fitting and tack welding. This procedure will permit proper cutting of angles of the streamline tube, filing, fitting and tapering inward of the top and bottom portions of the streamline tube in preparation of tack welding into proper position on the square tubes that form the strut to spar attachments.

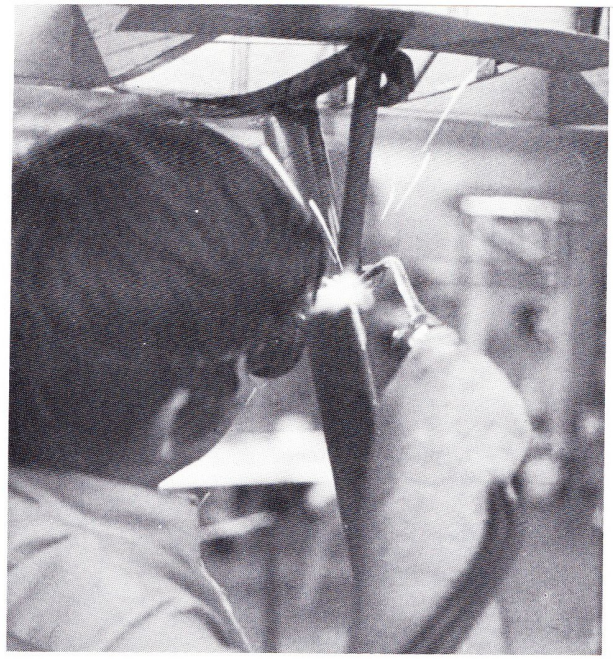
Again, one should be reminded that sufficient welding should be accomplished on the struts while in a permanent position to prevent misalignment or improper fit.

The tube diagonals, as called for in the drawings, running from the square tubing fore and aft ends to the streamline struts, should also be tacked into position before final welding. These tubes carry wing loads to the spar and also serve to hold the square tubing in proper position during construction. I might again remind you that during welding it has been noted that many welders oftentime while flowing the welding rod between pieces of metal to be welded, move too rapidly, causing a lack of penetration and proper fusion of metal. Although the outward appearance of the weld may look professional, if insufficient time is allowed to heat both metals into a wet or puddle condition, the poor penetration will result. It is better to weld slowly, patiently and with good penetration of both metals and welding rod rather than rapidly with the impression that one has a good bead going.

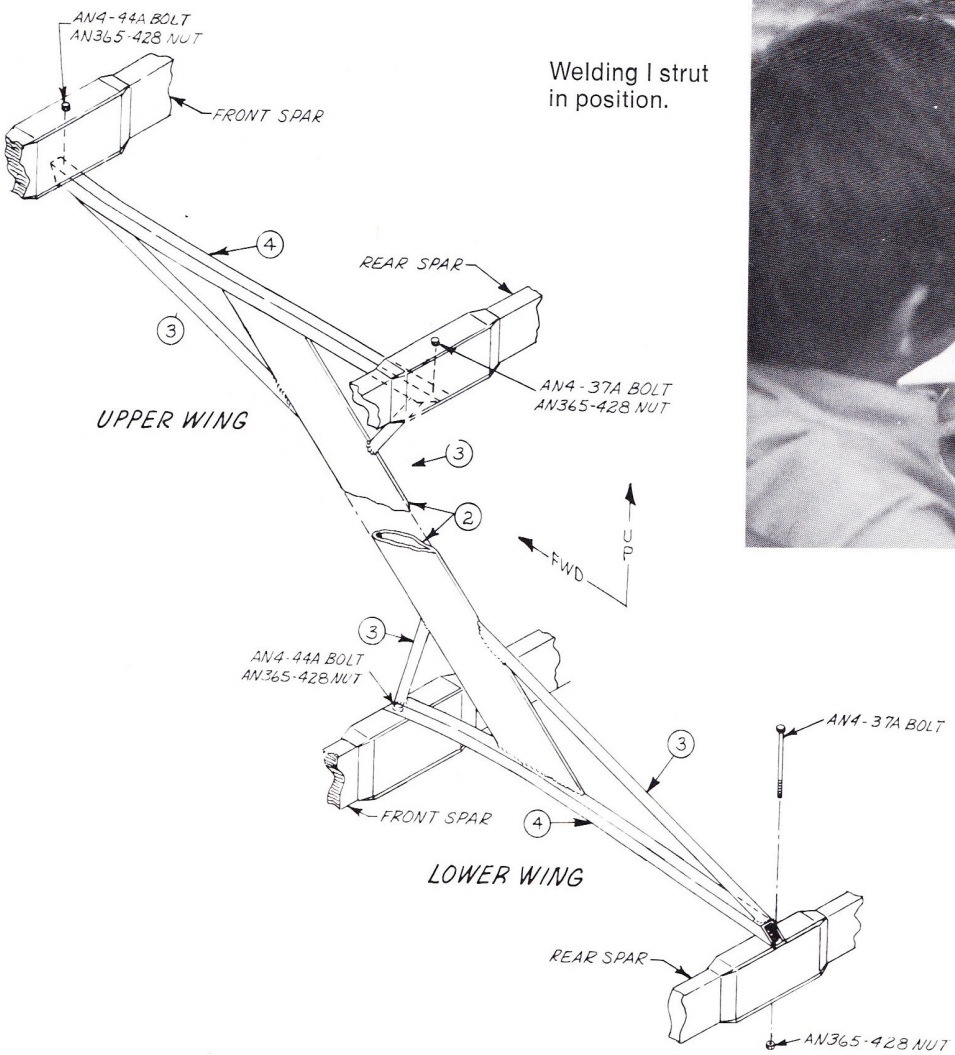
The streamlined wires which form an "X" between upper and lower wings, and the roll wires between the center section and the fuselage are vitally important. They are the prime wing supporting members. Without them the wing structures would collapse. **Do not substitute stranded aircraft cable for streamline wires or tie rods. Cables stretch under loads and if used would allow wing assemblies to distort in flight.** It is also recommended that wires other than those called out in the drawings not be used as each wire has been selected and placed into position with a known tensile strength.

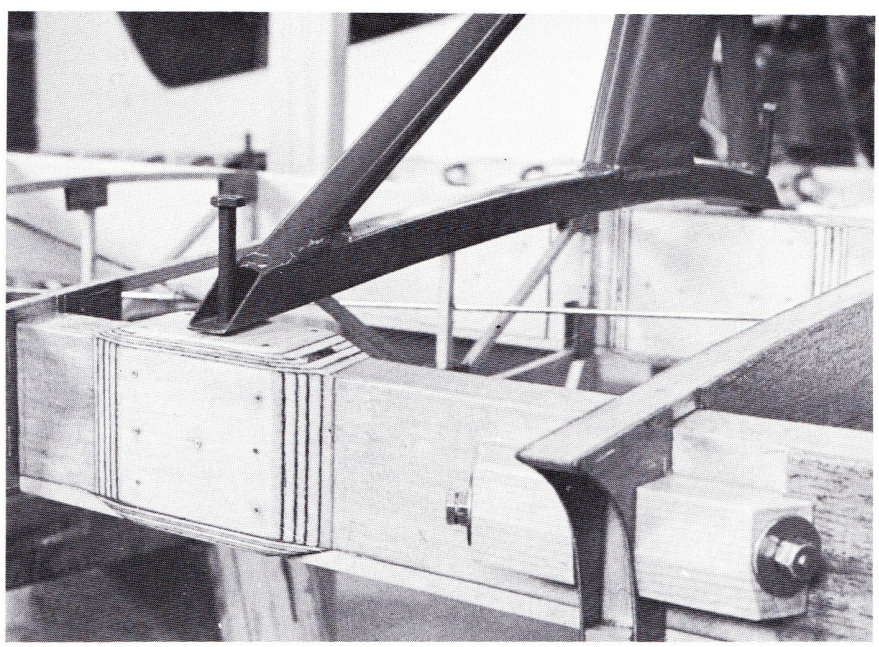


I strut tack welding into position. Wings are mounted with proper dihedral, 2° lower wing, 0° upper wing. Small adjustments for wing wash in or wash out (wing heaviness) are used for adjustment.

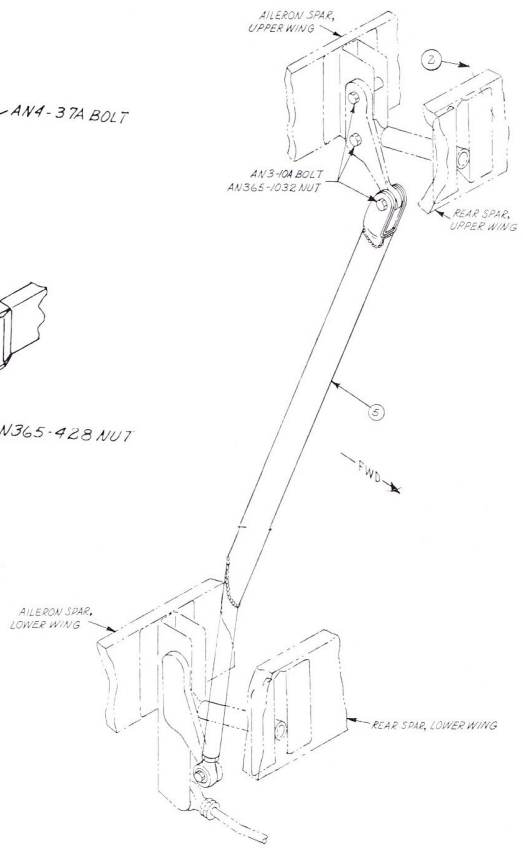


Welding I strut in position.

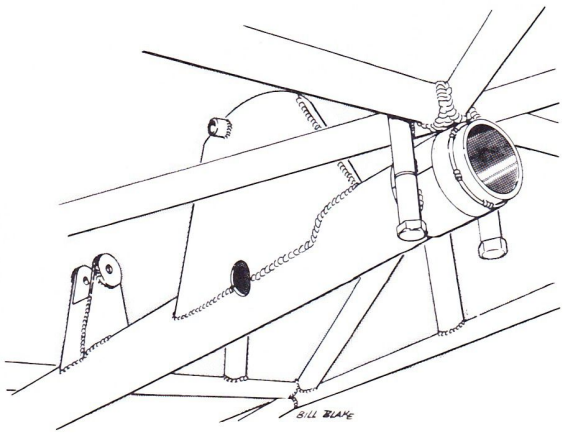




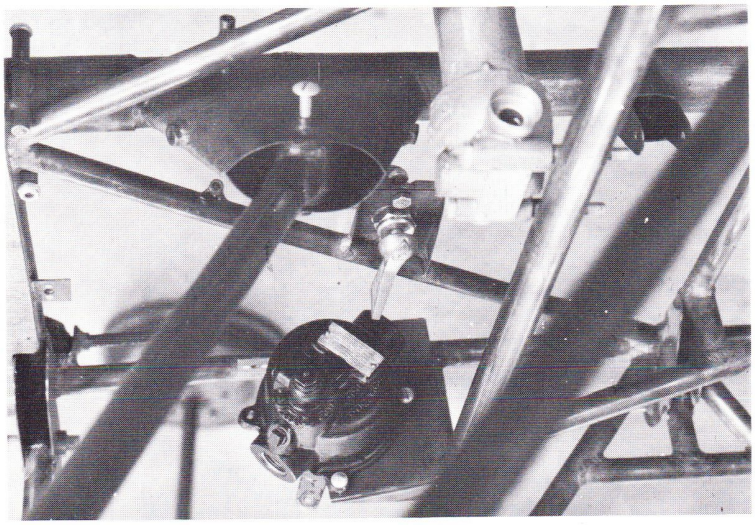
Note square tubing is curved to follow shape of airfoil.



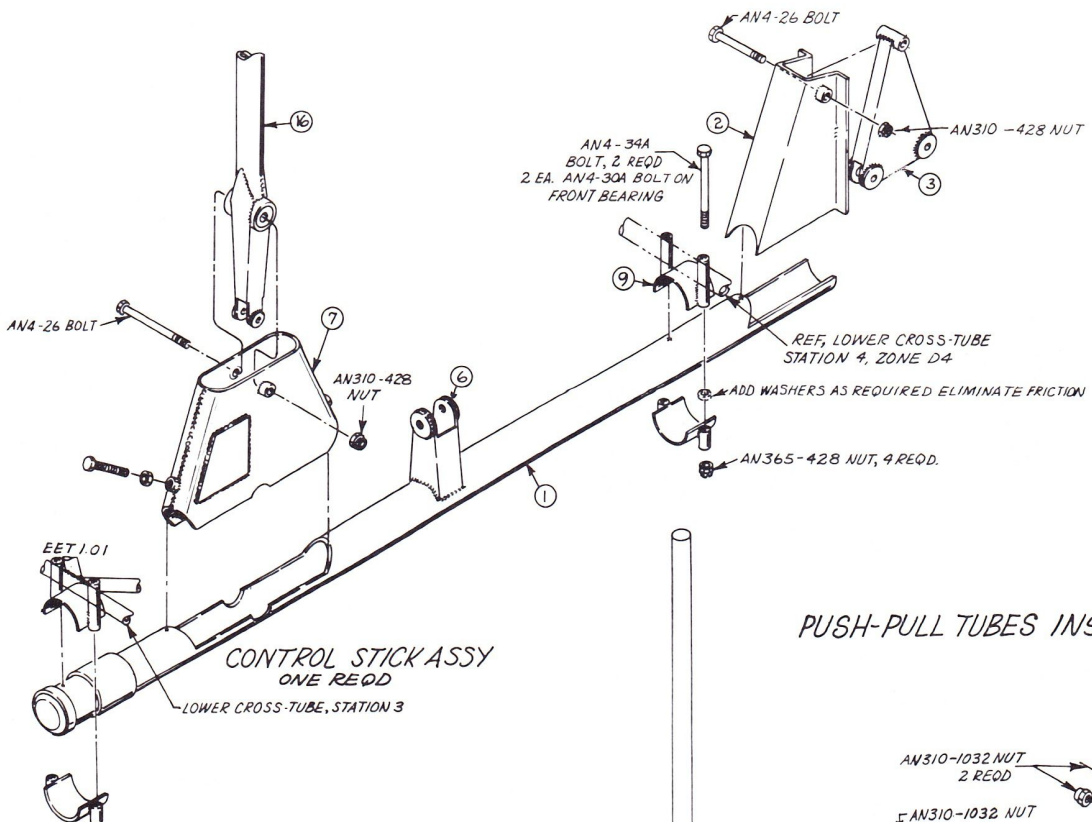
Jury — or slave strut — assembly details.

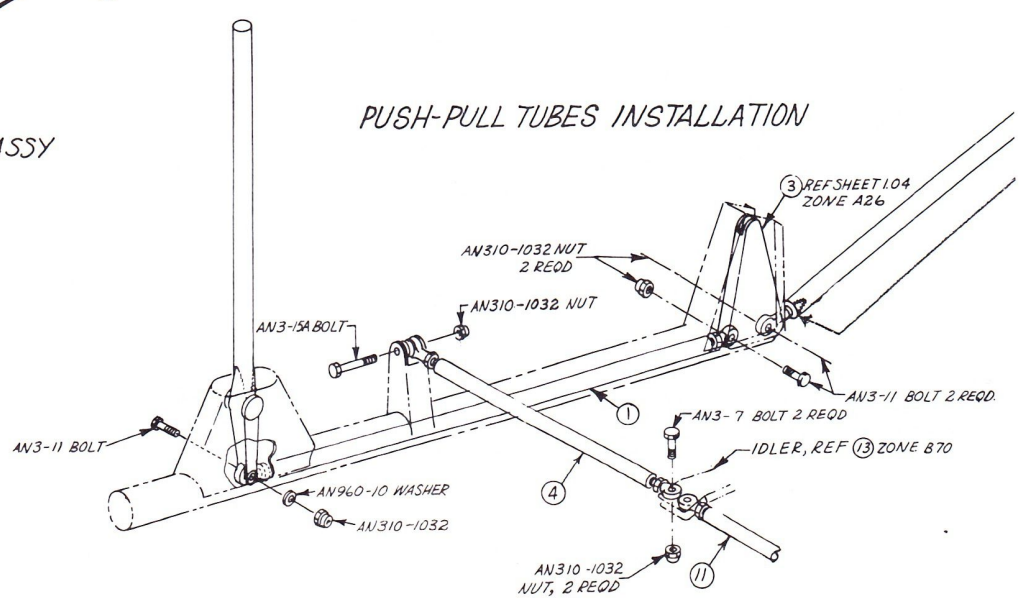


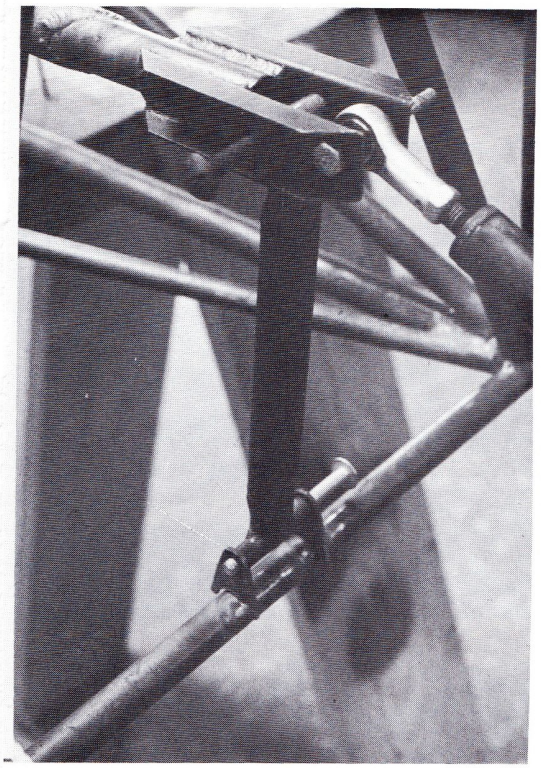
The torque tube control system is hung below the fuselage on two bearing supports. Proper alignment and clearance must be maintained. Control unit is of Pitts design.



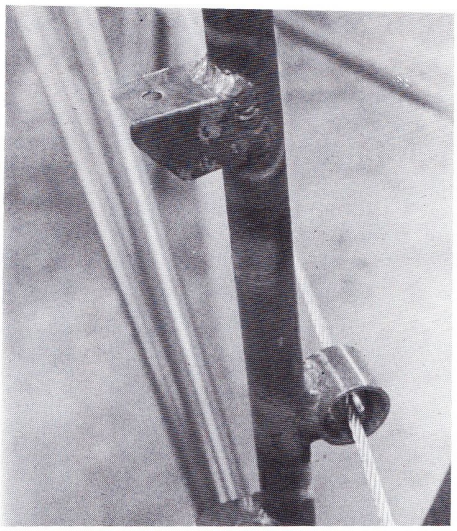
Fuel filter and wobble pump and fuel shut off shown in this picture as used on 180 Lycoming.



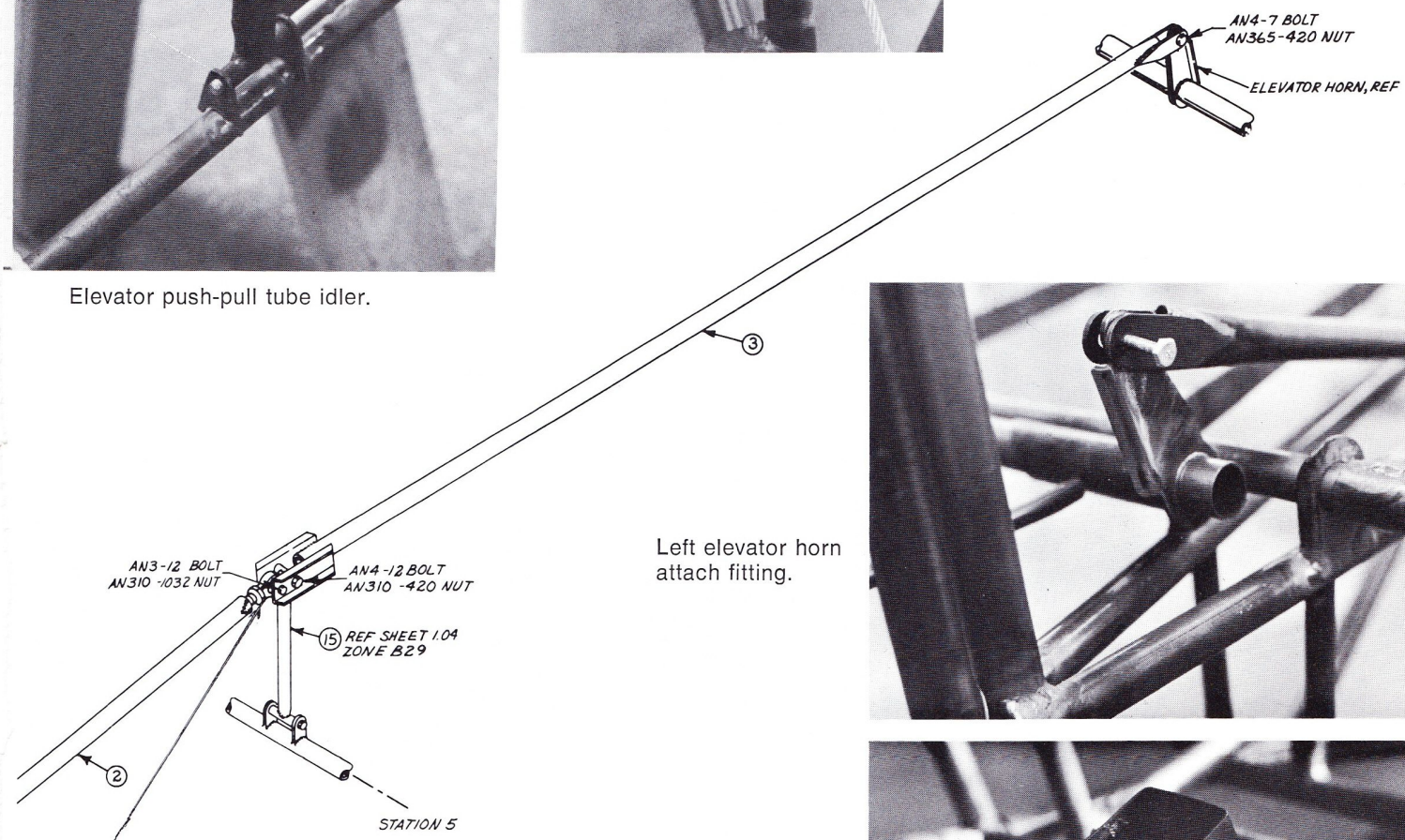




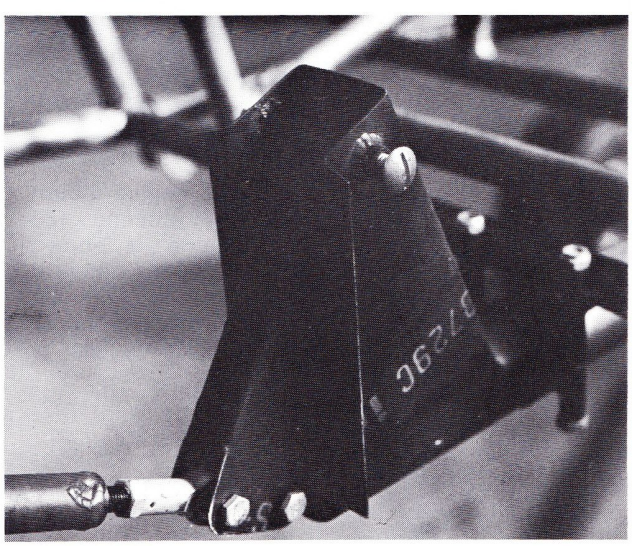
Elevator push-pull tube idler.

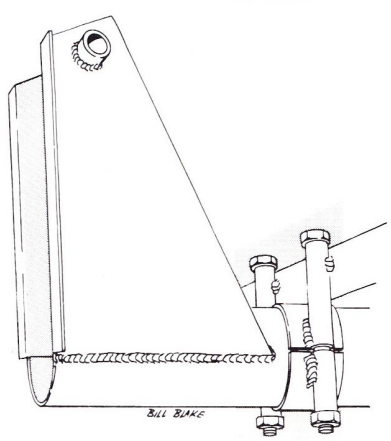


Rubber cable guides are welded to fuselage sides.

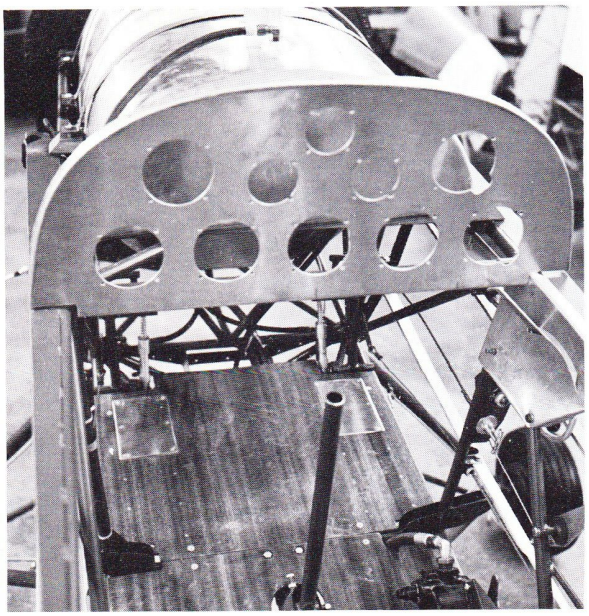


Left elevator horn attach fitting.



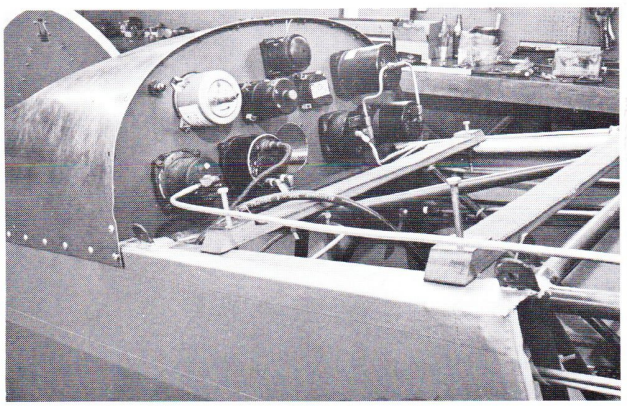


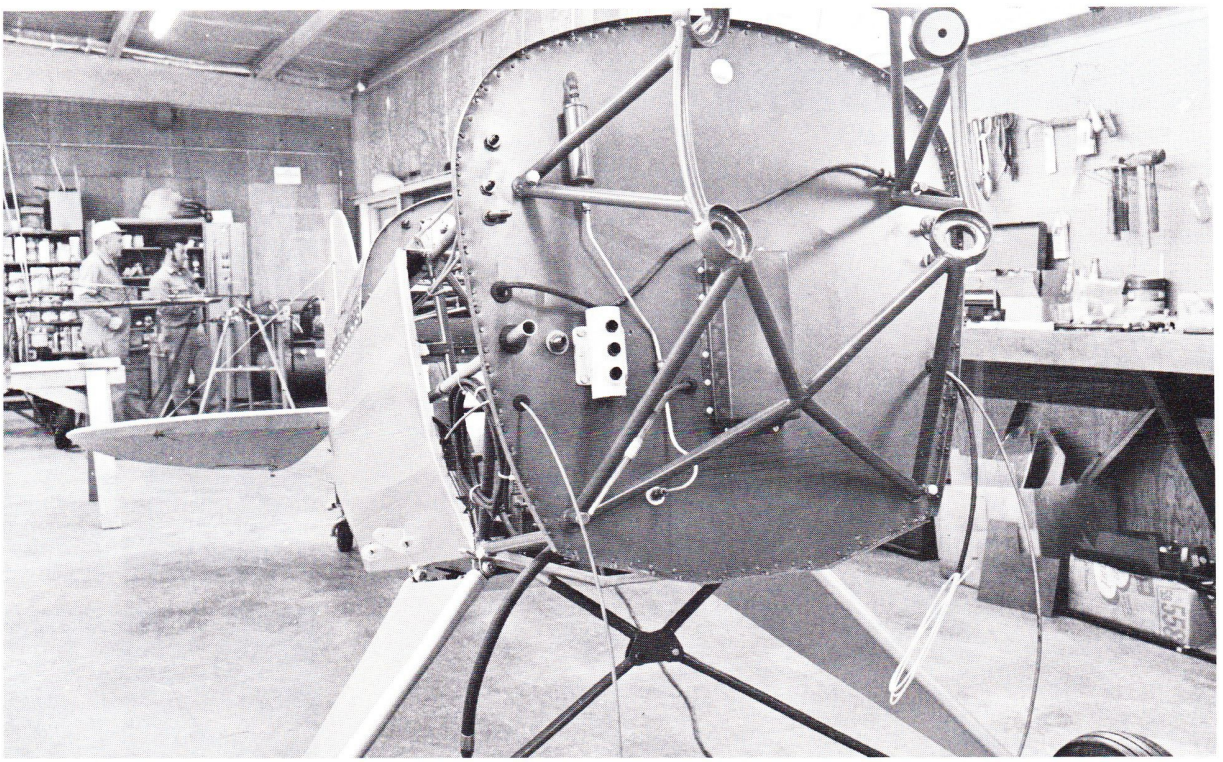
Elevator push-pull tube.



Instrument panel, fuel tank and controls appear here.

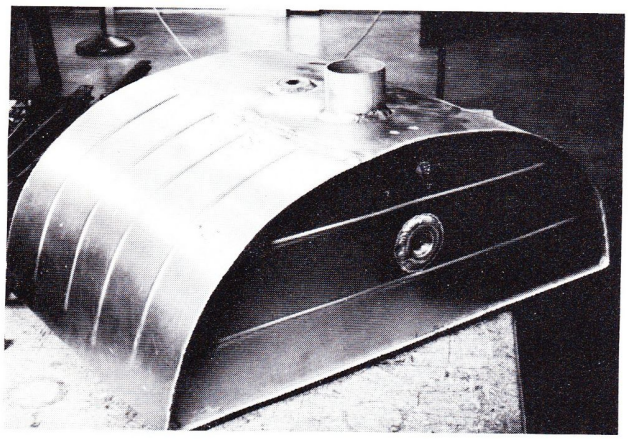
Plenty of room behind instrument panel.
Wood supports and felt provide base for smoke oil or auxiliary fuel tank.



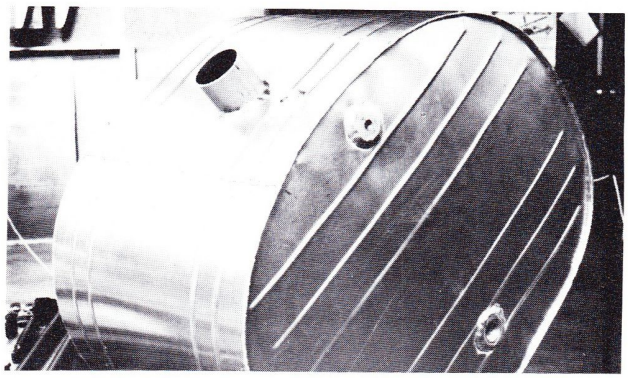


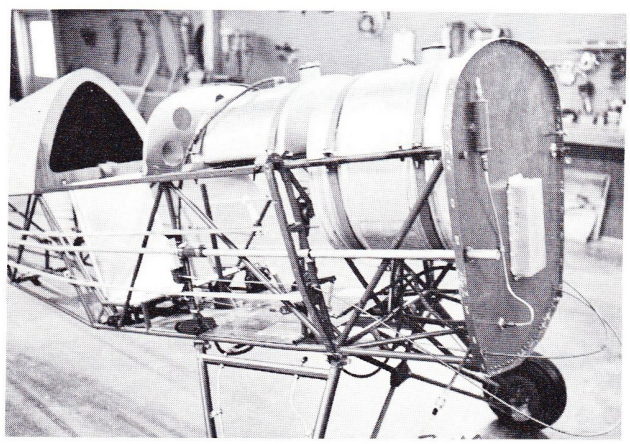
Dynafocal engine mount for the Lycoming 180 H.P. engine is shown here. A slightly different mount is used for the Teledyne Continental 0-200, 100 H.P. engine.

Smoke oil tank can be converted to auxiliary fuel tank — tank holds approximately 6 gallons.



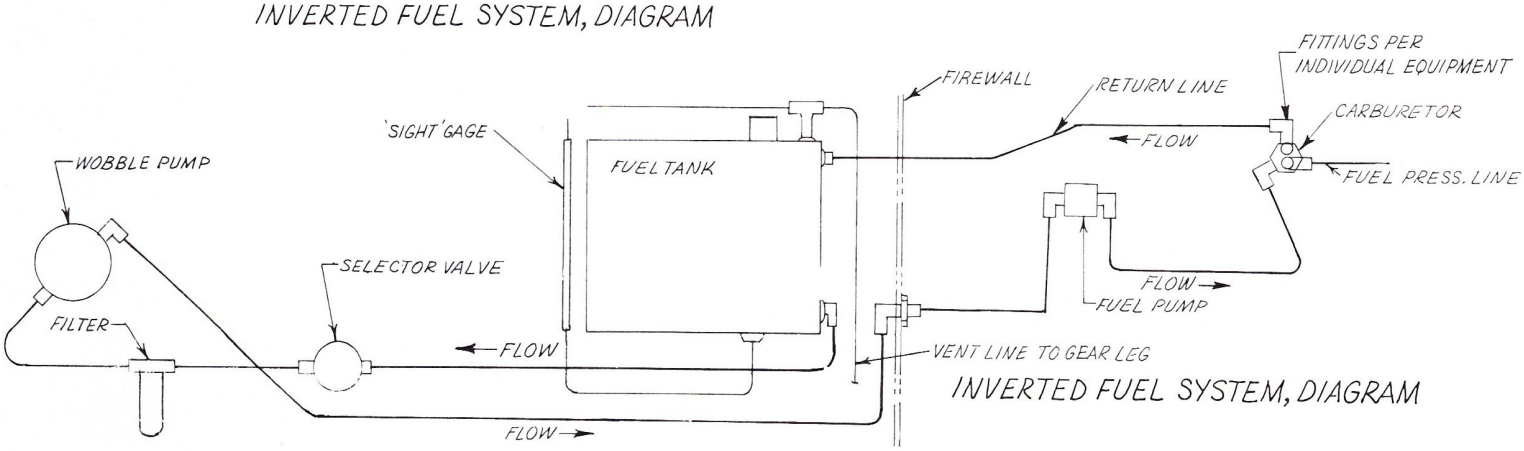
The Acro Sport fuel tank holds 20 gallons of fuel. Note reinforcing ribs pressed into aluminum to add rigidity and strength.





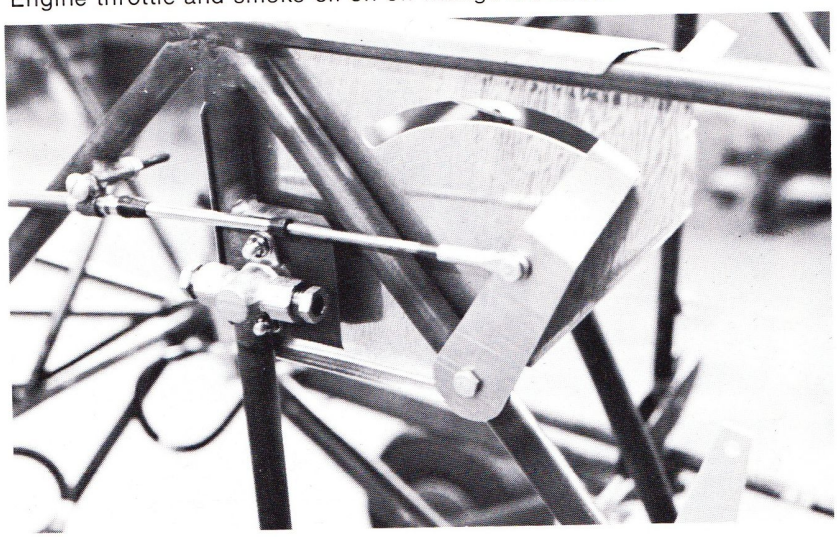
Fuel and smoke oil tanks in place on Acro Sport N1AC. Wheel brake hydraulic reservoir is located on front of fire wall. Tube along right side of fuselage is aerobatic breather tube to keep oil off fuselage belly. Lower wing fittings have been changed on later aircraft.

INVERTED FUEL SYSTEM, DIAGRAM

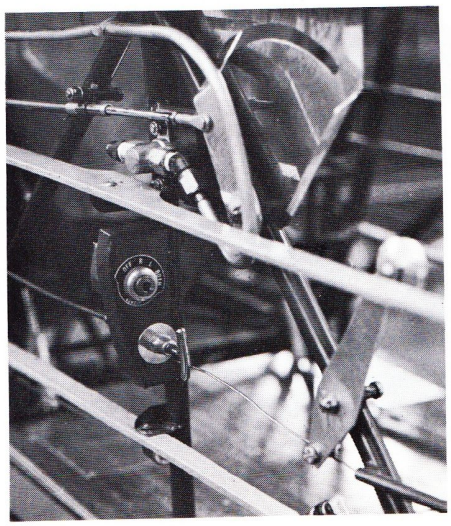


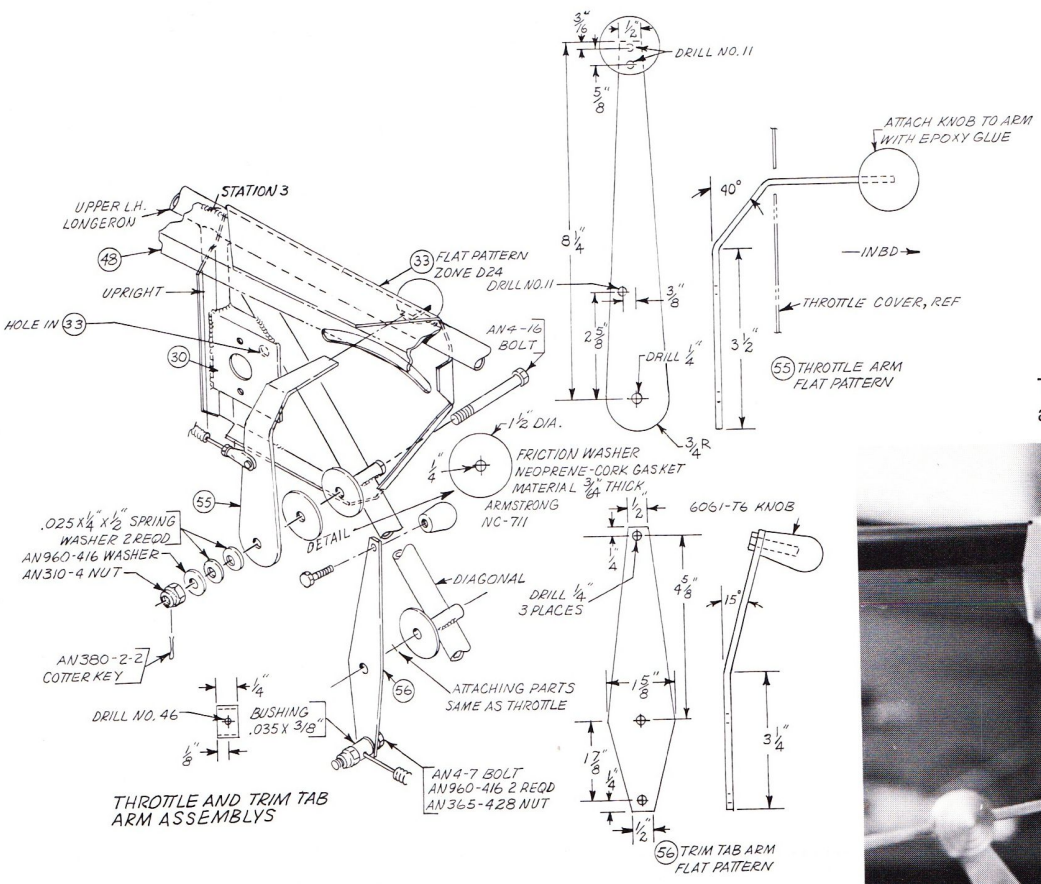
INVERTED FUEL SYSTEM, DIAGRAM

Engine throttle and smoke oil on-off fittings are shown.

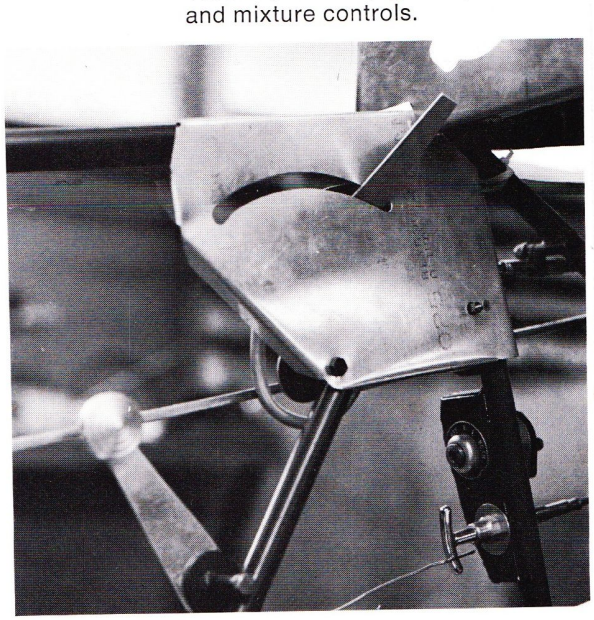


Trim tab lever, ignition switch and mixture control are located conveniently.





Throttle, trim tab, ignition, and mixture controls.

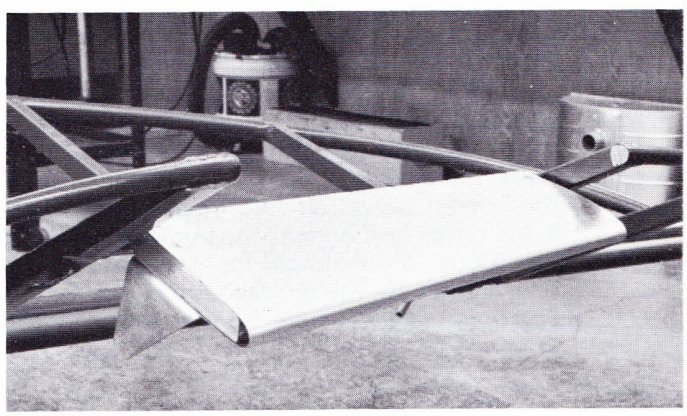


Building an airplane requires one to seek additional information as well as availing oneself of the publications from the Experimental Aircraft Association. It is possible, through self education, to construct a very successful aircraft. Federal Air Regulations require any airplane to be equipped with at least an air speed indicator, an altimeter, tachometer, oil and temperature guage and, depending on the engine, fuel and oil pressure gauges. Also, a single compass. Serviceable instruments of this type are fairly easy to find through the pages of SPORT AVIATION magazine.

Where instrument lines, ignition wires, and fuel tubes pass through the airplane's fire wall, make the fire wall holes oversize and use snug fitting rubber grommets to prevent fire wall metal from chafing or cutting the lines. Do not put humps in fuel lines which could cause vapor locks at high altitudes or in hot weather, or during bending decrease the size of the line. It is realized that many who will construct the Acro Sport will vary considerably from drawings, using different fuel lines, fuel systems, different engines, etc. However, when doing this, each installation must insure proper fuel flow from the tank to the carburetor. The engine weights may vary, which must be considered in planning weight and balance, and different lengths of engine mounts must be considered so as changes provide reasonable flight characteristics of the airplane due to weight. Fuel tank outlet and strainers should be attached in such a manner that the engine will not be starved for gas while climbing, or with a low fuel quantity level in different attitudes. You must also insure that a large quantity of water cannot accumulate in the fuel system and not be properly drained. The tanks should, if possible, have a drain cock located at its very lowest point when the plane is a rest on the ground. Tubes should be provided to lead drained fuel down and clear of the cowling or fuselage. The outlets of these drains must remain clear of exhaust stack ends. A rubber gasket is recommended around the fuel filler neck so that fuel overflowing from the tank, while servicing, will not drain into the fuselage. It is recommended that before the forward part of the fuselage is closed in by cowling, the fuel tank be filled with fuel and that points of leakage be noted. If the engine is to have an engine primer, shoot a bit of fuel into the intake pipe, noting that there are no leaks in the primer system.

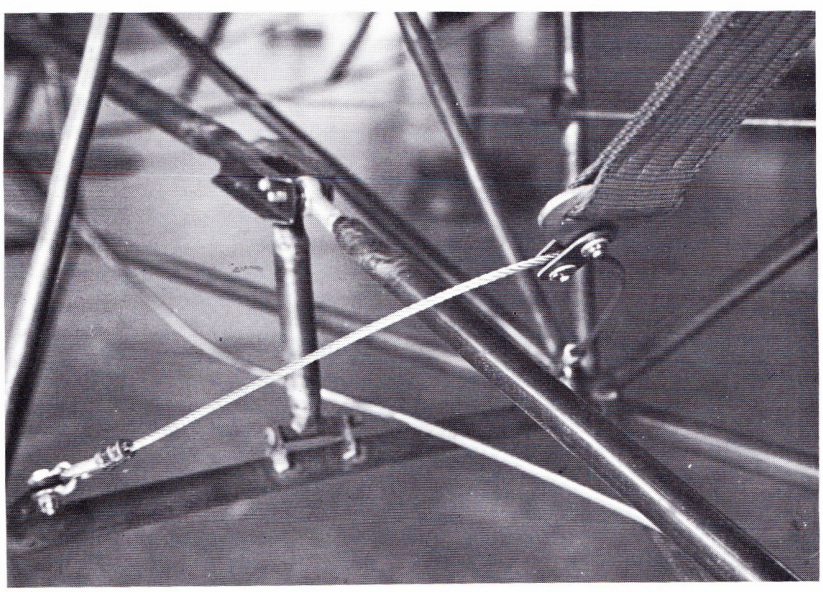
The dimensions called for in the drawing regarding cowling have been taken from the original prototype. It is realized that any inaccuracy during construction, even of one eighth or one quarter of an inch would adversely affect fitting of the cowl. It would be wise to use the dimensions as called for in the drawings, allowing at least a quarter to three

Trim tab mounted on right elevator. Servo tab mounted on left elevator.



Inspection door at elevator. Push pull tube attach.

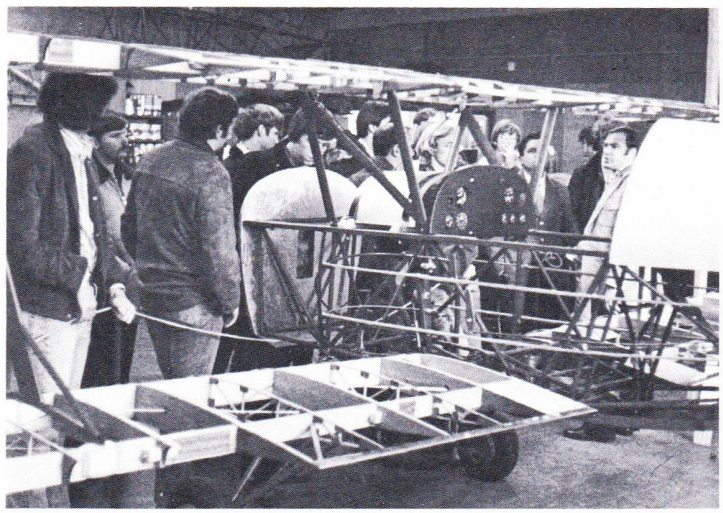
Shoulder harness attach lugs and cable.



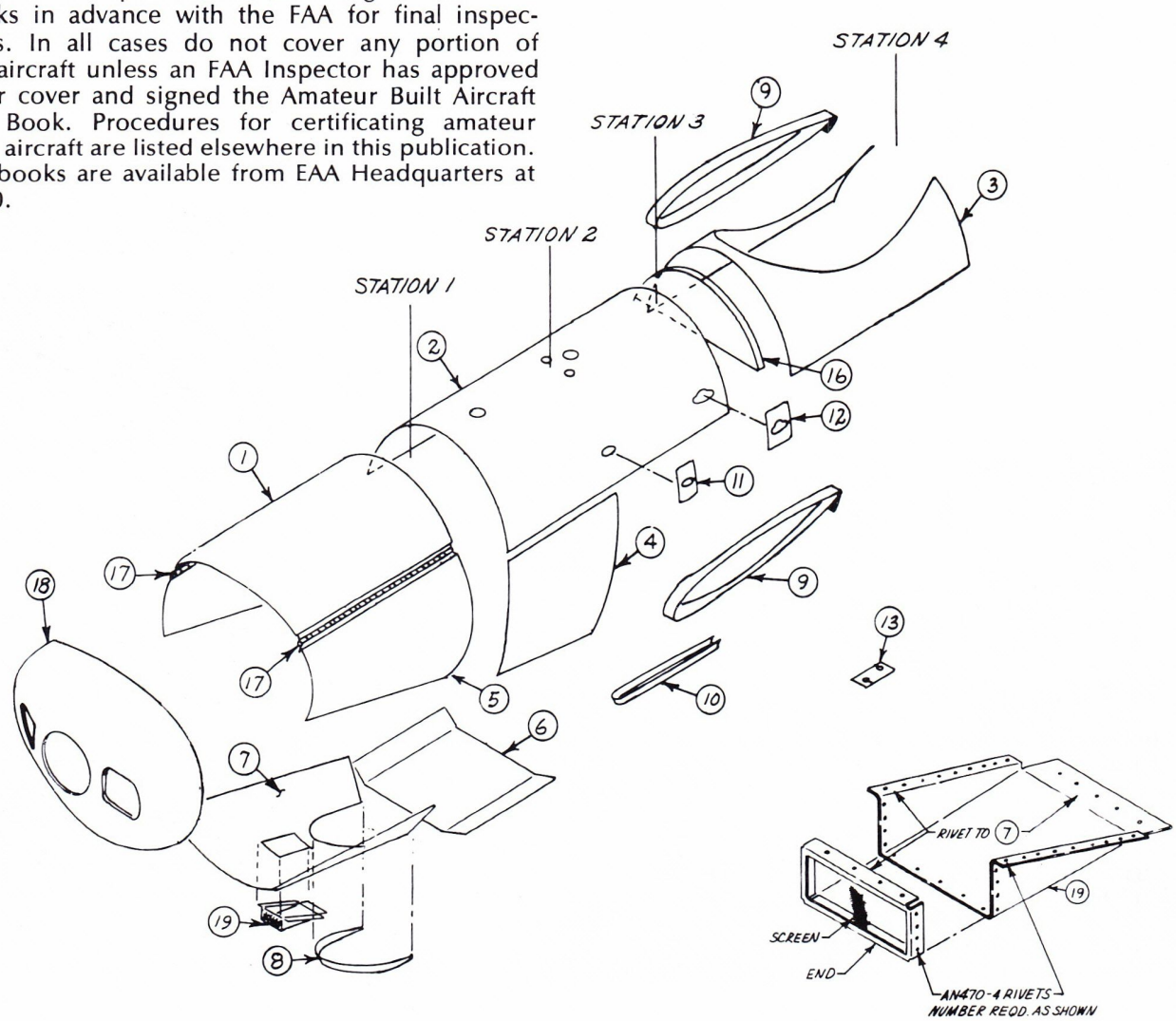
eighths inch overlap on each end, or better, for final fitting. It is always easier to cut off than add on. It is recommended that an enclosed cowl be installed on the airplane as called for in the drawing, to provide adequate and proper aerodynamic flight characteristics of the airplane.

It must be remembered that dependable operation of an air-cooled engine requires ample and free circulation of air. The closer your cowling and its internal baffles come to duplicating production airplane parts, the better. The cowling must be carefully and securely installed, because if it becomes loose in flight it can wrap itself around the propeller hub or upset air flow around the wings or tail group. The cowling has been so designed that no pockets exist which could catch dripping fuel and lead to dangerous fire hazards. Access to the oil dip stick is easily accomplished through the opening of one of the cowl cheeks.

When the entire framework of the uncovered aircraft is completed, assemble the aircraft so that the proper inspection of the design, materials and construction can be accomplished by either an EAA Designee or an FAA maintenance or engineering inspector. As the framework construction approaches completion, make arrangements some weeks in advance with the FAA for final inspections. In all cases do not cover any portion of the aircraft unless an FAA Inspector has approved it for cover and signed the Amateur Built Aircraft Log Book. Procedures for certificating amateur built aircraft are listed elsewhere in this publication. Log books are available from EAA Headquarters at $1.00.



Interest by school groups in the Acro Sport is great.




covering

COVERING THE EAA ACRO SPORT

The prototype EAA Acro Sport was covered using grade A cotton aircraft cloth, however, imported linen aircraft cloth or a synthetic fabric such as Ceconite, Razorback, etc. could be used. Grade A cotton aircraft fabric is certainly entirely airworthy and reasonably durable for an airplane of this small size. The Acro Sport is so small that chances are that it can be kept out of the weather in some hangar corner most of the time. Sunlight is the worst enemy of aircraft fabric, for eventually it makes the finishes both hard and brittle. If your ship is to be hangared, grade A cloth may last ten or fifteen years easily. If it is kept outdoors all year around, it could last five or six years before needing to be replaced.

In general, you will find it easiest to get reliable literature and local advice on the use of grade A cotton through publications of the Experimental Aircraft Association or by writing to some of the advertisers listing **their** covering products in the Association's house organ, SPORT AVIATION. If desired, an extremely handsome finish can be put on by using plenty of dope and polishing the final job with rubbing compound. Dope, so called because as formulated long ago its fumes made workmen groggy, is available in two types — nitrate and butyrate. The latter is more expensive but is more durable and has a greater fire resistance. Doping should be done in a well ventilated place with no open flames or sparks present. Use good brushes with tight bristles. If bristles come out and are allowed to remain in the finish, they will cause cracks later. A two inch brush is handy for small work such as putting tape into place on edges of wing ribs, stringers, and trailing edges. A five inch brush will allow this fast drying material to be spread on rapidly and with ease over large surfaces. Each wing rib is a girder designed to take loads in a vertical plane. It is quite flexible in a horizontal plane, and when fabric is put on, it can bend a little so that the rib's spacing seems irregular through the fabric. Therefore, an aircraft type reinforcing tape, available from fabric suppliers, is run diagonally from rib to rib, midway between the spars very much like a diagonal bridging used with floor joists. It is wrapped once around each cap strip at the top of the wing rib or the bottom. This keeps the ribs in alignment while the fabric is being put on and the finish job shows straight, evenly spaced ribs through the fabric. Prior to covering, go over the complete framework looking for and correcting sharp edges which could chafe or cut the fabric.

The aluminum leading edge oftentime is installed in two or three pieces. If this is the case, where they join or overlap, affix a strip of painter's masking tape. The cap strips and the edges of wooden stringers on the fuselage should have their sharp edges broken with light sanding prior to varnishing. Raw metal edges in the elevator ribs and on wing fitting edge strips should be turned down slightly. It should also be noted that during doping that if any dope is permitted to drop inside of the fuselage, tail group or wing, a boil or blister will show permanently. Putting fabric on a plane is a job full of mysteries. But, actually, once the idea is grasped it can be easily and satisfactorily accomplished. On all airplanes the cloth is applied with its long dimension parallel to the wing, the reason being the relationship of weave to stretching and tearing characteristics. If the fabric area on the bottom or sides of the fuselage is so many feet long, you unroll that length with 6 to 8 inches of margin from a roll of fabric and apply it lengthwise. But, in covering wings, it is wrong to unroll cloth and lay it span wise from end of the wing; then its weave would be at right angles to the air flow. Instead, any required number of strips are sewn together, edge to edge, to make a single sheet large enough to wrap around the wing. Depending on the width of fabric selected, whether it be thirty six, forty two or sixty inch wide material, it will determine how many panels one

Smooth, easy strokes are used in applying dope. Keep dope from thickening by adding a bit of thinner.