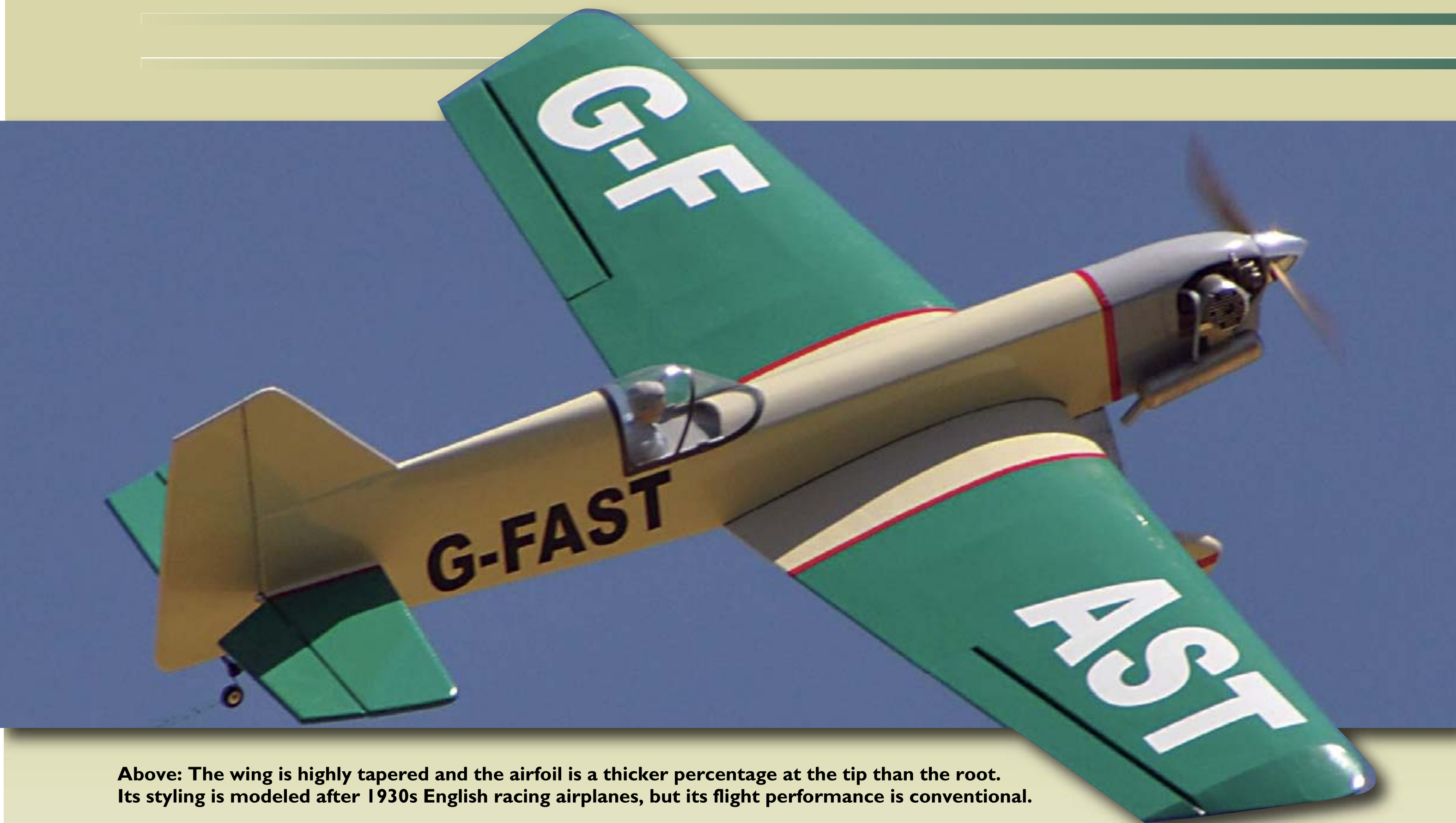


Above: The wing is highly tapered and the airfoil is a thicker percentage at the tip than the root. Its styling is modeled after 1930s English racing airplanes, but its flight performance is conventional.

Right: Using English/European-type registration numbers—G-FAST—seemed appropriate. But this is not a high-speed aircraft; it's comfortable, aerobatic, and easy to fly.

Go *fast* and *turn* left——or right and up and down if you want

by Dick Sarpolus

The G-FAST

I HAD A Moki 1.80 engine and no airplane to put it in. Then I saw some photos of English 1930s racing aircraft, and I wanted to try building a wing with Bob Hunt's Lost Foam construction technique. The G-FAST is the result.

It's an easy-to-build, 90-inch-wingspan IMAA (International Miniature Aircraft Association)-legal model with a nice, thick fully symmetrical airfoil over a tapered planform that takes up approximately 1,400 square inches of wing area. The fuselage is 68 inches long, and the flying weight is 13 pounds, which equals roughly a 21-ounce-per-square-foot wing loading.

"Easy" is the word, and it's easy to fly yet fully aerobatic—but not 3-D. It's the kind of large airplane I like for Sunday, or anytime, flying.

If you're into scratch-building, making sawdust and wood chips, or if you need an aircraft this size that doesn't have to be exact scale or do that 3-D stuff, take a look at my G-FAST.

Moki engines are made in Hungary and have enjoyed a good reputation for quality, power, and reliability for many years. Because of whatever business reasons, they are now labeled "Mark" engines in the US, but they're still the same old Mokis.

I knew that my Moki 1.80 was comfortable turning an 18 x 8 propeller, and I liked the Bisson muffler and an old JTEC cast-aluminum mount I had for it, so I laid out this new model design around that. Any power plant that can handle the G-FAST specifications could be used.

A 90-inch wing will just fit in my minivan, so I went for a simpler one-piece wing rather than plug-in wing panels with an aluminum-tube joiner. If you go for plug-in wings, you could raise the wing position on the fuselage for a different appearance.

Hey, if you're working from plans, you can make any design changes you want; it's your airplane. That is a big part of the fun of this hobby.

The G-FAST aerodynamic layout is conventional. It uses typical giant scale-recommended hardware and standard construction techniques and materials, except for Bob Hunt's Lost Foam wing construction, which you should try.

The Lost Foam method is an easy, accurate way to scratch-build a built-up wing structure. I comment on it in some detail in an accompanying sidebar.

I know that ARFs are extremely popular today, and for many good reasons. But if you enjoy your workshop building sessions the way I do, this project will certainly provide you with building fun.

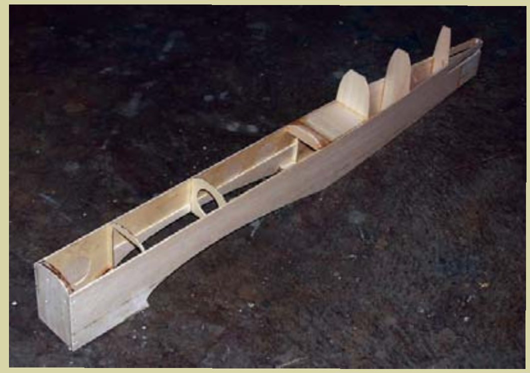
I'll review the construction procedures I follow. But if you're an old hand at it, you'll simply need to obtain a copy of the plans and do it your own way, at your own speed.

CONSTRUCTION

I use paper patterns to mark the wood for all parts cutting. Then I cut a set of plans or trace the necessary parts and cut tracings for the patterns. I draw around the paper patterns with a ballpoint pen and cut the parts with my band saw or scroll saw.

I cut all the parts up front, make my own kit, and start from there, or I cut the parts I need as construction progresses; any of those methods works. I generally have a decent stock of plywood and

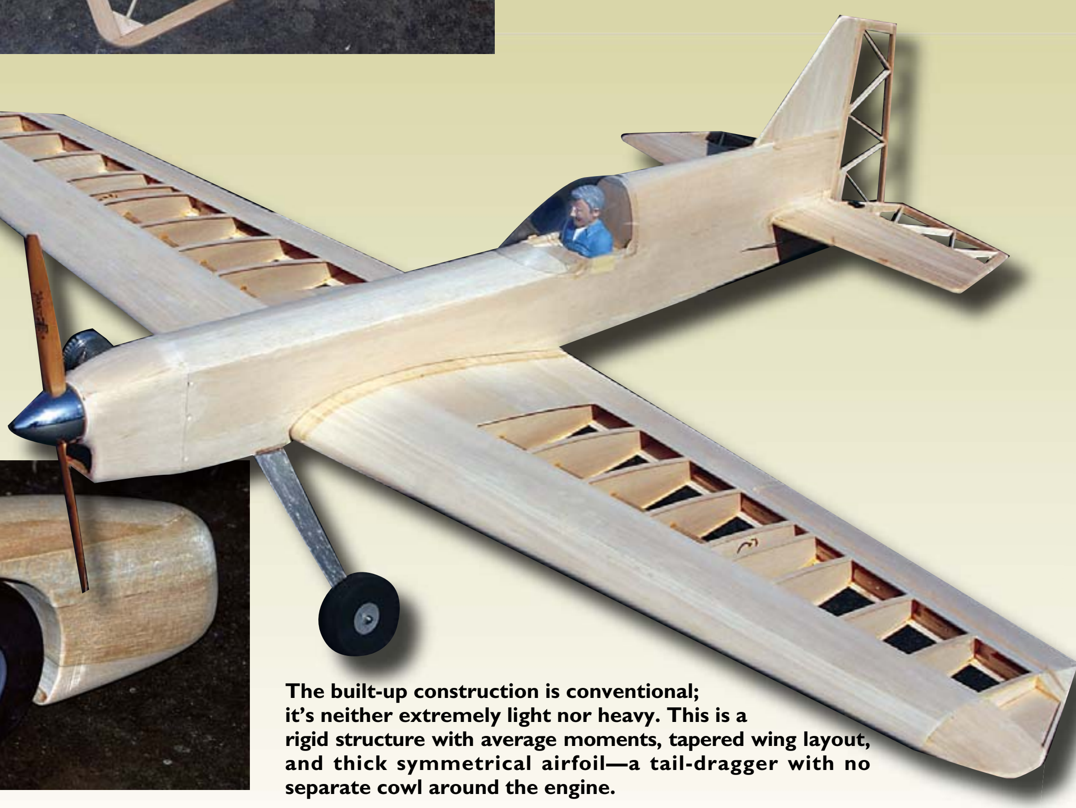
All cut balsa and plywood parts needed for fuselage construction are shown. Today's modeler has to pay through the nose for good material, but we build for the fun, not the price.



The completed basic fuselage assembly. Top and bottom sheeting will be added next. The firewall is pinned at the sides with screws.

The tail surfaces are simple structures built over the plans. The stabilizer and fin are solid balsa. Heavy-duty leaf-style hinges are the strongest option.

The author had no balsa blocks large enough for the wheel pants, so they are made from smaller blocks epoxied together and then shaped. This method works just fine.



The built-up construction is conventional; it's neither extremely light nor heavy. This is a rigid structure with average moments, tapered wing layout, and thick symmetrical airfoil—a tail-dragger with no separate cowl around the engine.

Static photos by the author. Flight photos by Lou McGuire

The cutout is large enough through which to pull out the Moki 1.80. It is mounted sideways, so that the standard muffler tucks in tightly against the fuselage. Balsa blocks are faired into the spinner.

The plastic canopy was cut from a Sig Four-Star 120. A Williams Brothers plastic pilot is finished in honor of the project creator. Small screws hold these parts in place.

Right: The author was eager to get the whole model together, to see how it looked. A leaf-spring tail wheel adds cushion. A heavy-duty horn on the elevator offers security.

Make sure you can transport a 90-inch one-piece wing. Employing fiberglass reinforcement over the wing saddle area is smart. Notice mounting plates under the aileron control horns.

Lost Foam Building System

Bob Hunt developed the Lost Foam Wing Building System in his efforts to fabricate extremely accurate, lightweight wings for top-level CL Precision Aerobatics competition.

Foam-core wings have been used in model aircraft for more than 30 years, and their advantages of accurate, quick, and easy construction are widely known and accepted. Many aeromodelers prefer the more traditional built-up ribs/spars/sheeting method of making wings; they believe that the built-up wing structures require more exacting work to result in an accurate completed wing.

I see Bob's unique construction technique as combining foam and built-up methods to make it easier to scratch-build a great wing structure. I'll briefly describe the procedure. But to see it in detail, you'll need to purchase the set of two instructional DVDs.

To begin, cut a top-quality foam core for the wing that will be built. This core is cut from oversize, accurately squared-off foam blocks, which will serve as a building fixture for the built-up structure. The parts are cut from heavier, denser foam than is normally used for wing cores, to better serve as patterns and the building fixtures.

Then the foam core is cut into pieces at the rib-station locations. Those core sections are used as patterns to make the balsa ribs. Since the patterns are from the foam core itself, the ribs will fit exactly into the foam building fixtures.

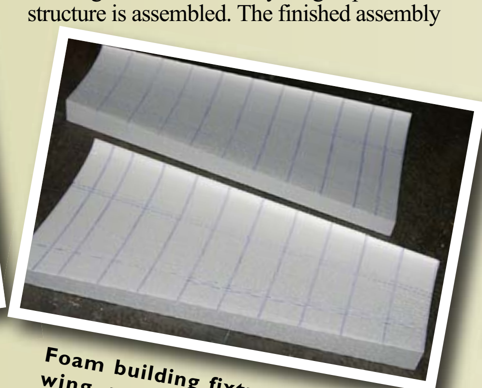
The building fixtures ensure that the built-up structure will be accurate and straight, with no bends, twists, or warps. Extremely light wood can be used, as desired, because the building fixture holds everything in place as the structure is assembled. The finished assembly will be straight and rigid when you remove it from the fixture.

There are other possible variations. You can make the ribs to be positioned diagonally in the structure. Again, since the rib patterns are the cut core, they will fit perfectly in the building fixture.

And then for the last step. Bob cuts a foam LE "buck"—a precisely shaped LE section—to be used for preforming the LE planking wood before it's glued in place on the wing structure. The big advantage here is that the LE shape is complete when the planking is adhered in place. The radius—the curve of the LE—is exactly as it should be from the root to the tip of the wing.

There are no oversize wood pieces on the LE to be planed and sanded to shape, and no chance for inaccuracies in shaping the LE. These details are crucial when you want a true-flying aircraft.

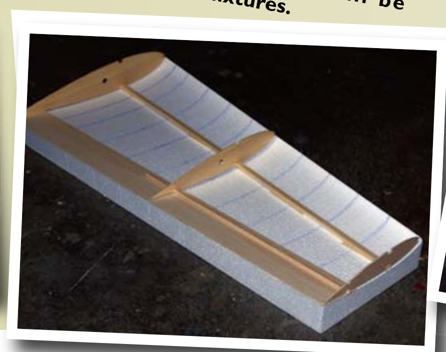
This DVD set provides the how-to-do-it description and instructions for this technique. It is available from Robin's View Productions and Airborne Media.



Foam building fixtures for the two wing panels, with rib and spar positions marked. The built-up wing structure, spars, and ribs will be assembled in these fixtures.

The wing core itself is cut apart at rib-location positions, ready to be used as patterns for balsa ribs. Because ribs will be cut from these foam patterns, they will fit perfectly in the foam fixture.

The balsa ribs match the foam patterns. They will fit perfectly into the fixture for wing assembly. The way this works is brilliant!



The wing assembles into the cradle. The lower spar, lower TE planking, and first few ribs are shown positioned in the fixture.

All ribs, upper spar, and TE planking are in place with slow-cure adhesive. Vertical-grain spar webbing is also in place between spars.

The loose foam piece is the LE buck, made to form the LE sheeting. The sheeting is soaked, bent around the buck, and bound with an Ace bandage until dry.

A short test piece of balsa sheeting has been formed to illustrate the function of the process. The LE sheeting will fit perfectly in place over the wing ribs.

Even the dihedral angle can be cut into the foam building fixtures, so that the wing panels can be tightly and easily joined.

As an RC sport/aerobatic machine that is not intended for competitive flying, the G-FAST demands neither accurate nor lightweight construction; it's a large, fun model. However, the structure should be built accurately so it will fly well, and light weight is desirable for good flying.

I asked Bob for his help so that I could try to build a wing his way, and he let me spend a full day in his workshop to see what it took to fabricate the necessary foam fixtures. Back in my workshop I took photos so you can see how the technique works.

And now I can state that it *does* work. I ended up with a nicely built, straight wing with an accurately shaped LE. I knew the wing structure was straight as I removed it from the building fixtures.

The Lost Foam technique is a way to continually turn out accurate wings; those foam patterns and building fixtures can be reused many times. This is handy if you know you'll be building more of a particular wing.

I've been cutting foam cores for 30 years or so, but I'd hesitate to try that after seeing Bob's precise setup to make the Lost Foam fixtures. The foam pieces have to be cut precisely for this system to work.

For those who like the technique but don't want to cut foam, Bob produces the required foam components on a custom basis for any size and type of wing. Therefore, anyone who wants can use this building method. *MA*

—Dick Sarpolus

The Moki 1.80 is a dynamite-running glow engine that purrs on zero-nitro fuel (cheap). UltraCote covering offers a smooth finish that is durable and fuelproof.

Sources:

Bob Hunt's Robin's View Productions
Box 68
Stockertown PA 18083
robinhunt@rcn.com

Airborne Media
(513) 755-7494
www.airbornemedia.com

The G-FAST

Type: Large RC sport/aerobatic

Wingspan: 90 inches

Wing area: 1,450 square inches

Weight: 13 pounds

Wing loading: 21 ounces/square foot

Length: 67 inches

Engine used: Moki 1.80

Propeller: 18 x 8 Zinger

Construction: Standard built-up balsa and plywood

Wing: Bob Hunt's Lost Foam construction method is an option

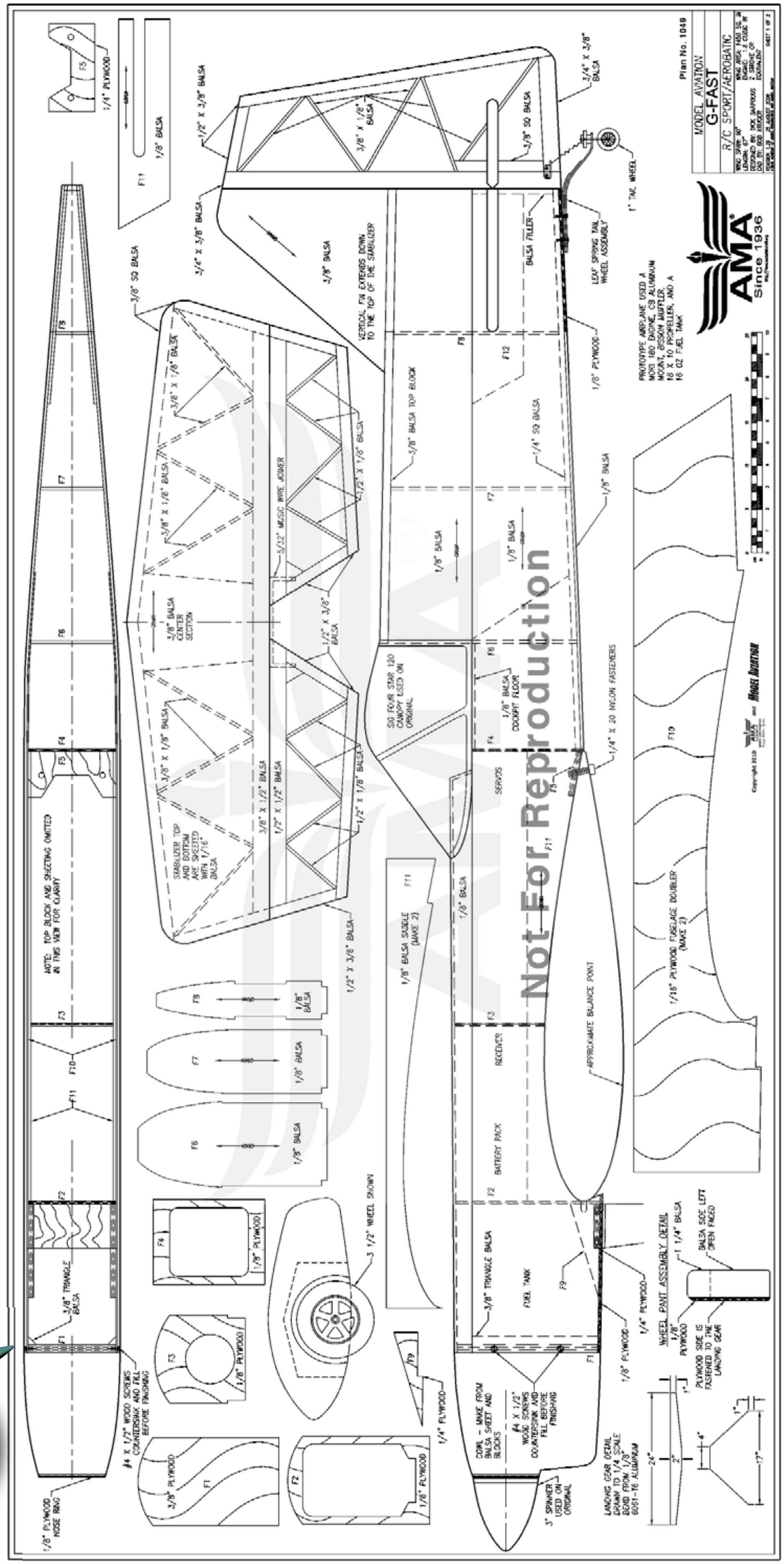
Covering/finish: UltraCote

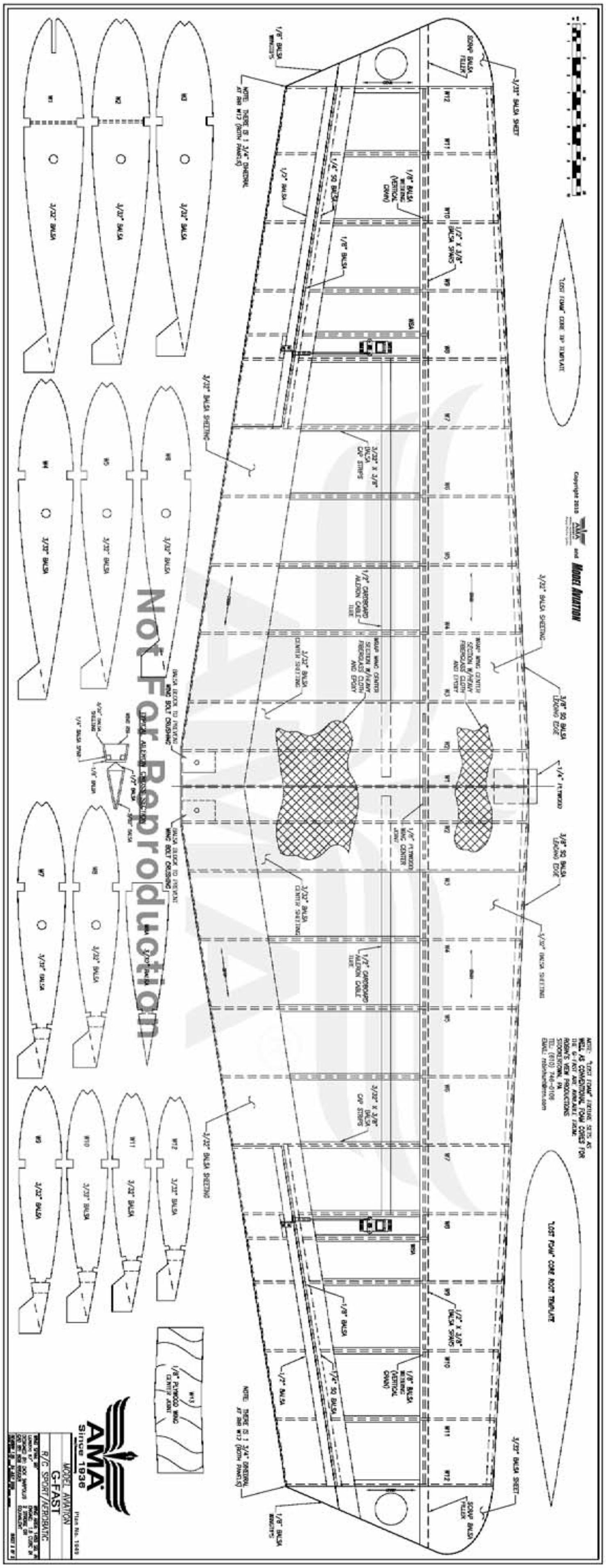
Other: 16-ounce fuel tank; four-channel radio with five servos; 100 ounce-inch servos on ailerons, elevator, and rudder; 3-inch aluminum spinner; aluminum landing gear and plastic canopy from Sig; 3 1/2-inch wheels; leaf-spring tail wheel assembly

The author looks small next to his G-FAST. The racing looks give this sport model character and appeal that reminds us of why building from scratch is so much fun.

Full-Size Plans Available—see page 191

The G-FAST





balsa on hand, so I examine the plans and order more wood than I think I'll need. The wood probably won't go to waste; you'll need it for repairs and for constructing your next project.

I've had good luck with wood from several mail-order suppliers, and I'm glad to see that Lone Star Balsa is back in business, again furnishing us modelers with the balsa, plywood, and basswood that we need.

Wing: You have a choice of three construction methods here. Cut conventional foam cores to be sheeted with $^{3}/_{32}$ balsa in the usual manner; use the Lost Foam procedures (see sidebar); or cut the rib patterns, trace them on the $^{1}/_{8}$ balsa, cut them with a band or scroll saw, and then build the wing structure as usual.

Working on a good flat surface and placing waxed paper over the plans for their protection, lay the lower main spar in place as the first step, holding it in place with lead weights.

Put the ribs in place next, over their positions on the plans. The building feet at the TE of each rib puts it in the correct location, and I hold those in place with T-pins pushed into the plywood building surface.

Vertical-grain spar webbing is next, and yes it's a pain. With the G-FAST tapered wing, each spar webbing piece must be cut/sanded to fit.

Add the top spar, the short aileron-section spars, and the LE, and apply the LE and TE sheeting. With this much completed, you can remove the wing panel from the building board.

Trim the building feet off of the ribs, and add the opposite-side LE and TE sheeting. The wing structure will still be slightly flexible until you do this, so be sure to check the alignment and not build a twist or warp into the structure. Cardboard tubes for the aileron cables are glued into the ribs before the wing halves are joined.

Cut the ailerons free from the built-up wing and trim them so that the $^{1}/_{8}$ balsa can be added to the wing panel and the $^{1}/_{2}$ balsa LE can be added to the aileron. The inboard ribs on each wing panel must be cut between the spars so that the plywood dihedral brace/wing joiner can be adhered in place. I add center-section planking after joining the wing halves.

For additional strength I add heavy fiberglass cloth with epoxy wrapped around the wing center joint. Cut the root ribs for the plywood wing mounting tab, and cut a slot through the LE for the tab.

Finish the wing by adding the wingtips and capstrips.

Control Surfaces: Build the horizontal stabilizer, elevators, and rudder structures over the plans, and sheet the stabilizer. The vertical fin is solid sheet balsa.

I use 5-minute epoxy for most of this work, to provide strength and keep the assembly moving rapidly. I use large Klett-type nylon pin hinges on all control surfaces, but there are many good giant scale-suitable hinges on the market.

Fuselage: This structure accounts for most of the work, but it's straightforward.

Epoxy the $^{1}/_{16}$ plywood doublers to the $^{1}/_{8}$ balsa fuselage sides, along with the wing saddle doublers, tail-section doublers, and strips along the lower rear edges.

Since the fuselage sides are parallel from the firewall to the wing TE position, I glue the first four bulkheads in place on one fuselage side, ensuring that they are perpendicular to the side. Then I adhere the other fuselage side to the four bulkheads.

Pulling the rear ends of the sides together, glue the rear bulkheads in place. Add the top front sheeting and the rear turtledeck side sheeting.

Sand the rear sheeting flush with the tops of the bulkheads. Add the thicker top piece and plane/sand to shape. Don't add the bottom rear sheeting until the tail surfaces and pushrod linkages are in place.

Because of the large, heavy engines used in a model this size, I employ a 3/8 plywood firewall, usually epoxying together a piece of 1/8 and 1/4 plywood. I also drill two screws, on each side of the firewall, through the plywood fuselage doublers and into the firewall sides.

Add the plywood wing mount plate and landing gear mount plate. Both of those plywood parts can be backed with an additional piece of 1/4 plywood, to provide more wood depth for the 1/4-20 tapped holes for the nylon bolts. Add the plywood at the end of the fuselage for the tail wheel mount.

With the wing bolted in place, add the horizontal stabilizer, lining it up with the wing. Then add the vertical fin, lining it up with the horizontal stabilizer and the wing. I work through the open bottom of the fuselage, cutting holes in bulkheads to clear the elevator and rudder pushrods.

I like carbon-fiber pushrods, with 4-40 hardware. For control horn mountings I recess a 1/4 plywood mounting plate into the control surface, epoxying it in place. Then the bottom fuselage planking can be added.

I like wheel pants on a model such as this. Rather than use the typical molded-fiberglass parts, I made a pair from plywood and balsa. I left the outside of the pant open around the wheel, for an old-time appearance.

I mounted the big Moki 1.80 sideways and glued balsa blocks in place around the engine so that they could be shaped to fair into the spinner with a simulated air inlet below the spinner. I almost went for a fiberglass round cowl to provide the radial-engine look, and I think a round-cowl version would make for a good-looking airplane.

Rather than try to find 6061-T6 aluminum to make my landing gear, I bought a Sig Four-Star 120 landing gear. I also used a Four-Star 120 plastic canopy, trimmed a bit to fit the G-FAST.

A metal leaf-spring tail wheel setup was used, coupled with small springs to the rudder for steering. A 16-ounce fuel tank works for me; if you like long flights, go for a 20-ounce Du-Bro tank.

Finishing: I used UltraCote to cover the model in a trim scheme that resembles those I've seen in pictures of 1930s racing aircraft.

I also applied computer-cut vinyl registration numbers in the English and European style, for the foreign flavor. "G-FAST" seemed to be an appropriate registration *and* provided the name for this project.

Flying: Despite the name and styling, this is *not* a racer; I expected the thick wing to keep the speed down and make for easy flying and full aerobatic capability. The G-FAST has those traits, but that powerful Moki makes it quite fast at full throttle.

I have an 18 x 8 Zinger propeller on the engine, which I run on FAI fuel; that is, no nitro. It's designed for no-nitro fuel, with its high compression, and that also keeps fuel costs down.

Because of the conservative design approach, I had no concerns before the test flights. I adjusted the control throws a bit, to suit my flying habits, and got the comfortable flying machine I wanted. This stuff is fun! **MA**

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Sources:

Mark (Moki) Engines
(800) 854-8471
www.hobbypeople.net

Lone Star Balsa
(972) 552-2922
www.lonestar-balsa.com