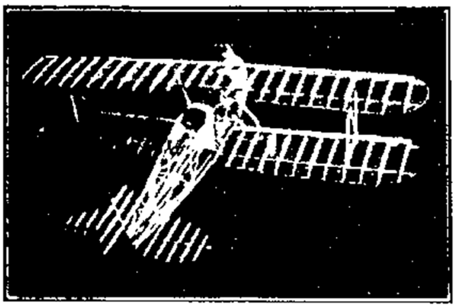
Build the Great Lakes Trainer

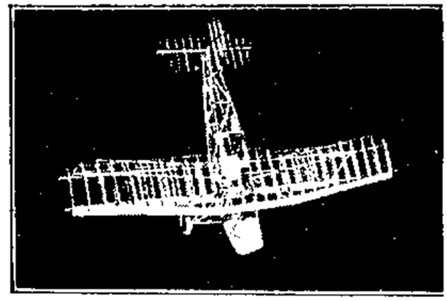


This interesting snapshot of the framework of the Great Lakes Trainer model built according to plans given here will give you a clear idea of what your model should look like before covering.

You thorough-going model builders who want to make exact replicas of large ships can go right to it this month! Here are plans and directions for building the Great Lakes Trainer, an exact reproduction of the real ship, complete with detailed structure work, movable controls and metal fittings. Follow the directions, and you'll have an amazing duplicate of this famous sport plane of today.

APRIL, 1935

By Avrum Zier



Over on its nose! Here's another view of th Great Lakes Trainer model in its framework stag

HERE'S something new in the way of model building. The replica model of the Great Lakes Trainer described in this issue is an exact reproduction of the large ship, incorporating all its detailed structure work. Movable controls and metal fittings for attaching the parts are its most outstanding features. The controls are operated through a system of rods and are operated directly from the cockpit in the same manner as on the large ship. All the metal fittings are cut out of aluminum and bent to form directly upon the part to which it is to be attached.

Due to the fact that the model was built to scale, it was found necessary to increase the power. This was accomplished by using a three-to-one geared-up motor. With this ratio, the propeller will, under the same conditions as if it were attached directly to the rubber, travel three times as fast, thus giving the necessary propulsion power. The type of gear described can be purchased at most model supply companies, as can the propeller, which is a nine-inch Japanese carved propeller.

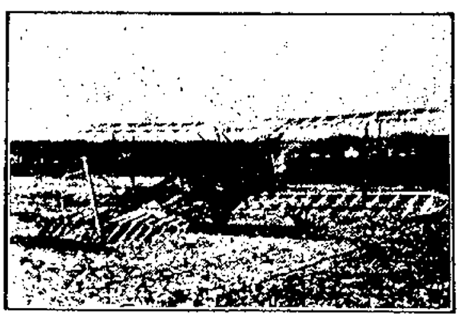
I would like to take the liberty of thanking Mr. Johnston of the Great Lakes Aircraft Corporation for his kind assistance in supplying me with the necessary information for drawing up the plans shown in this magazine. Another person deserving credit is Abraham Bergman whose skill as a model builder can easily be seen from the pictures shown on this page.

Sport planes, in my opinion, can be considered the backbone of the aviation industry. They are, in reality, like cars, built so that anybody can fly them.

The Great Lakes Trainer is a plane of this design, made to sell almost as cheaply as some of our cars, and as easy to drive. The span of the wing from tip to tip is 26 feet, 8 inches, and the length is 20 feet, 4 inches. With the thrust line in a horizontal position, the plane stands 8 feet, 4 inches from the ground. Powered with an upright Cirrus motor of 95 h.p., the plane is capable of a top speed of 110 miles per hour and a cruising speed of 90 miles per hour. Its initial climb is 600 feet per minute. All the above figures are calculated with a full load.

The construction of the ship is of metal, with the possible exception of the wing spars, which are probably wood. The fuselage is constructed of chrome molybdenum steel tubing, welded at the joints. The type of construction used is the Warren truss. Internal bracings are oil-treated to prevent corrosion.

Top and bottom wings are constructed of aluminum with the exception of the spars, as I have stated before. The airfoil section used is the standard M-12 and is stamped out of sheet metal. The top wing is built in three parts, as is clearly shown on the plan. The right and left panels of the top wing are set at a sweep-back angle of 9 degrees and 13 minutes. The bottom wing is set at a positive stagger of 25 inches. Both wings subtend a dihedral angle of 3 degrees.



Compare this picture with those above. Here we show you a picture of the actual Great Lakes Trainer ship, in skeleton shape. See any difference?

FUSELAGE

CUT out the various sheets from th magazine, then glue sheets 1 and : together. You will have a complete sid view of the Warren truss bracing. Thi bracing is clearly indicated by the lon line and dot just where the joint con nects. The frame is made completel out of ⅛″ square balsa. It is very im portant that the joint should fit per fectly; otherwise, the fuselage will no withstand the stress to which it is sub jected.

The top cross bracings may be ob tained by pasting Sheets 2 and 4 to gether. Looking from the top, you wil notice that the frame is slightly shorte than the full width of the body. Thi is to allow for the side stringers and covering.

After you have completed the frame and are positive that it is in line, set it away to dry. While you are waiting for the fuselage to dry, cut about 12 of the finest strips that you can possibly cut. These strips are going to be used as the formers. As you probably know, the large ship has the tubing bent to shape, but since we are not using tubing, we are going to substitute the bamboo in its place.

Bamboo has a tendency to retain its original shape. It is therefore impractical to bend it without a flame because of the strain that it will set up and that will probably ruin the model after it is completed. Therefore, I suggest that you bend the bamboo to shape over a flame. The plan shows clearly on Sheet 2 how the bamboo is imbedded into the frame. The bottom is made in the same manner as the top.

With the formers in place, the next step is to place on your stringers. The stringers on the top are bamboo and merely glued on top of the bamboo formers. The side stringers are balsa, as shown on the plan. One stringer, however, is also balsa on the top; that is, the one on which the cabane struts attach (Sheet 1). It is important to note how the top rear stringers run.

Bend the rear hook to shape and insert it into the rear post. The rear post is constructed of heavier balsa so that it will withstand the strain on it. The cockpit is covered with sheet balsa of about 1/64″ stock. The windshield is

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cut out of celluloid. As it is impossible to give a template for the cockpit, it is necessary to leave that to the builder who, with a bit of accuracy, can easily make his own template by observing the top and side of the cockpit which I show clearly, for this purpose.

Motor and Propeller

THE hood is constructed out of balsa as shown on the plan. One half of the top is covered with aluminum and hinged on paper so that it can be opened when necessary. The bottom of the hood is carved from a solid block, upright on the sides. Sheet balsa is glued. Attached to the sheet balsa is a very thin sheet of balsa which, as you can see from the rear view of the hood, extends to the top dead center. It is at this point that the sheet metal or aluminum attaches and hinges.

The three-to-one motor is installed and reinforced by cross dowels passing into the block of balsa. The shaft of the geared motor is made to protrude about ½ inch out. As there are various types of balsa, I suggest that you reinforce the motor according to the strength of the balsa. Cut out the air vents, as they will allow the gears to cool.

When you are flying the model, it is essential to oil the gears before winding the propeller. Use castor oil.

Glue the hood to the first former, making sure that it is extremely accurate as to the line of thrust. It may also be worth mentioning that the motor must be placed in with equal, if not greater, accuracy, as the slightest angle off the thrust line will result in bad, if not fatal, performance. The amount of rubber used in the first model was eight strands of 3/16 flat. The propeller is not carved but can be bought at the same concern which sells the motor. Attach the propeller, making sure that it is in track.

Landing Gear

THE landing gear is constructed of balsa and attached to the fuselage with aluminum fittings. The fittings are shown clearly on the plan. The top view will give you the position of the struts. You will notice that the cross brace on the fuselage has a single fitting which allows the two struts to attach. This fitting is bent around the brace and glued. The strut enters the fitting and is attached to it by a pin. An ordinary pin cut down is satisfactory.

The axle is a small piece of dowel glued to the joint where the landing gear comes together. The shock strut is attached to a small spring which, in return, is attached to the protruding struts coming from the side of the body. The spring is covered with an aluminum cover. Note plan. It is important that you test the landing gear to see that all the struts operate easily. Test the spring for its compression. Two-inch wheels are used.

The landing gear is placed on after the motor has been lined with great accuracy. Streamline all the struts as far up as the fittings.

Tail Construction

THE complete layouts of the tail can be found on Sheet 4. The rib members are all cut out of 1/32" stock. The outline is bamboo bent over a flame. The two spars, one for the stabilizer and one for the elevator, are 1/16" dowel. The two parts are made separately and attached by an aluminum sleeve.

Cut out all the ribs from 1/16" sheet. It is important that you cut the ribs to the proper airfoil. The stabilizer is made in two separate parts, left and right. Each part consists of one half of stabilizer and elevator. The elevator is attached to the fuselage by the small metal fitting shown in the control detail. This attachment consists of a piece of dowel with another piece of aluminum glued in an upright position in the center. All the spars are made of dowel with the exception of the diagonal, which is bamboo. The complete horizontal surface is attached by means of the small extended dowels, which fit into the small piece of tubing. See Sheet 4.

Controls

THE controls are clearly detailed on the plan and the builders should not have any difficulty in installing them. The ailerons are operated, as you will notice, by a torque tube. This tube, or dowel, is attached to another piece of dowel which is extended from the fuselage. As you will notice on the plan, this is attached to another piece, "E," which is at right angles to the dowel, and is attached so that it turns directly with the extended piece.

The control of the aileron operates in the following manner. As the stick is pushed sidewise, it turns the tubing on which it is attached. At the rear of the tubing, a piece of bamboo is inserted at right angles (note plan). This bamboo also turns. In turning, it forces the extended piece "E" either up or down, thus turning the dowel which operates the aileron. This is clearly illustrated on the plan.

The floor board is constructed to fit the inside frame of the fuselage. The turning tube on which the control stick is attached is held in place on the under side of the board by an aluminum strip which fits around it and is held to the floorboard by glue.

The seat is optional and can be made as the builder sees fit.

Wings

LAST but not least, construct the wings. It may be worthwhile at this point to remind you that you are building or constructing the wing in the same manner as the large wing is constructed at the airplane factory.

All the ribs are cut out of 1/32" sheet. As you can see, the rib or airfoil is a special type known as the M-12. This section was plotted. Therefore it is extremely essential to cut the ribs to the same shape. The layout of the top wing is shown in full, while the bottom one is cut in two parts. There is a little error which the author would like to have changed. Expanding the wing 5 1/16 inches would make the bottom wing fifteen. But fifteen is too large, since half of the fuselage takes up some space. It is therefore necessary to decrease the expansion until the wing measures 13¾ inches from tip to the side of the body. Check this measurement to be accurate. The wing tips lie upon the same vertical line.

The spars are made out of ⅛" x ¼" tapered so as to fit into the wing tip and ribs at the tip. The tips are flame-bent bamboo. Cover the leading edge, as explained on the plan, with sheet veneer. The bottom wings are attached to the fuselage by means of metal fittings whose shape is clearly drawn on the plan. It is advisable to use those pliers when bending these fittings so that you can be sure of having accurate bends. The metal fittings slide onto the spar and a small pin is inserted. To make the removing of the wing easier, do not cover the rib section near the fuselage.

Struts and Covering

ALL struts are built out of balsa and attached to the fuselage or wings with metal fittings. These fittings are shown in picture form and therefore need little explanation. Streamline all the struts.

Cover the model with ordinary tissue, and spray water over it to shrink the paper. Give the model a few coats of banana oil and sand all wooded parts to a smooth finish. All parts must be covered before attached to the plane. Rig the model with thread giving both wings a dihedral angle of 3 degrees.

Flying the Model

FIRST test the model over high grass, giving it a few turns. Adjust the model, using the controls to offset any tendency to turn or twist.