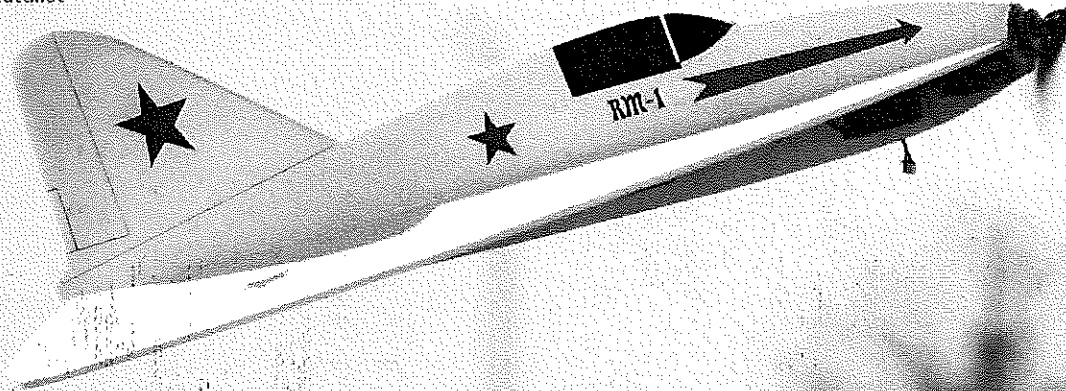


RM-1

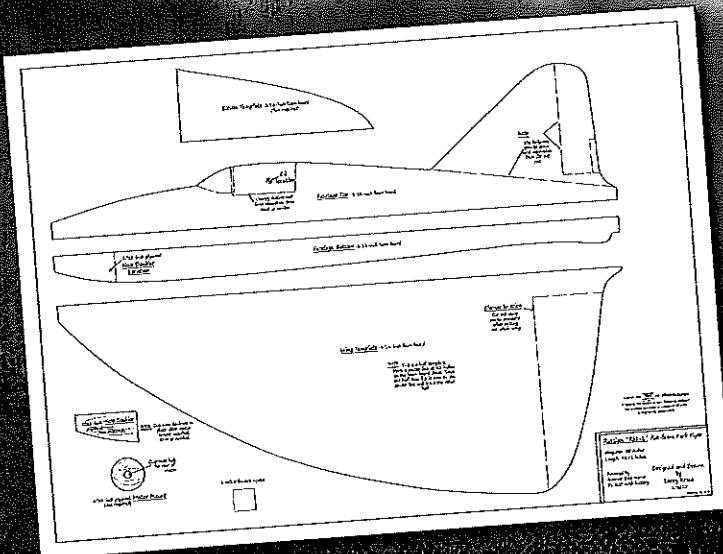
SUPERSONIC FIGHTER

Build a Soviet X-Plane

By Larry Kruse
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01



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In the aftermath of World War II and the discovery of proposed advanced aircraft designs that never made it into production, those that occurred in Germany were the most frequently published. At the same time, because of the political climate of the day, little was known outside of the USSR about what the Soviets were doing along those same lines. However, the decades after the war have revealed some extraordinary thinking and unexpected advances that were being made.

One of those involved was Aleksandr Moskalev (sometimes spelled Moskalyev), a brilliant young designer who, in the 1930s, was decades ahead of his peers in conceptualizing what it would take to break the sound barrier in an aircraft. His postulates centered on a wing shape and overall aircraft configuration that would minimize the air pressure that builds up in front of a wing surface as the airplane travels faster.

As Daniel Russ, the publications editor of the Civilian and Military Intelligence Group newsletter, wrote, "His idea was to see if creating a plane without a tail would make it easier to traverse the speed of sound. It was probably the first attempt to do this. It was the first record of delta-wing fighters that would fill the skies of the world 40 years later."

Accordingly, Moskalev began working on a series of airplanes clustered under the acronym of "SAM" that were labeled either numerically or by special names such as the SAM Sigma 4, which was notable in 1934 as an early, tailless, delta-wing design. Although the Sigma 4 was intended as a rocket-powered airplane, suitable rocket engines were still 10 years away, so Moskalev decided to place twin piston engines inside of the wing.

Continuing to refine the delta-wing concept for another decade, it was not until 1944 that Moskalev was given permission by the governing Zhukovsky Central Aerohydrodynamic Institute (TsAGI) to develop the RM-1 (SAM-29), intended as the first supersonic fighter. It was renamed the PM-1 and the construction order was signed by the People's Commissar of Aviation Industry, A.T. Shakhurin. However, in early January of 1946, Shakhurin was "repressed" by the Stalin administration and the order for the PM-1 construction was annulled, marking the end of the RM-1 effort and Moskalev's brilliant design.

The later specifics of this most unusual and potentially important airplane are murky, with much of it lost in time and the lack of historical data. What remains is a goodly amount of conjecture and several purported three-views existing in books such as *Soviet X-Planes* by Gordon and Gunston, and an entertaining YouTube video titled, "Secret Russian Aircraft of WWII."

The model offered here is true in planform and fuselage profile to one of the three-views in *Soviet X-Planes*. That does not suggest that it is anything more than what I choose to call "conjecture scale," and was done as a simple, flat foamie "study model"

because I wanted to see how it would fly.

It is a far cry from any scale representation of the proposed RM-1, but it is an easy model to construct and a surprisingly good flier. Although it is not rocket propelled, it still looks cool in the air, and you barely notice the propeller spinning away up front.

Preconstruction Notes

Like several of the flat foamies that I have had published in *Model Aviation* and *Park Pilot* (the Avro Vulcan, the Lippisch P.13B, and the MayBee), this airplane is constructed from two sheets of inexpensive Dollar Tree foam board with the paper left on. Take a little time and sort through the store's selection to find the most warp-free pieces. Do not be tempted to use a more expensive foam board because the weight will seriously impact the way the RM-1 flies. Weight is always an enemy, even in a simple project such as this one.

Other basic components I used included a RimFire 250 motor with a 7 x 5 APC Slow Flyer propeller; a 12-amp ESC; my trusty Futaba T6J radio system; two 7-gram servos; a 2S 500 mAh battery; a piece of 1/32-inch plywood for the motor mount and nose doublers; two 14-inch pieces of .047 music wire for the pushrods; and hook-and-loop material for the battery mount. Hinges were made with Du-Bro Electric Flyer Hinge Tape, and control horns and pushrod standoffs were of the Du-Bro micro horn variety.

Building the RM-1

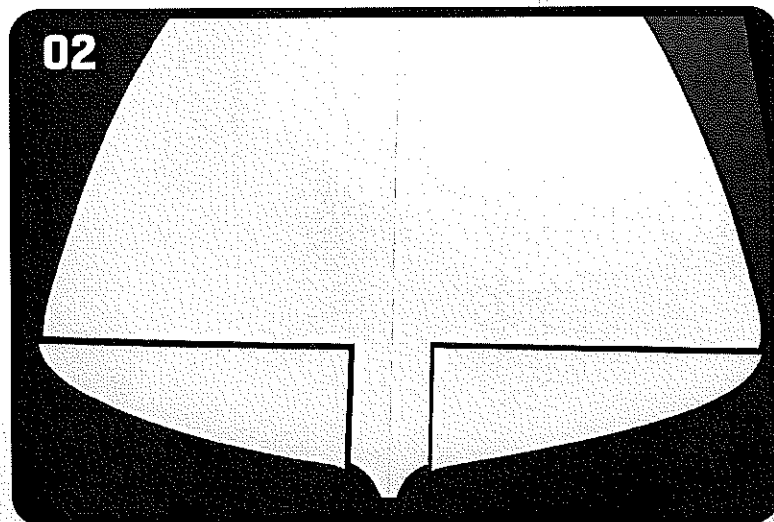
If you've gathered the materials and components, construction will move along quickly because there are few parts and nothing tricky in the assembly process.

The full-size templates can be attached to lightweight poster board with 3M Spra-Ment or a similar product and cut out. The required pieces can be traced onto the foam board with a soft lead pencil. Avoid using a pen because it leaves ink traces that are hard to remove from the poster board.

A large, self-healing cutting mat is a useful surface

01. The unique planform draws attention in the air, while still being exceptionally stable and is able to handle wind from 5 to 7 mph.

02. The wing plans feature a half template that is placed along the centerline that is drawn on the foam-board sheet then flipped over to draw the other half. After the wing is cut out, the two elevons are separated from the main panel.



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03. The lower right side of the airplane shows the ESC held in place with double-sided tape. The receiver is attached by hook-and-loop material and the servo is hot glued to the bottom of the wing.

04. The lower left side of the fuselage shows the 1/32-inch plywood doubler, the hook-and-loop strip for the battery mount, and the second 7-gram servo that is hot glued to the bottom of the wing.

to place under the foam board as you cut it. Any #11 sharp hobby blade will work well to cut out the pieces, although it might have to be sharpened or replaced during the cutting process. Foam board has a way of quickly dulling edges. I've had good success using #11 disposable scalpel blades.

Note that the wing template is a half-template and requires a line drawn the length of one of the foam boards at 10 inches. Trace half of the wing, flip the template over, and draw the other half before cutting around the outside only.

The two elevons can be traced onto the wing blank and separated from the full wing after it is cut out. Now draw a bottom centerline on the wing blank to help position the bottom of the fuselage.

The fuselage top and bottom can be traced onto the foam. Go ahead and cut out the outside profile of both pieces. Use a long straightedge to cut the bottom of the top piece and the top of the bottom piece, making a concerted effort to keep the cutting blade perpendicular to the mat. Both of those surfaces must be straight and square to avoid inducing any warp or curvature to the wing.

After the foam parts are cut out, you can gently true up the edges with fine sandpaper that is wrapped around a block or a T-bar sander to smooth everything out. You might want to cut out the two 1/32-inch plywood nose doublers and the plywood motor mount at this time so you won't have to interrupt the assembly process later.

On this project, several glue types are available, including hot glue, which I have used extensively in the past. In this case, I wanted to minimize the weight as much as possible, and hot glue is heavy. I used Beacon Foam Tac on the RM-1 for most joints with good success. It will probably be my glue of choice for future projects.

As many know, hot glue forces you to work fast and accurately before the glue sets up. Foam Tac allows more accuracy over a longer working time by placing a bead of glue on each of the parts to be joined, pressing them together, separating them for about 10 seconds, and then putting them together again. You do have a small amount of time after that to tweak the pieces into the final position and hold them there, or to brace them into position as the glue cures. I was very pleased with Foam Tac and used it to join everything except the motor mount to the fuselage.

As the plans show, there are only five pieces of foam in the airplane. Start by gluing the bottom of the fuselage to the bottom of the wing, placed carefully along the longitudinal line drawn previously. Position the piece so that the bottom of the wing is flat and level and the fuselage bottom is held at a 90° angle to the wing.

The fuselage top can be glued in place next, but you will have to elevate the wing slightly more than



At a Glance



Specifications

Model type: Flat foam park flyer

Skill level: Intermediate

Wingspan: 20 inches

Length: 25.75 inches

Wing area: 297 square inches

Weight: 6 ounces

Wing loading: 2.91 ounces per square foot

Power: 28-13 1,750 Kv outrunner

Propeller: 7 x 5 APC SF

Battery: 2S 500 mAh LiPo

Radio equipment: Futaba T6J transmitter/Futaba R2006GS receiver

Flight duration: 5 to 7 minutes, depending on throttle management

the depth of the fuselage bottom in order for it to clear the work surface. The top of the wing must also present a flat and level surface for the fuselage top piece to be attached, particularly because it includes the airplane's rather large rudder and fin.

After the fuselage top and wing joint are dry, square up the nose juncture and epoxy the 1/32 plywood circular motor mount in place. Five-minute epoxy works well for this. Be sure to keep the small relief circle in the center of the mount clear of epoxy so the rear of the motor can seat properly. The motor mount should have a 0-0 thrustline when the epoxy is cured. You might need to keep checking and tweaking it as the epoxy hardens.

The 1/32-inch plywood nose doublers are installed with either Foam Tac or epoxy. After they set, I used hot glue to make a fillet all the way around the backside of the motor mount to reinforce the fuselage/motor mount joint. Squeezing a puddle of hot glue onto a scrap of foam board then applying the fillets with a toothpick worked well for me.

The leading edge (LE) of each elevon needs to be sanded to a chisel shape with the angle on the bottom. Hinging the surfaces was done with 1-inch Du-Bro Electric Flyer Hinge Tape and is a simple process. Working with one elevon at a time, butt the wing and the elevon together top side up. The chisel shape of the elevon LE should face down.

Cut a length of hinge tape roughly an inch shorter than the length of the surfaces to be joined. Gently lay it lengthwise over the two surfaces, keeping them touching along their seam. When it's placed to your satisfaction, press the tape down smoothly to avoid any wrinkles or creases. Now cut three 2-1/2-inch pieces of tape and place

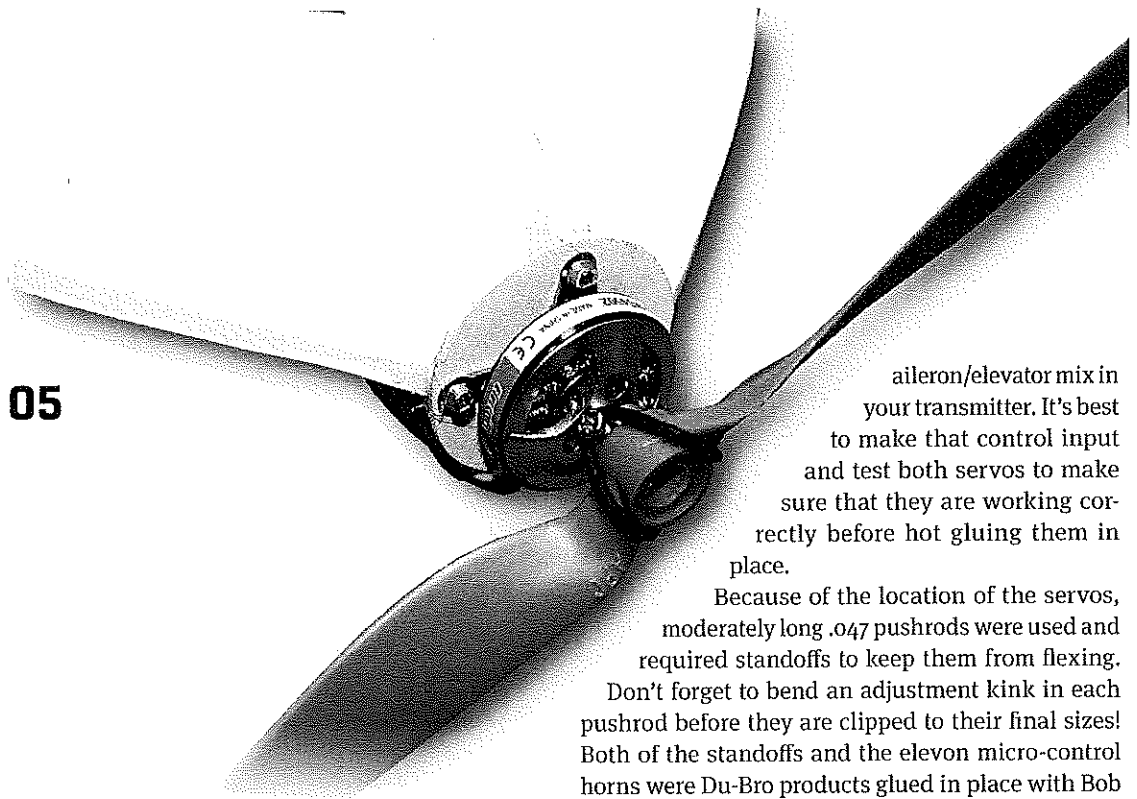
RM-1 SUPERSONIC FIGHTER

05. The RimFire 250 motor that the author used was screwed to the motor mount. He made sure that there was no downthrust or side thrust. The O-ring prop saver is the appropriate propeller mount for the belly-lander.

06. Static 3/4-view shots show the unique planform and compact structure of the airplane.

07. The relatively long elevon pushrods require standoff support to keep them from flexing under loads. Both the elevon control horns and the standoffs are Du-Bro products.

05



aileron/elevator mix in your transmitter. It's best to make that control input and test both servos to make sure that they are working correctly before hot gluing them in place.

Because of the location of the servos, moderately long .047 pushrods were used and required standoffs to keep them from flexing.

Don't forget to bend an adjustment kink in each pushrod before they are clipped to their final sizes! Both of the standoffs and the elevon micro-control horns were Du-Bro products glued in place with Bob Smith Super-Gold foam-safe CA.

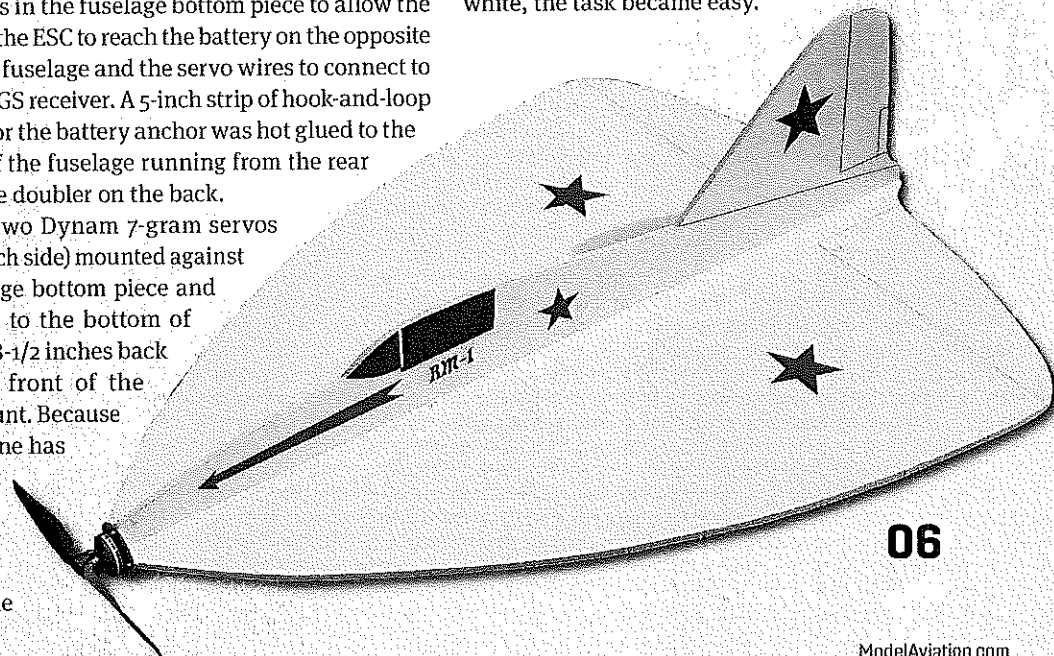
Because the center of the 2S 500 mAh LiPo battery I used ended up 6 inches back from the front of the motor mount, there's room to adjust its location during test flights. You can roughly determine placement of your servos, ESC, receiver, and battery by just laying out the components on the top of the wing and test-balancing the aircraft each time you shift them around.

The RimFire 250 (28-13 1750 Kv) motor and the 7 x 5 propeller assembly was screwed into the motor mount with screws long enough to penetrate the foam. I cut small holes in the fuselage bottom piece to allow the wire from the ESC to reach the battery on the opposite side of the fuselage and the servo wires to connect to the R2006GS receiver. A 5-inch strip of hook-and-loop material for the battery anchor was hot glued to the left side of the fuselage running from the rear of the nose doubler on the back.

I used two Dynam 7-gram servos (one on each side) mounted against the fuselage bottom piece and hot glued to the bottom of the wing 8-1/2 inches back from the front of the motor mount. Because the airplane has elevons, you will need to activate the

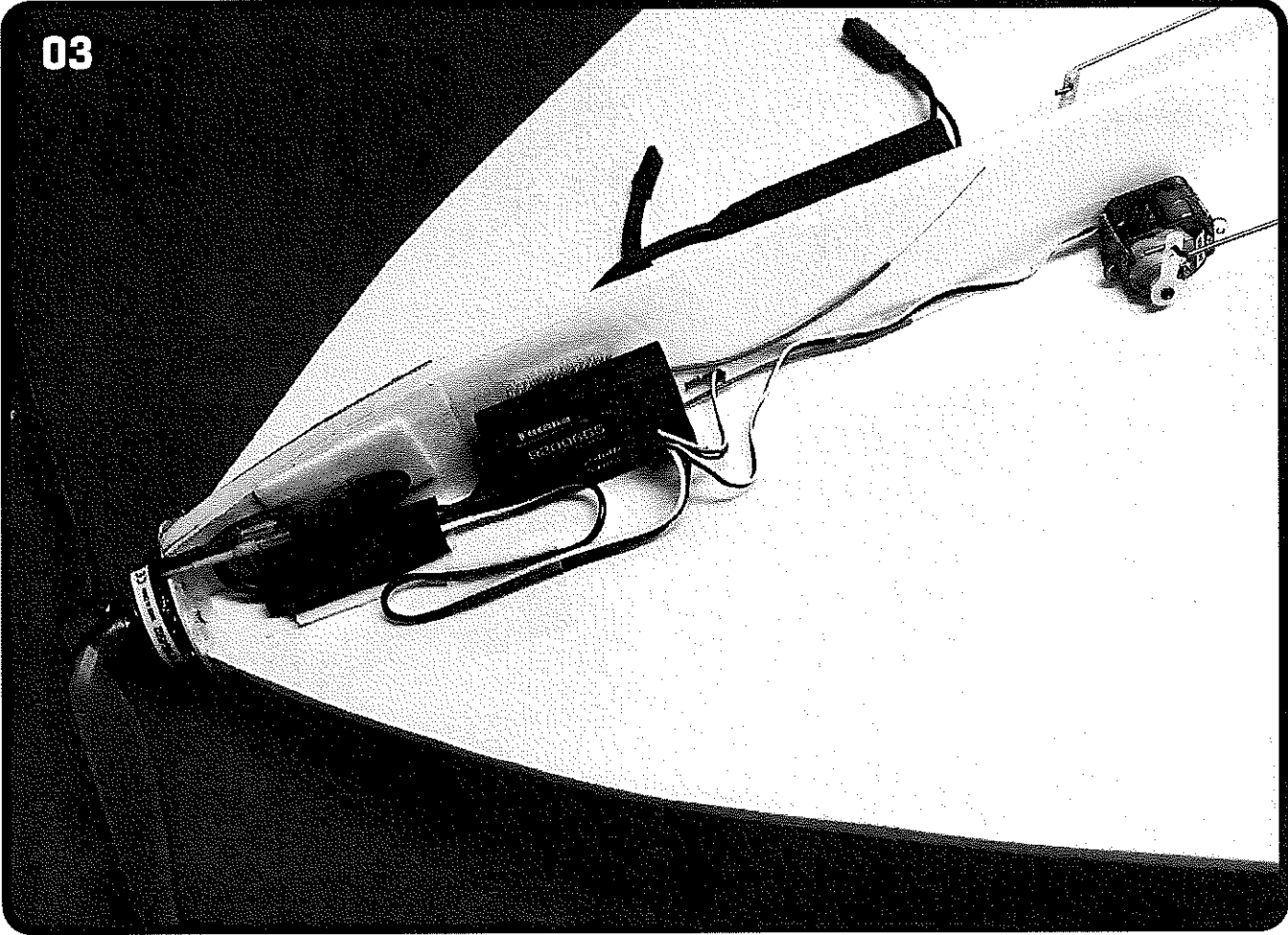
Finishing the Model

After the construction was complete, I was faced with giving the model some character with a color scheme and details. That problem was compounded because the airplane was never actually built, so it had no color scheme or details to replicate! However, because I had always been enamored with the all-white winter camouflage scheme used by Russia in the 1940s on MiG-3s and Ilyushin Il-2 Shturmoviks, and because the airplane was already foam-board white, the task became easy.



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03



them off to the side.

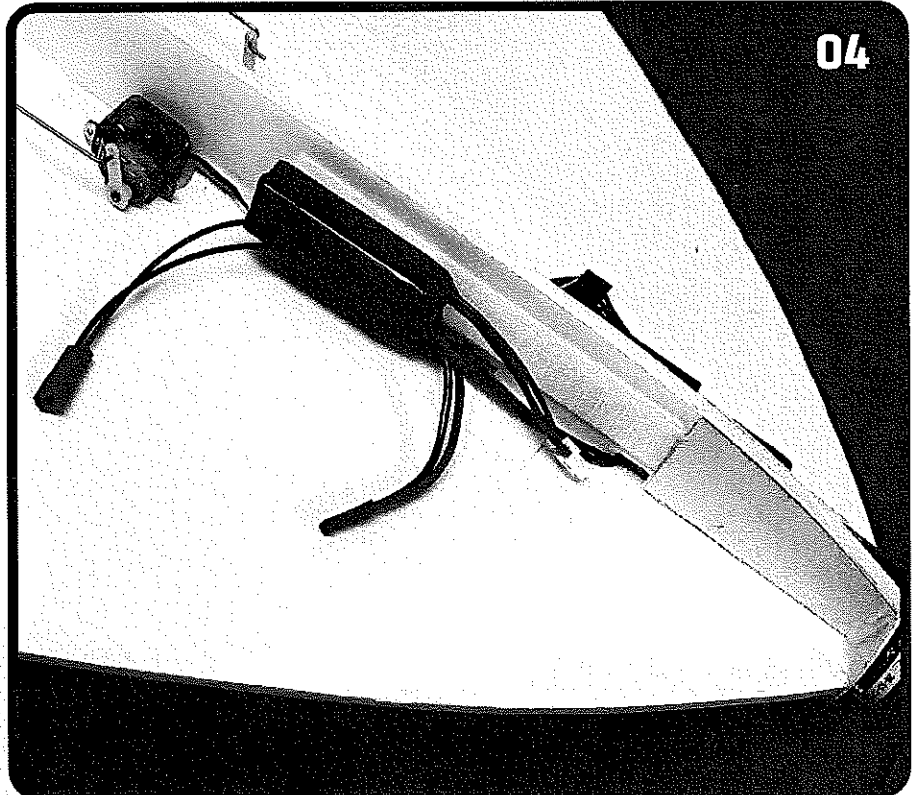
Fold the two surfaces you just joined back over each other (keeping the edges even) and apply the short pieces of tape perpendicular to the joint. Space them out so that they support the surfaces equally and rub them into place.

You can then flatten out the surfaces. Flex the elevons several times to make sure that the joint moves easily then smooth the tape pieces again to remove any bubbles or wrinkles. Treat the second elevon joint the same way and that will finish the RM-1's basic construction.

Power and Control Installation

Surprisingly, placement of the power and radio components on this model is not particularly critical because its center of gravity (CG) is located at 39% of the root chord. There's room to maneuver, but everything should be placed as much as possible ahead of the CG location, which nominally falls at 10 inches aft of the front of the motor mount.

04





The only things that required painting were the motor mount and the two nose doublers. One of my club members, Dan Nicar, does some outstanding vinyl cutting and was kind enough to cut the red stars to my specifications. I finished the model with a printing font from my computer and a MonoKote canopy. Control surface lines on the rudder and fuselage separation lines were inked in.


The RM-1 in the Air

Having mentioned that weight is the enemy, I was happy to find that this model weighs an even 6 ounces, which certainly contributes to its fine flying characteristics.

Immediately after finishing the airplane, I waited for a calm evening, shortly after sundown, to at least try the model in my front yard. I set the low rates at 70% with 25% exponential.

At less than half power, with two clicks of up-elevator and an underhanded release, the little airplane made a full circle at approximately waist high and landed at my feet. The next evening, I managed to get to our local flying field shortly before sundown, after the wind had dropped to roughly 5 mph.

I applied a little more power with the same elevon setting and an underhanded launch resulted in a full 5-minute flight that proved how stable the aircraft was, and yet how maneuverable it could be.

Subsequent photo flights the next morning, in the hands of two additional club members, Leonard Baker and Harold Anderson, showed what a solid performer Moskalev's planform proved to be—more than 75 years from what might have been. 

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