The Georgias Special is a slightly larger monoplane than we have run before.

THE DESIGN OF THE GEORGIAS SPECIAL

By Orville Hickman

Well, here we are, boys — with something a little advanced. I expect that you have been waiting for some time for this kind of a plane to build; all steel but the wings, and they are of the conventional wood type.

The first thing we will start on is the fuselage. It is rather simple when we know how to go about it. First get your tubing that you are going to use for the longerons and then lay a plan of the side of the ship out on some level surface, preferably a wooden table so that you can drive nails around your outline to lay the tubing into. This work of laying out the fuselage side on the table must be very carefully done or our good intentions are defeated before we get very far. After we get the side laid out we put the pieces of tubing into the outline that we have made and cut the vertical and diagonal pieces to fit. All joints must fit closely and neatly, otherwise we will have to use an undue amount of welding rod to get the holes filled up. This does not make as strong a joint.

When all of the pieces are laid, get a welding outfit and if you are not a good welder get someone who is and just "spot" the joints all together with the welding rod — not too much — then make the other side. It is the same so you can use the same jig. After you have completed the second side take out the side and draw another diagram of the top of the ship on the table and drive your nails in. Place the two sides on that outline, with the top longeron down and the vertical sides perpendicular to the table. Be sure that these sides are straight up and down. The best way to assure that is to use a carpenter's square. After plumbness is determined cut your pieces to fit horizontally and tack them to the sides with a torch. Also put in the cross bracing on the top and bottom and the internal diagonals and all other bracing that the plans call for.

Now the fuselage is ready to take out and weld. The best plan to do this is to weld one bay at a time going around the fuselage laterally a joint at a time. You will find this method the best, having the least amount of warping.

After this operation is complete cut all of your

fittings that go on the fuselage and then weld them on in their respective places, motor mount lugs, landing chassis lugs, and so forth.

Special care must be used here for all things must have the exact measurement. Otherwise the parts that fit these lugs will not go on if "out" any. After the fuselage is all welded and the lugs welded on, then give it a painting of lionoil, which protects it from rust.

Empennage

The next thing is to build the empennage, which is a rather simple procedure. First thing to do is to get the outline laid out on the same table that we used to lay out our fuselage, and cut the tubing to fit and spot this the same as you did the fuselage. Take out the spotted framework and weld up. When you have all of the empennage welded, put the control horns on to the elevators and rudder in their respective places, making sure that they are exactly in line.

You will find that the empennage will warp considerably in the part that the light tubing is used, but with a little careful checking and lining up by hand, bending cold (for there is only slight bending to be done) you will get a perfect job. But let me tell you here that there is a little trick to heating a steel tube in the proper place to get the right results. That is, heat the tube on the side that the bend is to a dull red. At first this actually increases the bend but when the tubing cools off you will find that it has assumed an angle opposite to the original bend and almost invariably comes out exactly straight.

In handling small gauge tubing extreme care must be used not to get this metal too hot and burn the tubing because it is a very easy thing to do and, of course, might cause disastrous results after the ship is flying.

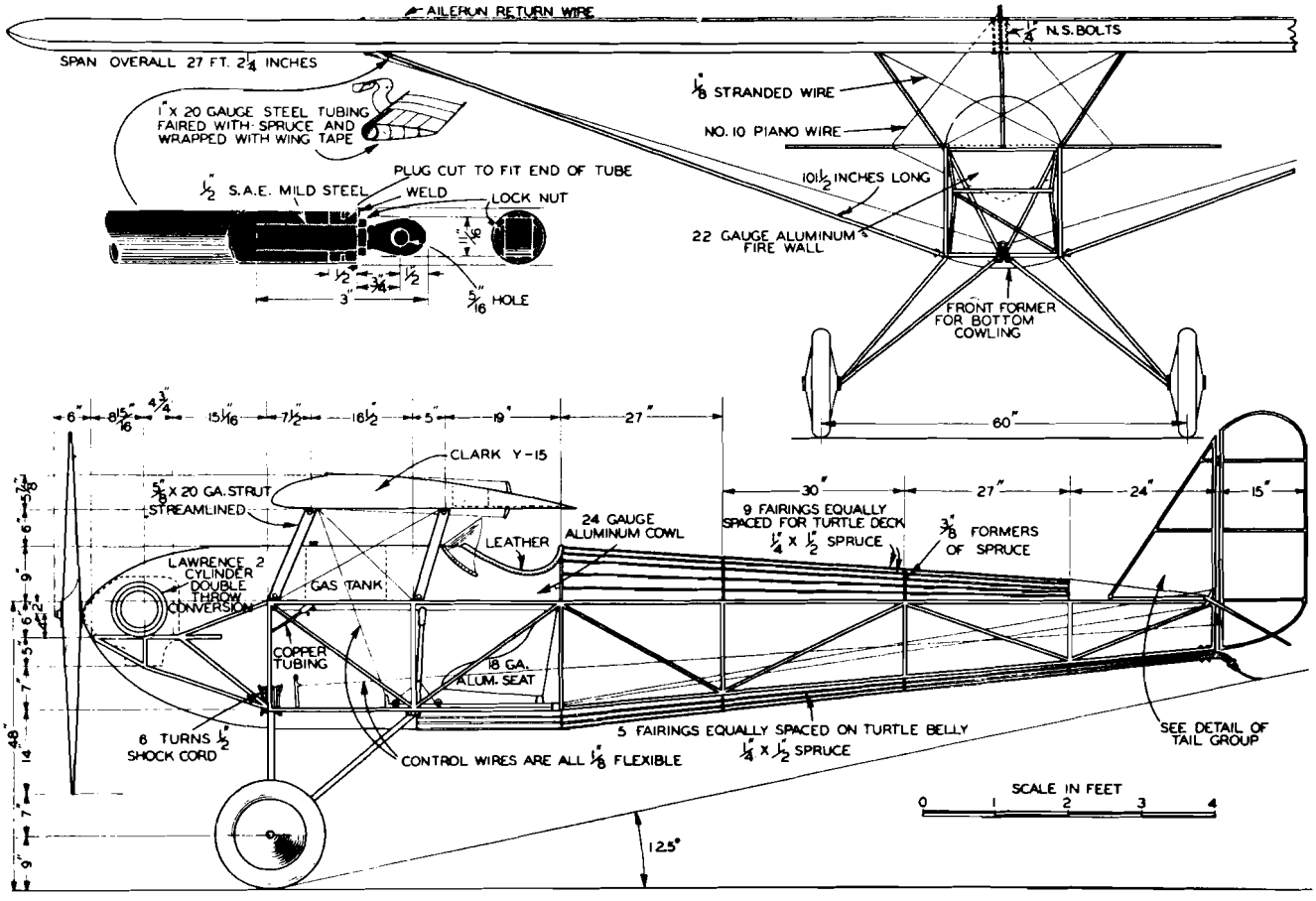
The best way to tell if the weld is good is as follows: the weld must be good, clean metal, looking as though new metal had been placed there. A poor weld has a sand effect on the outside, or is very scaly. If any of these faults show up it is always best to throw that piece away and build a new piece. It will cost more, it is true, but nevertheless it is always best.

Fittings

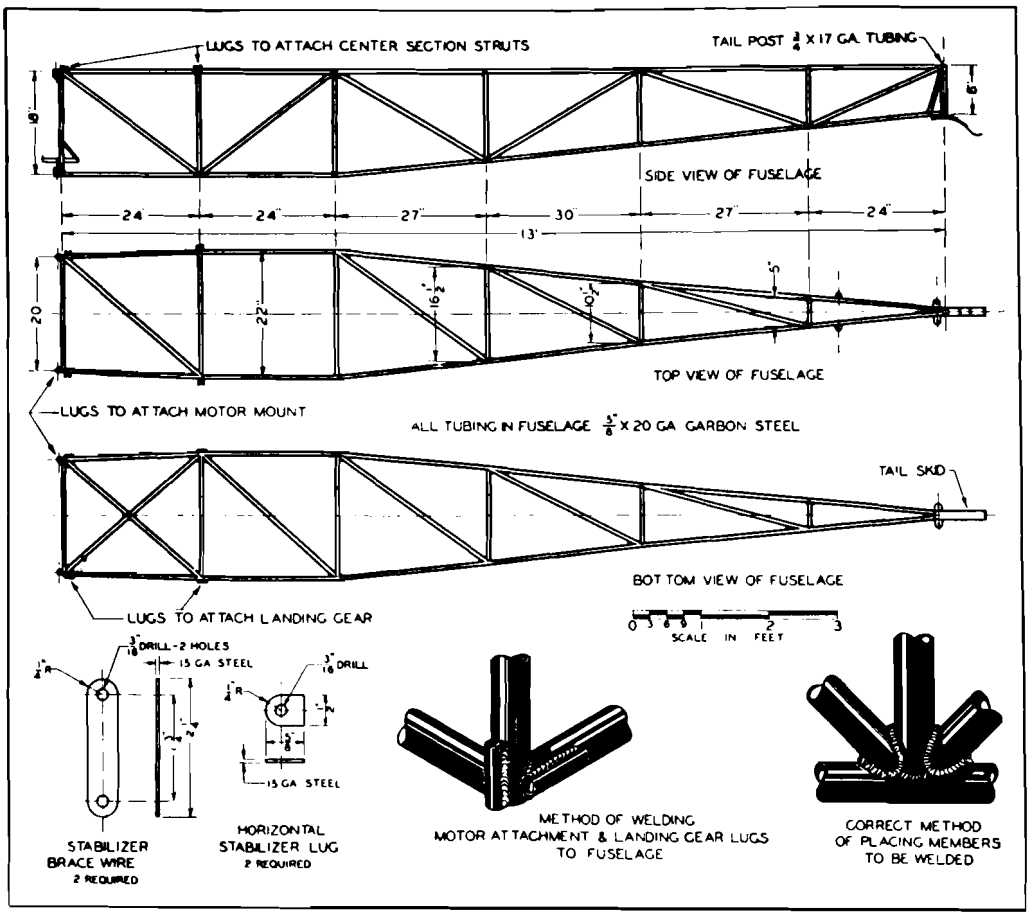
This work is also another very important part of the work. All fittings are designed to be cut out of sheet steel and not more than one bend must be made in these fittings before they are used on the ship. The wing fittings should be installed upon the spars before the ribs are slipped on. Extreme care should be taken in cutting and boring the holes, for these fittings are a very vital part of the airplane.

Landing Gear Lugs

These lugs are made of three-eighths by six-



From these drawings one makes the full size drawing for the layout so the fuselage can be welded.



Here is a more specific drawing than the one on the preceding page. It shows the side, top and bottom layouts for the fuselage members. Note the manner in which the lugs are welded on.

teen gauge steel tubing. They are welded on the lower longeron at the first and second bay of the fuselage and are securely welded to the longeron in line to the landing gear struts and in reference to the longeron.

Motor Mount

The lugs for the mount are welded to the front end of the longeron and for greater safety are reinforced with a piece of 16 gauge sheet steel passed around the lug and welded to the horizontal tube and the longeron. This mount need not be made demountable unless the builder likes, but in case you do want it this way, cut out the straps which fit over the ends that are to be supporting tubes of the mount and drill the correct size holes; then the mount is bolted to the lugs that were welded there for same. Next lay out the mount on the table and spot it as you did the other metal work, then place each respective half on their respective places and block up and get lined up and spot the cross bracing in place after all of the members are placed in. Then weld up the mount.

Tail Skid

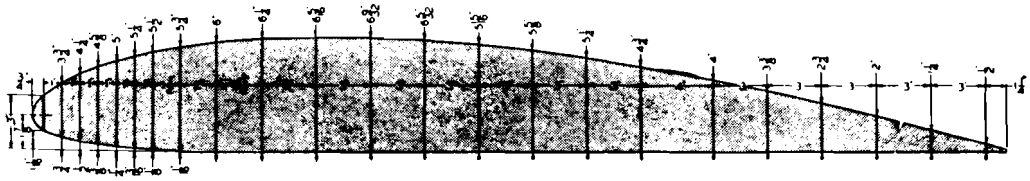
This part of the ship is a small spring that can most generally be secured in a junk yard where there are some old buggies to pick from, but if not procurable there, make one from spring steel 3/16 in. by 1¼ in. shaped as shown and placed at the extreme rear part of the lower longerons. The skid is secured to the longerons by two ¼ in. N.S. bolts.

Instrument Board

This is made from a piece of plywood ¼ in. thick and cut to fit under the cowling. The form should first be secured by cutting a paper pattern, and then using that to cut the correct form on the plywood. Next, the exact size of the holes for the instruments can be cut by an expansion wood bit. The cowling is clamped by small aluminum clips to the vertical and to the horizontal tubing the same way.

Fuselage Fairing

On the side of the fuselage the fuselage fair-



Here is the accurate scaled layout chart for the Clark Y-15 wing used on this ship. These dimensions are taken from the full sized ship and are accurate within close practical limits.

ing is secured by drilling a small 1/8 in. hole opposite each tubing that the fairing passes and wrapping heavy cord through the hole and around the tubing. This is later doped.

The bottom and top turtle decks are built up and mortised into formers. They are bolted to the longerons and cross bracing by small aluminum clamps that go all the way around the tubing, bolting into the spruce formers.

Seat

This is made from a piece of 16 gauge aluminum secured around the top horizontal bracing of the third bay of the fuselage. A wood former is placed on the floor board. This piece of board is determined by the size of the person who is to fly the ship and a little "self designing" must be used there.

Fire Wall

This is a very important part of the ship so care must be taken in fitting it to the front part of the fuselage. It is built of 18 gauge aluminum and has as small openings as will just let the necessary gas and oil and other necessary instrument accessories through. Right here let me say that the gas and oil lines should have a piece of rubber tubing placed over them where they go through the fire wall so that vibration will not chafe the lines and cut through.

The Landing Gear

The landing gear is the most important part of the ship when you come in to land so must be built with the most exact care. It is best built with the ship leveled up and in the correct distance from the ground. Then the correct diagram placed on the floor directly underneath, the tubes cut and placed in their respective places.

The stub axle as you see from the drawing should be first built up, bent and welded into the false axle which goes up to the top of the gear. The shock cord is attached to the cross member, the gear is reinforced down at the attachment with the stub axle with 16 gauge sheet steel 6 in. up from the stub axle inner washer on both sides.

The wheels can be streamlined if you like with cloth, and doped, but it is not necessary. Use 1/2 in. shock cord. It takes 3 ft. for each side.

Tank

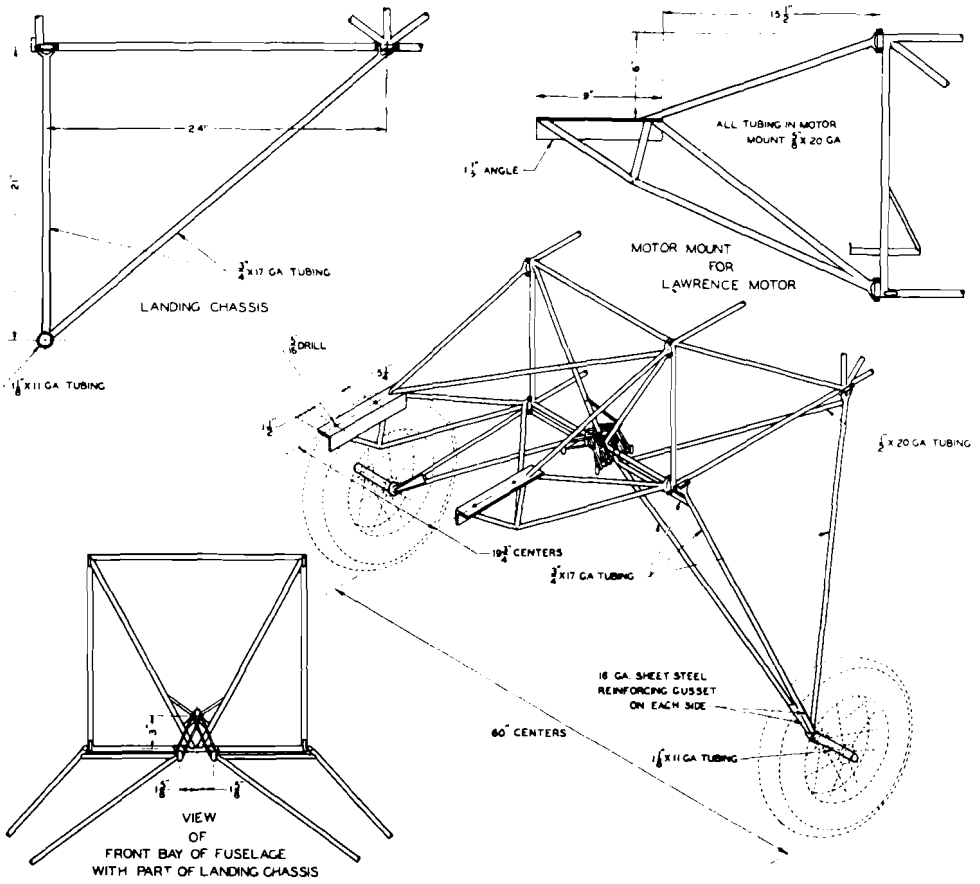
This should be built with tern plate and no dimensions are given, because each person wants a different capacity. Its location is shown. Unless you are very good with a soldering iron and solder, I would advise you get it built by a local tinsmith.

Propeller

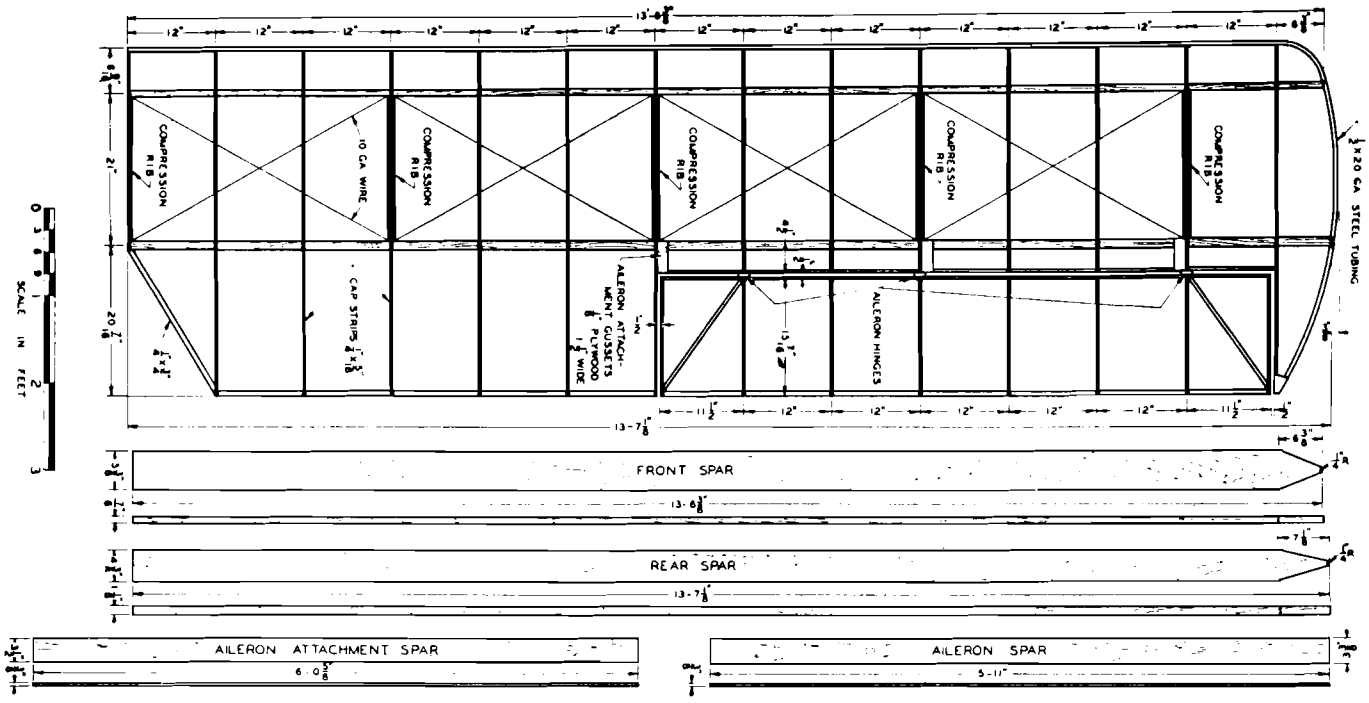
This should be bought from some of the propeller companies for best results. A ship has been built from these plans using a 28 hp Lawrence-Hickman conversion.

Cowling

This can make or break the looks of the plane, and extra care should be used in making this. A great deal of ingenuity must be used here for the correct lines of the ship depend on the correct



The Cessna type undercarriage is one of the most simple types of landing gear to build, as well as being the easiest of the split types to keep on a ship. The drawing will give you a good idea of how the motor mount is lined up.



This very clear drawing will enable one to build all the details needed for a successful wing panel. Note the method of aileron placing.

cutting of the aluminum. There is no beating to be done on this cowling. The fuselage cowling can be cut from one piece and the cockpit cut out in its proper place. The motor cowling is in one piece on the bottom and two on top, bolted together with 3/16 in. stove bolts.

Ribs

You will see that the ribs are made from pieces of ¼ in. by 5/16 in. spruce, fastened together with airplane glue and ⅜ in. by 20 gauge flat head nails. Use 1/16 gusset plates; these gusset plates are best determined in size by the place they go. The outline of the rib should be placed on a smooth piece of board and outline caps placed so as to hold the form of the rib when nailing the gussets, also all of the internal bracing of the wing should be outlined with outline caps so as to hold the bracing while being glued and nailed. After the one side is glued and nailed take out of the jig and turn over and glue and nail the gusset on that side.

The Wing Beams

These are made intentionally solid. For the amateur, "I" beams are a little too difficult and often the professional makes mistakes with them; therefore, solid beams of the best selected spruce must be clear grained, no knots, pitch pockets, and straight grained, with at least 10 annular rings to the inch.

Cut the beams very carefully, follow the drawings, and you cannot go wrong. It is best to cut the beams just a little large and then plane down to right size, making sure not to get them too little as that is the first step to heaven.

Aileron Attachment Beam and Aileron Beam

These are made solid. Follow very carefully drawings of same. Mortise the aileron attachment beam for the ribs and place the safety plywood gussets as per drawing. Securely glue and nail these attachment ribs and gussets. Use ¾ in. by 20 gauge flat head nails for this, also for attaching the rib ends to aileron attachment spar.

The aileron spar is built the same way by mortising the ribs into the beam and gluing and nailing with ¾ in. by 20 gauge flat head nails, and placing little triangular spruce pieces glued, together with nails on each side of the aileron rib at its attachment to the spar.

The aileron is made up very easily. It consists of the aileron spar and ribs cut off of the regular ribs at the aileron space. A trailing edge of aluminum shaped in a "V" shape is slipped over the ends of the ribs. Be sure that the aileron lines up when the hinges are placed on, and that the trailing edge of the aileron is in line with the wing. A web of ⅛ in. plywood is applied to the inner end rib of the aileron and to the adjacent end of the common rib at the inner end of the aileron opening in the wing.

Internal Wood Bracing of Wings

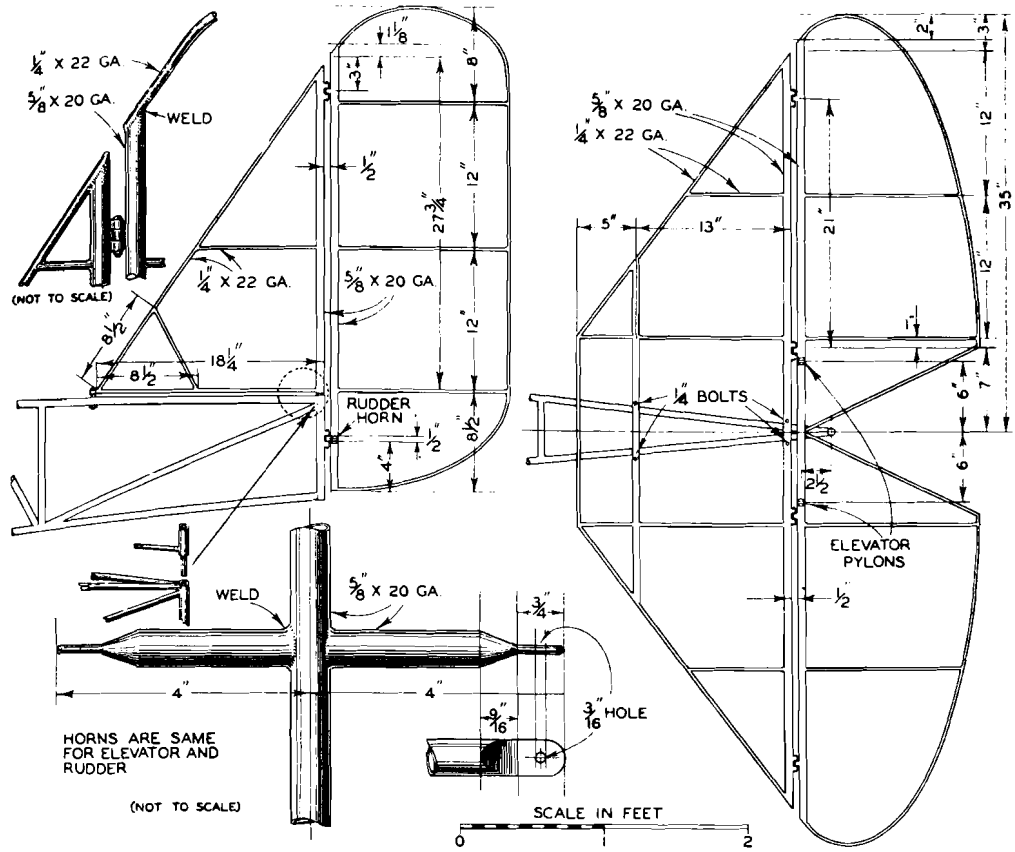
Three-eighths inch by ⅜ in. wood braces are applied inside the wings as shown in the drawings. First the wooden blocks are nailed and glued to the members to be united by a brace, then the brace is nailed and glued both to blocks and the members to be joined together.

Compression Struts

These are pieces of ⅜ in. by ¾ in. spruce nailed on each side of the regular rib, also glued at each place, and nailed. You will need 10 of these and 18 regular ribs.

Leading Edge

This is made of a piece of 1½ in. by 1½ in. spruce 13 ft. long, planed to required size which



Orville Hickman, author of this article, tells how to manipulate the fine tubing so that it will not bend or warp. Notice how the horns are made. Simple, eh?

is determined from the wing profile that you laid out on the rib jig. Secure this to the ribs with 3/8 in. by 3/8 in. wooden blocks, glued, and lots of small nails.

Trailing Edge

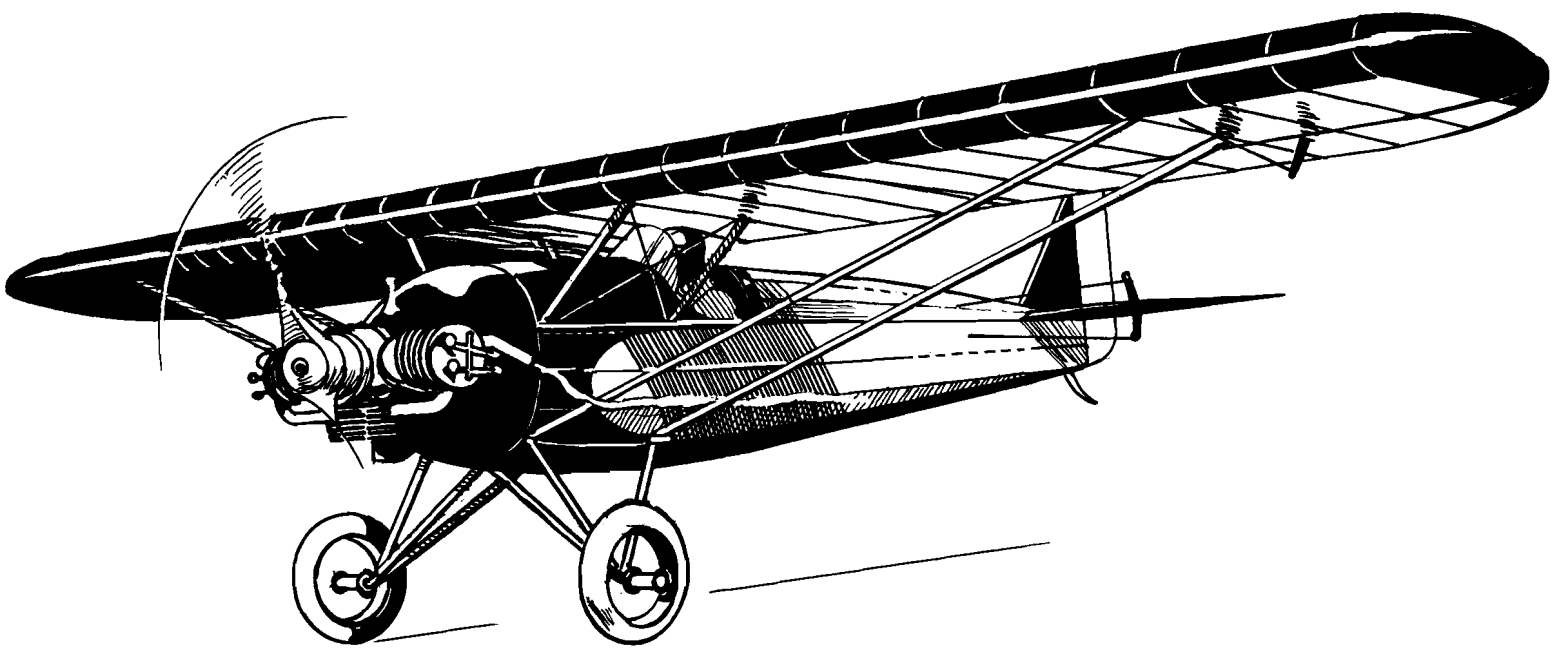
This is made of a two-inch piece of 24 gauge aluminum, nailed after it is formed, into a "V" shape onto the tips of the ribs.

Aileron Control Pulleys

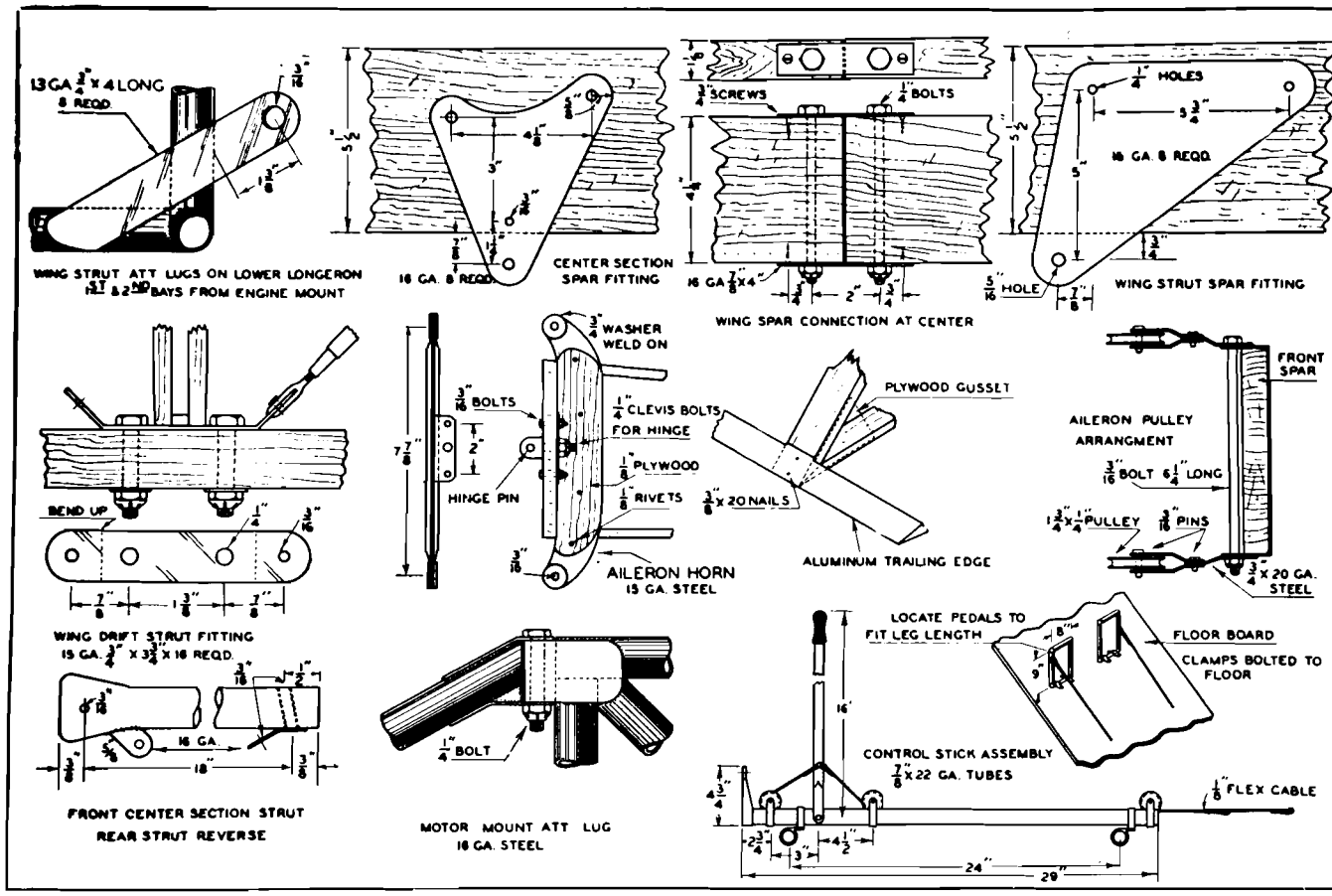
These are secured at their respective places as shown on the drawings.

Aileron Horn

This is made up as shown by drawing. Care should be used to get the attachment bolts good



In action the Georgias Special is reminiscent of the new Boeing high wing fighter. It flies strongly with the Lawrence, providing the motor is turning up properly, and the standard Lang prop is used.



This sheet covers all the necessary details for building the Georgias

and tight, but do not crush the wood fibers by getting *too* tight.

Wing Tips

The wing tip is elliptical in form and ½ in. steel tubing is used to form this curve. It is attached to the leading edge, spars, and aileron attachment spar by strips of copper. Nail and solder the nail heads to the copper strip.

Wing Struts

They are made up of 1 in. by 20 gauge seamless steel tubing and streamlined with spruce and taped. Then dope them. They are adjustable on one end for rigging purposes.

Assembling

In assembling this ship, first put on the tail surfaces and be sure that they are bolted and all nuts cottered, then put the control wires in and determine where the wires will come out of the fuselage covering so that you can put little leather patches where they come through.

Covering of the Ship

This procedure is carried out as an envelope method wherever possible and the open edges hand sewed. Five coats of dope clear are used and pigment color that the builder desires. The wings should be sewed before they are doped, every 4 in. between the spars and around the ribs. After the first coat of dope the ribs must be taped over and the leading edge and the trailing edge, control surfaces are taped over each rib, but it is not necessary to sew the cloth to the ribs in this small plane.

Balancing the Plane

To correctly balance the plane put the fuselage with all parts assembled on a knife edge made from a 2 by 4 with the weight of the pilot in the cockpit and gas and oil in the motor, then place the wing by rigging the center section struts until the center of lift comes right over the place that the plane balances. In the Clark "Y" airfoil the center of lift is 42 percent from the leading edge. The bottom part of the airfoil must be level with the top longeron as the wing curve is set at "0" degrees for the best efficiency.

Then be sure that the wings are exact laterally — this ship should be flown without any dihedral, and the wash-in on the wing tips will best be determined by flight. Adjust until the ship will fly hands-off and have no tendency to fall off on one wing or the other. • • •