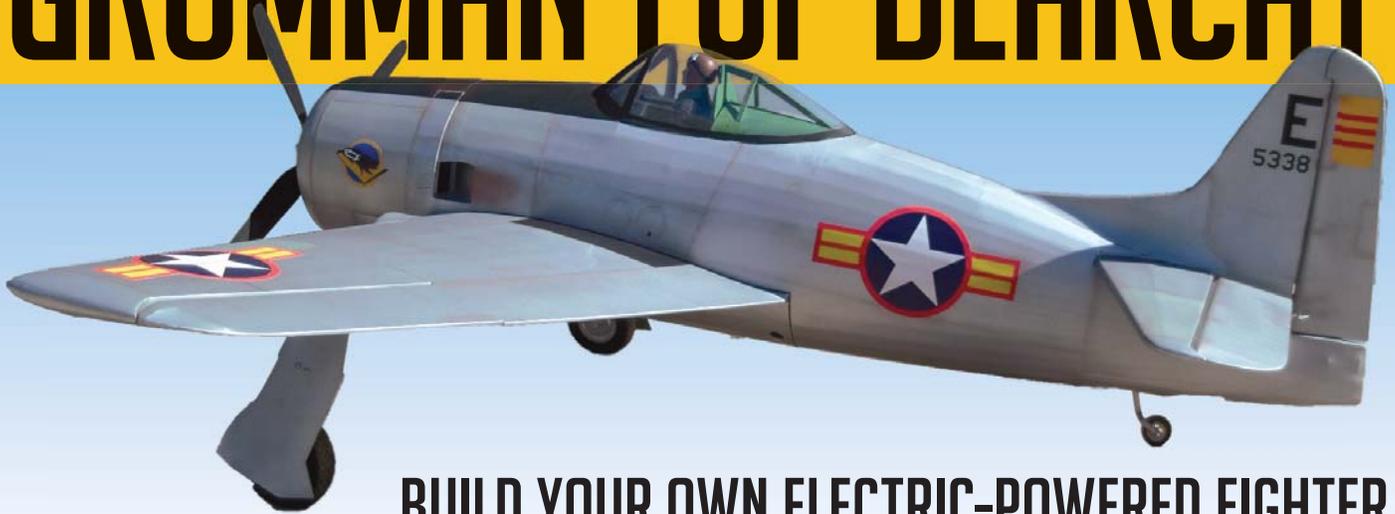


GRUMMAN F8F BEARCAT



BUILD YOUR OWN ELECTRIC-POWERED FIGHTER BY DEREK MICKO | PHOTOS BY THE AUTHOR AND JOE BALABON

The F8F Bearcat was the final piston fighter produced by Grumman. The initial concept came from a meeting in 1943 with combat veterans from the Pacific theater and Grumman Aircraft. The pilots emphasized the need for maneuverability and climb rate to best combat Japanese aircraft—specifically the Zero.

Because the most powerful engine at the time was the Pratt & Whitney R-2800 and the Hellcat used the same powerplant, the design focused on creating the smallest and lightest airframe to mate with the engine, resulting in the Bearcat. It was significantly smaller, faster, and lighter, and had a higher climb rate than that of the Hellcat.

The design had several unique features. It was the first carrier aircraft in the U.S. Navy to feature a bubble canopy. The wide-track landing gear made for easier takeoffs and landings. It also had a “knuckle” hinge feature that allowed the struts to fold onto each other during retraction.

The initial prototypes and production aircraft had breakaway wingtips when the aircraft exceeded 7.5 Gs to help reduce structural weight in the wings. This option was impractical in the field and was later removed from production.

The Bearcat was too late to see action in World War II, but

did see combat with French forces in 1946. In addition to the U.S. Navy and Marines, the Bearcat also flew in the Taiwanese and South Vietnamese forces.

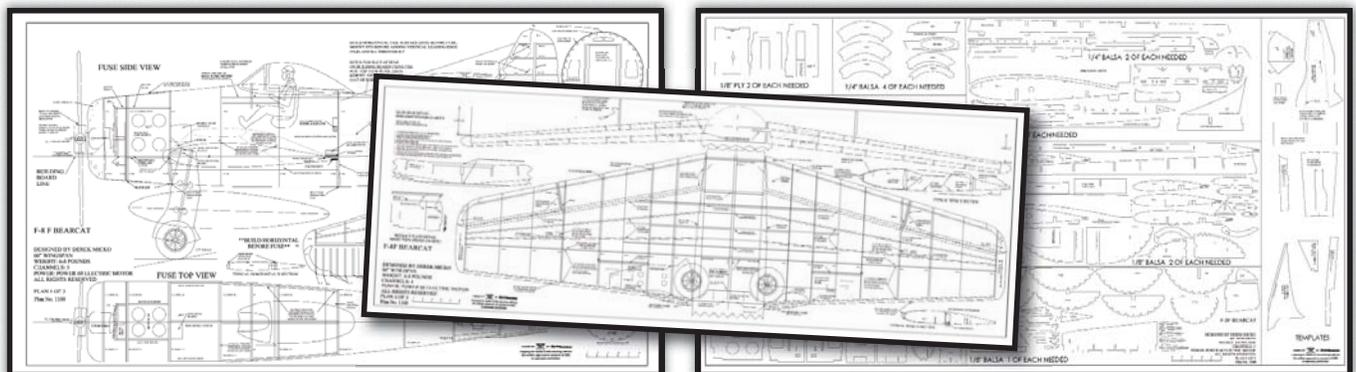
The Model

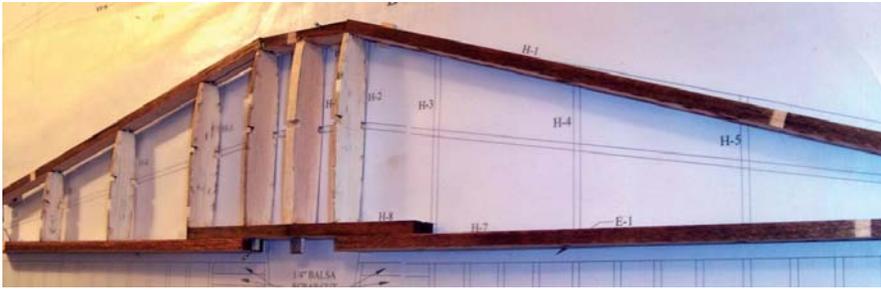
Similar to some of the designs I have done in the past, the Bearcat is a continuation of my Fun Scale series. It is designed with exacting outlines, but features a stick-and-tissue Free Flight stringer look. It is an accurate-looking model of the full-scale aircraft, but with a lower wing loading for gentler flying. The model features CAD-designed interlocking parts and is built using plywood, light plywood, basswood, and balsa.

The motor is a Power 60 with an 80- to 90-amp ESC, and a 5,000 6S LiPo battery. The design allows for an all-up flying weight of 8 pounds, resulting in a wing loading of 23 to 24 ounces per square foot.

The prototype utilized a large, four-blade propeller from an FMS 1,700mm P-47, and main gear struts/tail wheel retract from the FMS 1,700mm P-51. The main gear retracts are standard 90° 3.5 kg units, but 85° would make for a more scalelike appearance.

The plans are currently available from *Model Aviation* and the AMA Plans Service. Should you choose not to cut the

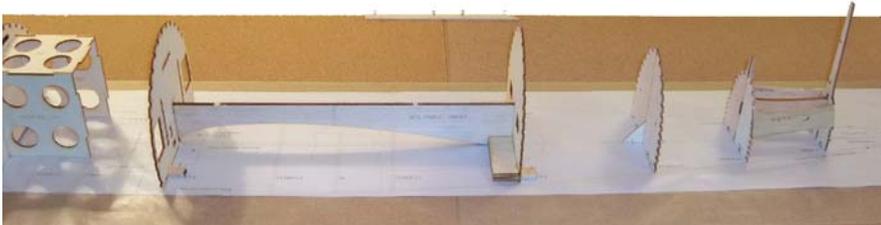




The start of the horizontal stabilizer construction. All parts can be built over the plans.



The elevator is dry fitted together. Note the 1/4-inch square scrap under the TE.



The main fuselage subassemblies. The horizontal mounting plates have been added to F-8 and F-9 and the wing mounting plates and wing saddle center have been installed.



The 3/16-inch square balsa stringers and outer wing saddle have been added.

parts yourself, Manzano Laser Works sells the parts in a short kit. This also includes a canopy and dummy radial engine from Park Flyer Plastics.

Construction details will cover the main points of building the model and are excerpts from the construction manual. The full manual is available for download on Manzano's website as well as on www.ModelAviation.com.

Construction

Horizontal, fuselage, and rudder: Construction begins with the horizontal. The parts have tabs on them to allow the modeler to build them on a board over the plans. Dry fit all of the H parts over the plans and glue them after you are satisfied with fit and alignment. Add the wingtips and 1/8-inch basswood stringers.

The elevator trailing edge (TE) is made from a 1/2-inch strip of 1/8 balsa sheet. Glue E-7 to one end and trim according to the plans.

Cut several shims from 1/4-inch balsa and pin them to the board so that the TE can sit on top of them. Place E-1 flat on the table and tab in E-2 through E-8. Carefully dry fit the TE into the cutouts on the ribs and place the assembly over the plans with the bottom of the TE resting on the top of the 1/4-inch shims. Glue the elevator assembly at this time.

The fuselage is built over the fuselage top view and has several subassemblies. Glue wing mounting plate 4 together and make two separate assemblies of wing mounting plate 2. Glue two F-2s together to make one 1/4-inch piece. Take care to ensure that all of the slots and holes are aligned.

For these subassemblies, I used wood glue for a stronger bond. Pin formers F-7 through F-10 to the board over the plans. Be certain that the notches in F-9 and F-10 for ribs R2 and R3 are situated on the same side.

Slide the horizontal mounting plate center into the center slots on F-8 and F-9 and tack-glue them in place. Test fit the horizontal between F-8 and F-9 and the horizontal mounting plates. Ensure a good fit and make sure the alignment is correct and level. Adjust and sand as needed.

When you're satisfied with the fit, remove the horizontal and glue all of the parts in the subassembly together. Slide the F-2 assembly (dry) onto the motor box left and right and add the motor box top rear. When the fit and alignment are correct, use wood glue to secure the assembly.

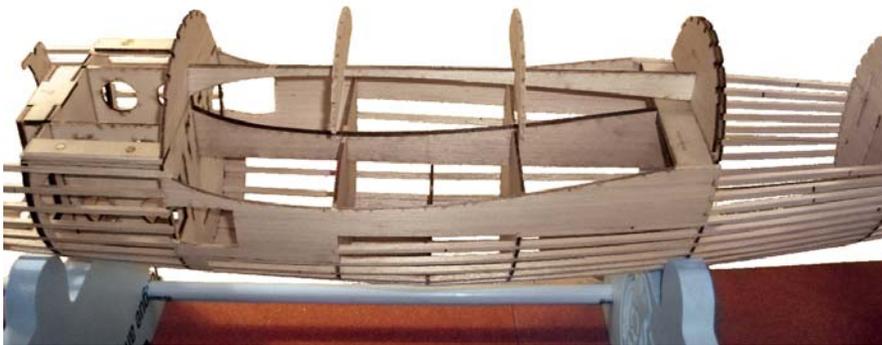
Glue the two firewalls together, noting that the marking lines match up. Dry fit the firewall, motor box top, front, and bottom in place, noting the down- and

SPECIFICATIONS

Wingspan:	60 inches
Length:	48 inches
Flying weight:	6 to 8 pounds
Wing loading:	23 to 24 ounces per square foot
Power:	.60-size electric brushless motor; 80- to 90-amp ESC; 5,000 6S LiPo battery
Radio:	Five to six channels



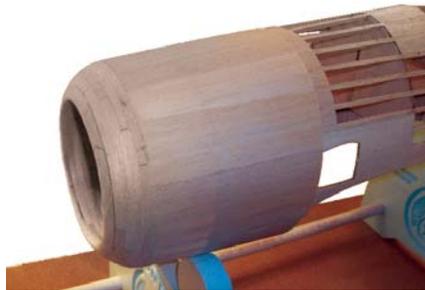
A closeup of the stringers and the horizontal stabilizer mounting plates show that the horizontal mounting plate outer has been notched for the stringers and the bottom has also been trimmed.



Bottom formers and belly pan parts have been added. The hatch rails on the left have been contoured and the magnets added.



The cowl ring has five layers with four parts for each layer.



The cowl ring has been added and contoured. The cowl has been sheathed with 1/32-inch balsa. You can also see balsa "infill" behind the cowl and around the canopy area. This will allow for better covering adhesion.



Here you can see the composite main spar assembly. A 1/2 x 1/8-inch basswood plank has been glued to the bottom of main spar A. The wing's TE (from W-10 and a lamination of 1/2 x 1/8-inch balsa and 1/8-inch square basswood) assembly is below the main spars.

right-thrust angles. When you're satisfied with the fit, bond it with wood glue.

Glue the wing mounting plate-4 assembly into F-6 and wing saddle center into F-6 according to the plans and pin it to the board. Slide F-3, F-4, IP, IPA, and F-5 in place and glue when it is ready. Slide the F-2 and motor box assembly into the front of F-3 and glue it in place with wood glue. Pin F-1 in place. Starting with the topmost stringer (stringer 1), glue in place the top four 3/16-inch square balsa stringers, alternating on each side.

These stringers go from F-1 to F-8. On stringers 5 through 7, you will need to cut a notch in the horizontal mounting plate outer to receive them. Add the wing saddle outers following the plans. Install stringer 8 and trim the bottom of the horizontal mounting plate outer. Stringer 9 should sit on top of the wing saddle outer and go from F-5 to F-10. Install the 1/4 x 1/8 magnets in the hatch rail upper and glue them in place. Add the remaining stringers on the top half of the fuselage.

Hinge the elevator and horizontal and dry fit the U-shaped 1/8-inch piano wire. Cover the horizontal and elevators with your lightweight material of choice. I used Coverite Microlite iron-on film. "Standard thickness" covering film is not recommended.

Test fit the horizontal in place and check for alignment. Glue it into place when you are satisfied. Dry fit R-2 through R-4 in place. Test fit the vertical LE and the remaining vertical parts and glue when you are content with the fit. Carefully contour and sand the vertical LE and R-7.

Slide R-2A through R-6A and R-10 in the slots on R-9. Add RP to the assembly and glue the parts together with R-8 on top and contour. With the fuselage still pinned to the board, lightly sand the overall structure.

When you're ready, unpin and remove the assembly from the board. Place the fuselage upside down in an adjustable airplane stand.

Add the wing mounting plate 2 assemblies into the slots on the rear of F-3. Add the pushrod sleeves in place through F-7, F-8, and the horizontal mounting plate outer. Glue F-6A in



The main left panel is nearly complete. The top 1/8-inch basswood stringers will be added after the two wing halves are joined.

position, noting the angle according to the plans. Add F-7A and F-8A at this time.

Glue the tail wheel mounting plates together and install both the tail wheel retract and the steering servo. Trim away plate material for the strut and test to ensure retraction and left/right movement. With the strut in the extended position, dry fit the tail wheel assembly into F-8A and test fit F-9A. Sand or bevel the parts as needed for a good fit, then glue into place.

Add the remaining bottom formers, wing saddle bottom, and hatch rail lowers according to the plans. Add the bottommost (center) 3/16-inch balsa stringer from F-1A to F-10A. Alternating sides, add the remaining bottom stringers.

When it is complete, cut the belly pan and the hatch from the fuselage and sand as needed. From F-3/F-3A forward, sheet with 1/32-inch balsa. Using scrap 1/8-inch balsa, infill behind F-3 and around the tail wheel area and remove a precut section of F-9A for the tail wheel retraction. Sheet the lower rear section vertical according to the plans with 1/32-inch balsa. Build the cowl ring per the plans, glue it in place, and contour.

Wing

The wing also has several subassemblies. Create the wingtips and the wing mounting plates. Following the notes on the wing plan main spar detail, glue a 1/2 x 1/8-inch basswood plank to the bottom of both main spars and trim according to the plans. Cut two strips of 1/2 x 1/2-inch balsa and trim following the plans for the wing's TE. Glue a 1/8-inch square basswood stringer to the forward edge and add W-10, but allow a little extra length at the center section (wing mounting plate 3 will sit on top of this overhang).



The retracts and struts are mounted and the 3/16 piano wire extensions have been installed. Block in around the strut with scrap balsa and basswood.

Pin the main spar, main 1/8-inch square basswood stringers, and the rear spar over the plans. Note the rear spar's height tabs on the bottom. Slide the sub spar into the forward slot on W-4, and then slide this assembly into place.

On the wing plans, review the retract plate detail. Make a left and a right set. Test fit the remaining ribs, retract mounting plate, and aileron LE according to

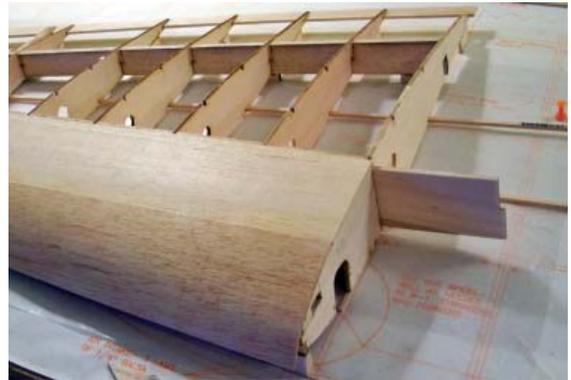
the plans. Test fit the LE then slide the TE assembly into the slots on the ribs. When you are satisfied with the fit and alignment, glue the parts. There will be some gap between the surfaces of the ribs and the rear spar/aileron LE. Use scrap balsa to fill in these areas and sand the components flush.

Bevel the top of the LE to match the contour of the ribs and sheet the "top front" of the wing with 1/16-inch balsa. This will butt up against the main spar and will overhang the top of the LE. The overhang will later be trimmed off.

Add the top 1/8-inch square basswood stringers at this time. Remove the wing half from the board, trim the sheeting, and sand the LE smooth.

Remove the precut section from the retract mounting plates. Repeat the same for the other half of the wing. Add the bottom 1/4 x 1/8-inch basswood beam according to the main spar detail, step 5, on one wing panel.

Place one wing half over the plans, raising the tip 3 1/8 inches off the board. Slide W-1 in place and ensure that the



The 1/16-inch balsa sheeting has been added. The LE's overhang will be trimmed.

main spar is at the rear of the slot in W-1 with a 1/8-inch gap in the slot in front of the main spar. The main spar doubler will be added later.

Test fit the wing mounting plates, removing the precut parts of W-1. Pin the other wing half to the board with the same 3 1/8 inches raised at the tip. Ensure that the main spar edges are flush against each other and resting on top of the bottom beam (1/4 x 1/8-inch basswood).

When you are satisfied with the fit and alignment, glue them together with wood glue. Add the LE center and sheet the top front center section with 1/16-inch balsa. Add the center rear spar and main spar doubler. Add the 1/8-inch square basswood stringers "bottom only" as directed on the plans, and remove the precut sections on W-1 outer and the rib/spar tabs. Test fit the retracts and struts.

If using the FMS wheels and struts, make strut extenders from 3/16 piano wire and note the bend. Sheet the underside of the wing the same way as

the top. Cut out the wheel well area.

Remove some of the sheeting on the wing's center section for wing mounting plate 2. Test fit the wing to the fuselage. When you are satisfied with the fit and alignment, mark and remove the sheeting on the bottom of the wing for the two forward bolts. Block in around this area with scrap balsa. Drill four holes for the 1/4-inch nylon wing mounting bolts.

After the wing is mounted to the fuselage, use the templates to make and add the outer LE center (inner and outer) from 1/8-inch balsa. Add 1/2-inch balsa triangle stock for the outer section of the LE edge, glue on the wingtips, and contour all of the pieces to shape. Add the intake parts and block in behind the intake with scrap balsa and contour.

Glue the belly pan into place, add additional stringers, and fill in as needed. Cut the ailerons free and contour the aileron's LE to shape. Hinge as desired. (CA hinges were used on the prototype.) Mount the aileron servo.

Covering

The prototype used Coverite Microlite and the surface was lightly scuffed with fine-grit sandpaper to allow the paint to better adhere. After the model is covered, use the templates to make the exhaust ducting, tail wheel cover, and fin fairing from cardstock and paint or glue them into place. Trim and glue the canopy in place and add cockpit detail as desired. Mount the motor and the remaining electronics.

Finishing

The gear doors were made with the templates provided on the plans. They are a lamination of .03 plastic and 1/32-inch plywood. Full construction details can be found in the manual.



Cover the model in sections, starting with the tail and moving forward.



The main gear doors have been added. They are mounted to the wing with a large hinge. The belly pan has been "in-filled" to allow cutouts for the wing mounting bolts.

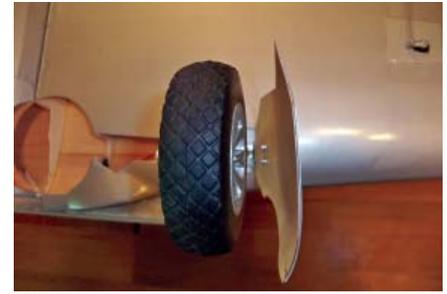
Du-Bro 257 heavy-duty pinned hinges connected the top of the door to the wing. Attach one half of the hinge to the door and the other half can be mounted to the retract plate or the retract itself. The bottom half of the door is attached with wire to the strut. Two Du-Bro Micro E-Z connectors were used on the door to retain the wire from the strut.

Balance the model according to the plans. The prototype flew with the following control surface deflections: aileron +/- 3/4 inch; elevator +/- 5/8 inch; and rudder +/- 3/4 inch.

Flying

Before flying, thoroughly check the model to ensure that all of the control surfaces are moving in the correct direction and the gear smoothly retracts and extends. Test the powerplant and perform a taxi test to check for proper tracking and adjust as needed. Takeoffs are fairly straightforward. The wide gear helps with ground handling.

The model cruises well at half throttle with the mentioned power combination. Rolls and loops are straightforward



The 1/16-inch wire connects the strut to the door. The wire slides into Du-Bro micro connectors attached to the door. You can also see the curve of the door.

and the stalls are gentle—the nose lowers and one wing drops, but does not snap. Recovery is standard for stalls. Landings are as expected as well. Power is kept on throughout the approach, gradually reducing to achieve the glide slope. The large propeller causes plenty of drag, so some power is needed until the wheels touch.

Many thanks to Joe Balabon for the in-flight photos. I hope you enjoy building and flying your Fun Scale Bearcat. Happy landings! 🛩️

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SOURCES:

RCGroups build thread
www.rcgroups.com/
forums/showthread.
php?t=2524535

Manzano Laser Works
www.manzanolaser.
com

Park Flyer Plastics
(817) 233-1215
www.parkflyerplastics.com

Coverite
(800) 637-7660
www.coverite.com

Du-Bro
(800) 848-9411
www.dubro.com

Callie Graphics
info@callie-graphics.
com
www.callie-graphics.com



The prototype was painted with rattle-can paint in several shades of silver. The panel lines were done with a pen and the dirt/exhaust was airbrushed. The decals are from Callie Graphics.