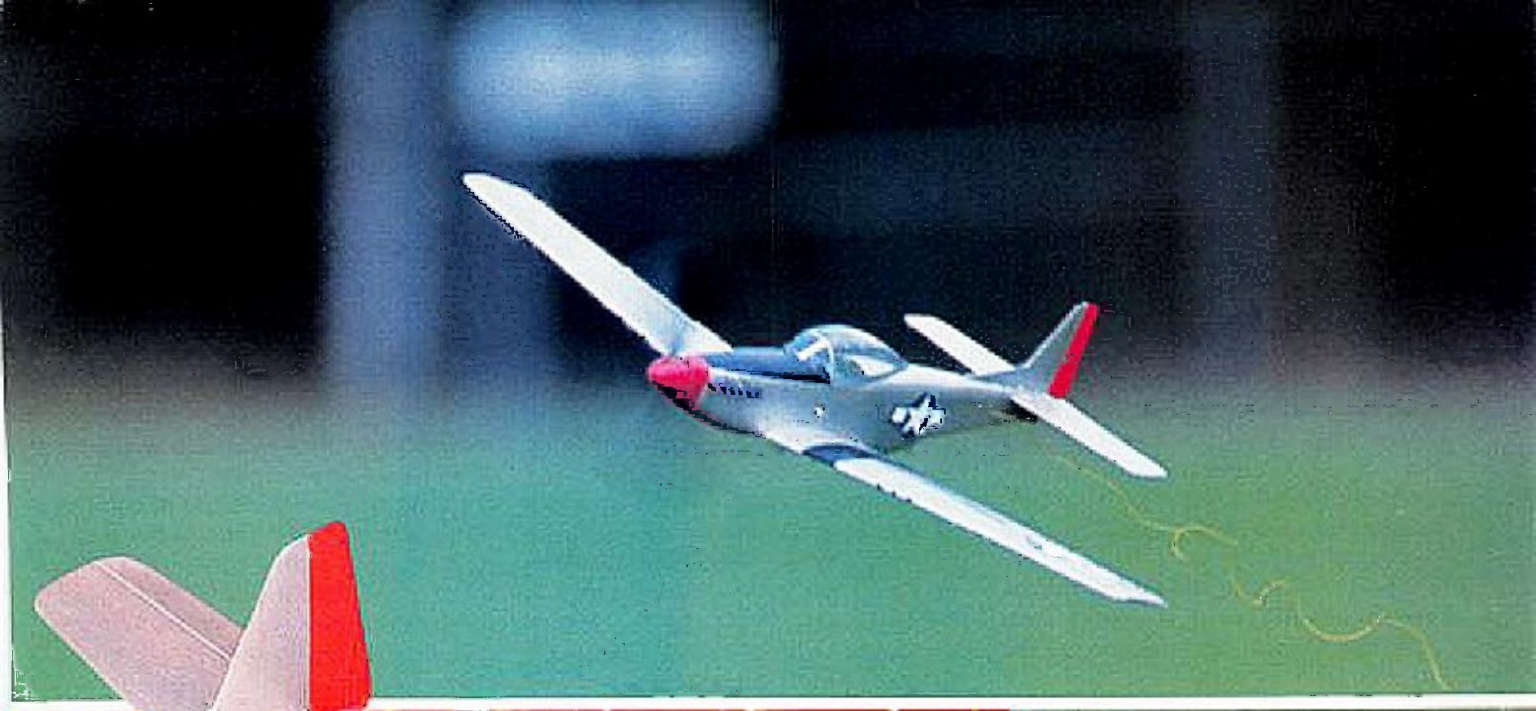
Designer Dave Robelen was kind enough to ship his model to us for a photo session. Pilots Chris Chianelli and Gerry Yarrish were amazed by this model's smooth flight performance.

BY DAVE ROBELEN

In all my years of modeling, I had never built a scale P-51 Mustang; odd, as it is one of my all-time favorite machines. I decided to develop this model from the late Fred Reese's ½A P-51D model design, with some subtle changes to simplify construction and enhance the model's flight qualities. The resulting model flies great, and its resemblance to its full-scale counterpart is acceptable. Many construction articles start by giving some historical background, but in this case, I'll assume that everyone is familiar with the venerable P-51 and get on with it. *continued on page 90*

BUILD YOUR OWN PINT-SIZE P-51

Micro Mustang



IN THE AIR

Since you have invested so much work in this little cutie, please be patient and test-fly it in fairly calm weather. I searched out a field that had some tall, soft grass for the first flights, and I recommend that you do the same. With the motor at full power, give the Micro Mustang a level shove, not a baseball pitch—and don't drop it. Mine was in decent trim right from the start, so I let it climb to about a 75-foot altitude while I sampled the control responses. I was pleasantly surprised that it felt like a smooth aileron trainer.

I've found that the best technique for performing maneuvers is to start a little high and then drop the nose after a few moments to build up speed (very realistic, really). The roll rate is smooth and comfortable with the movements shown on the plan, and the loops are not especially tight. When I make a firing run on the weed patch with the "Merlin" howling, I can almost see the muzzle flashes from the .50s! Power off, the glide is very flat with a smooth flare. The cruising speed is about 20mph, with a top of maybe 25 to 27mph and a landing speed of between 12 and 15mph. Moderate breezes are no problem—especially in an open area away from tricky turbulence.

SPECS

Model: Micro Mustang

Designer: Dave Robelen

Type: sport-scale

Flying area: outfield

Building/flying skill level: advanced

Wingspan: 17.5 in.

Wing area: 54 sq. in.

Length: 15 in.

Weight: 66g

Power: DC5-2.4 motor geared 4.2:1

Prop: 5.2 to 5.5-in.-dia. plastic Peck-Polymers

Channels: 3 (aileron, elevator, ESC)

Radio equipment used: Sky Hooks & Rigging Pro receiver, WES-Technik 2.4 servos and (modified) FMA Mini 5 ESC

Battery: 5, 50mAh Ni-Cd cells

Flight duration: 4 minutes

Comments: traditional balsa and ply construction; flight characteristics are very realistic, with a fairly fast cruise speed and smooth maneuvering, along with sufficiently gentle landing characteristics.

To order the full-size plan, turn to "RCStore.com" on page 100.

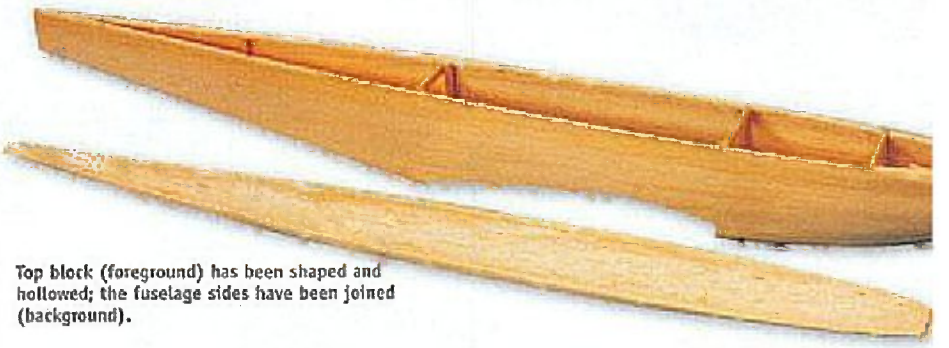
My model is powered by a DC5-2.4 motor that's geared 4.2:1 and spins a 5.2x5.2 homemade propeller. You can trim a Peck-Polymers 6-inch prop to this diameter as an alternative. A 5-cell, 50mAh Ni-Cd pack provides flights of at least 4 minutes.

My RC equipment consists of a Sky Hooks & Rigging Pro receiver along with two very early WES-Technik servos and an FMA Direct Mini 5 ESC that I rewired to reduce weight. I fly this package with a Hitec Prism 7X transmitter with a Spectra module, which offers me superb setup capabilities and the flexibility of quick frequency changes on the field.

The Micro Mustang is set up for ailerons and elevator; this is a very smooth way to fly a low-dihedral, low-wing model. The flight qualities are really sweet; the rate of climb is about 200 feet per minute, and it handles like a much larger model.

CONSTRUCTION

The most important thing to remember is that weight is critical! No part of the Micro Mustang needs heavy or hard balsa; the density should be no more than 5 to 7 pounds per cubic foot. The fuselage sides and wing ribs should be cut from the stiffer C-grain stock. The rest of the wood can be very light, clear-grain stock. Be sure to remove all of the unnecessary material from the inside of the blocks and nose. I used a Dremel tool with a large grinder point. The goal is to end up with a wall thickness of between 1/32 and 1/16 inch.



Top block (foreground) has been shaped and hollowed; the fuselage sides have been joined (background).

• **Wing.** The basic wing is really quite simple: just ribs and sticks with a little sheeting. Build it first, because you'll need to fit it to the fuselage later. I used medium CA sparingly for all of the construction. The leading and trailing edges (LEs and TEs) are stripped out of 1/8-inch-thick balsa. Note the taper in the LE and that the TE is cut to include the ailerons at this stage. Carve and sand the taper into the TE first. When you cut the ribs, use a glue stick to laminate two sheets of wood and the pattern for each rib station. Pop them apart shortly after cutting but before the glue has had a chance to set hard. Strip the spars out of stiff but light 1/16-inch-thick balsa. Put a layer of wax paper over the plan and start sticking things down with pins. I like to clamp the LEs and TEs first, then the bottom sheeting, then the ribs. All dry? Great; go ahead and glue the spar in along with the top sheeting. Remember, the little wedge on the LE makes the Mustang wing distinctive. After everything has dried, sand the panels smooth, shaping the LE and cleaning up the "bumps" around the ribs. The panels are joined with a simple butt joint; sand them to fit, and glue them without any braces or cloth. Cut the tip blocks out of very soft balsa and glue them into place.

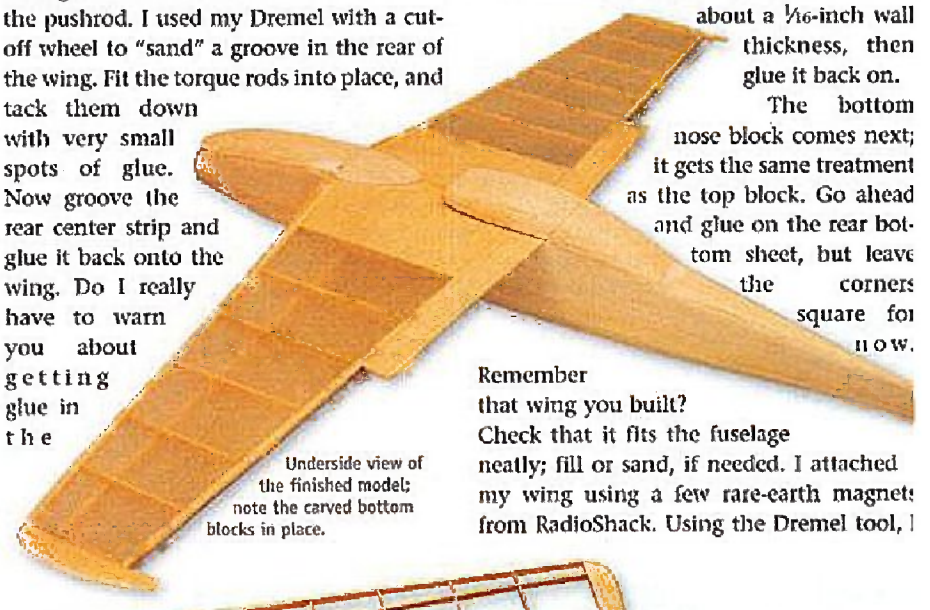
Depending on your servo choice, the center-section "hole" may vary a little in size. Cut away the top sheeting and center ribs where shown. Use a straightedge and a sharp knife to carefully slice off the ailerons and center TE together in one piece. Cut the ailerons free, and trim the ends a little for clearance. The torque rods are made of 0.020-inch music wire. The bearing tubes are several lengths of hypodermic needle tubing that are slip-fit over the wire. For a linkage connection, I folded the wire into a tight loop, shrank some narrow heat-shrink tubing over it and then drilled a hole for the pushrod. I used my Dremel with a cut-off wheel to "sand" a groove in the rear of the wing. Fit the torque rods into place, and tack them down with very small spots of glue. Now groove the rear center strip and glue it back onto the wing. Do I really have to warn you about getting glue in the rods? Sand a bevel on the front of the ailerons, and set them aside.

I covered the open sections of my wing with a fine grade of tissue attached with a light smear of Elmer's School Gel. When the glue had dried, I shrank the tissue by spraying it lightly with rubbing alcohol, then finished it with two coats of Krylon clear spray lacquer.

• **Fuselage.** The fuselage should begin as a pair of side assemblies with all of the edge strips, vertical braces, wing saddles, etc., glued on. All of this bracing should be of the lightest stock you can find. Starting at the wing's LE and TE, join these two assemblies with the cross-braces, checking alignment from here on. Pull the sides near the tail together and join them; then join the sides near the front bulkhead. I made a spinner ring out of 1/64-inch-thick plywood. Find a very light balsa block and cut out the top nose block to both the side and top shape. Tack-glue it onto the sides and carve or sand away anything that does not look like a Mustang. Pop it off, hollow it out to about a 1/16-inch wall thickness, then glue it back on.

The bottom nose block comes next; it gets the same treatment as the top block. Go ahead and glue on the rear bottom sheet, but leave the corners square for now.

Remember that wing you built? Check that it fits the fuselage neatly; fill or sand, if needed. I attached my wing using a few rare-earth magnets from RadioShack. Using the Dremel tool, I



Underside view of the finished model; note the carved bottom blocks in place.

Ailerons have been cut free after being shaped.

trimmed out neat holes in the top of the wing at the TEs and LEs that just fit these magnets. I then glued the magnets into the wing, flush with the surface. The next move is to fit and glue a few cross-members into the fuselage that have small scraps of 1/32-inch-thick steel glued on them. These should be positioned so the magnets just touch them as the wing is seated. With the wing in place, you can cut, shape and install the radiator blocks on the bottom (note the slanted separation line).

• **Tail.** The tail surfaces are cut out of light, 1/16-inch sheet and sanded to a streamlined airfoil. The elevator joiner is a length of 0.020-inch-diameter wire. I made my hinges out of 0.005-inch-thick Mylar drafting material cut 1/8 inch wide. I used thin CA to install the joiner and hinges. When you finish, check to be sure the elevator moves freely; the little servo should push against air—not stiff hinges!

With the wing in place, make sure that the horizontal tail lines up. Now glue on the vertical tail and check that it's square. It's beginning to take shape, right?

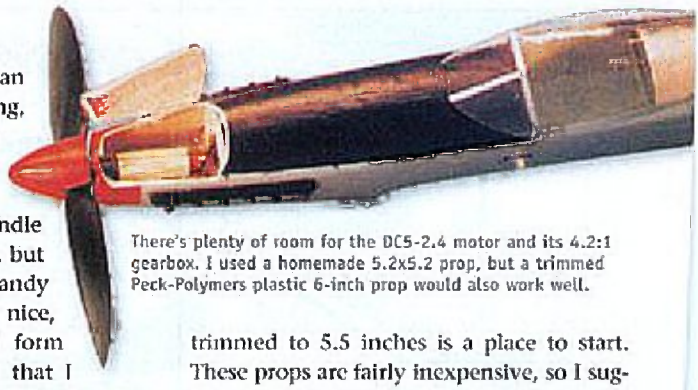
FINISHING

Start with one coat of lacquer sealant on all of the bare balsa parts (remember those ailerons?). When they have dried, smooth them with 400-grit sandpaper. The idea is to leave a film of sealant on the wood and to sand away the fuzz. Next, lightly coat all of these parts with Krylon clear spray and let them dry thoroughly. Decision time! You now need to select your color scheme. I chose a very basic version that I could match with auto touch-up spray lacquer. If you go with an OD finish or camouflage, check out model railroad paints (especially Floquil).

My basic philosophy was to put only one layer of paint on any surface. When I painted the silver coat, I masked off everything that was not going to be silver, and so on, until I had the basic colors on. Another trick worked well for me: I sprayed the auto paint from the can into the bottle of my airbrush and then used that to spray the airplane. The result was that each color added only 1 gram.

I made my insignia from trim MonoKote. Before cutting out the parts, I rubbed the MonoKote thoroughly with steel wool to give it a nice, dull finish. I then taped several layers of the MonoKote and a pattern to my cutting board and cut them out with a sharp hobby knife. I decided to make a solid blue part and fasten the white pieces to it before I mounted it on the airplane.

By now, you should be an expert at carving and shaping, so round up a block of firm balsa, and shape your canopy from it. I glued a 1/4-inch-diameter dowel handle to the bottom of my block, but you can stick whatever is handy under there; just make a nice, solid joint. I finished my form with one coat of thin CA that I sanded smooth after it had dried. For the canopy, I stapled a clear plastic blister pack that was larger than the canopy onto a frame made of scrap plywood. For the next step, put on some thick gloves and clear off a burner on the electric stove. Turn the burner on high, and when it begins to glow, hold the plastic at a height of 8 inches over the burner until it gets nice and limp. The next move has to be quick: tilt the plastic and quickly plunge your mold into it. Too slow? Reheat it and try again until the form is covered neatly with the plastic. Bingo! A nice custom canopy. Mine weighed 1.2 grams after I trimmed it to shape. I decorated mine with a combination of enamel paint and trim MonoKote. Use RC-56 glue to attach it to the fuselage.



There's plenty of room for the DC5-2.4 motor and its 4.2:1 gearbox. I used a homemade 5.2x5.2 prop, but a trimmed Peck-Polymers plastic 6-inch prop would also work well.

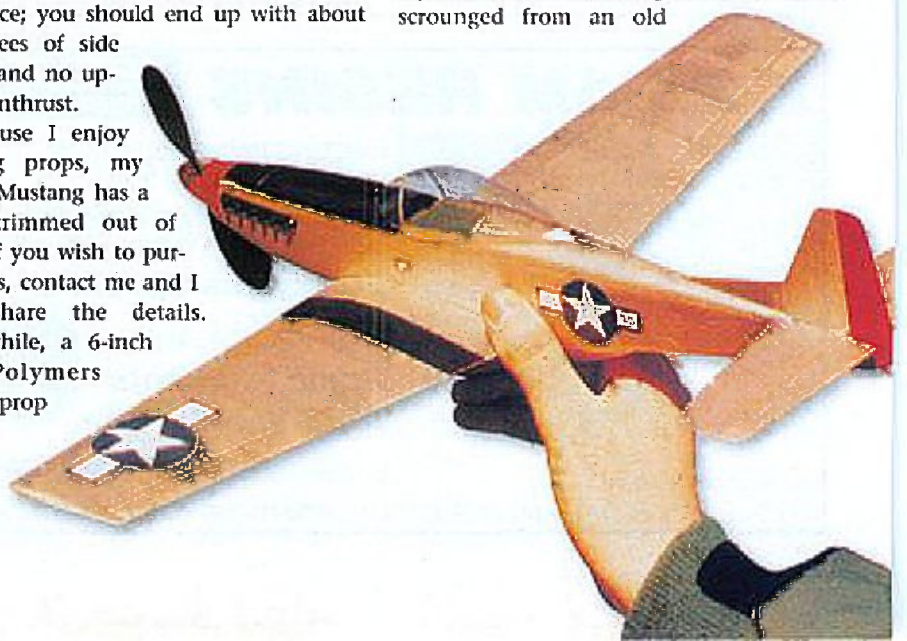
MOTOR AND RADIO INSTALLATION

This is a good time to make up and mount the motor package. I used a DC5-2.4 motor from Todd's Models and a 4.2:1 gearset available from Cloud 9 RC and David Lewis. The gear shaft runs in a 1/16-inch-o.d. brass tube that's mounted on the motor with a balsa spacer to give the proper gear mesh. My unit has a thin wire protruding from the face of the large gear to provide a prop drive; see the plan for more details. I mounted my motor on the bottom nose block with a balsa-block spacer. Trim it with the Dremel tool for proper spacing and clearance; you should end up with about 2 degrees of side thrust and no up- or downthrust.

Because I enjoy carving props, my Micro Mustang has a prop trimmed out of pine. If you wish to pursue this, contact me and I will share the details. Meanwhile, a 6-inch Peck-Polymers plastic prop trimmed to 5.5 inches is a place to start. These props are fairly inexpensive, so I suggest that you get several and try various diameter and pitch combinations. Just for reference, my prop has 5.2-inch pitch, and the static rpm at full charge is 3,950.

The spinner is a prominent detail on the Mustang, and the basic material is a medium-soft balsa block. I glued a dowel to the back and spun this in a drill to trim it to shape. I used thin CA to put two layers of thin fiberglass cloth on the spinner and sanded it well. I also painted it while it was still on the stick. The next step was to cut the dowel off the back and hollow away most of the balsa with the Dremel tool. Going slowly, I cut the openings for the prop blades until the spinner fit without wobbling. Hot glue worked well to attach the spinner to the prop, but silicone glue would work well, too.

Set the fuselage aside at this point so you can hinge the ailerons and attach the torque rods. I used only one hinge on each and made sure that the torque rods were glued tightly. This whole system must be bind-free yet not sloppy. Because my servo has only one output, I mounted a thin plywood bellcrank near the wing LE and connected both torque rods to this with 0.015-inch-diameter music wire. I then connected the servo output to the bellcrank with another piece of 0.015-inch wire. If you are careful with the bends, both ailerons will be at center when the servo is centered. I cut the plug on my aileron servo off a strip connector that I scrounged from an old

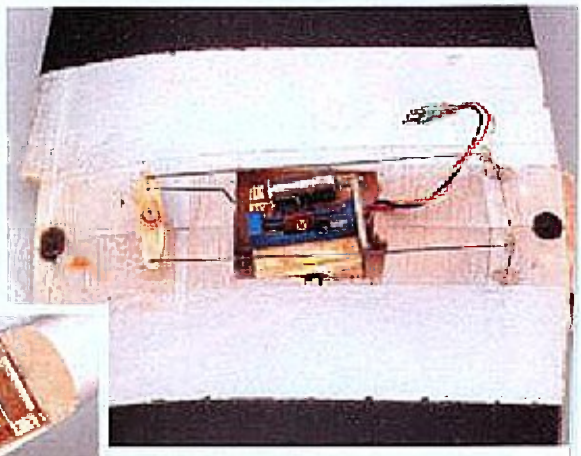


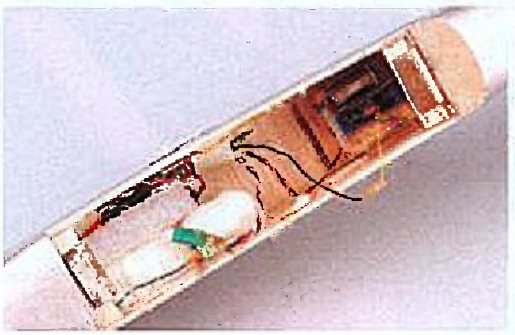
computer. You could also use the "unisex" connectors sold by Cloud 9 RC.

Mounting the equipment in the fuselage is mostly a matter of shifting the parts around until the little Mustang balances where shown on the plan. My elevator servo is in the rear with a 0.020-inch-diameter music-wire pushrod attached to a thin plywood horn on the elevator. The receiver and ESC are on one side of the cabin; the battery is on the other. I used a few dabs of hot glue to hold the battery in place. Make sure that the aileron system works smoothly with the wing mounted; it is kind of snug in the cabin. As we are using ailerons for control, please verify that they are moving in the proper direction!

CONCLUSION

The Micro Mustang makes a very entertaining little park flyer. The construction is straightforward, though its small size makes building a bit more challenging. This little plane is a joy in flight; it behaves like a larger model and is quite smooth. If you have some micro experience, try building one of your own. You can climb up and cruise while you watch for the "Hun in the sun" right in your own neighborhood. Enjoy, and let me know how you are doing—you can contact me via email at backyardflyer@airage.com. ⊙





Right: before you cover the fuselage, you'll need to trim the center opening to accommodate the aileron servo. Notice how this linear-output servo is attached to a straight bellcrank that transfers the force to the two aileron torque tubes—a neat setup! Below: inside the fuselage, the Sky Hooks Pro receiver, FMA Mini 5 ESC, 5-cell Ni-Cd pack and WES-Technik servo (without its case) fit snugly beside one another. The receiver, ESC and servo are held in place with double-sided tape; hot glue holds the battery securely.

Cloud 9 R/C, (703) 273-0607; jwc9@mindspring.com.

David Lewis, (216) 251-2517; dlewis@homefly.com; www.homefly.com.

Dremel Tool, (414) 554-1390; www.dremel.com.

FMA Direct, (800) 343-2934; www.fmadirect.com.

Hitec RCD Inc., (858) 748-6948; www.hitecrcd.com.

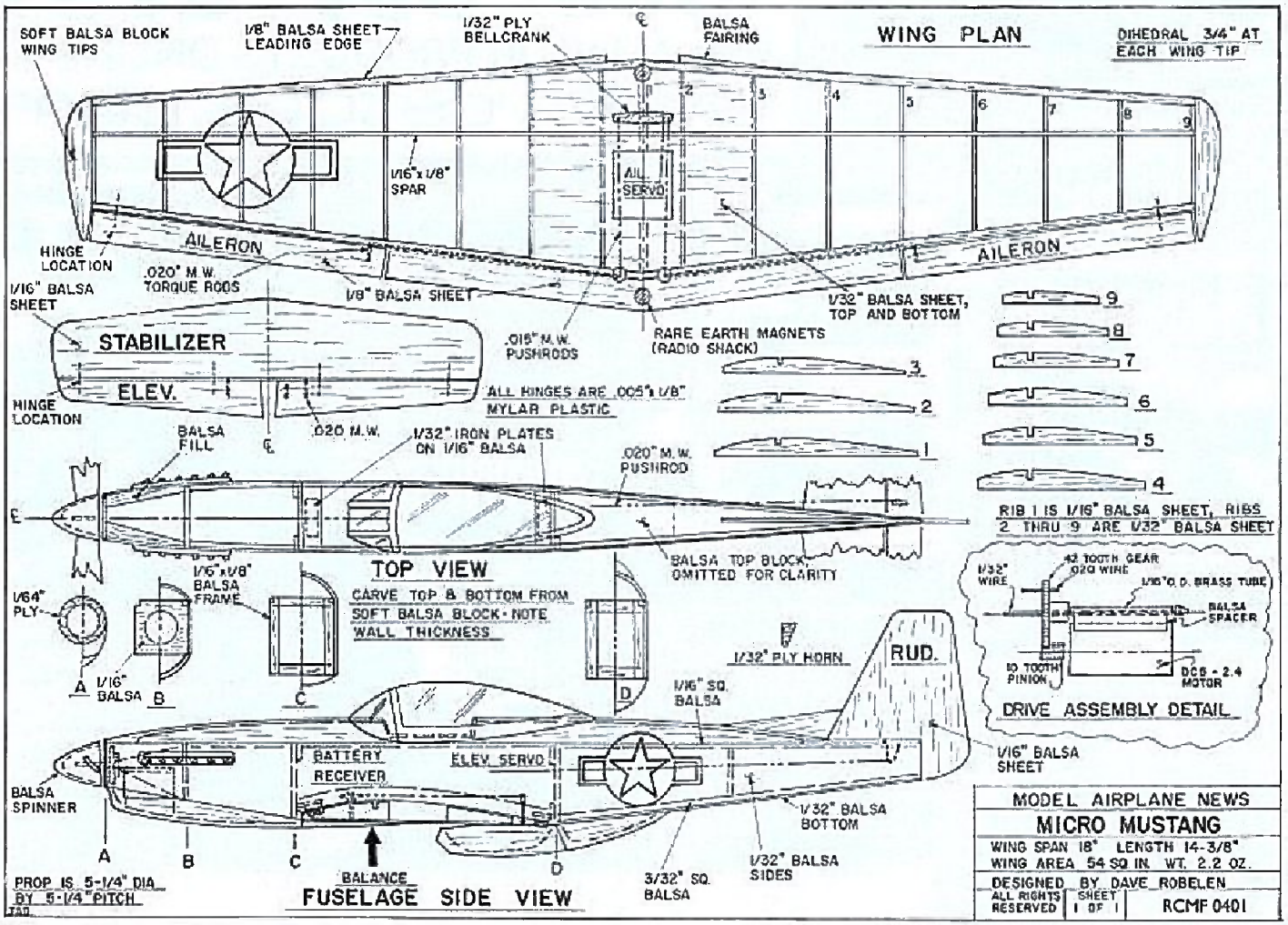
MonoKote; distributed by Great Planes Model Distributors Co., (800) 682-8948; www.greatplanes.com.

Peck-Polymers, (619) 448-1818; www.peck-polymers.com.

Sky Hooks & Rigging, (905) 257-2101; info@microrc.com; www.microrc.com.

Todd's Models, (425) 888-8530; todd@toddsmodels.com; www.toddsmodels.com.

WES-Technik; distributed by David Lewis; Todd's Models; and Sky Hooks & Rigging.



To order the full-size plan, see "RCStore.com" on page 100.