VintageCorner

REBEL III

ALEX IMRIE REVEALS THE TRADITIONAL CONSTRUCTION DETAILS OF PETE BOWERS' 1938 ORIGINAL

A cowling with only the cylinder and engine controls protruding proved impractical in the heat of competition flying and was discarded - the model was flown with the 'bath-in-headache' shown here.

The fuselage is built upsweep while the crutch is still held to the bench. Pete applying cement to the first of the rear fuselage triangular formers.

Peter Bowers is (as Bill Winter wrote of Paul Plecan), '...an original, he was there then!' I have already leaned heavily on this pioneer modeller's work in previous articles and this month will look at what he had to say about building his famous Rebel III power model.

A general survey of the Rebel designs appeared in the July 1996 issue. It included a three-view drawing from Frank Zaic's Junior Aeronautics Yearbook and in the narrative I made so bold as to mention the unusual fuselage construction, stating that members were '...raised at the front to allow the forward part of the crutch to curve upwards to impart the correct bottom outline...' This was merely a loose interpretation from the drawing and as we shall see below it was, strictly speaking, incorrect! In June last Vintage Corner, mention was made of work that Peter Bowers did in 1945 while serving in the US Army Air Force based in India when writing a proposed book on the hobby occupied his leisure hours. The book was

Fitting the tailplane sheeting to the integral spar before the fuselage is covered. The Gold Seal iliss

number of interesting chapters of value to present day enthusiasts. Readers should bear in mind that Pete was catering for beginners, so if you aspire to be a true vintage modeller, his building instructions, although appearing labour intensive to modern eyes, need not be thought difficult or boring - the writer considers them to be a first class introduction to the making of a free flight power model, and recommends the practices he describes. Follow them and produce a Rebel - you will then be justified in feeling that you have actually MADE your model in the manner used some 60 years ago. The construction is all-balsa, and the only adhesive used is balsa cement. If you are a 'cyano kid' and intend to take present day 'short-cuts' to ease your lot, maybe you should not be reading this column anyway!

FUSELAGE (1)

Study the plans carefully. The construction is a bit unorthodox in places, and while it is simple enough, it is possible to ruin the whole job by setting it up improperly. Lay out a full-size - drawing of the plan view of the basic fuselage frame on the bench, and build it from 1/4" square hard balsa; be sure that the longerons project 1/4" beyond the first cross piece, as these stubs are needed to hold the front bulkhead in place.

Trace the right half of the cabin top onto a

labelled 'joint B' to complete the hull, then duplicate the right half on the left side, matching on the 'joint C' lines. Trace the full outline onto a 4" wide sheet of 1/4", if necessary buts joining narrower wood together to get the required width.

Fasten the crutch to the bench or building board in such a way that the section between crosspieces 1 and 4 is flat on the surface. Insert a piece of 1/4" square under the longerons at station 6, and prop up the ends of the longerons so that they are 1-1/4" above the bench. Sight from the end to station 6 to ensure that the longerons are straight between these points. Four pieces of 1/4" square hard balsa 3-1/4" long are butt joined to the longerons at stations 3 and 4; check their vertical alignment with a set-square - they should be held in place with pins until the cement has had a chance to set. Before the cement has set completely, fit the cabin top in position, round end forward, with the four uprights fitting into the four notches. Re-check the alignment and allow the cement to set. Add the two 1/4" square uprights that join the rear of the cabin top to station 5, forming a triangle. These are fitted by the 'cut and try' method. Two more uprights 2-1/2" long are now fitted at station 2, and two sub-longerons of sufficient length to reach from the front bulkhead to station 3 are fitted parallel to the lower longerons. These upper longerons are continued with pieces of 1/4" square between the uprights back to station 5. Install the triangular upper main longeron running from the rear of the cabin top to the tail. Ensure that the end does not come into contact with the lower longerons, but is separated by 1/2" inside measurement or 1" outside. Fit the remaining uprights by the 'cut and try' method again, shaping the upper joints as shown in the detail drawing. Before removing the framework from the working surface, insert the uprights at station 1 and the diagonal braces from stations 1 to 3.

Wing ribs, cut out with a single-edged razor blade around a sheet its template, held in place with drawing pins.

As the wing is prepared for covering, the fuselage now has the engine installed - lower sand-circular formers fitted with the 1/16" square bottom longerons.

WINGTAIL TAIL SPARS

One of the most unorthodox features of this model is that the tail surfaces are built right on the model and not on the building board. Cut the rudder and tailplane spars to shape from 1/4" x 1/2" hard strip. Both are shaped like elongated diamonds, the rudder spar being 13-1/2" long with the wide point 2-1/2" from one end, and having straight taper to a point at either end. The tailplane spar is 17-1/4" long, with the wide point at the middle and straight taper to the ends. Fasten the rudder spar to the ends of the longerons, with the wide point midway between the upper and lower longerons. It is a good idea to drive pins through the spar into the ends of the longerons. Check for vertical alignment. The tailplane spar is inserted between the upper and lower longerons, with its rear face 1-1/4" forward of the forward face of the rudder spar. Do not spare the cement at this joint, but before it sets be sure that the spar is at right angles so the longitudinal axis of the fuselage, and parallel to the lower crosspieces.

FUSELAGE (2)

The 1/4" plywood front bulkhead or firewall is now fitted in place, and the landing gear formed from 1/8" piano wire and bound with thread to the longerons and crosspieces at stations 2 and 3. Pins should be driven through the longerons and crosspieces at these stations for reinforcement. Add the 1/4" sheet lower formers and the 1/16" square bottom longeron.

TAIL UNIT

Cut two each of the 'S' and 'E' ribs and one each of the 'F' and 'R' ribs from 1/32" sheet. Butt join pieces of 1/32" sheet together to form a sheet 6-1/4" by 15" long. Cut in half to provide material for both sides of the vertical tail. Repeat the process with the material for the tailplane. Using the scale of inches shown on the drawing, construct a graph over the drawings of the rudder and tailplane assemblies, and lay out a corresponding graph of 1" squares on the prepared balsa sheets. It is then easy to transfer the exact outlines of these surfaces from the drawings to the sheet balsa.

Completed Rebel III, August 1939 ready for covering. This was exactly the same design as the prewining Rebel II built one month earlier, which came to it untimely end due to Percy's 'carelessness' during trimming adjustment.

Cement the 'S' ribs in their proper places on the forward side of the tailplane spar. Cement the top and bottom sheets that have been shaped for this part to the spar, ensuring that they do not project further aft than the mid point of the spar (see detail sketch). When the cement has set, using a long stock, coat the edges of the ribs with cement, and after coating the inner surfaces of the leading edges and tips, join the two surfaces and hold them together with pins until the cement sets. Repeat this process on the trailing sections, after first clearing away any clotted cement from the joint between the spar and the sheet covering for the forward sections. Leading and trailing sections should, of course, line up with one another, and the leading edge proper should contact the fuselage uprights at station 11 at a point 1/2" above the lower longerons as measured on the rear face of the uprights. The vertical tail is assembled the same way, the only difference being that a strip of 1/8" square is inserted between the two surfaces of the trailing section as shown on the drawing. A separate trim tab is made from 1/16" sheet and is attached to the forward section by a cloth or wire hinge.

Bottom surfaces covered first. Note that the silk cowl must be adequately large in order to prevent canvas shrinking on application.

FUSELAGE (3)

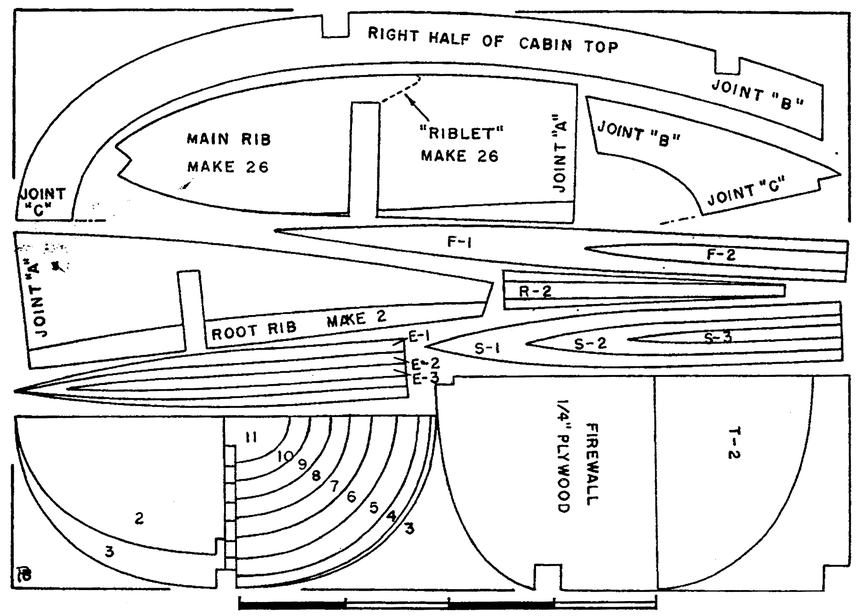
Before covering the remainder of the fuselage, form four downward pointing .064" (16swg) wire hooks, as shown in the cutaway drawing of the centre section detail, and bind and cement them to the uprights at stations 3 and 4 so that they face into the cabin. The fuselage sides are covered with 1/16" medium sheet, the grain running parallel to the axis of the fuselage except over the section between stations 4 and 5. The grain must be vertical at this point to enable the wood to conform with the curve of the cabin top. The rounded bottom section is covered with short lengths of soft 1/16" sheet, each piece being just large enough to cover one section. No details of the engine installation are given the original used a radially mounted Ohlsson Gold Seal (9.35cc), but beam-type engines can be fitted by using bent sheet metal mounts.

WING

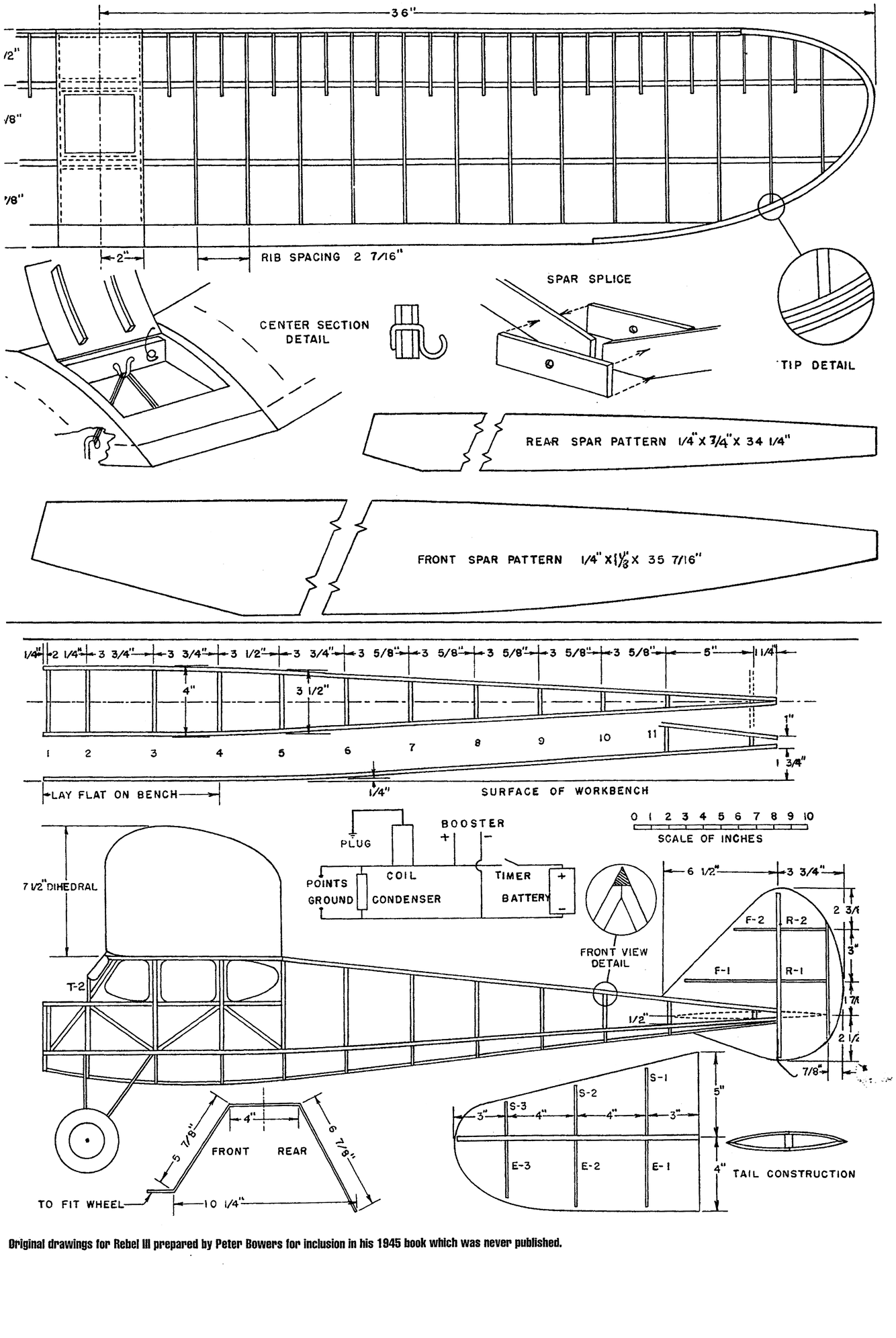
Lay out a full-size drawing showing the position of the ribs and spars. Trace the rib outline from the drawing in the same manner as used for the cabin top. The 1/16" ribs can be traced by means of carbon paper, or the outline pin-pricked onto the wood, but it is best to use a template cut from tin. The photo shows ribs with the spar holes set into the ribs, but the plans show the holes at the edges of their lower surfaces. Having the spars at the bottom of the ribs makes it easier to cover the undercambered surface. The trailing edge, 1/4" x 1" x 27-1/2" triangular stock, is pinned in place on the drawing, the forward edge being propped up above the surface by 1/8" to accommodate the undercamber of the Goettingen 497 aerofoil section. The tips and roots of the front and rear spars should be shaped according to the templates shown on the wing drawing. The rear spar is not used at all in the initial stages of wing construction. With the front spar in position, fit the flat bottomed root rib over it and cement the rear of the rib to the trailing edge. Note that this rib is NOT cemented to the spar. Cement the 12th rib (last one in the straight section of the wing) into position at the trailing edge only and follow with all of the intermediate ribs. Cement the 1/4" square x 27-3/4" long leading edge into the rib notches, the inner end being flush with the root rib. When the cement has set at leading and trailing edges remove the wing from the building board and push the spar up until it goes home into the rib notches. The rear spar is now fitted in the same manner and all rib/spar locations cemented. The ribless can now be installed between the main ribs. The wing tip bow is formed from four strips of 1/16" x 1/4" which are first cemented into the cut-out in the trailing edge each strip is bent individually in the steam from a boiling kettle, and held in place with pins. When all have been shaped, cement is applied between them, and the result is the strongest wing tip bow that can be made from balsa. Since no jig is used, the strips being merely bent around the spars, wing tip shapes will vary from model to model. For this reason, no drawing is given for the smaller wingtip ribs, these being trimmed from main rib shapes until they fit. The two wing halves are joined by four 4" long rectangles of 1/4" plywood, the front pair being 1-1/4" high, and the rear pair 1/4" high. A small hole is drilled through the centre of each for the wire hooks to hold the wing in place. Butt the inner end of the spars together, prop up each wing tip to give 7-1/2" dihedral, and cement the plywood joiners to either side of the spars. Cut a centre section trailing edge from a piece of 1/4" x 1", taking care to bevel the ends so fit the now tilted root ribs connect the two outer panel leading edges in the same way, with a piece of 1/4" square, and let the cement set overnight. Install the two centre section hooks, and cover the centre section with 1/16" sheet (grain running spanwise). Cut it away on the underside between the spars to a distance 1/2" in from the root ribs. The wing is now covered with silk and when doped, cut a 3-1/4" square trapdoor in the upper surface as shown in the detail sketch. Use two stiffeners for the hinged section corresponding to the curve of the upper rib outline at this point. A coiled spring from light piano wire is cemented to the rear face of the forward spar, and this will pop the trapdoor open when a latch at the rear is released, giving access to the interior of the model when the wing is in place. The wing is held by rubber bands connecting the hooks on the wing spars with those mounted on the fuselage uprights, as shown in the sketch. This is a very desirable arrangement, in that the rubber bands do not cause drag by passing over the centre section, nor are they liable to suffer damage from sunlight or engine oil.

COVERING

As the cost of slight additional weight, the sheeted fuselage and tail unit should be covered in lightweight silk or paper attached with dope brushed through the covering material. This will greatly increase strength and reduce the risk of the wood splitting when subject to sudden shocks. On the wing, attach the silk to the roots and tips first, pulling taut spanwise and then doping through the silk on leading and trailing edges. Do not overtighten the covering on the undersurfaces dope should be applied to the undercamber of all ribs and pinned until dry. On the upper surface, dope through the silk at each rib and allow to dry this will prevent bunching of the silk when the overall coats of shrinking dope are applied. The original model built in 1938 was coloured vermilion and black, and had a run of competition successes, as recounted in July 1996 Vintage Corner. AM



Ribs, formers and cabin top drawing will require enlarging on the photocopier to restore inch scale to actual size.



Original drawings for Rebel III prepared by Peter Bowers for inclusion in his 1945 book which was never published.