MicroWave EDF

A compact electric ducted-fan design that uses recycled ARF foamy jet power systems

IF YOU LOOK QUICKLY at the pages of Model Airplane News or, for that matter, any other RC publication over the last year or two, there's a pretty clear indication that one of the hottest areas of growth in the hobby is that of jet models, specifically electric ducted fans (EDFs). Huge breakthroughs in propulsion systems, including Lithium Polymer (LiPo) batteries and brushless motors have enabled us to achieve power and thrust levels that we simply couldn't get with glow engines. Electric power introduces a level of reliability never before seen in jet modeling; simply turn on a switch and you've got thrust, and plenty of it! Additionally, EDF models have the clear advantage of being able to fly at existing flying fields. They require less support equipment and are far less intimidating than their turbine-powered brethren. One of the biggest advantages of EDFs is that there's a huge choice of small inexpensive ARF, pocket rocket jets that are a ball to fly. Most are injection-molded foam and while they may be a tad fragile, they work! My MicroWave was designed to provide an easy-to-build sport jet model that could use existing EDF propulsion packages leftover from some of these worn-out foams.

My prototype was fitted and flew quite well with a Hyperflow fan unit fitted with stock brushed motors—a $30 package! Five airframes later, my newest version is equipped with a Hyperflow, Ammo brushless inrunner (3740kV) on a 3S 2100mAh pack. When I really want incredible performance and an adrenaline rush, I strap in a 4S pack!

The MicroWave can be built easily in less than a week's worth of spare time with conventional, off-the-shelf materials including balsa and lite ply. A laser-cut parts package for the model is available from hobby hangar.com. I've laid the parts out to use standard-size balsa and ply with minimum waste.

As cute as this model may appear, it's not an EDF foamie park flyer, but a high-performance sport jet capable of very impressive speeds. If you're not yet hooked on EDFs, you soon will be, so let's get started.

WING CONSTRUCTION

The first decision you need to make is which configuration wing you want for your MicroWave. The building sequence is identical, with only the rib spacing and some minor parts being different. The "LW" version has a greater span and wing area than the "SW" and as a result, is not quite as fast, but it makes up for it by being a bit more docile. Due to its lighter wing loading, it will cruise around comfortably at reduced power settings. In either case, the wing is built in three separate panels directly over the plan.

OUTER PANELS

After cutting out all the required parts, build the outer panels first. Pin ribs R-1 through R-9 onto your building surface, pinning through the small tabs at the bottom of each rib. These tabs allow you to build the symmetrical airfoil on a flat sur-
A HIGH-PERFORMANCE SPORT JET CAPABLE OF VERY IMPRESSIVE SPEEDS

SPECFICATIONS
- WINGSPAN: 29.25 or 36 in. (details included for both)
- WING AREA: 182 or 225 sq. in.
- WEIGHT: 20-24 oz.
- WING LOADING: 12-17 oz./sq.ft.
- LENGTH: 27 3/4 in.
- MOTOR: Ammo 3740kV brushless inrunner (or similar)
- FAN UNIT: Great Planes 70mm Hyperflow
- BATTERY PACK: 3S 2300 LiPo or 4S
- RADIO REQUIRED: 3-channel (throttle, aileron, elevator)

First step in wing outer panel construction is to pin each rib to the building surface. Pin through the tabs.

Aileron bellcrank and linkage installation. Aileron has been cut away from main wing structure and opening capped with 1/8-inch balsa.

Face without twisting. Add the upper trailing edge sheet and the upper spruce spars. Add the lite-ply gussets and bellcrank mounts as indicated and then add the upper Leading edge sheeting, but not the root area sheeting just yet. You can either sheet the leading edge or use capstrips in each of the ribs. There’s no appreciable difference either way, except you’ll save a small amount of wood using the capstrip option. After adding the balsa leading edge, remove the panel from the board and build the opposite outer panel. When finished, turn both panels over, separate the tabs from the ribs and add the bottom trailing edge sheet, lower spars and rib/leading edge sheeting to match the opposite side of the panel. Now install the shear webbing between the upper and lower spars. It extends from R1 outboard to R8. Glue the wingtip blocks in place, mark the location of the ailerons, cut them away from the trailing edge and cap both the aileron and wing cutout with 1/8-inch balsa.

CENTER PANEL
Build the center panel directly over the plans. Don’t forget to install the tapered filler between the upper and lower trailing
edge sheets; it reinforces the area to accept the wing hold-down bolts.

When all three panels are complete, join the outer panels to the center using slow-setting epoxy. Pin the panels inverted to the building surface and, after re-checking alignment, allow the epoxy to fully cure. The upper camber of the three panels should rest on the building surface and form a straight line with the dihedral created by the taper of the lower surface.

When cured, remove the complete assembly from the board and install the R1C and R1P assemblies, the ½-inch dowel, ¼ x ½ spruce aft spars and, finally, all upper balsa sheeting that extends from R2 to R2. Sand the leading to shape and then install the aileron bellcranks and linkage. It’s important that the linkage be tight and slop-free to ensure proper aileron operation. Temporarily install a servo in the wing center section and fit the hinges. Sand the wing to eliminate any imperfections.

If you’ve built the fuselage “square,” installing the horizontal stabilizers is a piece of cake. Just turn the fuselage over, glue the parts into position and allow them to lie flat on the building surface.

**FUSELAGE**
The fuselage is basically a box with balsa longerons added along the edges for additional strength and gluing surface. Glue the wing saddle parts (WS) in position on the fuselage side followed by the longerons. Since the fuselage is a constant width from F6 aft, formers F6, 7, 8 and 10 may now be glued to the right fuselage side. To ensure a square and properly aligned fuselage, make certain the formers are perpendicular to the building surface. Assemble the aft end of the
fuselage by gluing parts F1 into the slots in F9. Glue this assembly in position by gluing F9 in place on the fuselage side and properly aligning former 10. Add F11, making sure its upper edge is forward of the stabilizer cutout in the fuselage side. This forms the rear attachment point for the stabilizer, F10 provides the forward point. Glue the left fuselage side in place and add the hold down plate with tri-stock reinforcements.

Pin the fuselage directly over the top view of the plans, and begin sheeting (1/16-inch balsa, crossgrain) from F7 through 9 on the upper surface, add fan mounts as shown, followed by 1/16-inch ply FE. Be sure to maintain squaresness! Remove the fuselage from the building surface, turn it over, add the hardwood blocks to the bottom of the fan mounts. Now install the elevator pushrod guide tubes, before sheeting the bottom. When happy with your elevator linkage, sheet the bottom from F8 thru 9. The crossgrain bottom sheeting aft of former 9 only spans the space between the fuselage side to FT, it does not completely enclose the aft fuselage.

With the fuselage again inverted over the plan, glue F4 thru F1 in place. If necessary, kerf cut the lower longerons to help alignment and aid in bending. Check alignment and apply sheeting from F4 forward to F1. The lower 1/16-inch ply vent panel goes between F2 and F3. Remove 1/16-inch balsa sheeting as necessary to accommodate the ply panel.

**HATCH**
Slide parts HS into the slots along the upper edge of formers F2 thru F6 and allow the upper edges to stand 1/8-inch above the fuselage side. Temporarily pin HS in place through the fuselage side and apply sheeting from F1 to F7. Be careful not to get any glue on the sides of the HS parts because this will make it very difficult to remove the hatch from the fuselage! Add a short length of balsa at the rear, underside of the hatch between HS parts. Remove the pins and push the hatch down until it fits flush with the upper fuselage sides. Add the balsa nose.

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**Revolver**

Almost Ready-To-Fly .46-.70/EP Sport Aerobat

A sleek aerobat with hybrid versatility!

No matter what power source you prefer, the Revolver ARF will fire off one crowd-pleasing maneuver after another. Airfoil-shaped tail surfaces enable the Revolver to lock in and track solidly, and short, direct linkages deliver strong, accurate control during high- and low-speed flight. Contemporary “sports car” styling makes the Revolver ARF a real standout on the flight line, too!

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block to F1 and then carve and sand to shape to match the fuselage contour. Remove the hatch and install the 1/8-inch hold-down dowel. Drill a corresponding hole in the nose block to accept the dowel. The rear hatch hold downs are simply a pair of nylon landing gear straps rotated to retain or release the hatch.

TAIL GROUP
The stabilizers, elevators and vertical fins are cut from solid 3/32-inch balsa and assembled directly over the plans. Temporarily install hinges and toothpick “dowels” to increase the strength of the fin-to-fuselage joint. Use the jig drawing shown on the plans to establish the correct angle of the vertical fins.

EQUIPMENT
Next, pre-fit all the radio and mechanical components. The hatch allows total access to the battery and there’s plenty of room for shifting it to establish proper CG balance. The receiver and ESC, along with the elevator servos, are located in the bay between F7 and F8. The aileron linkage consists of a single servo driving the wire linkage through the bellcranks to the ailerons. Plywood horns are used on the ailerons and elevators and no rudder control is used or considered necessary.

COVER AND FINISH
A good finish starts with a thorough sanding, inspection and preparation of the airframe. Make certain parts fit well, fill any minor imperfections and give a final sand. All five prototypes were covered with either MonoKote or UltraCote with similar results. Pseudo-military or sport jet schemes all seem to look great on this model! Reinstall all the equipment, check the CG, verify correct operation of the radio and fan and get set for the flying field.

Great Planes Hyperflow fan/ammo motor installation on third version of model. Simple 90-degree nylon brackets screwed into the fan mount keep it secure.
MicroWave EDF

IN THE AIR

If you feel comfortable with a medium-to-high-performance sport model, flying your MicroWave should present no problem. Control response is comfortably quick and smooth. The ailerons are very effective so start at low rate and gradually increase throw until you like the result. Be sure to make certain your ailerons return to true neutral or trimmed position. Any control linkage slop will show up as a bit of roll hunting as the ailerons attempt to catch up with the servo!

It’s easily capable of most scale-type aerobatic maneuvers, but will not hover, "wall," "harrier" or perform other 3D antics. It is fast enough to be impressive and slows down nicely for landings, especially when you have a gentle headwind available. It will glide a considerable distance, so plan your approaches accordingly.

In short, the MicroWave does everything I had hoped it would and I am really pleased with the result. Not only is it an easy-to-build, nice-flying jet, but it also provides valuable experience for some of my future scale EDF projects. It’s small and nimble, so you need to keep an eye on it when performing high-speed circuits and maneuvers!

I have a clear plastic canopy that replaces all the wood parts required for the canopy shown on the plans. You can customize your MicroWave by shaping your own canopy from balsa block or foam. If you want the plastic canopy, please check my website (richuravitch.com) for details. Hobby Hangar (hobbyhangar.com) has laser-cut parts, which includes all the parts shown on the Parts Template Sheet.

I hope you enjoy your jet! When you get yours completed, how about sending a photo or two? You can e-mail me at aeroscale@aol.com.