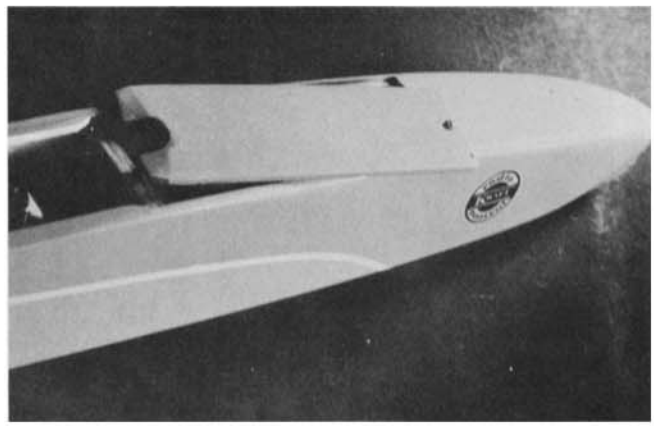
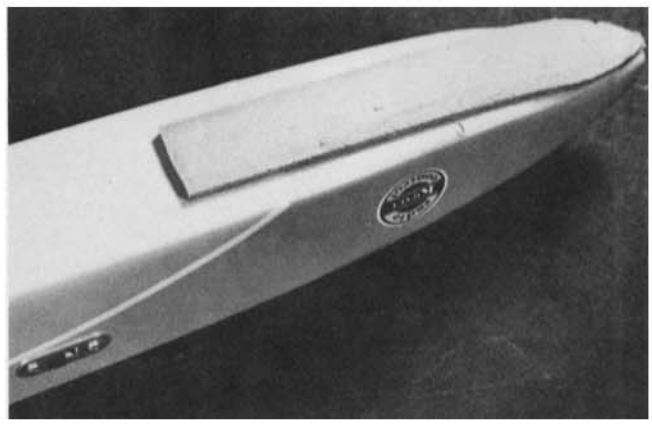
GENTLE

LADY

By Carl Goldberg





As a novice glider pilot, Carl wanted a two meter ship that was respectably efficient, and, if possible, competition worthy. RCM feels the Gentle Lady meets that criteria.

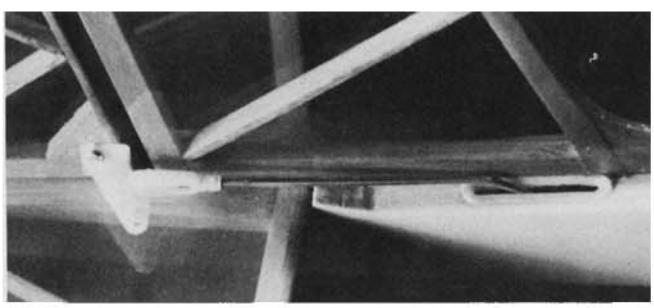
Like most people who like airplanes, I've always been drawn to sailplanes. They are the most beautiful of man-made birds. Their sleek lines, high aspect ratio wings, utter cleanliness, and refinement of detail make them the ultimate "clean machine." At the Toledo Weak Signals show each year, I have to stop, study, and admire the very appealing sailplanes that are always on view.

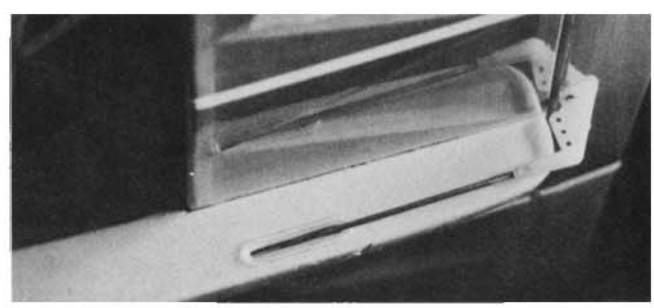
Naturally enough, when thinking of designing one myself, I studied some of the better known ships around. Among them were the Pierce Arrow, Wanderer, Soar Birdi, Drifter II, and others. One of these was a fine East Coast design by Woody Blanchard, which has done well there. In addition, I spent many hours talking to glider flyers, reading magazine articles, newsletter reports, etc. There was a lot to learn.

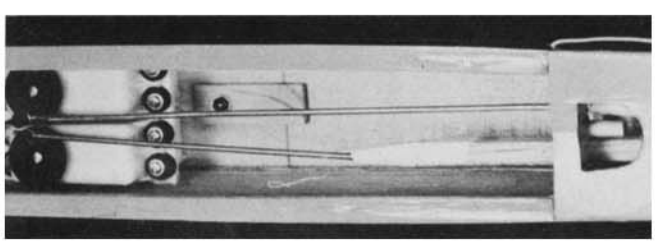
Totalling things out, this is the design philosophy that emerged. First of all, I decided I wanted a two-meter ship. The essential reason for this was a desire for simplicity. Getting into one of the larger birds, I felt, would tend to draw me into complications. They just naturally tend to be a little more sophisticated. Also, I had noticed growing general interest in the two-meter class. Interestingly, I later learned that the Dassel, the Austrian design that has aroused such great interest world-wide, and which was used by the new world champion, Anton Wackerle, has only about 6" more span.

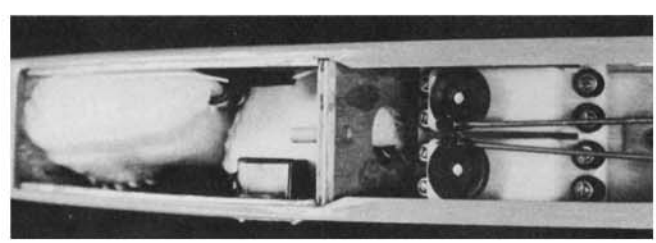
Besides simplicity, I wanted the ship to be easy to fly, and stable. Obviously, as a novice glider pilot, I didn't want to shoot for more efficiency through means that might require some real flight skills.

At the same time, I definitely wanted a ship that was respectably efficient, and, if possible, competition worthy. One major means of achieving the efficiency sought, based on past experience, was to use a thin airfoil, and build it with a smooth top. The lift-drag ratios of such airfoils tend to be quite high, and it turns out the "Gentle Lady" can really "cruise" when desired.







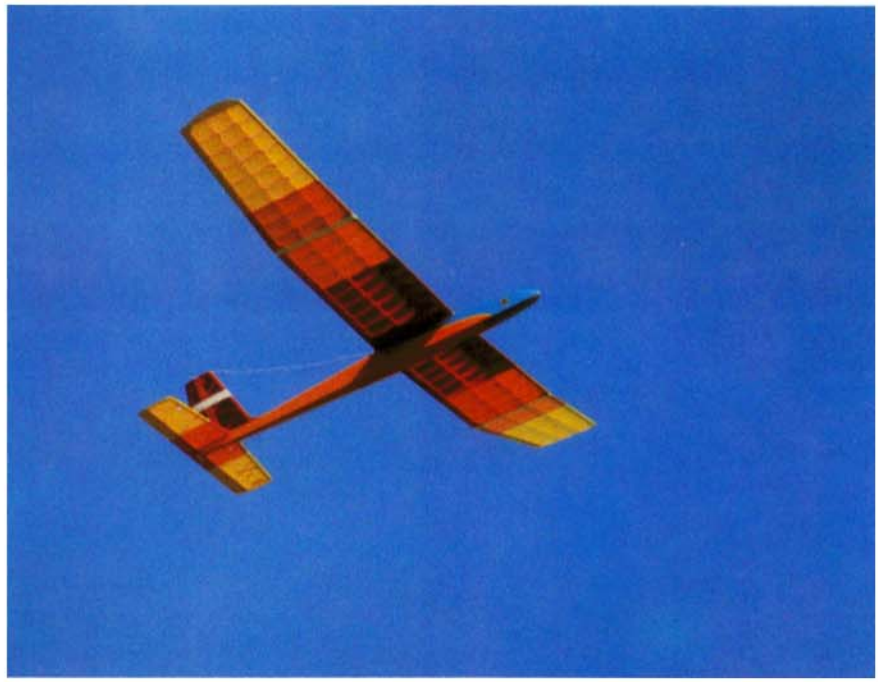


GENTLE LADY

Designed By : Carl Goldberg

TYPE AIRCRAFT
Two-Meter Sailplane
WINGSPAN
78¼ Inches
WING CHORD
8.47"
TOTAL WING AREA
663 Square Inches
WING LOCATION
High Wing
AIRFOIL
9% Flat Bottom
WING PLANFORM
Constant Chord Inboard Pannels
Tapered Outboard Panels
POLYHEDRAL, EACH TIP
1¼" Inboard Panels
6⅜" Tip
OVERALL FUSELAGE LENGTH
41 Inches
RADIO COMPARTMENT AREA
1¾" (Max) x 2" (Max) x 15"
STABILIZER SPAN
20.8 Inches
STABILIZER CHORD (incl. elev.)
4.63" Average
STABILIZER AREA
96.3 Square Inches
STAB AIRFOIL SECTION
4% Flat Top & Bottom
STABILIZER LOCATION
Top Of Fuselage
VERTICAL FIN HEIGHT
8 Inches
VERTICAL FIN CHORD (incl. rud.)
4⅞" Average
REC. NO. OF CHANNELS
2
CONTROL FUNCTIONS
Rud., Elev.,
BASIC MATERIALS USED IN CONSTRUCTION

Fuselage	Balsa and Ply
Wing	Balsa and Ply
Empennage	Balsa
Wt. Ready-To-Fly	25 Oz.
Wing Loading	5.4 Oz./Sq. Ft.



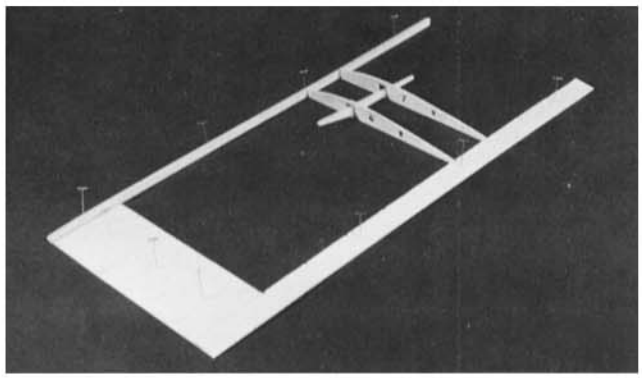
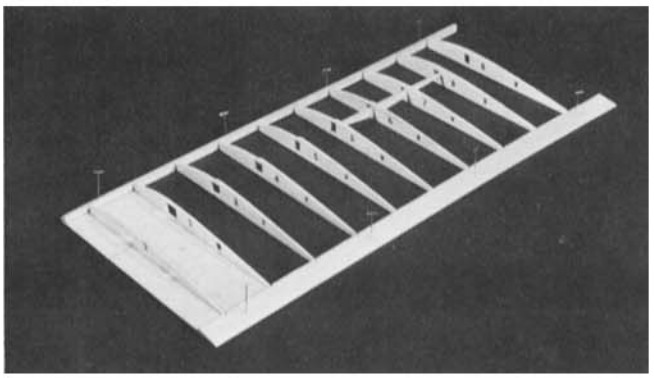
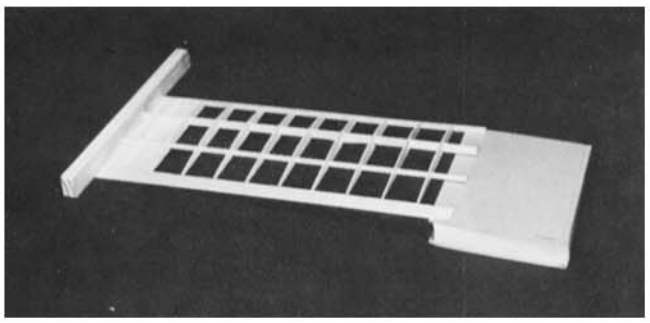
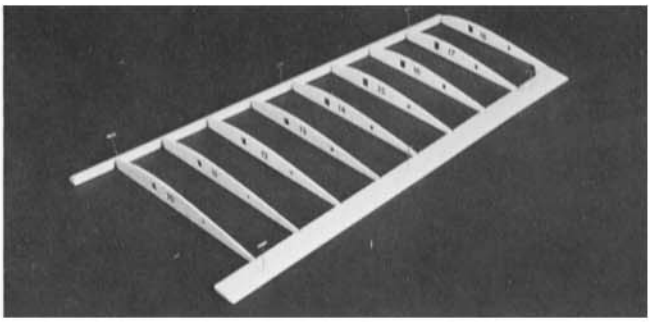
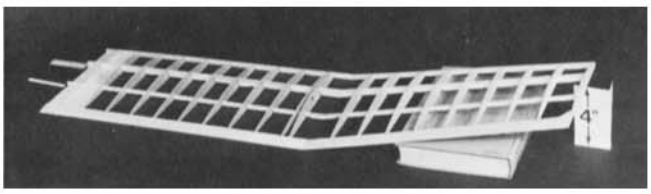
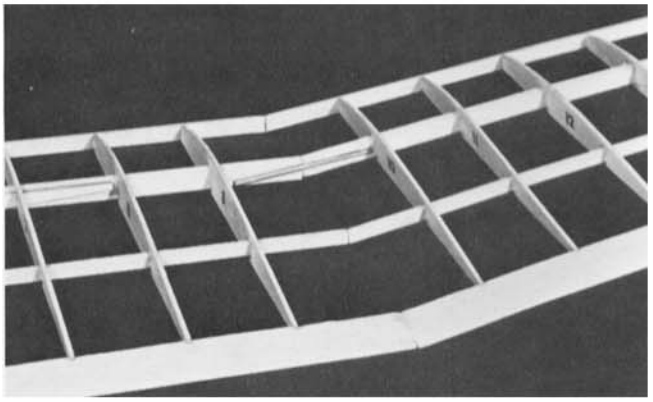
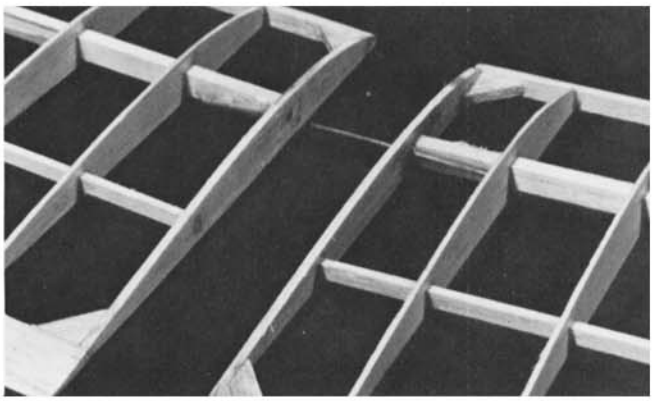
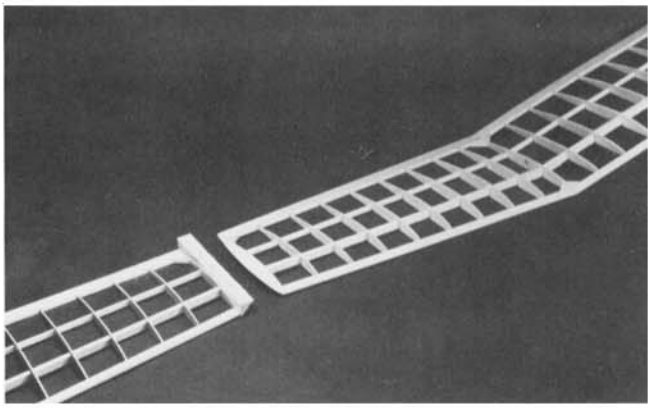
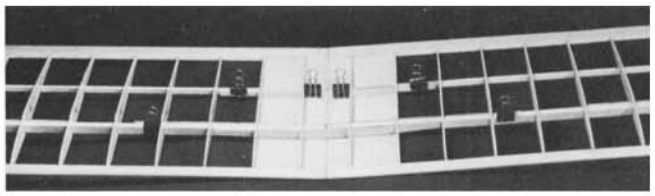
Further, in addition to keeping the model lightweight, I felt it desirable to have lots of wing area to reduce the wing loading, and help pull up the weight of the tow line, whether high start or winch. Despite having what appears to be a large chord, the aspect ratio comes out at 9.3, which compares not too badly with the Dassel at 10.6. In addition, the stabilizer does provide a slight amount of lift, not just drag. This is proven by the location of the Center of Gravity, which is around 40% back.

Lastly, I wanted no projecting wing dowels, or rubber bands crossing over the center of the wing. After all, why disturb the air flow? When you get right down to it, a glider has no means, such as an engine, to make up for a lack of efficiency. All it has to help it stay up is cleanliness. The dirtier it is, the quicker it will come down.

How has it all worked out? A real pleasure. "Gentle Lady" is a sweetheart to fly. She really is gentle, and a lady. She reacts quickly to lift, can circle very tightly without falling off, trims out easily, can really go when necessary, is very responsive, and yet so stable I've been able to put the transmitter down right after release from the tow and she'd fly herself all the way down. What more could I ask?

I've been impressed, also, with the beauties of glider flying. It's great to be able to take just the model and a transmitter and go fly off a nearby slope! Guiding a trim-looking ship as she sails quietly and smoothly along, high in the blue, is a neat experience. Then when you get home, there's no worry about oil dripping on the carpeting! Yet, glider flying is definitely a challenge — far more than I would have guessed before. Searching and finding lift, learning to be sensitive to it when it's very light, staying in the lift instead of flying out of it, etc., — it's all going to take a lot of flying to develop the skills. And, while I'm at it, let me pay tribute to Ben Matsumoto and Paul Trist. They built the first prototype and, as ardent and long time glider flyers, they were extremely helpful in getting me started.

"Gentle Lady" will soon be a kit, but if you want to scratch build it, the RCM plans are exactly like the final prototype, except that they contain some minor improvements. Equipment we've used has been the Futaba FP3S with S20 servos, the EK brick, and the final model has the new Kraft KP3AS with KPS 14 servos. All the equipment has worked without problems. Obviously, some weight can be saved with small servos such as the S20's, or the Kraft KPS 18's. The battery we've used has been a 450 mah, whereas a 225 would obviously save a little weight, too. However, since the battery is way up in the nose, it would be important, if using a small battery, to also keep the tail end quite light. In the Kraft KP3AS, I'm also using the nicad conversion rather than dry batteries. The airborne four cell nicad pack is about 1⅛" square and easily fits up into the nose. Without any special effort to keep the tail end light, only

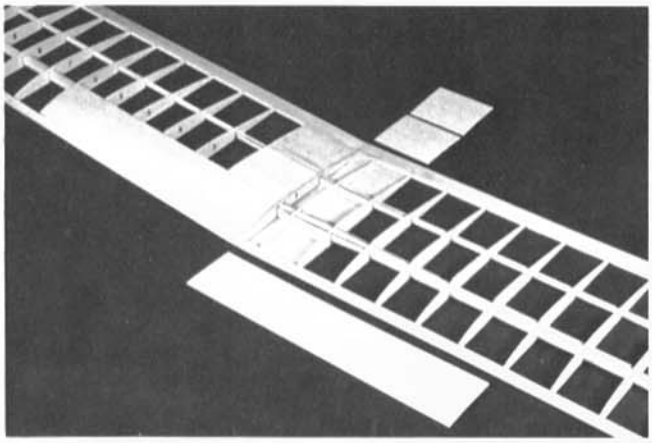










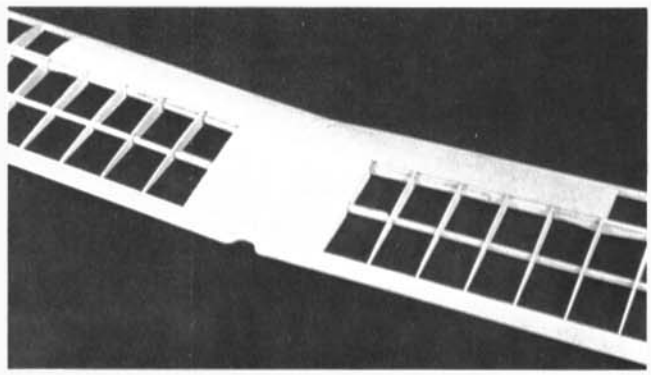
1/2 oz. of additional nose weight was needed. If a heavier skid had been used, no additional nose weight would have been required.

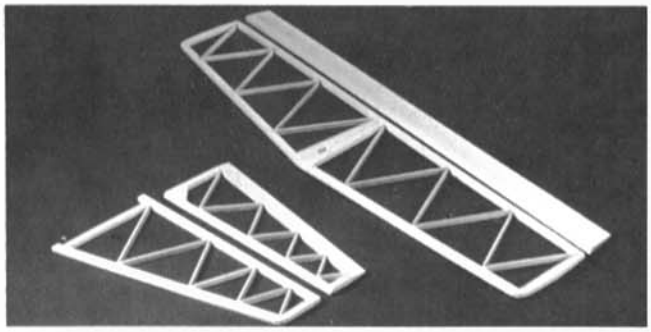
The Cox 2 channel radio would also work fine. If you want to use the tray for the servos, you will need to widen the fuselage in that area about 1/16''. To use the Logictrol brick, cut away 2½'' of the center of the 1/8'' square triplers under the wing.

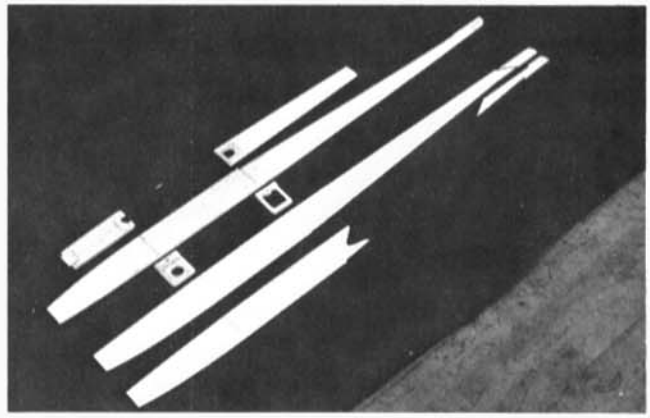
Before we get into the actual construction, let me mention one additional thing. If you have a small car, you obviously will want detachable wing tip panels. This option is shown on plan sheet 2 and, although quite simple and light, it works very well. The final prototype has this feature, as it was built in Chicago, and shipped to me in California by United Parcel Service! The 3/4'' wide tape around the joint is Scotch Brand #35 vinyl plastic electrical tape. It's available in some electronic stores. Be sure to secure the brass tube and music wire firmly to the spars, using nylon fabric and Super Jet or epoxy.

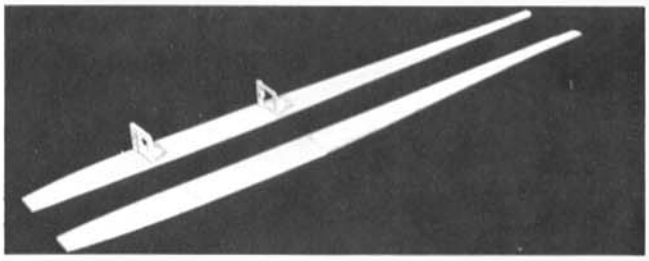
Speaking of Super Jet, the final prototype was completely built with this new glue. And although I didn't build the model and may be prejudiced anyway from my own work with it, it sure has been great! It's strong, fast, and the very fact that you can see where it is sure relieves any anxiety over whether you've really made the joint or not. And for applying doublers, it's so easy to use it just can't be beat. Just run beads of the glue all over the area, then press the parts together on a flat surface. As you press, within seconds you'll feel the warmth coming up out of the balsa as the Super Jet

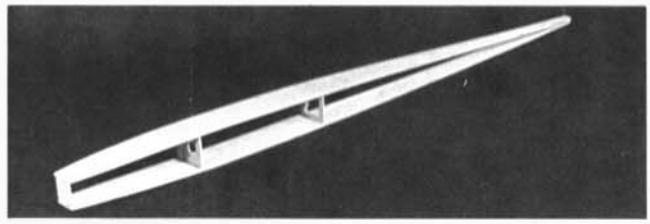


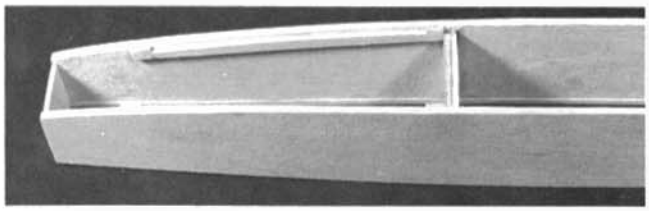


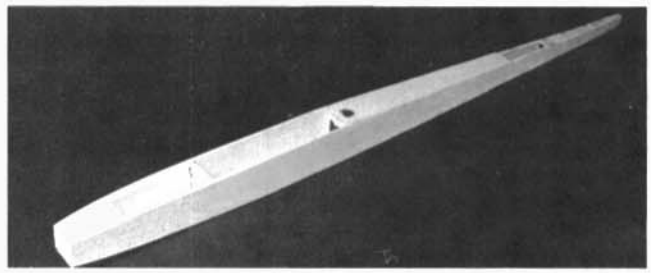


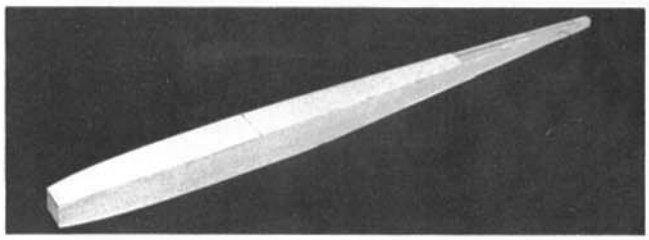


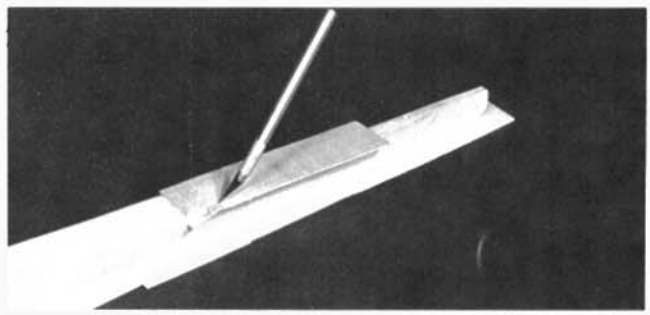


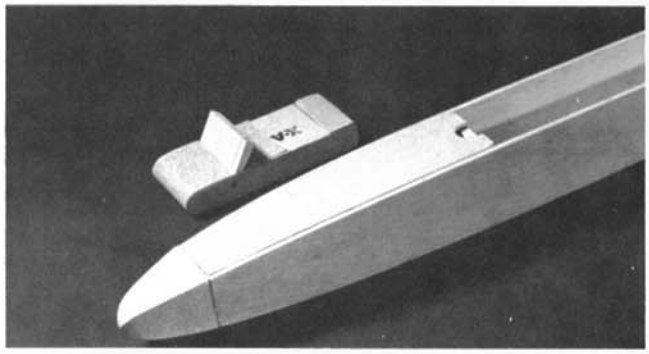


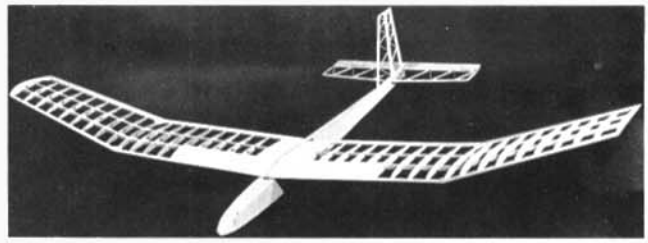












Material List

1/16" ply x 3" x 12", 1 req'd. — fuselage bottom, polyhedral joiners.
1/8" ply x 2" x 18", 1 req'd — wing joiners, former braces, tow hook mount.
1/4" x 3/8" x 21", bass or spruce, 2 req'd — inboard main spars.
1/8" x 1/4" x 21", bass or spruce, 2 req'd — inboard rear spars.
1/4" x 3/8" x 18", med. to med. hard balsa, 2 req'd — outboard main spars.
1/8" x 1/4" x 18", med. to med. hard balsa, 2 req'd — outboard rear spars.
1/16" x 3" x 36", med. balsa, 4 req'd — fuselage sides, top, bottom, & doublers, wing sheeting, stabilizer & fin trussing.
1/16" x 2" x 36", med. balsa, 1 req'd — fuselage sides, top, bottom, & doublers, wing sheeting, stabilizer & fin trussing.
3/32" x 3" x 36", med. balsa, 4 req'd. — wing ribs.
1/8" sq. x 36" hard balsa, 4 req'd — longerons.
1/8" x 3" x 18", med. balsa, 1 req'd. — fuselage hatch, formers, stab fairing.
3/16" x 1/4" x 36", med. balsa, 2 req'd. — stabilizer & fin framework.
3/16" x 3" x 36", med. balsa, 1 req'd. — elevator, dorsal, gussets, etc.
3/16" x 15/16" x 36", med. balsa, 3 req'd. — wing trailing edges.
3/16" dia. x 1½" dowel, 1 req'd. — wing hold-downs.
1/4" sq. x 18", med. balsa, 2 req'd. — pushrods.
5/16" x 3/8" x 36" med. to med. hard balsa, 3 req'd. — wing leading edges.
3/4" x 3/4" x 15" tri-strip, soft to med. balsa, 1 req'd. — wing tips.
1½" sq. x 2", hard balsa, 1 req'd. — nose block.

Accessories:

Small control horns, CG #CH2, 2 req'd.
Clevis & threaded rod, CG Mini-Snap #MS1, 2 req'd.
Small Airtronics Tow Hook, 1 req'd.
1/16" dia. x 18" music wire, 1 req'd.
3/32" dia. x 6" music wire, 1 req'd. For optional detachable wing tip panels.
3/32" dia. I.D. x 3" brass tube, 1 req'd. For optional detachable wing tip panels.
Pushrod exit guides, Klett #PEG-1, 2 req'd.
Pushrod connectors, CG #PC1, 2 req'd.
Super Jet instant glue, CG #SJ-50, 1 req'd.
MonoKote, approx. 26" x 8 ft. req'd.
Spring stationery clamps, 10 req'd.

goes off. And if you try to break up the joint, you'll destroy the whole thing. Try it on some scrap balsa and see for yourself.

WING:

(1) From Sheet 2 of the RCM plan, cut out rectangular strips for each of the 18 rib drawings. Using rubber cement or similar, glue the strips to 3/32" balsa, and carefully cut out pairs of ribs except as noted.

(2) Follow the same procedure for the plywood wing joiners and braces.

(3) Taper the leading edge to 7/32" in front to make it easier later to sand to correct leading edge shape.

(4) Mark the wing trailing edges for the rib locations. Tape hack saw blades together and notch all rib locations, **except** at the dihedral and polyhedral breaks.

(5) Pin inboard leading and trailing edges in place, as shown in first wing construction photo. Add bottom center sheeting.

(6) Glue ribs #6 and #7 to leading and trailing edges. Place 1/8" ply spar brace in front spar slots.

(7) Add remaining ribs #2 through #8.

(8) Sand dihedral angle in one end of main and rear spars. Then glide spars through ribs, with dihedral angle at wing center joint.

(9) The next photo shows a book lifting the outer end of the framework, but this isn't really necessary. Use a flat block to flush the dihedraled spar ends with the leading and trailing edges.

(10) Glue spars to ribs #5, #6, #7, and #8 only.

(11) Glue brace to spar firmly.

(12) Pin leading and trailing edges of outboard panel in place over plan. Position and glue ribs 10 through 18 in place. Add gusset.

(13) Sand angle in one end of spars, as in Step 8. Use angle indicated in "Optional Removable Outer Panels" as guide. Slide spars in place, but do not glue yet.

(14) Notice small strips at left end of photo #5. These are 1/16" balsa spacers to be glued under spars and to center sheeting. Slide rib #9 on inboard spars.

(15) Sand leading and trailing edges slightly to match polyhedral angle. Support outboard panel tip at 4". Join inboard and outboard spars using 1/16" ply joiners and clamps.

(16 Join leading and trailing edges.

(17) Glue rib #9 in place at polyhedral joint and add gussets. Glue outboard spars to ribs.

(18) Trim off excess of spars extending beyond rib #18. Glue balsa tri-strip in place on wingtips. Carve and sand, following top contour of rib. (See plan).

(19) Sand leading and trailing edges slightly at center joint for dihedral angle. Glue 1/8" ply dihedral joiners in one wing, using clamps, and let dry.

(20) Join wing panels, and check for correct dihedral. Each wing tip should be about 6⅜" above the table.

(21) Glue doubled #1 rib and gussets in center joint.

(22) Glue top sheeting in place.

(23) Cut and sand the rubber band recess in trailing edge at wing center joint.

(24) Glue 3/4" nylon across entire center joint, top and bottom.

(25) Sand entire leading edge carefully to shape, checking with templates made of 1/16" ply.

(26) Sand entire wing smooth.

HORIZONTAL & VERTICAL TAIL:

(1) Cut stabilizer tips and center section out of 3/16" balsa.

(2) Cut and trim leading edge carefully for center joint and exact length at tips.

(3) Assemble outline, and add 1/16" x 3/16" balsa trussing. Carve and sand elevator to taper as shown.

(4) If you are going to use MonoKote hinging, bevel leading edge from top side only. Otherwise, for conventional hinges bevel in both directions from the center of the leading edge.

(5) Follow the same basic procedure for building the fin and rudder. Note the bottom of the fin leading and trailing edges will extend down into the fuselage. Add scrap filler to bottom of fin outline. Do not glue dorsal fin in place yet.

(6) Sand round all leading edges and tips, except areas for dorsal fin and stab fairing.

FUSELAGE:

(1) Using 1/16" x 3" x 36" balsa, cut out fuselage sides including rear end pieces.

(2) Cut out front and rear side doublers, top and bottom, and top rear doubler and stab platform. Also cut out hatch rests, hatch brace, and top hole doubler.

(3) From 1/8" balsa, cut out formers 1, 2, and 3.

(4) From 1/8" plywood, cut out doublers for formers 2 and 3, and also tow hook doubler. From 1/16" plywood, cut out front fuselage bottom, and hatch tongue.

(5) Glue rear end pieces to fuselage sides.

(6) Add doublers to front and rear fuselage sides. **Important:** Make one **left** side and one **right** side! Add doublers to formers 2 and 3, and drill 3/16" dowel holes.

(7) Add ply tongue and balsa brace to hatch. Also, add hole doubler to fuselage top.

(8) Mark former locations on fuselage sides. Add 1/8" square longerons to sides, and cement formers 2 and 3 to one side. Be sure to orient formers so ply doublers are facing correctly. When dry, add second side.

(9) Add #1 former, and pin together at rear. Use top view to help keep fuselage true.

(10) Glue hatch rests in place. Add 3/16" dowels to formers, gluing securely.

(11) Trim off hatch rest gauging ends, and glue on front fuselage top. Add main fuselage top, and top rear doubler and stab platform. Note that this last piece goes **between** the fuselage sides.

(12) Add 1/16" ply bottom, and main balsa bottom. Also add 1/8" ply tow hook doubler.

(13) Add cross grain 1/16" balsa to the fuselage rear top and bottom. Trim carefully to avoid cutting into sides.

(14) Add 1/8" square balsa wing rest rails, and nose block. Tack cement removable hatch in place.

(15) Flat sand hatch, nose, and complete fuselage. For easier MonoKoting, keep nose flat surfaced, with minimal rounding of corners.

(16) Trim stab platform area for a good fit with stabilizer. Be careful not to change incidence angle. Also, with wing rubberbanded in place, check to see that stabilizer is not tilted to one side or the other.

(17) With the stabilizer centered on the fuselage, cut through hole in stab center into fuselage top to receive fin trailing edge. Trial fit fin in place, and add dorsal. Add stab leading edge fairing to fuselage.

(18) Trim top of hatch rear to match the wing dihedral, so it will be held down by the wing, yet can be slid back 1/4".

(19) All the construction is now finished, except for the pushrods. These can be made of 1/4" square medium balsa, with 1/16" wire in front, and threaded rods and clevises in back. In view of tight quarters in the rear, it's a good idea to taper and round off the ends. Glue the wire to the balsa, and wrap with either thread or vinyl tape. Pushrods of wire cable inside nylon tubing can also be used, and possibly will save a little weight.

COVERING:

Our prototypes were covered with Super MonoKote. **Do not** use softer, more flexible films, or any fabric which may not provide the torsional strength required. The transparent colors of MonoKote really look good out in the sun.

A major difficulty with any very shiny surface is checking it for warps. The traditional sighting methods don't work very well. What I've found quite helpful is to set each panel of the wing on a flat surface such as a door or a good table, and examine the panel very carefully for warps. I would then hold in any counter warp indicated, and tighten further with the MonoKote iron. This process was repeated many times for each panel until it was true.

The tip panels were treated with the same method to produce the 1/4" washout. 1/4" washout shown on the plan (washout being a reduction in incidence angle). This washout reduces the tip drag losses, and resists tip stalls.

Once set, my experience is that a wing tends to stay true. The structure tends to take the set induced by the covering. However, if re-tightening becomes necessary, one must be careful again to avoid unwanted warps.

(1) Assuming you are covering the wing with MonoKote, do each panel separately, keeping the frame approximately flat, and applying the film with as few wrinkles as possible. Do the bottom first, then the top. Wherever possible, besides sticking the film firmly to the end rib of the panel, run some of the film down the vertical side of the rib. Also, whenever overlapping one piece of film on top of another, make sure you have **at least** 1/8" of the top film firmly stuck to the one below for the full width of the joint. Otherwise, with a little carelessness in tightening, you can later find yourself having developed an opening to be patched.

(2) Covering the tail is simple and straightforward, as the surfaces are flat. After covering, be sure the underside of the stabilizer center section has the film firmly stuck to it at least 1/8" in from the edges. Then remove enough film to permit a firm glue joint to the fuselage later. Also, remove a strip of film on top forward from the hole for the fin. Mount the small control horns in the positions indicated.

(3) Since the fuselage may well have had some filler applied in various areas, a non-transparent film may be best. Begin covering the fuselage at the bottom, then the sides, and the top last.

(4) Temporarily set the stabilizer and fin in place, and mark and remove film from the fuselage top to permit a firm glue joint.

Assembly:

(1) Mount the wing on the fuselage with rubber bands (four #64's are used in flight). Measure carefully from the fuselage sides out to the polyhedral breaks to be sure that the wing is centered. Then measure from the polyhedral breaks to the back end of the fuselage to correct any skew. Mark the wing with some line-up points on the fuselage. On the prototype, I used white tape to indicate clearly when the wing is lined up.

(2) Trial fit the stabilizer in place, marking it for center, and adjust as necessary to line up with the wing. Glue firmly in place. Glue fin in place, and square up with the stabilizer.

(3) Remove the wing, and make holes for the pushrod exit guides as indicated. Trim off one side of the flange for the rudder pushrod exit guide so it can fit flush against the fin.

(4) Try the rudder and elevator pushrods, but with the clevises not yet screwed on. Make adjustments as necessary so the threaded rods head right for the horns.

(5) Trim out a channel inside the fuselage, going forward from each pushrod exit guide hole. This will make it easier to get the threaded rods through. Also, open up the front of each pushrod exit guide channel for the same reason. The nylon will be hard to cut, so use a sharp blade, and work carefully.

(6) Glue pushrod exit guides in place. Try pushrods again and, when in place, add clevises. Connect to control horns, and check for free operation.

(7) At this point, the servos can be mounted, using 1/8" x 5/16" plywood cross rails. I placed the front one 1/2" behind former 2. Rudder servo is on the left, elevator servo on the right.

(8) Since gliders don't suffer from vibration, foam rubber isn't essential for wrapping the battery and receiver. I used polyethylene foam to help absorb possible crash damage. (No crashes yet!) The battery goes up in the nose, with the receiver as close by as practical. The switch is mounted on the left side, just ahead of the wing.

(9) Drill a hole for the tow hook, and mount it securely. So far, a simple tow hook seems to work just fine. The only problem we've had is one time when someone who had never flown the model before looped it off the tow right after the launch.

(10) Add a foam or sponge rubber skid. Also, add the small screw at the front of the hatch, and file it off flush inside. This screw simplifies pushing the hatch back and forth. I probably should have painted mine blue.

(11) I like to use pushrod connectors for securing the front end of the pushrod wire to the servo. They're convenient, and quite reliable.

(12) At this point, everything seems to be done except for balancing. With everything installed, mount the wing and very carefully check the Center of Gravity. I tend to do it by perching the model on the thumb and forefinger of my left hand, while steadying the model with my right. A better way is to use a set-up with a couple of 1/4" dowels with rounded tops, spaced apart just enough to clear the fuselage. Mark the desired C.G. on the underside of the wing, then set the model on the dowels at that location. Add weight if necessary for balance.

Do not attempt to fly the model with the C.G. **even slightly** behind the aft recommended position.

Flying:

(1) At the flying field, check everything out for proper operation. With switches on, and the transmitter in one hand, try several hand launches. Make any adjustments indicated in the rudder or elevator by means of the clevises. If you've done a careful job at home, this is where you will start to get your reward. On the final prototype, after one hand launch I went to the high start. On the very first tow, the model needed no guidance on the way up, then gradually arced over and finally released itself at the right point without assistance. Quite a thrill! On subsequent flights, I didn't always do as well!

(2) It would be great to hear from any of you with comments, results, suggestions, etc. Remember to fly smoothly — smooth operators keep it up longer! Best of luck! □

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