

Sport-scale 2-place aerobatic trainer

MODEL AIRPLANE NEWS CONSTRUCTION

by MARK SIRIANNI

receiving 3-view drawings and technical information from Bob Banka at Scale Model Research*, I started my new project.

I decided on an 80-inch-span model that would be IMAA-legal and light enough to fly with my trusty SuperTigre*.90. I knew my .90 would easily pull a 10-pound model, so that was my target weight (minus fuel, the finished weight was 10 pounds, 4 ounces). When I had finished all of the designing, I started the construction process with the wing.

CONSTRUCTION

• **Wing.** Pick a piece of hard, 1/8-inch balsa and make the leading-edge (LE) jig. The jig tapers from 1 3/4 inches to 3/4 inch, with the thicker end under the wing center and the thinner end under rib 12. Pin the 3/32x4-inch trailing-edge (TE) sheeting over the plans. Glue the bottom 1/8x1/4-inch spar into place on top of the TE sheeting. Pin all the ribs to the jig and to the bottom spar. Make sure the ribs are flat on the TE sheeting. When you're satisfied with the fit, CA the ribs to the bottom spar and the TE sheeting.



Three generations help to make this flight a success. I check the engine while my Dad and son, Tom, hold the plane.

Add the top 3/8-inch-square spruce spar. Add the top 1/8x1/4-inch TE spar. Glue the 1/4-inch

thick plywood aileron-control-horn plate between ribs 5 and 6. Sand the tops of the ribs flush with the top spar, and add the balsa filler block at

rib 1. Glue on the top LE sheeting. Add the 1/2-inch leading edge. Add the 3/32x4-inch-wide LE sheeting. Do not sheet the landing-gear area at this time; this will be done after the gear has been installed.

Keep the wing pinned to the jig until the glue has dried completely; then turn it over and glue the bottom 3/8-inch-square spruce spar into place. Do not add the bottom TE sheeting yet. Build the left wing panel up to this point.

The wing panels are joined upside-down on a flat work surface. Cut an 1/8-inch slot at the rear edge of the spar and rib 1. This will allow the dihedral brace to slide through. Lay some wax paper over the center of your plans, and pin the panels over the wing top view. Keep the top spar flat on the work surface. Epoxy the dihedral brace securely to the backs of the main spars, and let the epoxy cure completely. Epoxy the 1/8-inch-plywood ribs (1A) into place. They should be flush with the top of wing rib 1. This rib sets the proper angle for the landing-gear plate.

Sukhoi Su-29



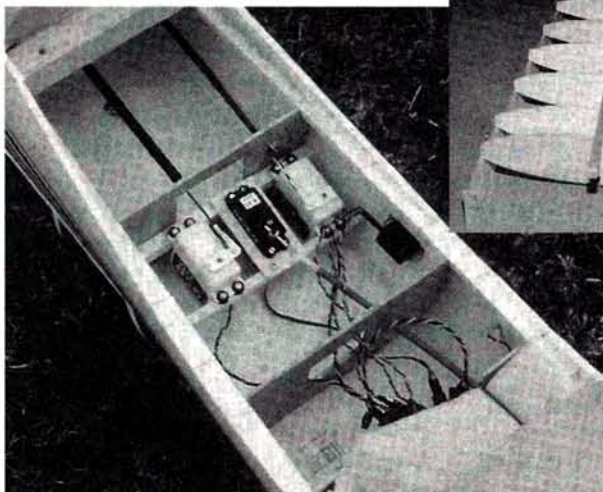
Here's the Su-29 (right) with its counterpart, the Su-26. Both are great flying models and will provide hours of aerobatic fun.

Epoxy the landing-gear plate into position. This is a very important part of the wing because all the stress of the landing gear will be on this plate. Drill two $\frac{3}{8}$ -inch-diameter holes in the front dowel plate, and then epoxy the plate into place. Do not install dowels yet. Add the bottom $\frac{3}{32}$ -inch-thick LE sheeting.

Install the landing gear with $\frac{6}{32}$ -inch screws and blind nuts. Use epoxy around the blind nuts to make sure they do not come loose. Sheet the top center section of the wing, but don't sheet the bottom until later. Install the $\frac{3}{32}$ -inch-thick vertical-grain shear webs and the tubes for the aileron wires. The ailerons were cut out of the completed wing, finished with a leading edge, then hinged into place. Install the aileron servo rails and the servos. Sand the wing and then set it aside until later.

• **Tail surfaces.** These are constructed over the plans. Each is a $\frac{1}{4}$ -inch-square balsa framework sheeted on both sides with $\frac{1}{16}$ -inch-thick balsa (I used 6-inch-wide Sig* balsa sheet). Make sure you have the lite-ply control-horn bases on both elevator halves. Let the glue dry; then sand the tail surfaces to shape and set aside.

• **Fuselage.** This is built in top and bottom halves over the $\frac{1}{4}$ -inch-square balsa crutch. The $\frac{1}{4}$ -inch-square crutch is pinned over the top view of the plans; the top-half formers are then glued to it. Add the $\frac{1}{4}$ -inch-square spruce crutch doubler. Glue two F1 formers together; glue F2 to the back of F1.



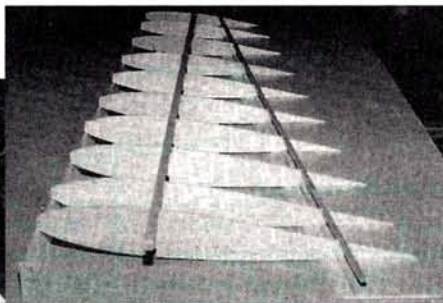
In this fuselage, there's plenty of room for any radio. Here's my setup.

Use your engine as a guide to determine how far back to position F3. The plans show the approximate position for a 1.20 4-stroke. Mount the aluminum engine mount on F3 and F3B. Carefully draw a centerline on each of these, and attach the mount using 8-32 screws and blind nuts. Glue F3 into place; then add F4, F5 and F6. Build your tank compartment to suit your tank. Glue the remaining top formers into place. Carefully check the rearward slant of F9. Add the $\frac{1}{8}$ -inch balsa cockpit floor and instrument panels 1 and 2. Glue in the top turtle deck $\frac{1}{4}$ -inch-square balsa and $\frac{1}{4}$ -inch-square spruce stringers. The middle $\frac{1}{4}$ -inch-square spruce stringer should be parallel to your work surface. This is the



The completed tail framework. This type of construction helps to prevent the model from being tail-heavy.

base on which the stab sits, so it must be level. Add the $\frac{1}{4}$ -inch balsa filler under the stab and let the top half of the fuselage dry. When it's dry, sheet the entire top with soft $\frac{3}{32}$ -inch balsa. Keep the framework securely pinned to the work surface, and use aliphatic resin glue so



The wing ribs on the leading-edge jig have been pinned into place. The trailing-edge spars, bottom trailing-edge sheeting and the top main spar are in place.

that you'll have plenty of time to get things pinned into place. Sand the tops

of F9, F10 and F11 after the glue has dried. Add the $\frac{1}{2}$ -inch-thick-balsa top.

Cut it a little oversize to allow for shaping. When the top is dry, unpin the top portion of the fuse and turn it over in preparation for building the bottom.

Glue two F1B formers together, and glue F2B to the back of them. Glue F3B into place. Check its fit by attaching your engine mount to F3 and F3B. Epoxy F3B, F4B and F5B into

place, making sure they are straight. Add the bottom $\frac{1}{4}$ -inch-square balsa stringer. Epoxy the $\frac{1}{8}$ -inch aircraft-grade plywood dowel doubler to the back of F5B.

Place the fuselage upside-down in a Robart* stand, and level the fuse with the work surface. If you have an incidence meter, the next steps will be much easier. Put the wing into place on the fuselage. To mark the dowel locations on F5B, I used a $\frac{1}{4}$ -inch doweling center—a metal plug that has a sharp point on one end. The plug fits into the holes in the front dowel plate. Simply set the wing in the wing saddle area at zero incidence and press it forward. The doweling centers will put small marks on F5B at the exact places where the holes should be drilled. Also, carefully measure the distance from each wingtip to the tail post; make sure both distances are equal.

When you are satisfied that everything is aligned, drill the holes in F5B. Remove the wing from the fuselage and, using a long drill bit, drill two holes for the rear dowels in the $\frac{1}{8}$ -inch plywood

SPECIFICATIONS

Scale: $\frac{1}{4}$ -scale aerobatic monoplane

Wingspan: 80 in.

Length: 54 $\frac{3}{4}$ in. (including spinner)

Wing area: 1,036 sq. in.

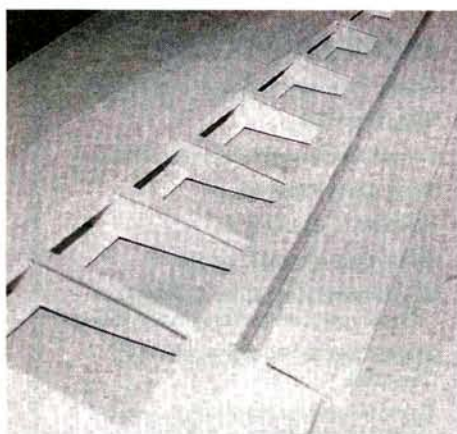
Weight: 10 lb., 4 oz.

Wing loading: 22.80 oz./sq. ft.

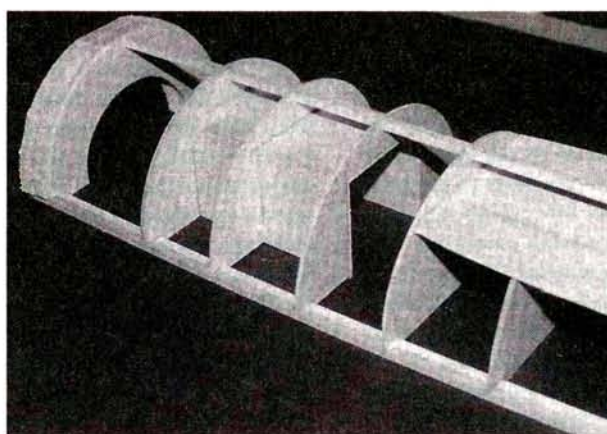
No. of channels req'd: 4 (elevator, rudder, aileron, throttle) and 5 servos

Engine req'd: .90 2-stroke or 1.20 4-stroke

Comments: this IMAA-legal, sport-aerobatic model is easy to fly.



When a wing panel is complete, the ailerons are cut free; the trailing-edge cap and the aileron cap are in place.



The forward top section of the fuselage showing the framework and the tank compartment.

dihedral brace. Epoxy the dowels into place, and finish sheeting both sides of the wing. Epoxy the 1x6-inch hardwood wing hold-down block into place. Try the wing on the fuselage and check its fit. Measure wingtip to wingtip, and when you're satisfied with the measurement, drill holes through the wing and into the hardwood block. Drill and tap for a 1/4-inch nylon bolt.

Sheet the front bottom of the fuselage.

Add the rear bottom formers and the 1/4-inch-square balsa stringers. Plan your pushrod installation and then sheet the fuselage bottom with soft balsa. Test fit and level the stab on top of the 1/4-inch-square spruce stringers. Add the plywood stab base between the stringers. I usually use a screw to attach the

stab to its base. Drill 1/4-inch holes through the plywood base and the stab for the fin dowels. Add soft balsa blocks to the side of the fin and sand it to shape.

With the wing firmly attached to the fuselage, it's time to build the belly pan and the removable hatch. Set formers H8 and H5 into place. Glue rear H6 and H8 to the wing. Add the 1/4-inch-square stringers between H5 and H8. Cut the stringers between the two H6 formers and remove the forward portion of the fuse. This is the removable section that will cover the landing gear. Sheet the belly pan and removable hatch with 3/32-inch-thick balsa. The hatch is attached

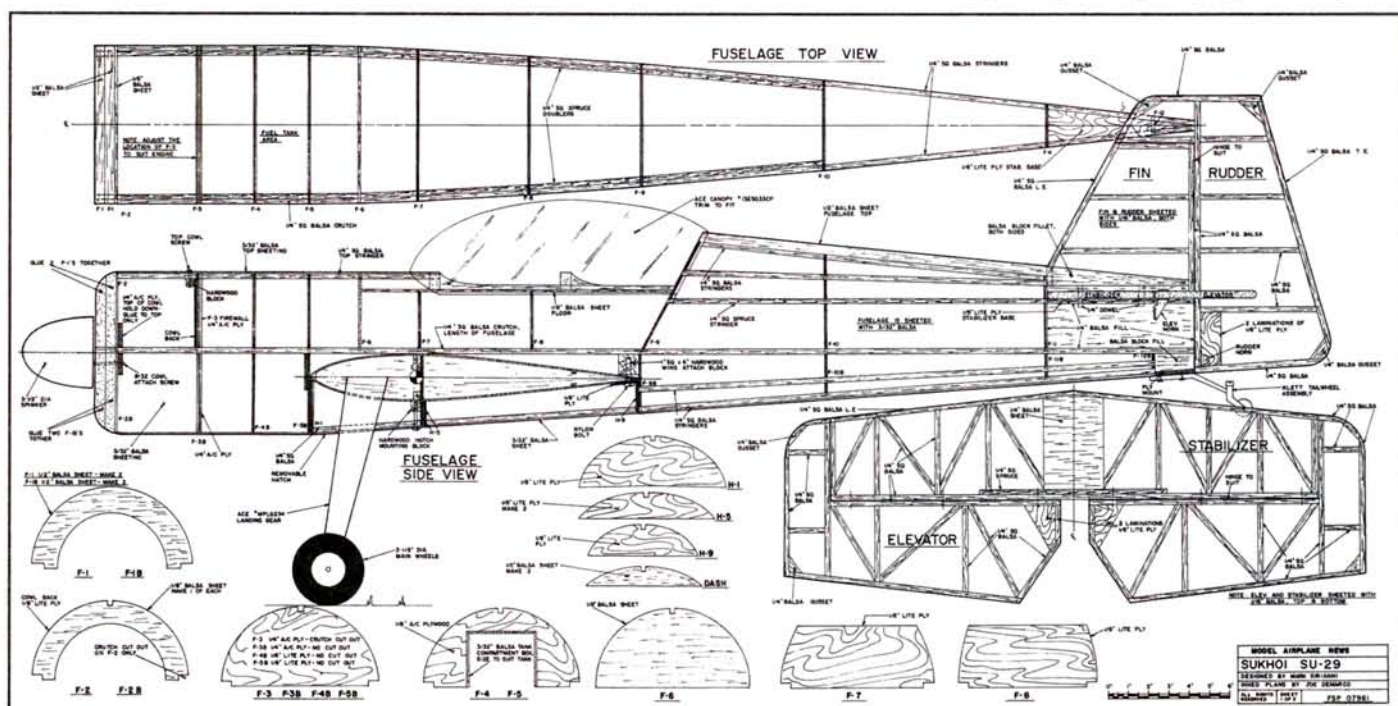
to the wing with an 8-32 screw. Glue a hardwood block to the bottom of the wing and tap it for this screw. Make sure the hatch is a tight fit.

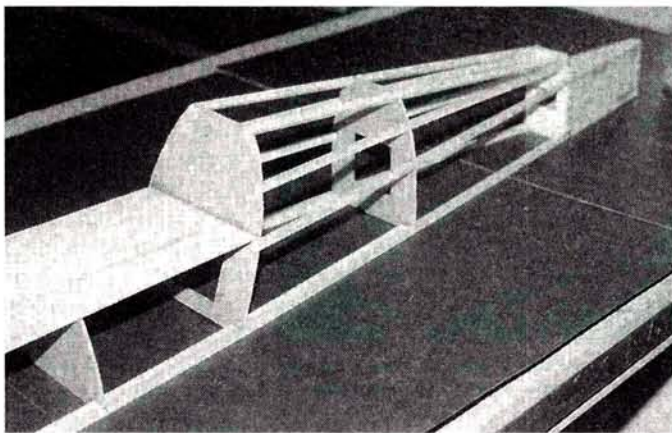
• **Cowl.** After the fuselage has been final-sanded, it is time to cut the top half of the cowl loose. Draw a line in front of F3 and cut along it with a saw. Cut above the crutch and remove the cowl top. Epoxy the two front 1/4-inch plywood hold-down plates to the top cowl. Glue the hardwood block to F3. When everything is dry, drill holes for the front and top screws.

With the top cowl half removed, you have complete access to the throttle pushrod, the fuel lines and the engine (to make adjustments). There is no fiberglass to paint, and when you remove the cowl, you don't need to remove the prop and spinner. Cut holes in the bottom of the cowl for the exhaust pipes. Make the holes large enough to help with engine cooling.

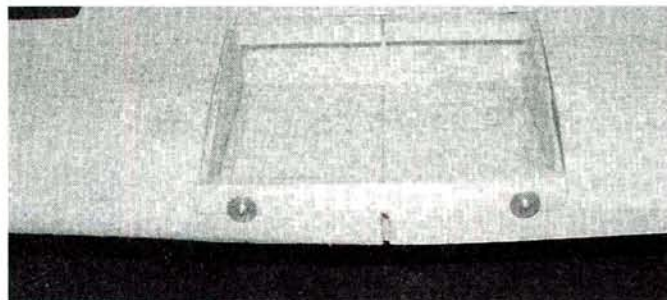


The Sukhoi glides well and is quite easy to land. One of my landings was dead-stick, and it was easy to accomplish.





The fuselage's aft top section, including the rear stringers and the cockpit floor.



Dowel-centering marks are used to position the dowel holes on F5B.

• **Finishing.** Fill any nicks and dents with a balsa filler, and sand the entire model. I covered the plane with Carl Goldberg's* Ultracote. The covering is easy to work with and goes around curves well. Ultracote can be applied over itself with very few bubbles. I cut all the stripes, stars and numbers out of it. To seal the inside of the cowl, I used black Rustoleum.

• **Canopy.** I used an Ace* Extra 230 1/3 size canopy and two William's Bros.* pilots. Instruments on the rear panel add a little extra touch.

• **Radio and engine.** I used my reliable SuperTigre .90 2-stroke engine with a Master Airscrew* 14x6 prop, a J'Tec* Pitts-style muffler and an

tank finish things off. I used my Ace R/C Micro Pro 8000 transmitter, Pro 810 receiver and five atlas servos.

Before you test your new model, take an evening to go over every control linkage, engine bolt, etc. Cycle your batteries and make sure you have taken care of the smallest detail. Balance the plane properly

and make sure the control surfaces are all at neutral. A few extra minutes at home could make the difference between a successful first flight and a real disappointment.

• **Flying.** The model weighed 10 pounds, 4 ounces, and I was a little nervous about the SuperTigre .90's ability to pull this weight around. When the weather cleared up, we headed to the field and took a few more pictures. I started with a few high-speed taxi runs to check the plane's ground handling. The Su-29 tracked perfectly straight and seemed to accelerate very quickly.

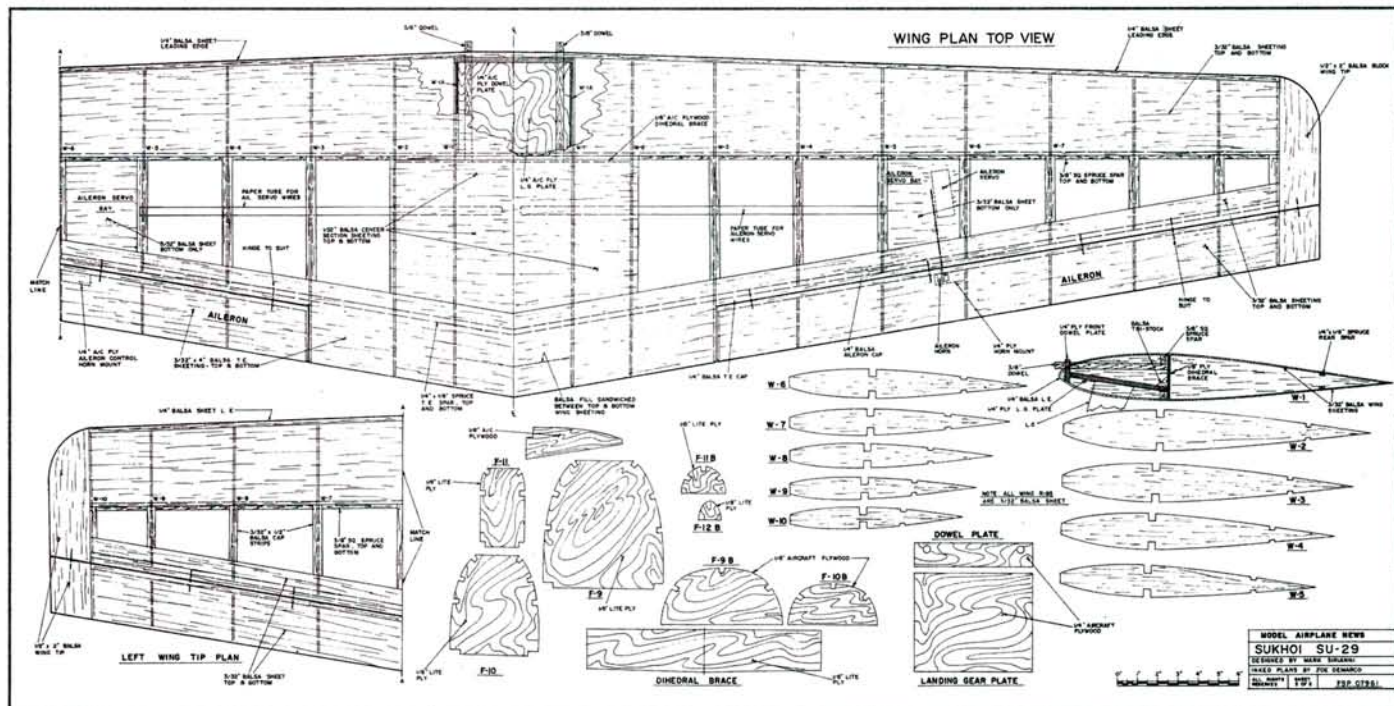
We refilled the tank and the moment had arrived. The Su-29 lifted off easily using about half of the field. The .90 pulled

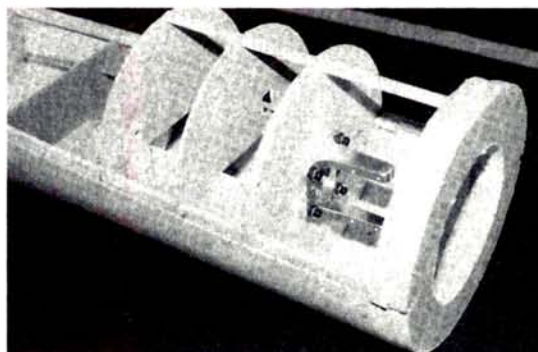
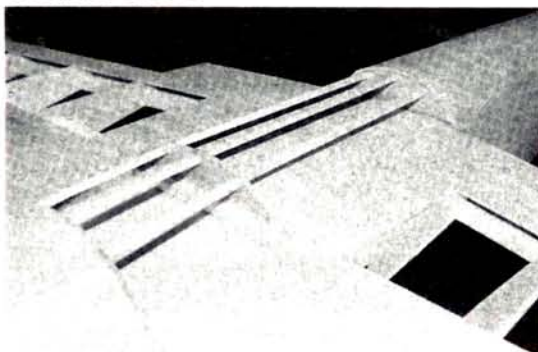
The two Williams Bros. pilots prepare for an aerobatic flight. To dress up the cockpit a little, I added two instrument panels.

the model around with authority, and the plane was rock solid; I never touched the trim levers. After it had



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Left: the constructed belly pan and removable hatch before sheeting has been added to their framework. Right: the bottom formers are in place. The holes have been drilled in F5B, and the engine mount has been attached to F3 and F3B.

gained some altitude and I had calmed down a bit. I put the Sukhoi through a series of loops, rolls and Immelmans—all very precise. The rolls were smooth, and the loops were done easily from level flight.

The model does not have the vertical performance that it would have with a larger engine, but for me, the

.90 did a great job. After 8 to 9 minutes—about 300 feet high and downwind—the engine quit. I just kicked in some down-trim and easily made it back to the field for a beautiful landing. The model never dropped a wing or seemed to want to stall. Later flights proved to be a joy; this model will do anything that you ask of it—loops, rolls, spins, etc.



The completed fuselage is ready to cover.

DESIGNER'S DREAM

This big, impressive Su-29 is the best flying model I've ever flown, and it gets noticed at the flying field. Its performance is everything I had hoped for—no bad habits and a real delight to fly.

With a larger engine, such as a YS* 1.20 4-stroke or a Webra* 1.20 2-stroke, this model would be awesome.

This is my fifth published design, and it was by far the most enjoyable to work on. If you want to move up to IMAA, this Su-29 will make you look good. If any builders have questions, I'll be happy to help. Please contact me: (814) 837-9435.

Enjoy!

*Addresses are listed alphabetically in the Index of Manufacturers on page 184.

About the author

A watchmaker and jeweler by trade, Mark Sirianni lives in Kane, PA, with his wife and three children. He has been building and flying model airplanes with his Dad, Joe, for more than 25 years. In his spare time, he custom-builds his own designs and other kit models at Mark's Model Building, which now offers a laser-cut semi-kit of the Su-29.

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