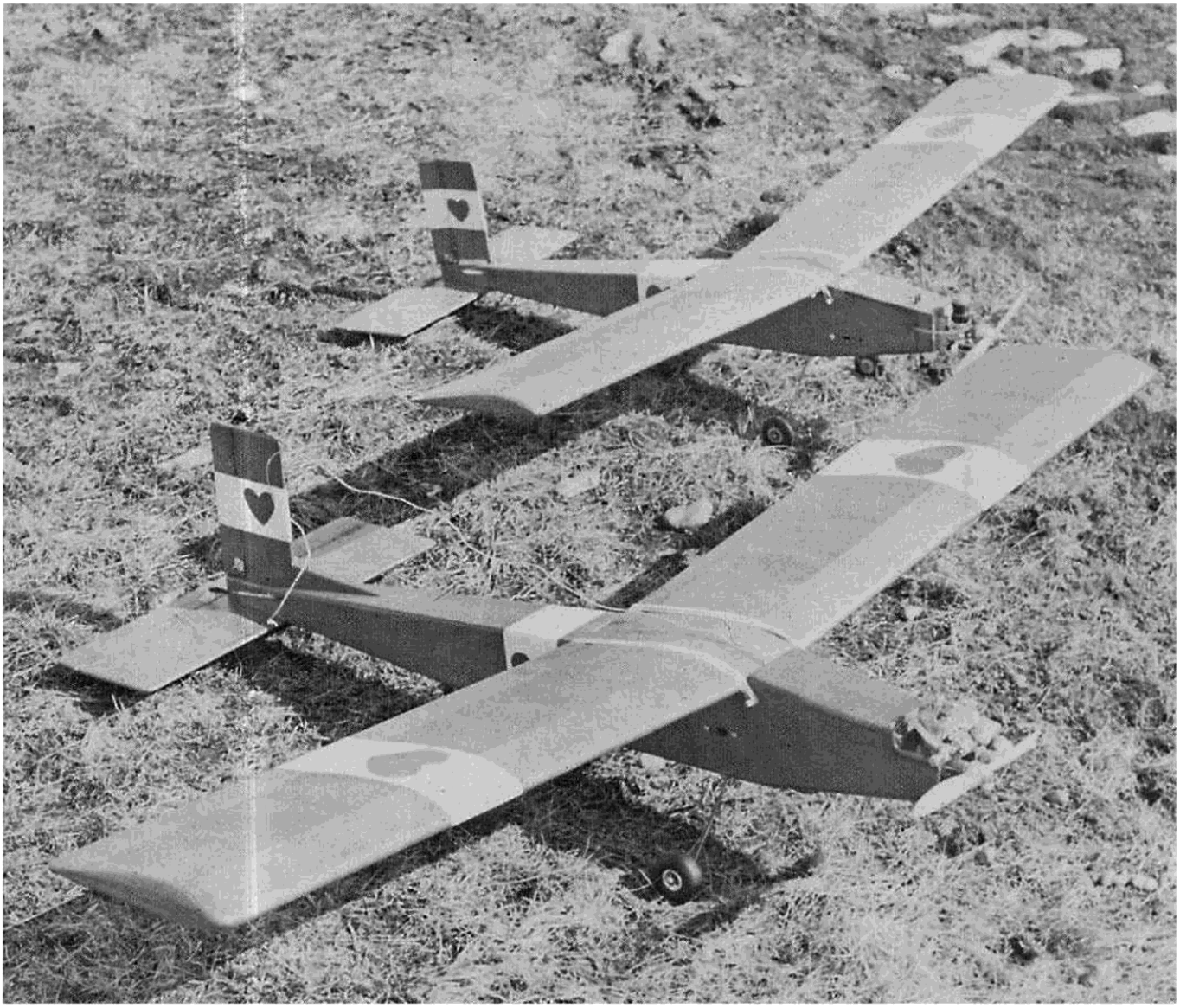
A simple, easy to build trainer is what **Howie Applegate** was aiming at when he designed this ship. It's called the . . .

BOXCAR



The Boxcar is not a beauty, but a good first (or second) airplane. It is economical and easy to build, a second generation airplane. Her baby sister is a 3-channel .049 powered ship, weighing in at 23 ounces with a 42" wingspan. This version is scaled up to a 49" span with a flying weight of 2 pounds. Boxcar is an .09-.10 powered airplane and is not designed around the ultra small radios. Any system using miniature servos such as D&R Bantams, Heath Miniature, will do.

Fuselage Construction

The fuselage is a boxy slab sided affair and simple to build. Start by cutting F-1, F-3 and F-4 out of ⅛" ply. F-2, F-5 and F-6 are 1/16" ply. All others are ⅛" balsa sheet. The two sides are 1/16" medium balsa sheet, reinforced with 1/64" ply doublers. The doublers go from the trailing edge of the wing forward, contact cemented to the sides. Make sure the sides are laying with their proper faces showing so that the doublers wind up on the inside of the fuselage. Otherwise, you may wind up with two left or two right sides (I have several odd sides laying around because of my modeling goofs). I usually leave the 1/64" ply a little on the full side before contact cementing and trim it after. You will find that the 1/64" cuts quite easily with a

razor or a model knife.

Contact cement the trapazoidal shaped 1/64" ply doublers to the inside sides at station F-10 and the 1/64" ply wing hold-down gussets to the ply doublers. While you are at it, you may as well contact a piece of 1/64" ply onto a piece of 1/8" medium balsa sheet 7" long. (This will become the bottom nose plank).

Epoxy F-3 and F-6 to the fuselage sides; F-5 may be added at this time if you know where your servo rails will fall. (If not, wait until you are ready to install your servos). F-4 should be positioned approximately as shown on the plans. You may slide it fore or aft to suit your servos. You do not want F-4 to capture your servos or make it difficult to remove the servo mounting screws.

The next parts to be installed are F-1 and F-2, but before installing F-1 locate and insert the engine mount nutplate to the back of it. Note that F-1 is angled to provide for engine downthrust. Fifteen minute epoxy, such as Hobby Poxy-I is ideal for securing the plywood bulkheads to the plywood doublers. The remainder of the bulkheads (1/8" balsa) can be white glued in now. Add the tail block and the 1/8" balsa wing and tail seat members; also add the 1/8" square strips to the aft section.

Next in line will be the belly. The center-section is 1/8" balsa, the nose is the 1/8" x 3" x 7" balsa plank with the 1/64" plywood doubler, and rear 1/16" medium balsa sheet. The top rear is also 1/16" medium balsa. The upper nose is made up of two 1/8" balsa plys, cross-grained. The tank access hatch can be three thicknesses. The third ply will act as a key to help hold the hatch in position. Add the 1/16" ply landing gear plate and the hardwood landing gear blocks. The landing gear retainer strips are 1/8" plywood 3/4" wide. Epoxy is recommended for installing all the landing gear parts. The top rear is 1/16" medium balsa sheet. The nose sides can be cut away at this time to provide clearances for needle valve and exhaust/muffler of particular engine used.

Tail Surfaces

The tail assembly is built up of 1/8" x 1/4" hard balsa strips, then covered with 1/32" medium balsa sheet on both sides. The stab center-section is 1/8" medium balsa - grain running chordwise. The rudder, elevator, and dorsal fin are cut from 3/16" medium balsa.

Wing Assembly

The wing is super simple to build. All the ribs are 1/16" balsa. Start by pinning down the 1/16" x 1" medium balsa lower trailing edge. Next, add the ribs (note: the three center ribs are skinned to allow for the center-section planking). At this point the fronts of the ribs should be elevated approximately 3/8". You may want to support them by sliding a 1/8" x 1/4" strip (edgewise) under them. This strip will be running spanwise. (Use the rib setting template to get the proper angle on the center rib. Next, glue in the top spar, 1/8" x 3/8" hard balsa, and the trailing edge webs, 1/16" x 3/16" medium balsa). Glue on the 3/16" x 5/16" medium balsa leading edge. Note: 3/16" x 5/16" may not be available at all hobby stores, so you may want to cut them yourself from the 3/16" sheet needed for the rudder and elevator. Sand the taper as shown on plans on the lower trailing edge and the webs and add the upper trailing edge; this is also 1/16" x 1" balsa. After removing the wing panel from the plans add the lower spar (1/8" x 3/8" hard balsa). It may be advisable to sand the top and bottom bevels on the leading edge now, as it will be more difficult to do it when both halves are joined.

Now build the other wing panel. The plans show the right hand panel only, so remember which ribs go where.

Glue both wing panels together. When the glue dries, notch the ribs and install the 1/32" ply dihedral braces. Install the 3/16" balsa gussets after securing the leading and trailing edge dihedral braces. If you have already beveled the leading edges, glue on the upper and lower leading edge planks (1/16" sheet). Please note that these sheets overlap the leading edge and are glued over the beveled edges. Construction hint: When planking a wing, it will be easier if you lay some scrap strips of 1/8" x 1/4" or 3/16" square balsa on top of the planking sheets, but over the leading edge and spar areas (spanwise). Now you can push your pins through these strips and sheets into the leading edge and spars. You will find that you will need fewer pins and get a smoother job than if the strips were not used.

Next, glue on the 1/2" thick soft balsa wing tips and add the 1/16" sheet center planking.

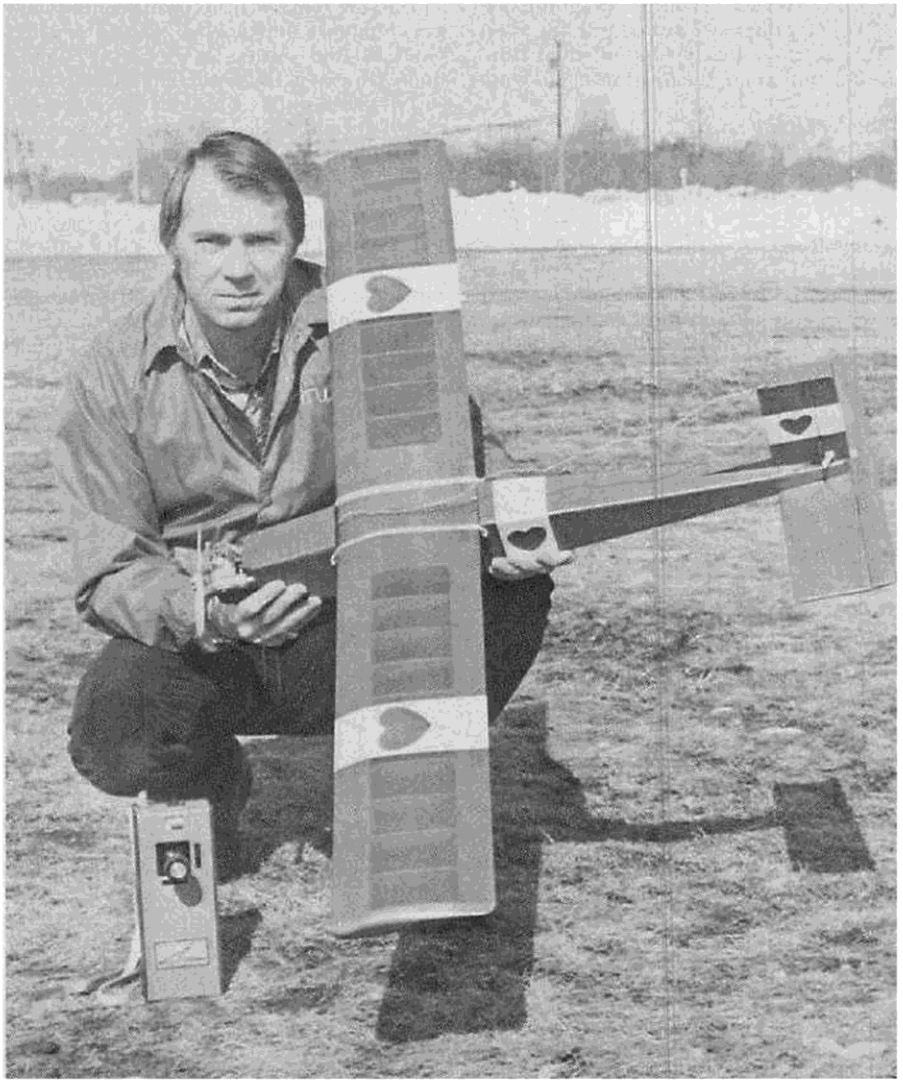
Miscellaneous Parts

Make the landing gear struts of 1/8" dia. music wire. Bend them both together so that they both turn out to be the same length. The tail wheel strut should be .030 or .040 dia. wire. Do not make the 90 degree bend to insert into the rudder yet. Shape a tail wheel bearing out of a small piece of 1/32" plywood about 1/4" square. Drill a hole in the center of it the same diameter as the tail wheel strut. Make the oil drail out of a short length of 3/16", 7/32", or 1/4" aluminum tube; cut it on a slight bevel.

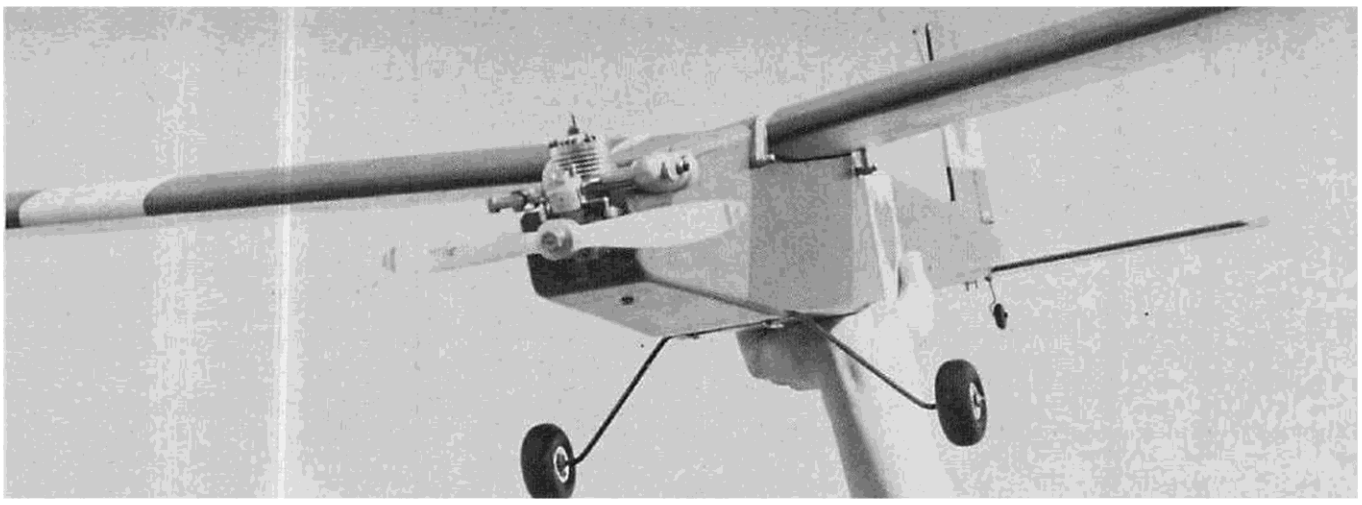
Finishing and Final Assembly

I guess this is as good a time as any to start sanding. Round all the fuselage corners to about an 1/8" radius. Do not sand any radius in the wing mount or stab mount areas. Sand all the flat surfaces with 6/0 sandpaper. Sand the leading and trailing edges of the fin and stab to a full radius. Do not sand the fin leading edge where it is to join the dorsal fin. The dorsal fin only gets its top edge sanded to a full radius. (You may prefer to glue the fin and dorsal fin together before sanding.) The rudder and elevator are to be tapered to about 3/32" thick at the trailing edge, then the leading and trailing edges get a full radius.

PHOTOGRAPHY: HOWIE APPLEGATE



Howie and his Boxcar. A Heath radio system is installed. There is a big need for some of these simple ships, helps get a modeler really up in the air. Retracts and exotic touches come at a later date in a flyer's experience. **Facing page:** Boxcar is in foreground, a little sister (.049 powered) in the rear.



The wing gets a rounded leading edge and the wing tips need a generous rounding (⅛" or so). Sand the wing planks and trailing edges to get rid of any high spots or rib mismatch to insure a smooth covering.

Glue the elevator to the fuselage and proceed with covering. The original airplane was done in blue silk. If silk is used, apply two coats of slightly thinned clear dope before covering. My airplane required 5 coats of clear after covering. I trimmed her with broad white bands on wing fuselage and vertical tail and then airbrushed red hearts on her. After covering, but before final trim, install the oil drain, fin and dorsal and wing hold-down dowels.

The landing gear strut holes and landing gear tie down plate screw holes are to be drilled. The tail wheel strut hole may be drilled and the tail wheel bearing glued in place.

Solder a washer on the tail wheel strut as shown on the plans and solder a retainer washer on to keep the tail wheel on. Insert the tail wheel assembly through the stab and bend the wire at right angles. Stick on the rudder and sew the hinges (3 places). Also sew the elevator to the stab (3 places). Now put on the rudder and elevator horns and you are ready to install your Gold 'N Rod pushrods. Drill a 3/32" dia. hole along the top and side of the fuselage where the pushrods are to enter the fuselage. Now, using a round needle file, open up a slot in the fuselage to allow the Gold 'N Rod outer sheath to enter the fuselage neatly. Use Ambroid glue, or a small amount of epoxy to secure the sheaths.

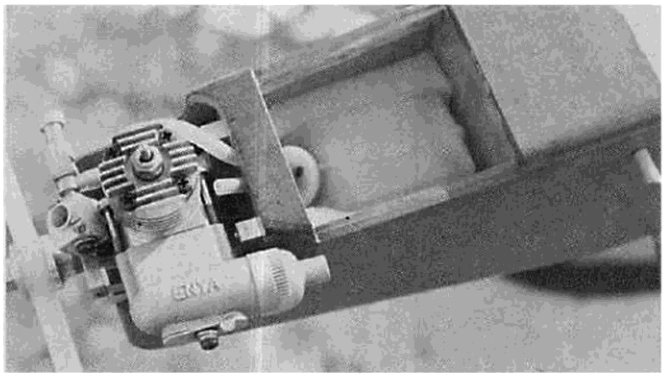
The aerodynamic loads on the controls are very light on a ship this size, so retaining the Gold 'N Rod sheaths at each end is adequate. Epoxy in the servo rails and tray and install the pushrods. I prefer a clevis at each end of th Gold 'N Rod for better adjustment. The throttle linkage on my ship consisted of a piece of 1/32" dia. music wire inserted in the sheath of a .032 dia. cable type Gold 'N Rod. Use a long drill about 7/64" dia. to go through F-1, F-2, and F-3. Bend the 1/32" dia. wire to suit your throttle/servo setup and solder on threaded couplers on each end to accept your clevises. Epoxy the sheath in place.

Make your tank tube holes and switch cut-out and put on your final coats of dope.

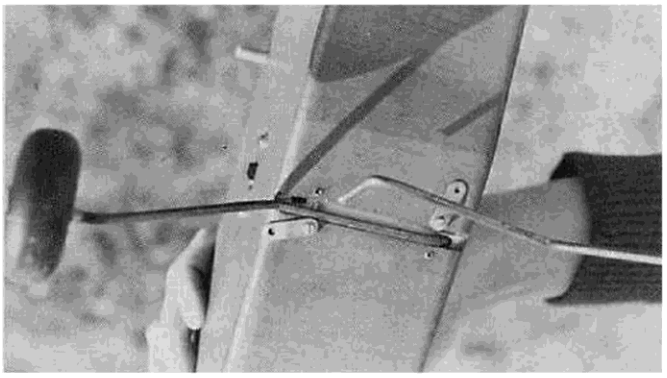
Final Adjusting and Flying

The balance point is shown on the plans (1¾" back from the leading edge of the wing). The airplane should hang level (with tank empty) when balanced. My ship balanced perfectly with a 450 mil battery pack. With the landing gear removed (for snow flying), I replaced the 450 pack with a 500 and still maintained balance of the ship.

Philosophies vary from flyer to flyer, but I believe in not over-controlling. Small control deflections is the name of the game, about ¼" up and down for elevator, and about ⅜" left and right for rudder. Of course, you want full throttle control at all times. The one ounce tank should give you 4 to 5 minutes of high speed running time (this can seem like an eternity to a novice pilot). The .09 or .10 engine will supply enough power for this ship. Take it easy and enjoy flying. When your confidence goes up, you may want to increase your control travels and go to a 2 ounce tank. Good flying with your Boxcar.



A one ounce tank fits neatly under hatch, room enough for two ounces if you feel the need. The battery pack is right behind tank bulkhead. **Beneath:** Trio of servos, rudder servo on right, elevator on left, engine servo is sideways.



Landing gear is simple to bend, plugs into an ⅛" dia. hole. The strap holds everything down. **Below:** Close-up view of the tail showing the elevator horn and sewn type hinges. Low-friction practical type hinge for smaller aircraft.