

It has no equal...

THE SEQUEL

So you've never built a pattern ship. Just follow the Sequel sequence and you're guaranteed success. (Part 1 of two parts) / by Carl Weber



The Sequel is a pattern ship of unexcelled quality, with features that make it ideal as a first scratch-built project. Possessing no bad characteristics, it will give the novice in pattern competition a fair shake with every flight.

Realizing that most magazine construction articles assume a high degree of building skill and knowledge on the part of the readers, AAM decided to present the Sequel as a step-by-step, pictorially detailed article. All the little "hints" are included, so that the reader who has shied away from a pattern plane can now build a competitive

ship. Even the experienced modeler can gain from building a Sequel, since the performance of this bird can equal the best piloting skills.—php

Encouraged by a first place win in C Novice at the Glenview NATS in 1971, I set out to catch those good guys in the white hats. By mid-1972, Gary Brautigam and I had established ourselves in C Expert on the Midwest Circuit. Later, we seemed to improve our style, but we just could not "clean up our act" enough to breathe down the leaders' necks. Sure, we had a



few firsts, seconds and thirds, but usually we fell back in the pack (about fourth to tenth), depending on the wind. When the wind blew, our scores would sag.

One problem. . .we just would not settle down to a one-design approach. Just like little kids (we really are at heart), when we'd see Ron Chidgey fly the Tiger Tail. . .that was it! So I built one, and found that, somehow, Ron put that extra something into his performance. The same with Norm Page—he could land his Mach 1 steadily in a hailstorm! Suddenly, it dawned on me that, after 31

RC ships (all different), I'd better pick out the features of all the planes I had built and incorporate them in a plane designed for my own clumsy style.

Gary and I had proven the "presentation" idea during the summer of '73. We would appear on the field wearing white flairs, white sneakers, and red, white and blue shirts, with planes to match. Believe me, the judges got to know us a little better at each contest. The team idea really caught on, as we brought home a little bread from the area contests. We even won a color TV (note: in the raffle draw-

ing. .well, it was won at an RC contest!) Norm Page often suggested that, in order to really get to the top, one must design a good bread-and-butter airplane, right for his own style! So, after goofing up six takeoffs and six landings at the "crosswind Oshkosh NATS" (the stuff in between was great—like eights and nines), and noticing that 33 1/3% of the qualifying score was for takeoffs, landings and spots, Gary and I concurred that this was enough! We'd design a winner for '74.

After experimenting with a swept-wing Mach I, I decided that I was more comfortable with a wing of that configuration. . .more stability in the looping maneuvers. After chatting with Jim Kirkland, before his untimely death, I was convinced that a constant radius leading edge, quite blunt, was the way to go. Very little dihedral is necessary with this wing, a la A-6 Intruder, with 1" under each tip, or 1/2" under the center, inverted. When I saw Dean Koger's Super Duck fly at Davenport, I was convinced that the flying stab was a great instrument in smoothing out maneuvers, without creating drag. As short a nose moment as possible seemed to make sense, since this close couples that gyroscopic effect ahead of the CG. A longer tail moment would permit smaller tail surfaces; thus, less crosswind effect. When Bob Violet showed up with his Flying Fork, I knew that a flying stab could be made strong and effective.

Since I wanted to use a Kraft-Hayes tank, instead of the hard-to-get Revlon

bottle (I think Norm Page bought them all!), the front end had to be a little more blunt. The engine was canted to bring the pick-up nearer to the needle valve level. Since we use muffler pressure (I think we were some of the first to apply this principle), tank placement is not too important. But, since Murphy's Law prevails, I tried to design out anything that might go wrong. .go wrong. .go wrong. .go wrong.

Watching Jim Martin fly knife-edge prompted me to bring the wing chord center line up into the fuselage, 1" below the thrust line. Also, the flying stab was placed 1" above the thrust line. I tried to build a lifting section design to the fuselage sides. A thick fin and rudder also should help in moving that center of drag back, well beyond the CG.

Of course, Kirkland's diamond stab conformation was a must. .a little thicker to accommodate the Flying Fork apparatus. Intruder tips were incorporated, to spill the air cleanly at the ends of the wing. A 16.2% root chord section (with the apex back at about the CG) and 14.2% tip chord section (with the apex sweeping toward the leading edge) should give good penetration, clean rolls, picture-slow main gear landings, and optimum takeoffs. Other significant concepts were easy, basic construction, a la Kaos, clean lines like the Nutcracker, and balanced side areas fore and aft of the CG.

A good aluminum engine mount is a must. .either the Tatone or the Fox mount. I'm certain that this method of

mounting (if everything is solid and tight) reduces the vibration effects on the vital parts (the radio, not you) and gives about 500 more rpm. You need that extra "tiger in the tank" to pull you through those unbelievable FAI maneuvers!

Many interesting discussions with my good friend Dr. Hollis Boren, in Tampa, Fla., prompted me to do some homework on airfoils, side areas, Reynolds Numbers and aspect ratios. He pointed out that my formula for aspect ratios, as used on the plans, was for rectangular wing planforms only. The correct method of calculating A/R for tapered sections is to square the span of the wing, and divide by the area in square inches. This comes out about the same. (The Sequel has proven out its design theory rather well. In its first year of competition, the plane has placed in *every* contest entered. Many of these were major contests, such as Chicagoland and the Huntsville, Ala., affair. With the help of such a reliable performer, I was able to make the cut and fly at the masters Tournament.)

CONSTRUCTION

Building Techniques. You've heard them all, but maybe you need a push!

Visit your local shop, and drive the hobby dealer nuts by going through every piece of balsa in the place. Remind him that you are planning to buy a new seven-channel rig from him, so that he won't chase you out when you sight down every stick or sheet of balsa for trueness, correct grain and lack of warps. The stuff keeps up with the price of gold in London, so remember—you pay as much for the scrap pieces as you do for the good ones! Spend a little time, start with good, true lumber, and you can build a true ship.

A warped flying surface is good for one thing. .to smack little kids when they come into your shop to borrow glue or paint! Don't put it on your airplane. I use our pool table top to check out every flying surface, incidence included. Just be certain to carefully level your pool table top, or you might end up with an aileron in the side pocket! Keep your ships light. .use glue sparingly (it really adds up). It's always easier to add 2 lb. of lead than it is to subtract 2 oz. of weight after your bird is sprayed and rubbed out!

Buy two sets of plans! (AAM is so



Amy Weber displays her dad's favorite airplane.

convinced that this method of construction is first-class that we are offering a special price on a two-plan package. See our Plans Service page for details.—php)

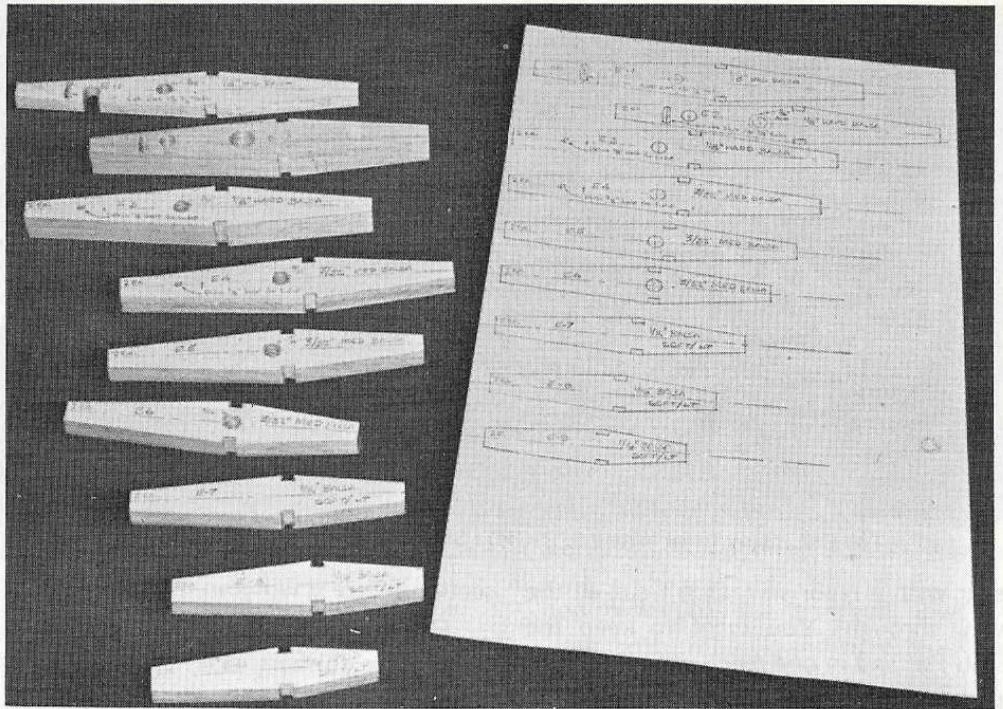
Make one set expendable by chopping it up into small parts. Determine how many sets (kits) you wish to make, including one for your best flying buddy, then rough-cut lumber of correct thickness, grade, grain and weight. Now stack the rough places, using small pieces of double-sided Scotch tape between layers. Put the printed plan part on top also with double-sided tape. Now, rough-cut about 1/32" around perimeter.

Using a medium grit disk on your sander, start the final shaping of parts. Just sand the line off each part. Now cut notches where necessary with a Zona saw, or on a jig saw. Drill holes in parts where shown (drill press if possible, again to assure uniformity through the stack). Now step back and admire your smooth, perfectly kitted airplane. Leave the stacks together, and peel off the parts as you build. . . it saves a lot of shuffling, and the part number is always on the top piece, until you peel it off to build.

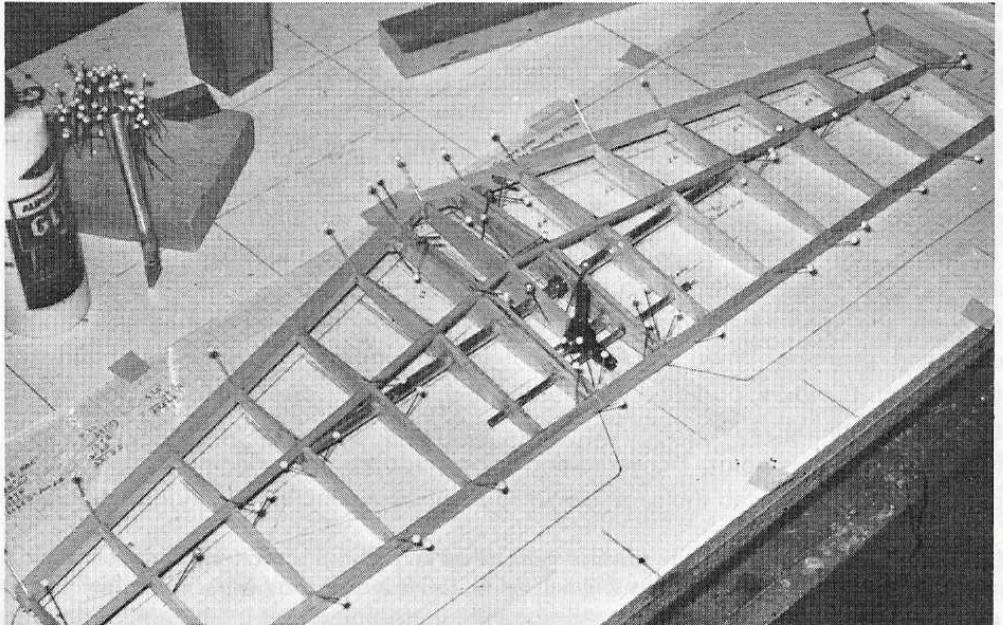
You'll need the completed stab while building the fuselage, so get the hardest part done first. The diamond stab is built flat (that's another reason I like it), and eliminates the "lap type" technique. Set the rear spar in place on the plans. A slight bevel on the bottom side will bring each rib end flush with the spar. Slide ribs over the flying stab tubing (see Violett's instructions, too). I use a fiberglass arrow shaft through the aluminum kingpin tube, epoxied inside. It is lighter and stronger than the dowel provided, and you can extend it beyond the aluminum tube for more rigidity.

When all is in place, mix your 5-min. epoxy and glue carefully and quickly. Caution: remember not to epoxy any points that are bearing or sliding contacts. Visualize the center section floating free of the two ends, except the turning point around bearings. Add the remainder of the ribs. Add center spruce longeron, and leading edge. With small plane, bevel the LE and TE to conform with rib shapes.

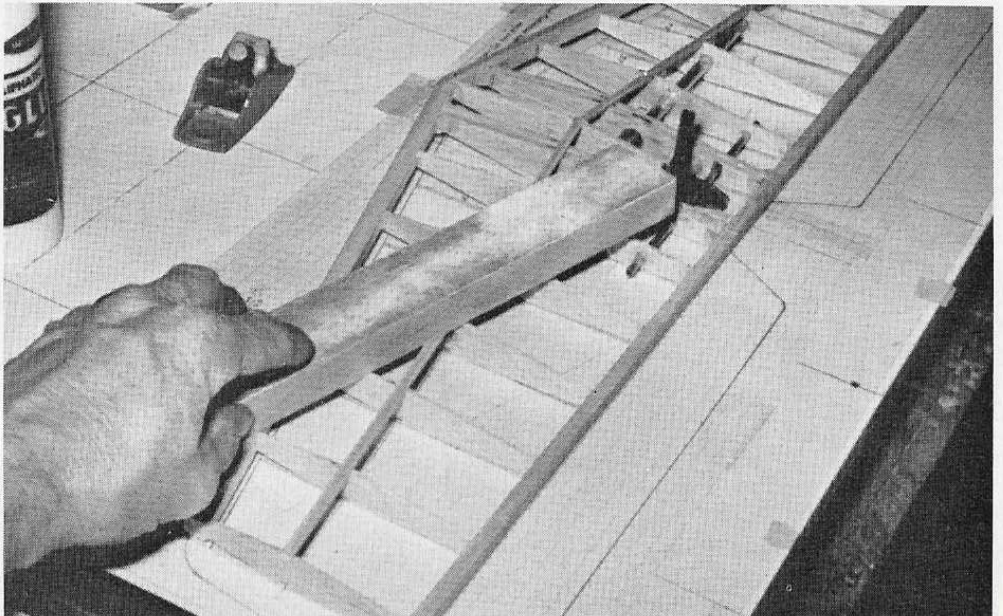
Lightly sand the bottom of stab after glue has set to prepare for planking. Time now to add the little TE ribs. At this point, just scribe LE, TE and

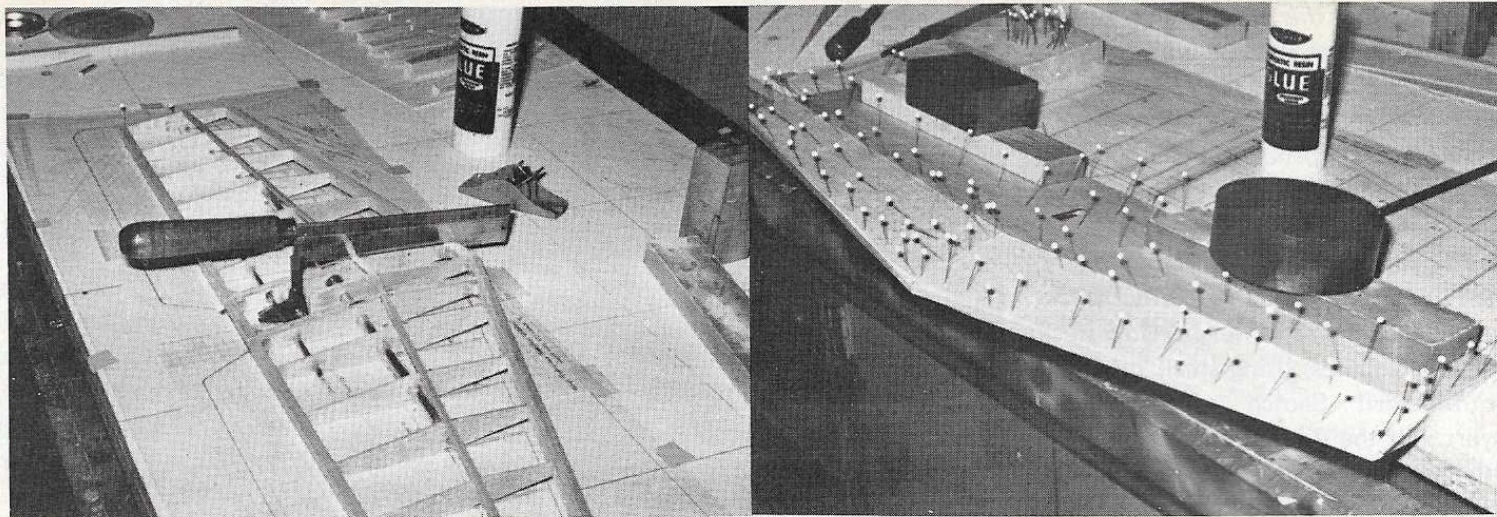


Using the plans as templates insures accuracy in building the model, as well as easy identification of parts. Here, the stab ribs are cut and sanded to shape.



TOP: The diamond-airfoiled stab was originated by Ed Kazmyski on his Taurus, over a decade ago. BOTTOM: Sandpaper, rubber-cemented to a straight block, helps "level" the ribs.





LEFT: The stab, ready to be installed. RIGHT: Sheeted wing core, with wheel wells, cutouts and retract mounting plates installed.

spar with a razor saw. Don't cut all the way through! You want to keep the stab flat and in one piece until it is completely planked, shaped and sanded.

Turn stab over, and plane and sand smooth. Now, rough-cut the 1/16" planking to shape. Plank the top rear first, blocking it dead flat on the board. Now plank the bottom rear and, while still weighted and pinned, plank the front of the stab. Let everything dry overnight while still weighted flat, top side down.

Next morning, before work, plane and sand to shape. Now, finish cutting through the spars, leading and trailing edge and planking. Wow! Look at the flying stab. It *moves*, provided you used the epoxy sparingly! Now add tips and final sand. At this point, I covered and primed the flying stab (except center

section where it will join the fuse).

Fuselage: Proceed with cutting out all fuselage formers, sides and doublers, using the same system with cut-up plan and double sided tape. It's fun, and fast! Drill holes, epoxy in blind nuts, attach engine mount and test engine placement and thrust.

Cut the triangular stock, as per plans, and glue to the fuse sides. Add the 1/32" doubler with contact cement (Weldwood, *not* the water base cement). Lay sides over plans and scribe the location of the main bulkheads.

With the top view of the plans taped to your *flat* building board, lightly spot-glue the formers (remember to build the fuse inverted) directly to the plan in exactly the right positions. The plane can be built completely inverted, so that everything, including flying stab and

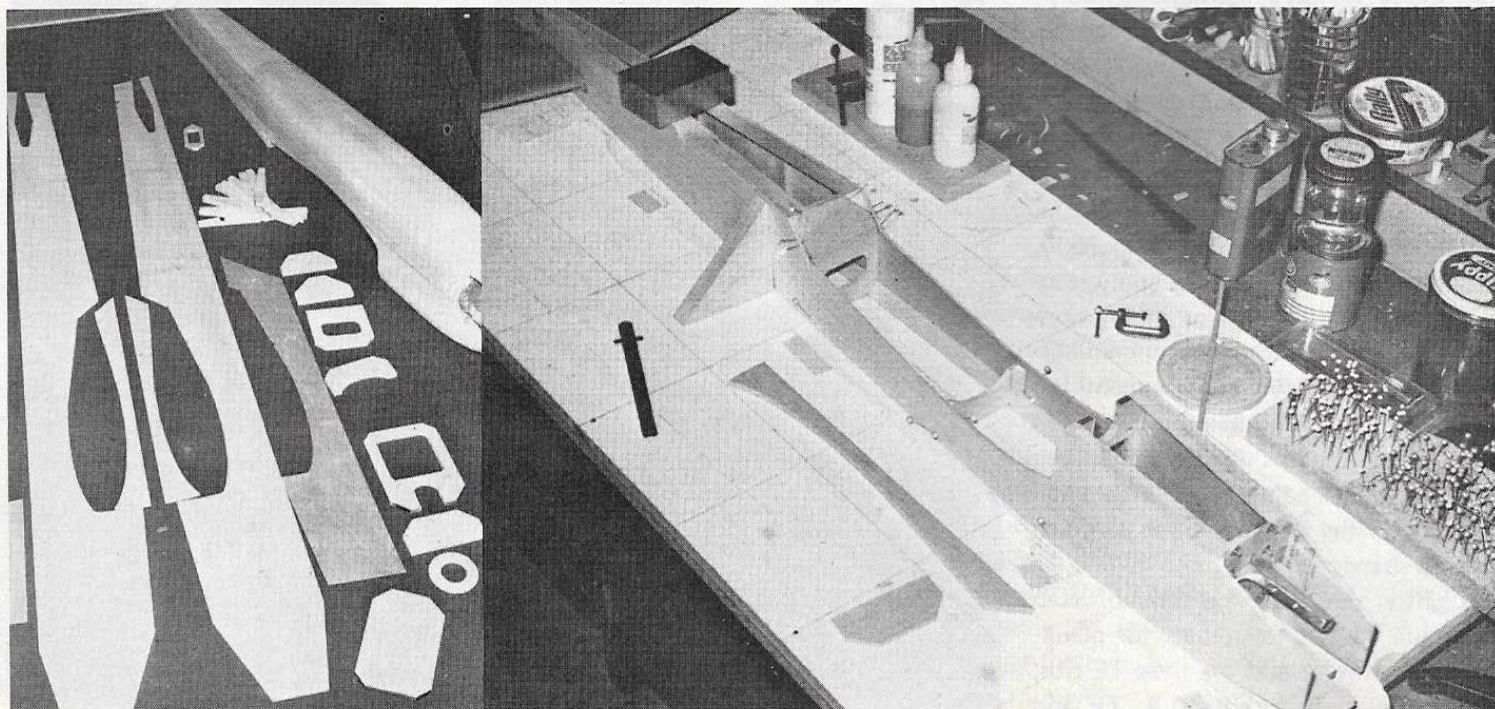
thrust lines, can be true. Block the formers 90° to the board (I use small triangular blocks of balsa, trued 90° on the sander).

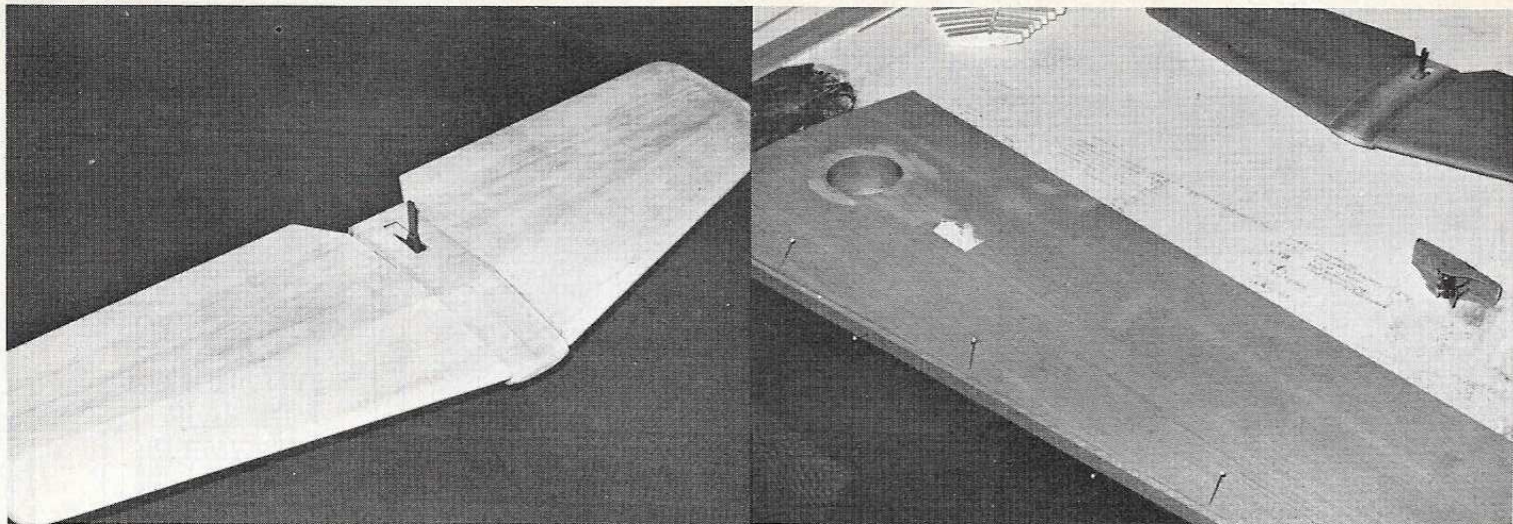
Check the side pieces previously glued up, to be certain that they fit like a glove. With a little sanding and chipping, you are ready to epoxy the sides to the formers. . . just the center three! When these are set, insert the stab, pull the sides together front and rear, square up everything, and wait for the aliphatic resin to dry (or if you are a genius, use 5-or 15-min. epoxy for this).

Now add the bottom rear sheeting and start building your mountain of shavings. Rough-cut the top block, but don't glue it on.

Wing: After sanding the foam cores lightly, line the wheel wells with 1/64" ply, then epoxy in the retract gear

BELOW LEFT: The parts of the fuselage must be cut and aligned accurately. Take your time. BELOW RIGHT: Note the triangles, weights, etc., used to keep fuselage straight on the building board. Don't force-fit any parts, or the fuse may warp.





LEFT: Cut out center section of stab with a razor saw. RIGHT: When planking stab, use weights, boards to hold everything in place as glue dries.

blocks, and glue on the trailing edge.

With the core cradled in its original form blank, sheet the bottom first. Then cut out the wheel wells and retract holes. Now, sheet the top of the wing, keeping the cores in their cut-out blanks to assure true shape. A 1/8" warp in the wing half at this time spells disaster. If you goof, better to start over again. Use the bad one for a canoe paddle!

The LE added, it should be shaped to a constant 3/8" radius. Add the tips; shape them and hollow them out. Cut the 1/4" LE stock wide enough so that, if it warps slightly before applying, you need not force the warp out.

Cut and shape the ailerons full length. When you are satisfied with the fit, tack-glue the whole piece to the

Detail views of the nose, Check the engine (with muffler and spinner) to make sure that all items have proper clearance. The nose gear unit can be fitted into place now.

trailing edge and final sand to shape.

Remove the finished ailerons, cut off center sections, and hollow out for torque tubes. Prepare torque tubes Kirkland-style, using Rocket City threaded torque arms and three sizes of brass tube, from 1/8" up. Use a high silver content solder, making sure the tubes and rods are clean and lightly sanded. Be certain that the joints run, by osmosis, deep into the tubes, to make a super-strong torque tube.

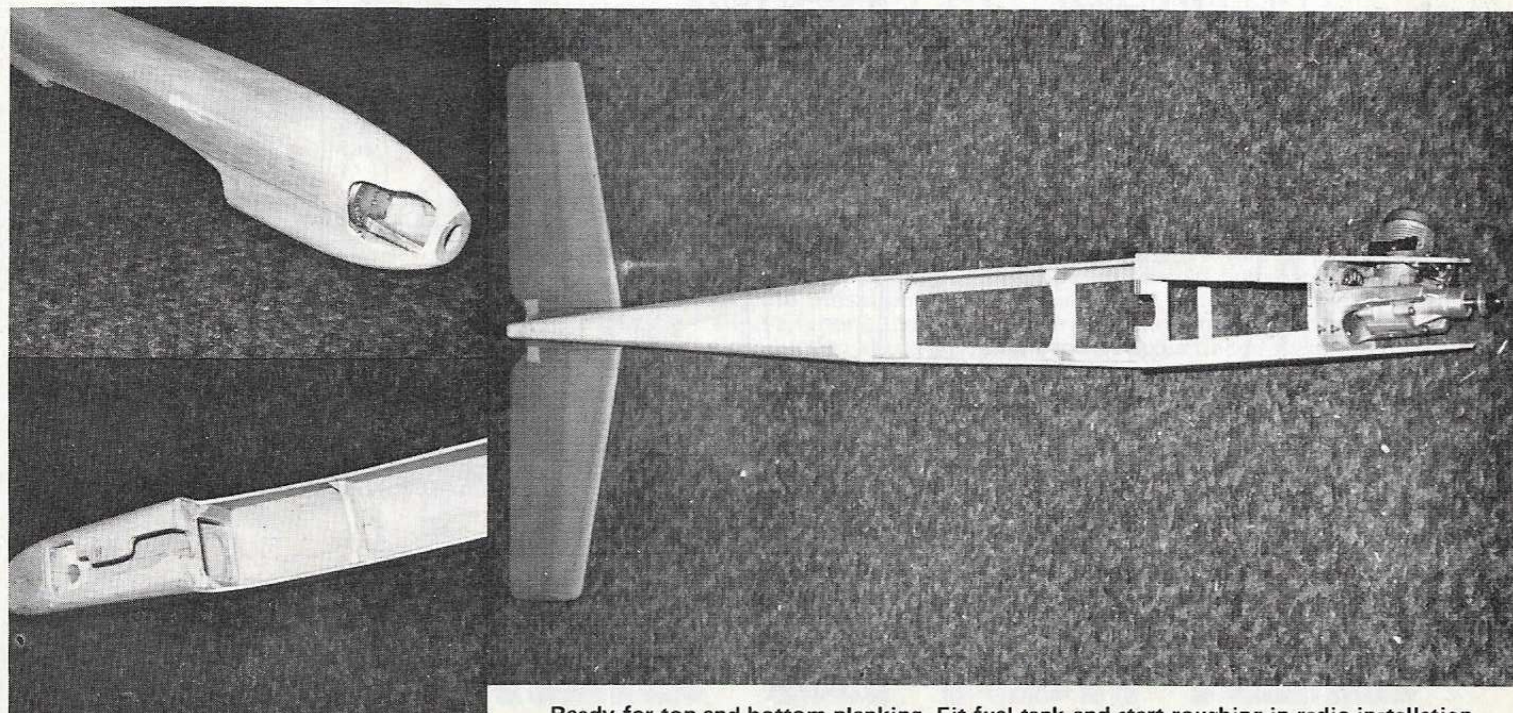
Now, fit the wing to its saddle. Check for exact incidence (0°). Check that the wing is level with the fuse sides and stab. The fuse top is still completely flat at this point, so now is the time to double-check all alignments. Run a pencil line the full length of the fuselage along the thrust line. Use this for a reference line after the top block is added and shaped. Scribe a similar line down the center of the fuse top block. The

top block can be attached now. The nose bottom block and nose blocks are now added, cut out and shaped. With the triangular bracing added, the engine cut-out is complete.



Now that your Sequel is beginning to look like an airplane, we'll leave you to admire it until next month. If you get bored in the interim, take your spare plan set and start another one. Most competition fliers have learned the wisdom of having two identical planes, and I urge that you adopt this approach to flying. The second Sequel will go together really fast.

Next month we'll complete the model, and we'll even throw in some handy hints on getting a good, light finish. So, stay tuned!



Ready for top and bottom planking. Fit fuel tank and start roughing in radio installation.

Part Two

THE SEQUEL



The pattern ship designed with you, the builder and flier, in mind.
Conclusion of a two-part, step-by-step construction article.

by Carl Weber

*(Last month, we left you with a very promising, but not very complete, Sequel. As mentioned in Part I, this design is a top performance pattern ship which is presented for those who aspire to aerobatics, yet have not built a competition machine before. This bird will keep up with the best of them at any level of contest work.—php)**

At this point, you should have a complete fuse, stab and wing. Let's pick up the construction sequence with the fin/rudder assembly.

**See the Plan Service page for the price and ordering information on the Sequel plans. In last month's AAM, Mr. Weber suggested that the builder get two sets of plans and use one for templates, thus our listing with a special price for a duplicate plan set.—php*

Rudder: Tail feathers from 3/4" balsa stock? Egad, there must be a better way! Use super-light balsa! It needs to be thick to allow for the internal mechanics of the flying stab. But there is a side benefit. The thick section keeps the drag back where it should be, and the airfoil shape makes the rudder more effective. I know I'll get an argument from Joe Bridi on this one! Any sane guy would build this structure of foam and plank, or build it up with ribs—but my kids have fun with 3/4" circles of balsa!

Invert the fuse, place Saran wrap over wing saddle, and line up the wing by pinning it to the saddle. Check for trueness by using the pin method, and triangulate from wing tips to fuse center line at rear. Keep it true. Add LE dowels and rear hold down bolts. Build up the under-wing structure as per plan. Plane and sand like crazy until it fairs into a nice fuselage. Now, just hang the goodies in and on, set her on her feet,

lay on the canopy and step back. It won't be long now!

Saran-wrap the wing center section carefully and start building the wing fillets by epoxying the 1/32" form to the side of the fuse. When that is set up, add the 3/32" ply piece to each side of the fuse at rear of wing. Now build up Epoxolite to the general shape of a fillet. When this has set up, finish the fillet with Glidden's Spred Patch, and a wet finger. When this material dries (1-2 hours), it sands like corn flakes, but remains strong and smooth. Better to use several coats, applied thinly, than to gob it on.

Finishing: Let me share with you one of the fastest, strongest, and neatest methods of finishing an airplane. This finish has a high resistance to knicks and dents, adds great strength to the airframe, is easy to patch, and is quite acceptable in appearance. First, go over the entire plane with a good, open grain 220 grit paper, lightly knocking off any

glue blobs, or high spots. Remember, the basic shapes already have been obtained using 80 and 100 grit, so don't sand too heavily, especially around the glue lines. Now use 300 or 320 grit and go over the entire plane once again. Wipe down, vacuum all open spots and crevices, and tack rag the whole works.

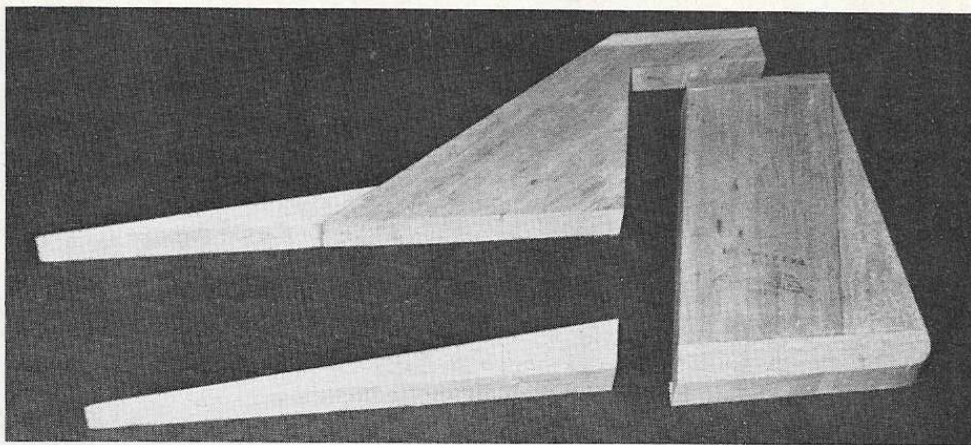
Working on a clean table with rubber foam protection, cut Silk Spun Coverite pieces, about 1" oversize for the part you are to cover. Set your sealing iron at a very high temperature, just so it does not melt the Coverite. Tack on two ends, pulling slightly and evenly. Now tack down along a side edge, then tack along other side edge. Firmly press all edges while applying pulling pressure around edges. This material will stretch in all directions and go right around highly compound tips. Trim off excess with a sharp razor or knife. After trimming, hot-seal the little raised edges firmly to the balsa.

Now, go over the entire surface with the hot iron and watch this stuff turn your flimsy balsa into a tough, resilient surface. Contrary to the light touch you use with MonoKote, bear down on this stuff so that it adheres to all surfaces of the balsa (do not cut or scribe lines into soft balsa by pressing too hard). When cool, you'll step back and have to admit you are really impressed. **DO NOT SAND** at this point, since it will only raise fine hairs from the surface.

Mix your favorite clear dope to brushing consistency (I use Ambroid and Ambroid Thinner), and brush on one coat. After about 2 hours, spray on a light coat of Ditzler Primer-Surfacer Lacquer base, if you go that route. Now sand most of the Surfacers off with dry 220 wet or dry cloth. Put on another coat of Surfacers and sand again with 220, finishing with 300 or 320.

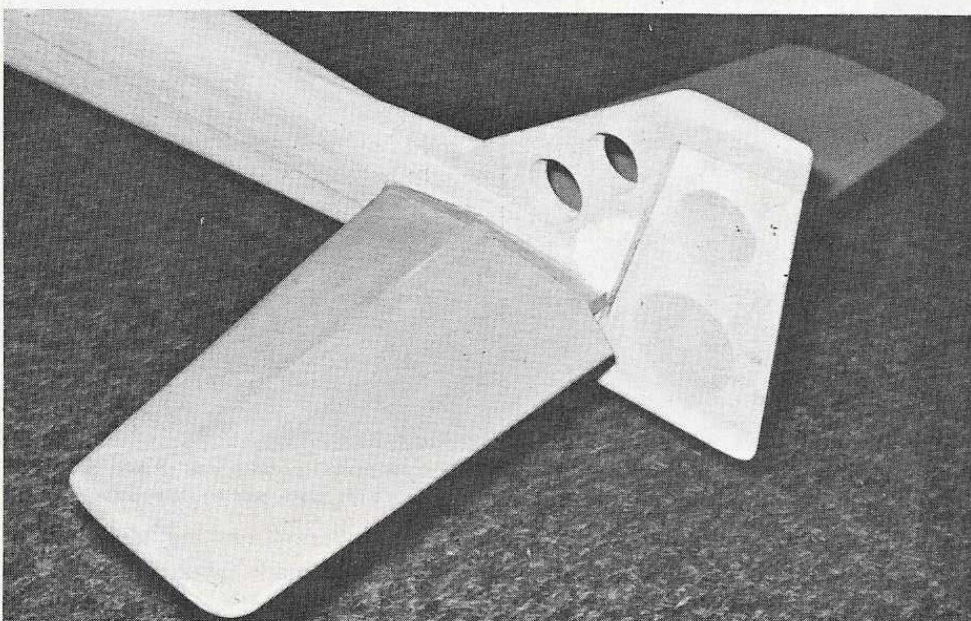
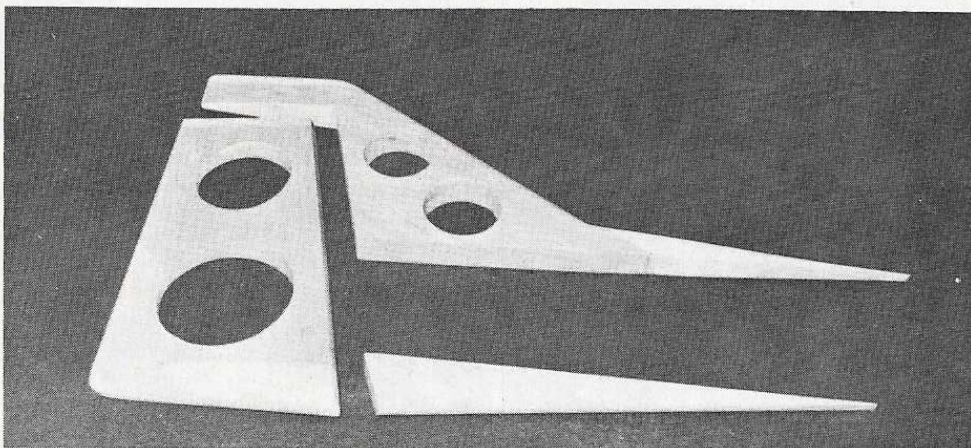
By the way, be certain to plasticize the Ambroid and the Surfacers with additive (I use Souther Products Plasticizer, two tablespoons per pint, unthinned). This keeps the Primer from pulling away from the fillets. By now, you have a beautiful surface. If you see any dings or slight imperfections, get out the Glidden Spred-Patch and trowel on. When dry, sand off smoothly and hit these spots with the Primer once more, then sand lightly.

Tack rag the whole thing and put on your final base coats. I use Butyrate



ABOVE: The fin and rudder are built from ultralight 3/4" balsa. This saves time and effort.

BOTTOM: A good workout with the sanding blocks will give the fin and rudder a nice shape. The lightening holes are essential, and can be done with a drill or jig saw.

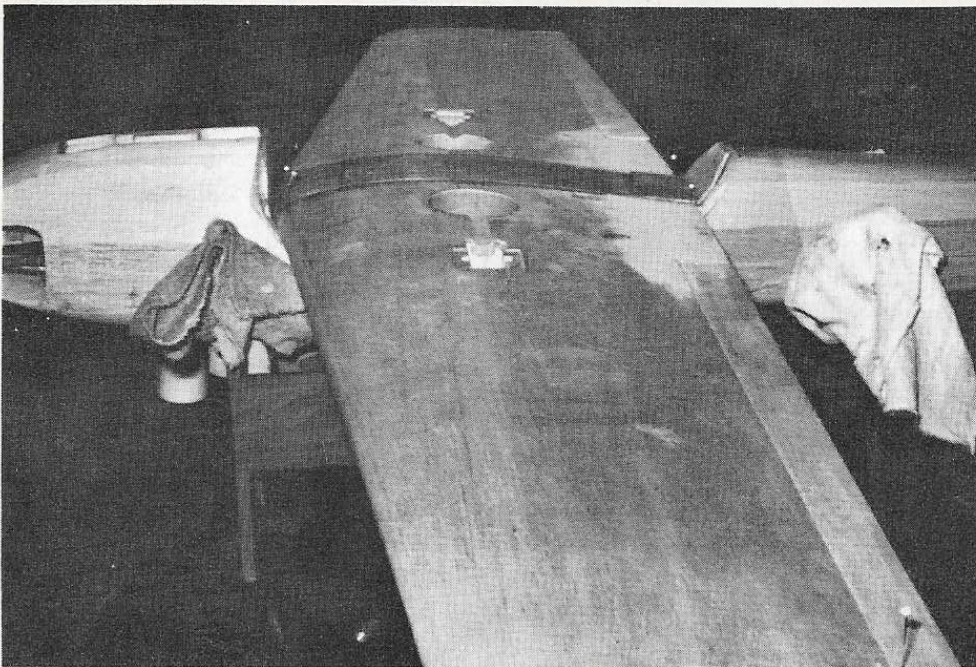


Secure the fin along the datum line drawn on the top of the fuse, and make sure that it is perpendicular to the stab. Use a draftsman's triangle to ensure accuracy.

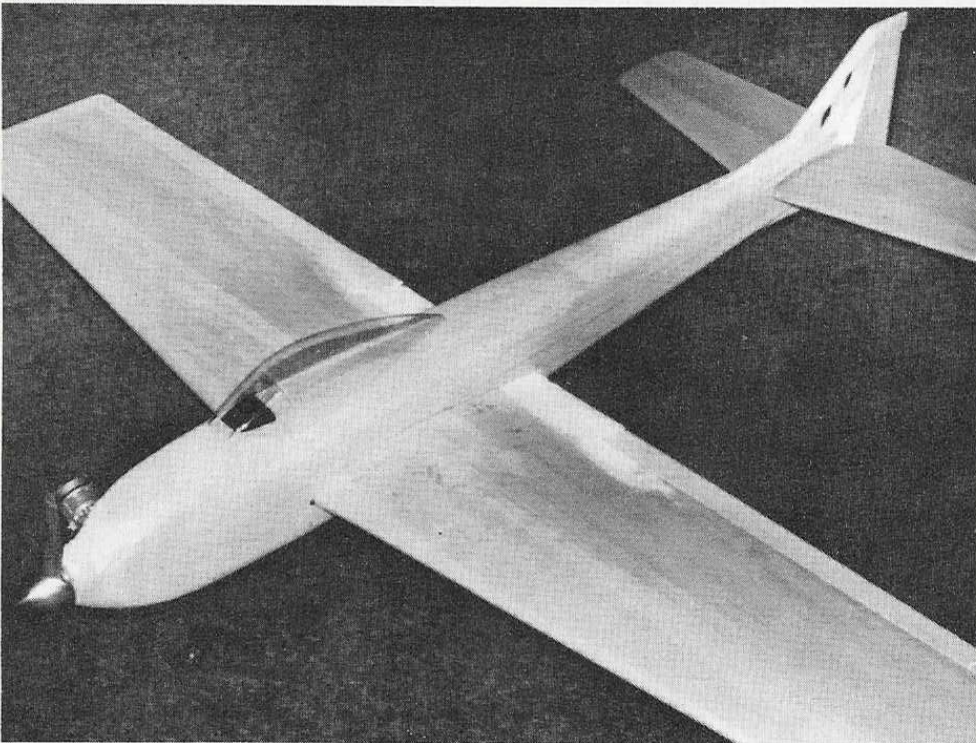
Dope and do it all in one night, starting with a mist coat, then going over with another and another and another. Don't build up the finish, since you are only adding weight; just fully color the surface with the base coat.

Next night, lightly sand the base with 400 wet, tack and apply one more coat of base color. In good drying weather, you can stripe three hours later.

If you choose to use a see-through canopy after applying Primer-Surfacer, carefully mark out location of the canopy on fuse top. Epoxy on any instrumentation, headrests, simulated radio equipment, etc. Now, roughen up the edges of the canopy, inside and out, about 1/8" with 120 grit. Be careful not to scratch the upper sections of canopy. Now tack canopy over scribed lines with 5-min. epoxy, being careful that the



This is probably the most critical step in building a straight airplane. Check that the wing is centered on the fuse, and that it isn't skewed longitudinally. Measure at least twice here.



At last, an airplane. This is usually the "hump" for most builders—once you're past this point, you just can't stop until the plane is ready to fly. But don't let haste lead to sloppiness.

epoxy glue "strings" are not attracted (by static magnetism) to the clear part of canopy. Tack in about six or eight spots.

Run a rim of masking tape 3/16" above joint of canopy and fuselage, and now finish a nice bead of epoxy around entire edge of canopy. When set, apply a nice fillet of Epoxolite, scraping off the excess, and not worrying at this time about a super-smooth finish on the fillet.

When set, get out the trusty Spred Patch, and spread evenly between the canopy and fuselage. When thoroughly dry, sand and blend.

Now remove masking tape and re-apply a new mask (about 1/16" above the old line), and lightly sand with 320. Quickly apply a thin coat of Ambroid clear to seal around tape. Cover balance of clear canopy with aluminum foil and masking tape. Now spray on the final touch of Primer Sealer around the canopy. Sand out when dry. After this, you are ready for the base color coats as previously described.

When the base coat is set up, and you are happy with the looks of the plane, remove the canopy mask by pulling back over itself. The whole covering process, primer coats and base coats,

add only 6 oz. to a big pattern ship like this, if done properly. Strive for a thin, tough, durable finish which looks like an airplane, not a super rubbed-out hot rod!

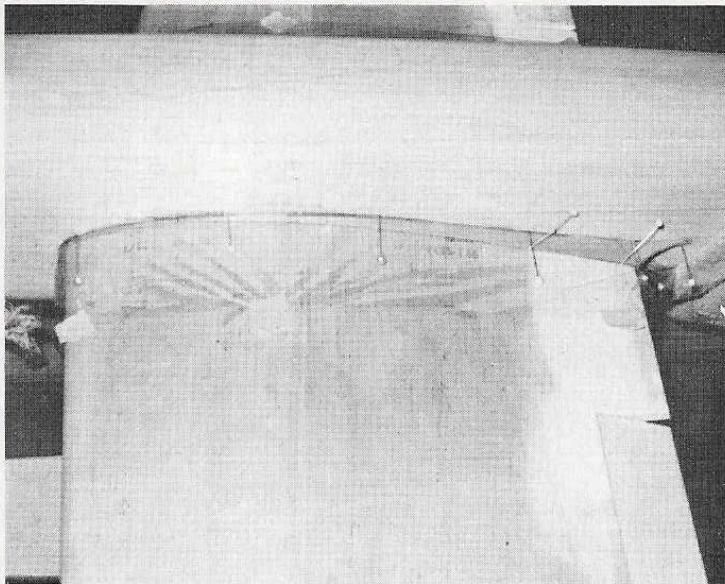
Grab some brown wrapping paper, a good scissors, low-tack masking tape (I like draftsman tape) and various widths of masking tape. Mark off your key points to assure symmetry (follow a general plan that you can lightly sketch out in advance on a miniature three-view). Cover the base coat areas to protect from overspray. When you are sure that the edges of the mask are pressed firmly down, use a small brush and lightly dope (clear) the edges of the mask.

When dry, you are ready to spray the color trim. . . I use the Binks Air Brush for this, and apply just enough color to cover. By the time you finish one end of the plane, you can remove the masks from the other end, provided that you used Butyrate Dope. When the color is set up firmly, use D-J Striping for the final accent color. Now, mist-coat the entire plane with clear Ambroid, then flow on another coat. This is it—a two-night finish, perhaps three if you use a clear canopy.

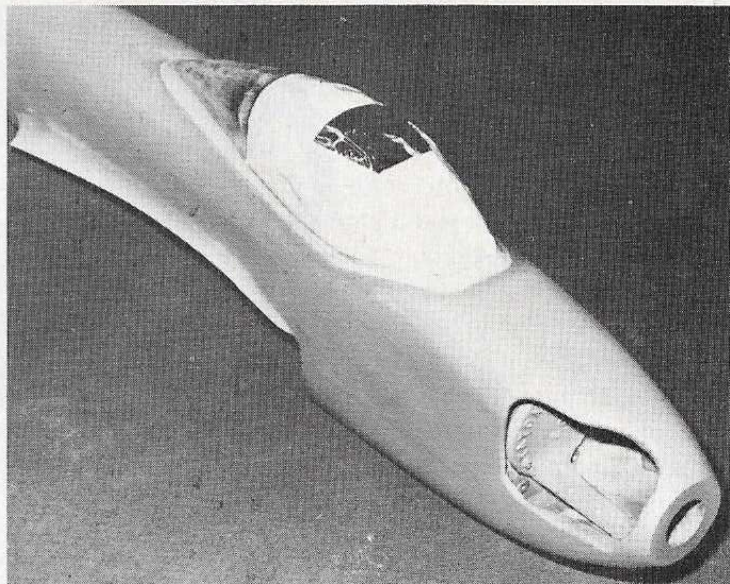
If you wish, you can rub this out after a couple of days. I usually do not . . . time is money to me, and a contest bird finished like this is plenty good to impress the judges, yet endure a full season of practice and competition, including frequent cleanings and waxing with Pledge.

I think it was old Ben Franklin who said, "There is nothing new under the sun." That is appropriate for our pattern birds, as pointed out many times by the magazine editors; however, it takes courage to depart from the ordinary, to pick out features you like, and eliminate things you dislike and come up with a scratch design. . . sort of an amalgamation of ideas gathered up from many RC fliers and designers, not only the great ones like Page, Whitley, Brown, Lowe, Mueller, Miller and Kirkland, Chidgey, etc., but from the real bread and butter contest buff who keeps changing and trying.

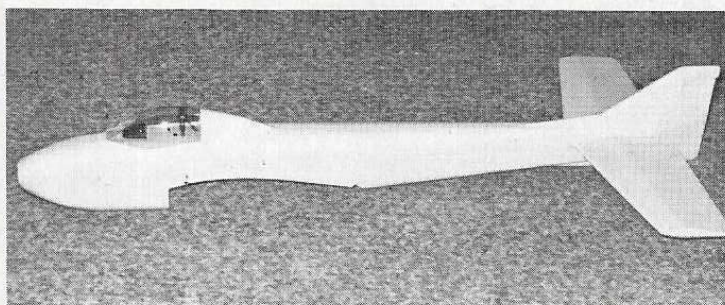
If credits are due, I can't overlook Roger Olson, our club's chief test pilot! If it's been made, he's tried it. He dragged me to my first contest in '69. . . and the bug bit deeply. Guys like



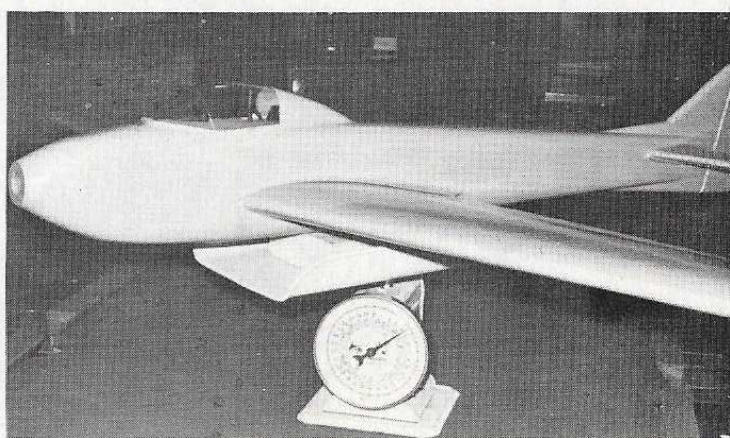
The fillets go quickly if you've made them before, but the first time will take some getting used to. Make them smooth and flowing.



Fillet and mask the canopy. People's eyes tend to focus on this central object on an airframe, so work carefully.



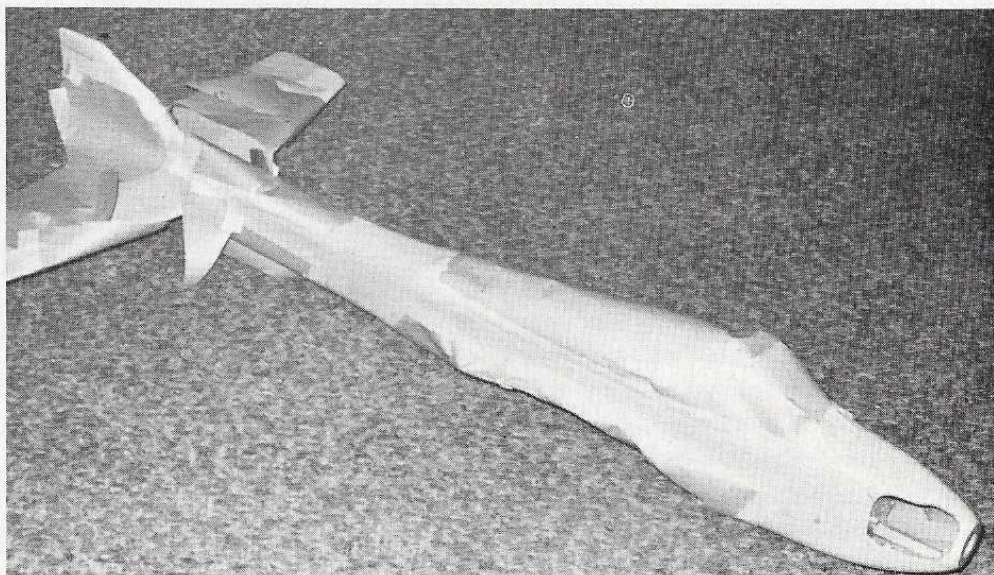
ABOVE: Looking like a piece of metal or glass, a well-built fuselage is pleasant thing to see (or have). RIGHT: The scale reads 4¼ lb., primed and ready for finishing. Add 16 oz. for engine/muffler, 10 oz. for radio, 6 oz. of finish (!), another pound for retracts, and you should be at the expected 7½ lbs. BELOW RIGHT: Use brown paper for masking. A good quality paint scheme is worth appearance points on the most objective judge's flight line.

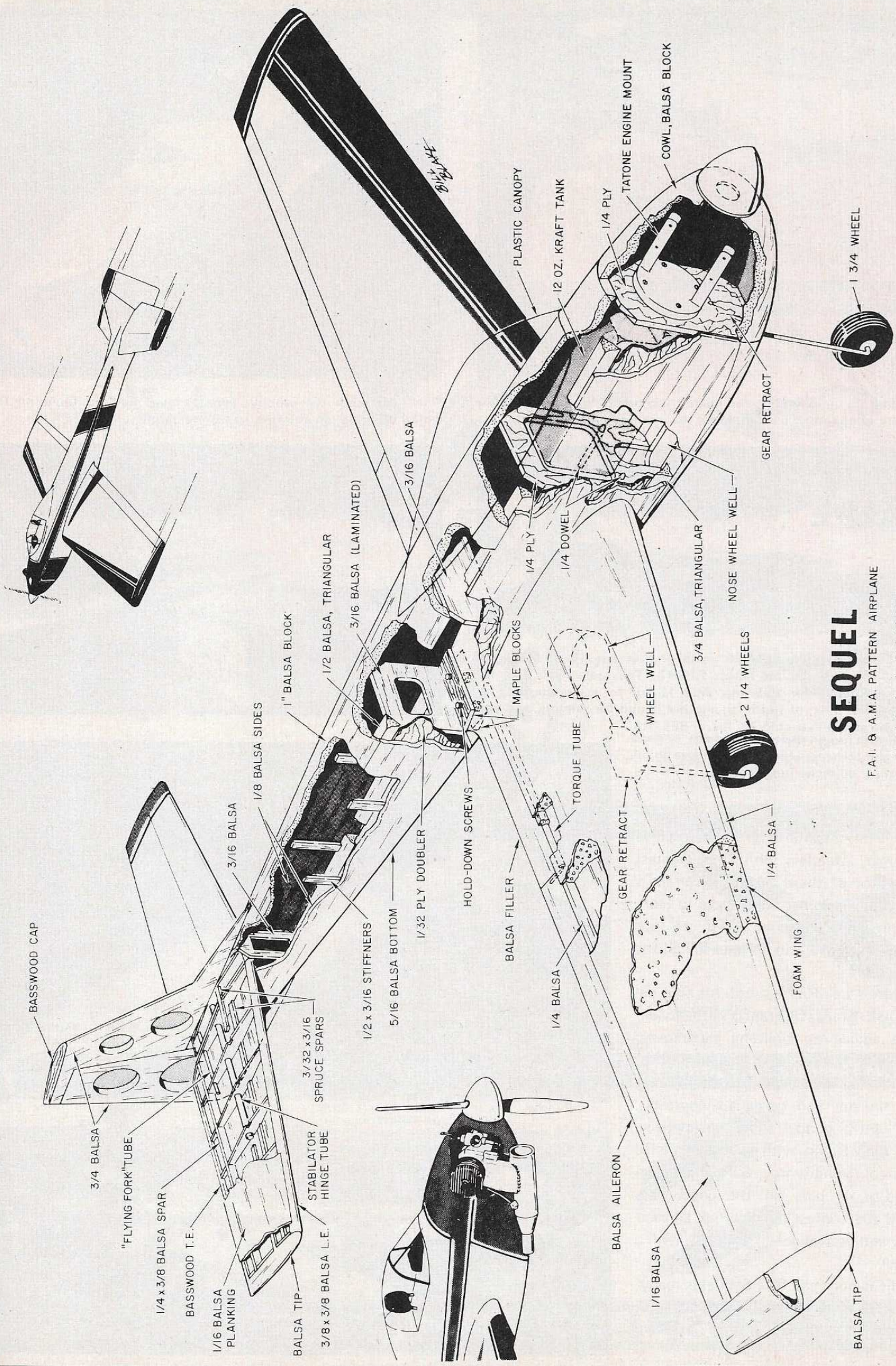


Elmer, Phil, Dean and Bart. There's Phil Seeburger...fearless Phil, the greatest competitor of them all. He *never* quits...he even runs his SuperTigre in Holiday Inn parking lots at 2 a.m. to iron out the bugs—he also loves to see all the lights go on.

There's Lee Richter with his own design Owl; Frank DeFranco with his unselfish advice on building techniques; Frank Morrissey with his super enthusiasm for the hobby (and smelly, gunky cigars in my van going to contests), laced with good, solid competitive spirit; Doc Boren with technical advice and encouraging words; Gary Brautigam (Sky Chief); plus all the good guys around the contest circuit. Pick all their brains and you've got to come up with a winner!

This is our year. The Sequel is ready. The rest is up to the pilot! You guys out there really designed this ship, so put up another shelf for the trophies.





SEQUEL

F.A.I. & A.M.A. PATTERN AIRPLANE

Model Design by BUD WEBER
 Technical Art by BILL BLAKE

BASSWOOD CAP

3/4 BALS

"FLYING FORK" TUBE

1/4 x 3/8 BALS SPAR

BASSWOOD T.E.

1/16 BALS PLANKING

BALS TIP

3/8 x 3/8 BALS L.E.

STABILATOR HINGE TUBE

3/32 x 3/16 SPRUCE SPARS

1/2 x 3/16 STIFFNERS

5/16 BALS BOTTOM

1/32 PLY DOUBLER

HOLD-DOWN SCREWS

BALS FILLER

1/4 BALS

TORQUE TUBE

WHEEL WELL

BALSAILERON

1/16 BALS

BALS TIP

1/4 BALS

FOAM WING

2 1/4 WHEELS

1/4 BALS

GEAR RETRACT

WHEEL WELL

3/4 BALS, TRIANGULAR

NOSE WHEEL WELL

1 3/4 WHEEL

GEAR RETRACT

1/4 PLY

1/4 DOWEL

12 OZ. KRAFT TANK

1/4 PLY

TATONE ENGINE MOUNT

COWL, BALS BLOCK

1 3/4 WHEEL

1" BALS BLOCK

1/8 BALS SIDES

3/16 BALS

1/2 BALS, TRIANGULAR

3/16 BALS (LAMINATED)

3/16 BALS

MAPLE BLOCKS

1/4 PLY

1/4 DOWEL

PLASTIC CANOPY

BILL BLAKE