GNOME 2M

Designed by John Luppreger **Text by John Luppreger & Bob Sliff**

Unlike many designers who go on about the many years they have put into their masterpiece of design, my Gnome 2M is really only an "up-growth" of my R/C HLG (that's hand launch glider), the Gnome. The Gnome came about from an idea I had for an R/C hand launch contest which was sponsored by the Inland Soaring Society (Riverside, California). In that case, all models were restricted to a maximum span of 60", and the Gnome was designed to both fit the size requirement and to look good doing it. Not only that, but it flew very well to boot. In fact, it flew so well, and received so many good comments, I decided to blow it up to 2-Meter size.

In the technical department, the Gnome 2M sports an Eppler 205 airfoil thickened to 12.5%. In practice, I have found that this gives it a much gentler stall than the stock 205. And since the thickened foil gives more lift, it allows the 2M to fly very slowly. On the other hand, it has better than normal penetration for a 12% foil and, when ballasted up, will give a good account of itself in a speed run. Furthermore, the thicker foil offers greater wing strength through the fact that the spars are farther separated from each other. Heavy duty hi-starts and winches are no problem, and moderate zoom launches will produce a good altitude gain.

Enlarged from the 60" hand launch Gnome which proved so successful, this 2-meter version has proven itself also.

The Gnome 2M offers generous tail volume and ample dihedral. These make her a very stable and easy to fly model. However, these same qualities that make it a good choice for the novice sailplaner, make it an excellent sailplane for the more experienced pilot. It thermals very well even in light lift, and if you are a sloper too, it is great fun there also. If you really like to have fun, put some extra throw in the control surfaces and it will do rolls and even spin.

It hasn't yet won the World Cup, but on its very first outing, it got me a second place in the Inland Soaring Society's monthly contest.

So, get out the plan, and **build.** But, before you start, read through the instructions carefully and be sure you understand all the steps.

I. Fuselage Construction

(1) With the plan on the building board and covered with waxpaper, lay up the two fuselage sides. We suggest that you face the bottom of one fuselage side to the bottom of the other side. This is to make sure that you build a right and a left side.

(2) Glue the 3/16" sq. longerons to the bottom edge of the fuselage sides, being careful to align them exactly

with the edge of the fuselage. These extend the full length of the fuselage.

(3) Glue in the fuselage doublers, spacing for F-1 and F-2. (Use F-1 and F-2 themselves for spacing, but don't glue in place yet.)

(4) Glue the 3/16" sq. top longerons to the upper edge of the fuselage from the extreme tail to F-2.

(5) Place the two fuselage sides vertically over the fuselage top view, and glue F-2 and F-3 into position. Check alignment and squareness before gluing (and after also).

(6) Use a sanding block to bevel the longerons at the extreme tail until the fuselage sides come together on the hinge post.

(7) Positioning the fuselage structure over the fuselage top view, pull the fuselage sides together at the tail. Check for straightness and squareness, and glue the two sides together at the hinge post.

(8) Next, carefully pull the fuselage sides into F-1 at the nose. Hold in position and glue F-1 into place.

(9) Turn the structure over and glue the bottom fuselage sheet in place. From the nose to the finger stop, 3/32" ply is used. 3/32" balsa, cross grain, is used from the ply to the tail.

(10) Glue the 3/32" ply tow hook plate in position as shown.

(11) Position the nose block against F-1. Use the hatch block to match up the bevel for a close fit, then glue the nose block into position against F-1.

(12) Determine the position of the servos you will use, and install the servo rails.

(13) The pushrods should be installed next. We used 1/4" dowel, with threaded rods inserted into holes at the aft end, and 1/16" wire at the forward end, "Z" bended for servo attachment. These will exit at the location shown on the plan side view.

(14) When locations are correctly established, insert and shape as needed for a smooth, kink-free run to the rudder and elevator horns. Remove and set aside for final assembly.

(15) Next, add the 3/32" sheet to the fuselage top aft of the wing --- apply cross grain.

(16) Carefully fit the hatch to the fuselage, and tack glue into position for sanding.

(17) Install the plywood bolt block in the fuselage at the location shown. Set it below the 3/16" longeron so that it will be secure when glued in place. Fill above it with scrap to give the wing T.E. a base to seat upon. Glue this very securely into position.

(18) Now, sand the entire fuselage structure to final shape. (See the side and top views for hatch and nose block shapes.) When sanding, round the edges to the degree that you desire. Part of the reason for using inside longerons is to allow for additional rounding, so use your best judgment here.

(19) Set the fuselage aside and go on and construct the wing and tail surfaces.

GNOME 2M
Designed By:
John Luppreger
TYPE AIRCRAFT
2 Meter Sailplane
WINGSPAN
78 Inches
WING CHORD
8½ Inches
TOTAL WING AREA
628 Sq. In.
WING LOCATION
Shoulder Wing
AIRFOIL
Eppler 205 (12½%)
WING PLANFORM
Constant Chord Center
Tapered Tips
DIHEDRAL EACH TIP
1-11/16" Center
4" Tip
O.A. FUSELAGE LENGTH
41½ Inches
RADIO COMPARTMENT SIZE
(L) 16½" x (W) 1½" x (H) 2¼"
STABILIZER SPAN
20½ Inches
STABILIZER CHORD (incl. elev.)
3⅞" (Avg.)
STABILIZER AREA
79½ Sq. In.
STAB. AIRFOIL SECTION
Flat
STABILIZER LOCATION
Top of Fuselage
VERTICAL FIN HEIGHT
8 Inches
VERTICAL FIN WIDTH (incl. rud.)
7⅝" (Avg.)
REC. ENGINE SIZE
Option — 7 cell electric
or .049 power pod
FUEL TANK SIZE
NA
LANDING GEAR
Skid
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Rudder and Elevator
BASIC MATERIALS USED IN CONSTRUCTION
Fuselage ..... Balsa & Ply
Wing ..... Balsa, Ply & Spruce
Empennage ..... Balsa
Wt. Ready To Fly ..... 24-32 Oz.
Wing Loading ... At 28 Oz. — 6.3 Oz./Sq. Ft.

The Dust Club of Palm Springs, Calif., will be holding a one design contest with the Gnome 2M sailplane on April 6th, 1986. For more information, contact: Craig Ericksen at (619) 327-5854.

II. Wing Construction

(1) Cover the wing plan surface with waxpaper, and pin the trailing edge into position over the drawing. (Cut the trailing edge at the polyhedral joint.)

(2) Pin the lower leading edge sheet and center bottom sheet in place over the plan. (Cut bottom center sheet to shape when doing this.)

(3) Glue the lower capstrips in place (except at the polyhedral joint --- these strips will be installed after the polyhedral angle is established and the brace and ribs are installed).

(4) Place the lower main spar over the plan on top of the lower L.E. sheet.

(5) Place the ribs in position over the spar. (Leave out the ribs at the wing center and at the polyhedral break --- these are installed after the panels are joined.)

(6) Place the top spar in the spar notches of the ribs.

(7) One at a time, glue the ribs into position, squaring and fitting carefully as you go along.

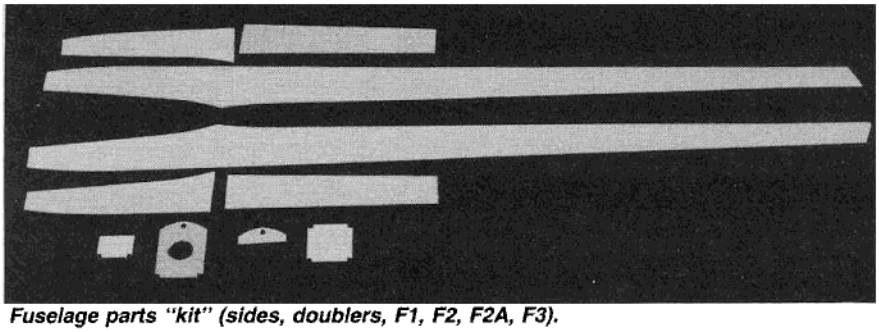
(8) Shim the leading edge so that it is held up even with the front of the ribs, the bottom even with the bottom of the ribs. (A spare piece of trailing edge stock works well for this purpose.) Place waxpaper between the shim and the L.E. piece so that the shim piece is not glued to the ribs and L.E. Note that the leading edge will be angled compared to the building surface (hence the T.E. piece making a good shim). This is to allow it to conform to the lower surface of the ribs and allow a smooth flow of the sheet from the ribs to the leading edge piece with no shaping of the leading edge piece required.

(9) Glue the L.E. to the ribs.

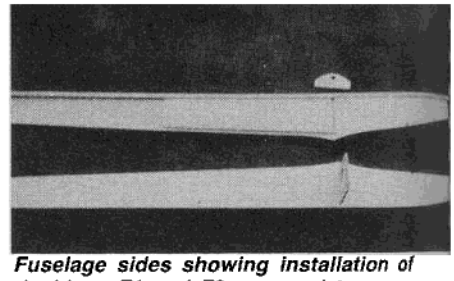
(10) If needed, lightly sand the rib upper surface to smoothly flow to the upper surface bevel of the leading edge piece.

(11) Remove all pins from the panel, but leave the panel on the plan.

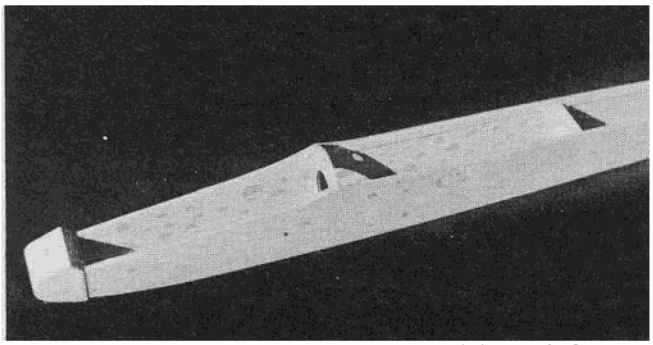
(12) Next you will want to glue the lower leading edge sheet to the ribs and leading edge piece. To do this, begin by lifting the trailing edge up and, while pressing down and forward on the ribs and the leading edge, rolling the panel so that the lower leading edge sheet against the leading edge piece while the leading edge sheet is pressed against the plan surface. Glue the sheet to the ribs and the leading edge piece (at the inside



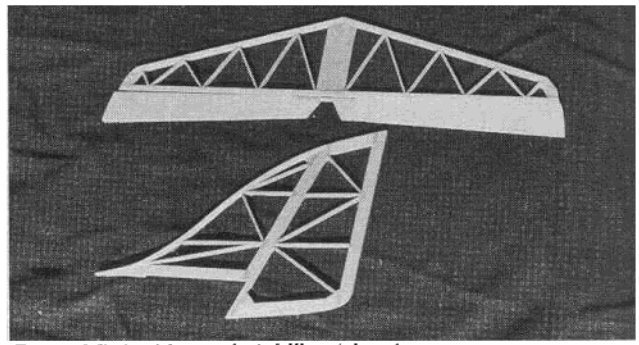
Fuselage parts "kit" (sides, doublers, F1, F2, F2A, F3).



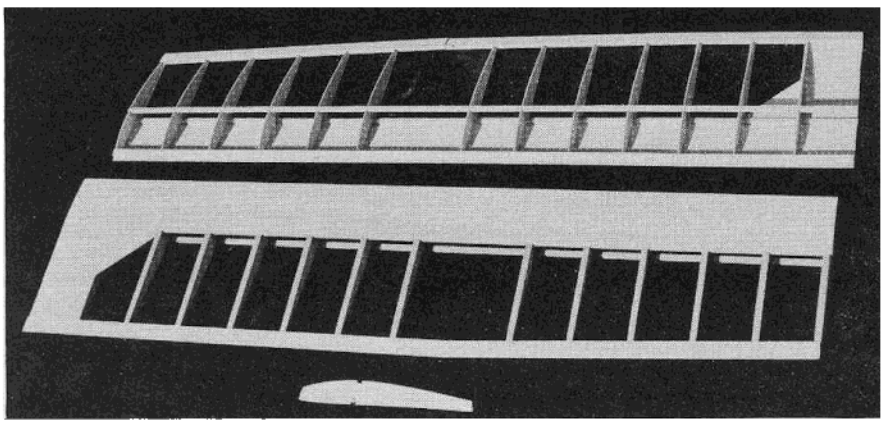
Fuselage sides showing installation of doublers. F1 and F2 are used to space doublers as they are glued to the fuselage sides.



Fuselage structure showing cyanoacrylate gluing technique — holes made with pin and glue dripped into holes.



Framed fin/rudder and stabilizer/elevator.



Wing panels are framed to point of cutting at polyhedral break.

edge) with thin CA glue.

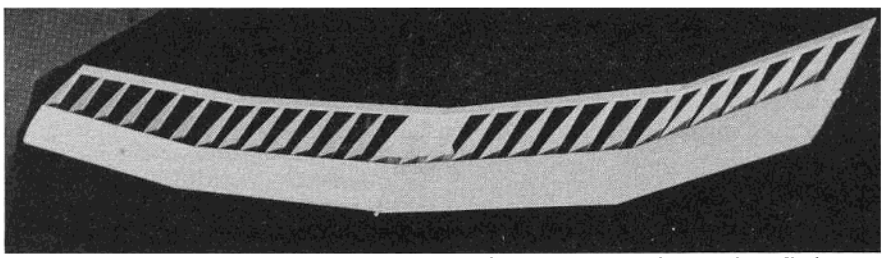
(13) Remove the panel from the plan surface and glue the L.E. sheet along the outside joint to the L.E. using thin CA glue.

(14) Cut the center and tip panels apart and sand at the polyhedral break as needed for a flush fit when the tip panel is correctly angled. Then, with the center panel pinned flat, block up the tip as specified and glue in the polyhedral brace. Glue the trailing edge and leading edge piece with CA glue.

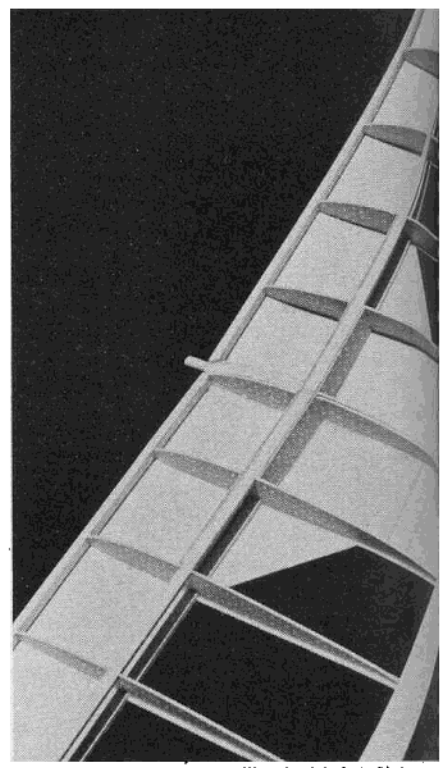
(15) If you have built only one panel to this point, go back and go through the above steps for the other panel.

(16) Now, glue the right and left panels together at the wing center by sanding to establish the proper angle. Then block up one panel and add the dihedral braces. The two ribs (one out from the center of the wing) will have to be cut to clear for the front brace --- a Zona saw works well for this. (Also, loosening the top glue joint at the next set of ribs makes it easier to insert the front brace.) Glue at the leading edge and trailing edge with CA glue.

(17) Next, install the 1/4" wing dowel. To do this you will have to use your framed fuselage structure to get the fit correct. First notch the leading edge at the center for the dowel ---



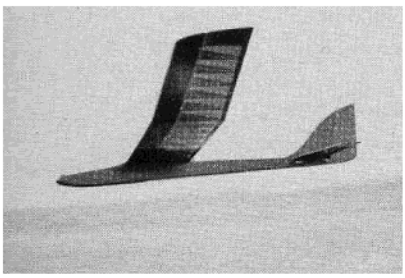
Wing with top sheeting in place. Top, center sheet, top cap strips are installed next, followed by the wing tips.



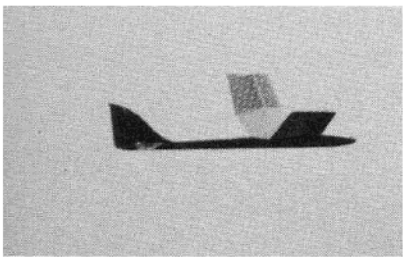
Detail of wing center dihedral joint. Note that wing dowel is captured completely by center ribs and 1/4" sheet.

notch as needed for the dowel to fit as shown on the fuselage side view. Insert the dowel into F-2 and, with the wing firmly seated in the wing saddle, tack glue the dowel at the leading edge and to the front center dihedral brace. Then add the 1/4" sheet filler below the dowel --- shape to fit between the dowel and the bottom leading edge sheet at the center. Add the two front half W-1 ribs on each side of the wing dowel. Then insert some of the remaining 1/4" fill material between the ribs and glue the entire structure solidly. Shape the insert to match the rib contour.

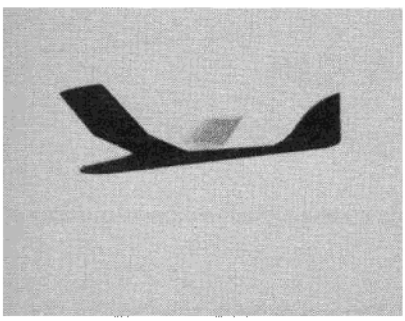
(18) Now add the ribs at the rear of the wing center and at the dihedral breaks. Then add the capstrips to the bottom side of the polyhedral break ribs.



Gnome 2M in flight — note the glide angle and the slight down-sweep of the fuselage.



Gnome 2M turning to line up for landing.

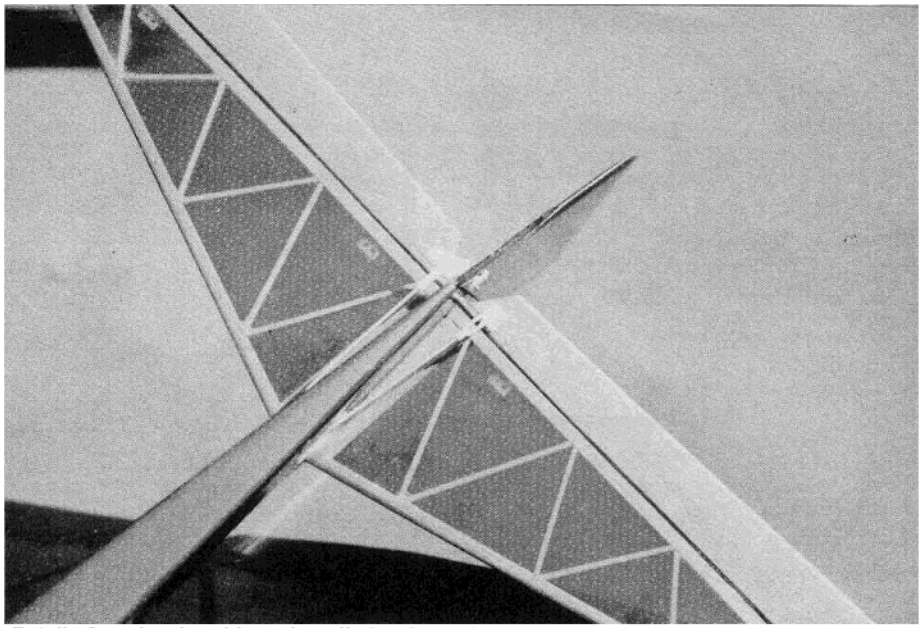


In flight.

(19) Begin the process of adding the upper wing sheet by pinning one wing section at a time to the plan surface. Then, following the next steps, add the upper wing sheeting.

(a) Glue the top sheet to the main spar.

(b) Pull the sheet tight to the leading edge top and make some pin holes through the sheet and into the leading edge.



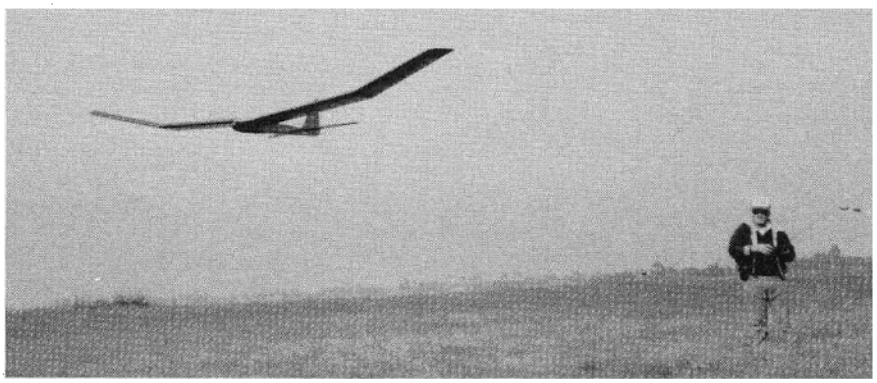
Detail of pushrod and horn installation for rudder and elevator.

(c) With the sheet held tight, put drops of thin CA glue into the holes. (An alternate here is to run a bead of slow CA glue on the leading edge strip, followed by pulling the sheeting tight to the leading edge strip, and holding tight in position for a few seconds until the glue hardens.)

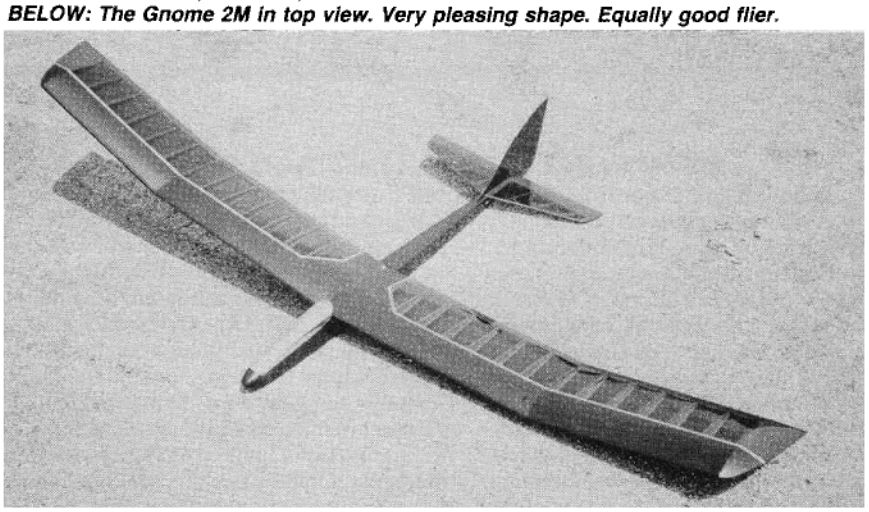
(d) Now, remove the wing section from the plan surface and, working between the spars, hold the sheet tight to the ribs (one at a time) with a finger and drop CA glue into the joints. (When glue is hard, go on to the next rib.)

(e) Also drip CA glue on the sheet to leading edge joint.

(f) Repeat for other panels. (Note: some trimming and sanding



ABOVE: Co-Author, Bob Sliff, in "control" of G-2M.
BELOW: The Gnome 2M in top view. Very pleasing shape. Equally good flier.



will be needed for the sheets to fit flush against each other.)

(20) Again pin the wing sections, one at a time, to the plan surface and add the shear webbing by inserting the webs between the spars. (Wood grain must be vertical and there should be no gap between the web and each rib.)

(21) When adding the webs to the tip panels, we found it advantageous to block up the trailing edge at the tip 1/8". This will give some washout to the wing tips for a more gentle stall characteristic. (With the full "D" tube wing of the Gnome 2M, it is difficult to add the washout later.)

(22) Add the upper capstrips and the center aft sheeting.

(23) Trim the tip panel ends flat and glue the sheet tips in place. Then add the tip gussets.

(24) Shape the 1/32" ply bolt brace and glue into position.

(25) Position the wing on the fuselage, and carefully align. Mark and drill for the 1/4-20 nylon hold-down bolt. Check your bolt tap for the correct first size drill bit. Remove the wing from the fuselage, and further enlarge the hole in the wing for the 1/4-20 nylon bolt. (Tap for the wing bolt in the wing block in the fuselage.)

(26) Sand the entire wing to a finished shape --- work from coarse to fine sandpaper.

(27) Set aside for fitting to the fuselage and for final covering.

(28) (Note: For those of you who really like to test the strength of a wing with one of those gorilla winches, you might consider using glass cloth at the wing center. Only under the most strenuous of circumstances will this be needed, so use your own judgment.)

III. Stabilizer/Elevator Construction

(1) Over the plan, cut and pin the stabilizer leading edge and hinge line spars into position.

(2) Cut and fit the tip and center pieces, and glue them into position.

(3) Cut and fit the stabilizer ribs. Glue into position as you go along.

(4) Glue the two elevator halves together with the dowel joiner, aligning over the plan and against the stabilizer.

(5) Sand the elevator and stabilizer to an airfoil shape by rounding the stab leading edge and tapering the elevator.

(6) Sand the elevator hinge line for the hinges you will use. When using standard hinges, first cut the slots and then fit (but do not glue in) the hinges. (Hinges are glued in only after all covering is completed.) MonoKote hinges are done along with the process of covering.

(7) Set the stabilizer and elevator aside for final covering and assembly.

IV. Fin And Rudder Assembly

(1) Begin with the fin by laying out the fin base and vertical hinge line spar over the plan.

(2) Use some scrap balsa to make some blocks to form the leading edge laminates. Laminate (using CA glue) the leading edge out of the 3/32" x 3/16" strips. Do this by first wetting and then forming, using the blocks to hold the leading edge shape.

(3) With the forming blocks still in place, add the ribs to the fin, and allow the assembly to dry out.

(4) Now, lay up the rudder by first cutting the outline parts and then gluing.

(5) Cut, fit and glue in the rudder ribs.

(6) Sand the rudder/fin assembly to an airfoil shape, and sand the hinge line of the rudder (as you did with the stab) for hinging.

(7) If using conventional hinges, slot and set aside for final covering and assembly.

V. Covering

(1) Final sand all structures with fine paper to achieve a clean, smooth surface. Final sanding should be with 240 or 320 paper.

(2) Cover the wing with a "seeable" color of Super MonoKote. (Other coverings may be used on the Gnome 2M, but we like the extra strength and the ease of covering with Super MonoKote.) Follow the instructions with the MonoKote if this is your first time using it.

(3) For general sport flying and contest work, cover the entire fuselage with Super MonoKote.

(4) Finally, cover the stabilizer and elevator, the fin and rudder as separate pieces.

VI. Final Assembly

(1) Carefully hinge the stabilizer and elevator. Trial fit the hinges to make sure all hinges and slots line up; then glue the hinges into place with CA glue. (Note: If you are using pinned hinges, do not use CA glue as it will lock up the pins solidly.)

(2) Gluing the stabilizer/elevator to the fuselage:

(a) Bolt the wing onto the fuselage, and move to a clear area.

(b) Check fit the stab to the fuselage to assure that there is no stab tilt. (Sight from the stab to the wing trailing edge.) Correct any misalignment now.

(c) Next find a point on the center of the fuselage top just behind the wing trailing edge. Mark this point with a pen. Then, measure from this point to each stab tip, and adjust the stab until the measurements are the same.

(d) Now, with the stab held firmly in position, draw lines on the stab at the point where it contacts the fuselage.

(e) Remove the stab and, after making sure the covering is ironed down, cut the MonoKote away from the center (contact) area. This will allow a wood to wood glue joint for gluing the stab to the fuselage.

(f) Carefully reposition the stab on the fuselage, and again align. Using CA glue, glue the aligned stab onto the fuselage.

(3) Attach the fin/rudder to the stabilizer and the fuselage:

(a) Align the fin so that it is straight with the center line of the fuselage and the hinge line spar is straight with the fuselage rear. (To do this, it may be helpful to have the rudder temporarily hinged to the fin --- this can help with vertical alignment.)

(b) Mark the stab and cut away the MonoKote that will be under the fin --- remember the wood to wood joint.

(c) Carefully align, and pin or hold in place using building triangles, and apply the CA glue.

(d) Now, glue the hinges into the slots in the rudder with CA glue. Then, insert the hinges into the slots in the fin and fuselage rear and glue into place with CA glue.

(4) Install the pushrods (use a piece of inner Gold'N-Rod or similar material to pull the pushrods through the aft fuselage and through the exit holes), and add the clevises. Now position the horns, drill for the horn screws, and install the horns to the elevator and the rudder.

(5) Check for exact length and "Z" bend the rods at the servo end so that it aligns with the servo arm. Install in servo arm, and set rudder and elevator centers by adjusting the clevises.

(6) Set the rudder and elevator throws by moving either the clevis in or out on the horn holes or the "Z" bend in or out on the holes in the servo arms. Try to achieve initial throws of 1/2" each way for the elevator and 1½" each way for the rudder.

(7) Your battery pack and receiver will be placed in the forward fuselage location. The radio switch should be located in this area also. Use your best judgment here.

VII. Flying Your Gnome 2M

(1) Begin by balancing at the location shown on the plan. Either move components (if you can) or add ballast as needed to achieve this balance point.

(2) With first test glides, launch your Gnome 2M level and straight ahead. Adjust as needed to correct for deviations from a nice flat straight ahead glide.

(3) Now you are ready to put your Gnome 2M through its paces. (Note: If you are a novice R/C sailplane pilot, please seek help from an experienced pilot. While your Gnome 2M is very durable when it comes to handling in-flight loads, smacking the ground will do it little good.)

(4) We have found the Gnome 2M to be an excellent flier for all types of sailplane flying. It will do very well on a hi-start or winch, going up as well or better than many other 2-Meter and larger models. On the slope, it will fly in light lift to moderate winds, and will do some very nice aerobatics --- loops, rolls and limited inverted flight. Finally, it is very gentle in stall, allowing recovery with minimum altitude loss and if you get good, it can be slowed up to gently land in your hand.

(5) The Gnome 2M is designed to be a very durable model, so give it a workout. Of course it can break, but it will take some really heavy handedness to do so. Crashing can be detrimental to your Gnome 2M's well being, but the very fact of its strong structure and low weight, makes it quite resilient of hard knocks.

Partial kit available for $18.00 (UPS shipping included), includes wing ribs, dihedral braces, wing tips, fuselage sides, doublers and formers. Available from Gnome 2M Partial, Bob Sliff, P.O. Box #9, Midway City, California 92655.

Good flying and happy thermaling. □

From RCModeler Dec. 1985