BY **MARK RITTINGER**

The Pharaoh

Sport aerobat with a pyramid full of power!

I like airplanes that look like airplanes. You know, they look like you could hop in, fire up the go-power, and have a lot of fun flying. I also like a ship with nice lines and moments that just look right. So this time out, I thought a nice, new, original design would be fun.

Back when I was 15, I designed a 2m sport glider that I called the "Pharoh" (missing the second "a"). So this time, I went with the proper spelling and added an ancient Egyptian theme. Note the all-over Aztec Gold MonoKote and the general theme of the covering scheme to convey the Egyptian Pharaoh feel. As it turns out, the Pharaoh has become one of my favorite models ever. It flies beautifully and smoothly, and it is very linear for a sport model. It has a relatively light wing loading, and it builds quickly, using commercially available foam cores and canopy. Anyone who has a little building experience should have no problem constructing this. You can order the wing cores (WT-2) from eurekaaircraft.com to go with the plans.

SPECIFICATIONS

Model: The Pharaoh
Type: Sport aerobatic
Wingspan: 54 in.
Length: 48.75 in.
Wing area: 530 sq. in.
Weight: 72 oz.
Wing loading: 19.56 oz./sq. ft.
Power: 750 watts at 48 amps
Power loading: 166.66 watts/lb.

GEAR USED

Radio: Hitec Eclipse 7 transmitter w/ Hitec Optima receiver, two Hitec HS-65HB servos (hitecrcd.com), and two Futaba standard servos (futabarc.com)
Motor: O.S. Engines 3825-750 brushless motor (osengines.com)
ESC: Castle Creations 75A Edge HV w/ 5A BEC (castlecreations.com)
Battery: Turnigy nano-tech 4S 4000mAh 35-70C LiPo pack (hobbyking.com)
Propeller: APC 11x10 E (apcprop.com)
Canopy: 15-in. SIG Mfg. Co. WW I I bubble canopy (sigmfg.com)

The author and designer Mark Rittinger poses with his electric-powered Pharaoh.

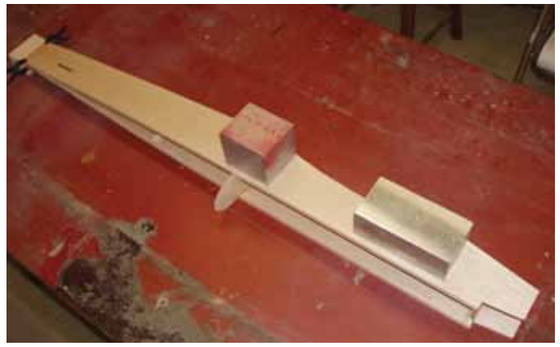
BUILDING

Order the cores as soon as you decide to build the Pharaoh as it takes a bit of time for the supplier to cut the cores. In the meantime, you can start on the fuselage and empennage. Begin by cutting out all the parts from the materials shown on the plans. Make the fuselage using medium 1/8 x 48-inch balsa for the sides. Add the 1/4-inch-square balsa longerons at the top and bottom. There are also a couple of 1/4-inch-square pieces that run from former F3 forward to support the battery tray. Glue the battery tray to former F2 and to one fuselage side using some triangle stock reinforcement. Install the 1/8-inch plywood former F3, and glue it to the same side. The 1/4-inch plywood firewall should be drilled for the motor mount before gluing it in place. Note that it has an offset center. This is so the spinner will be centered when the motor is installed with the appropriate right-side thrust as shown on the plans. Epoxy the firewall to same fuselage side.

With the fuselage on its side, place a 1 15/16-inch block under the tail and epoxy the fuselage sides together. Weigh it down, then clamp the tail ends together to produce a straight and true fuselage. Add the top turtle-deck formers and center stringer, then either sheet or plank the turtle deck with 1/8-inch light balsa and then sheet the lower rear fuselage with cross-grain balsa. Add the filler pieces to the inside of the nose section, then cut and fit the top hatch and top nose blocks. Carve and sand to shape, and install your hatch retainer hardware.

I built up the rear portion behind the canopy from scrap balsa. Note that the firewall does not go to the top of the fuselage. This is to allow some airflow in and also to provide clearance for the motor-power wires to fit. Tack-glue the lower nose blocks into place, but don't install permanently. Add the plywood nose ring, and carve and then sand the blocks to shape. Remove the blocks until you drill the wing-alignment dowel hole in the wing. Epoxy the plywood wing mount at the trailing edge. For all the gluing (except where noted), I use medium and thick Zap CA.

You can now trim the front portion of a 15-inch SIG Mfg. Co. bubble canopy to fit the hatch, then make from scrap balsa the small filler block pieces for above the stabilizer. By now, you should have a nice-looking fuselage! The horizontal and vertical stabs are simple 1/4-in. sheet balsa and can be cut from a standard 1/4 x 4-inch balsa sheet. Use medium balsa, and form a nice taper on the trailing edge. Bend

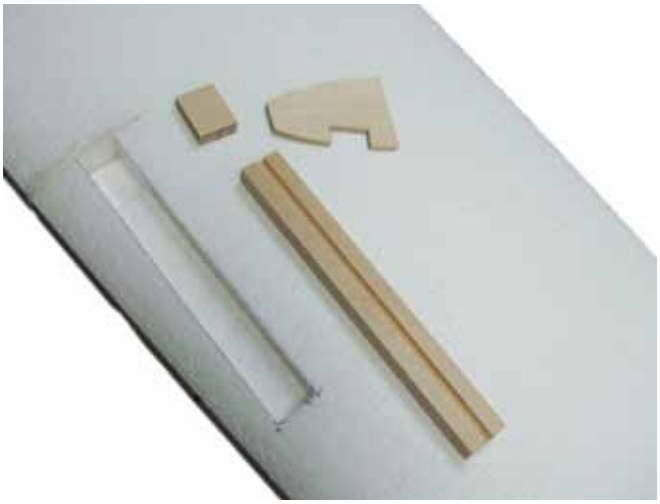


After cutting out the fuselage parts and gluing the front formers and battery tray to the right side, place the assembly on its side on the workbench and block up the tail so that the assembly is straight and true. Glue the left side in place, weighing it down until the glue dries.

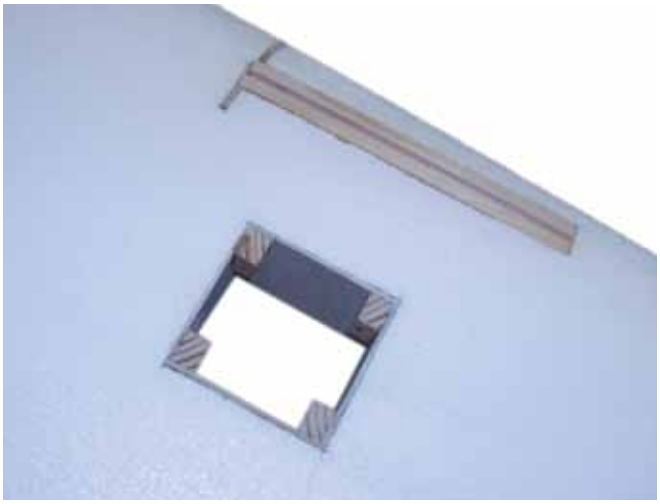
Here the turtle-deck formers and the top stringer have been added.

Sheet or plank the turtle deck with soft balsa, and let dry.

The tail surfaces are simple balsa sheet parts glued in place.



Here's the landing-gear block and plywood support parts ready to be installed in the wing core. Use the plans as a guide for the position of the block.



Here are the completed gear block and aileron servo well details. Now, the wing gets sheeted.

to shape the wire joiner for the elevators, then bevel the control surfaces.

THE WINGS

Using the plans as a template, mark and remove the foam from the wing cores for the landing-gear blocks. Epoxy the blocks to the subrib, then epoxy the assembly into the core. Mark and cut out the servo wells, and add the hatch-cover retainer blocks. I used a 1/2-inch brass tube to cut/bore a trough through the wing panels for the servo wires.

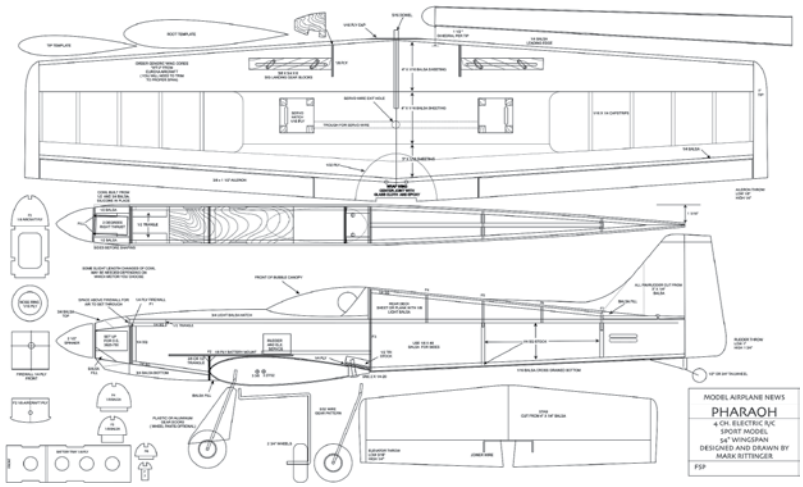
Start sheeting from the leading edge, then the center, then along the trailing edge. You can use 3M 77 spray adhesive or finishing resin. Glue on the 1/4-inch leading and trailing edge caps, then add the rib capstrips. Cut out the sheeting over the servo wells on the bottom, and make the servo hatches from 1/16-inch plywood. Carefully cut away the sheeting from the areas around the landing-gear wire. Bevel the wing root for the proper dihedral angle, then epoxy the two panels together. Fit the trailing edge into the center, then glue the 1/32-inch plywood wing-bolt plate in place. Add the wingtip blocks, and carve to shape. I used 3/8 x 1 1/2-inch trailing-edge stock for the ailerons. After cutting it straight, fit the 1/16-inch plywood center cap to the leading edge, then wrap the center joint with fiberglass cloth and resin.

Make sure that the wing sits in the wing saddle at zero degrees incidence. If it is off, sand the wing saddle until the wing is at zero degrees. Align the wing, and use a long 5/16-inch drill bit to drill the wing-alignment dowel hole. Remove the wing, and glue the dowel in place with epoxy. Reinstall the wing, then drill and tap the rear plywood mount blocks for the two 1/4-20 wing bolts. Bend the landing-gear wire to shape using 5/32-inch music wire, then make the gear doors from 1/16-inch plywood and attach them to the landing gear with gear straps.

FINAL ASSEMBLY

I used Aztec Gold and Metallic Teal MonoKote on the prototype. Be careful if using MonoKote on the foam wing, as it's a high-temperature film, then install the radio gear. I used Hitec HS-65HB servos on ailerons, standard (big, but affordable and strong) Futaba S3003 servos on elevator and rudder, and a Hitec Optima 6 receiver. Use 9-in. servo extensions for ailerons and 3-inch extensions on the receiver.

With a 2.5-inch E-flite spinner and the



The Pharaoh | **XO416A**

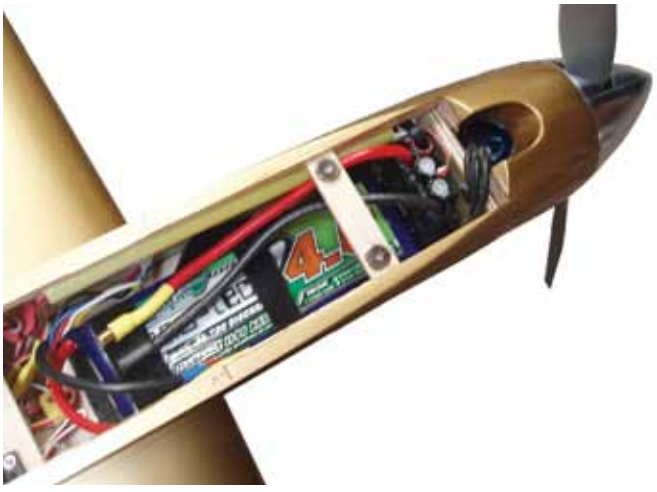
Designed by Mark Rittinger, the Pharaoh is an electric-powered sport aerobatic design, which uses commercially available foam wing cores to speed construction. The rest of the model uses traditional balsa, light ply, and aircraft plywood construction. All hardware is available at your local hobby shop.

Wingspan: 54 in.; Length: 48.75 in.; Power: 750Kv brushless motor; LD: 2; 1 sheet; $16.95

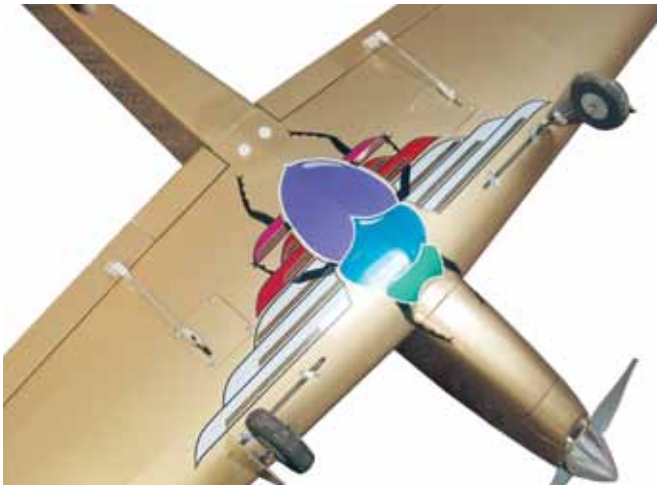
To order the full-size plan, visit AirAgeStore.com.

I used a Robart incidence meter to check the wing, making sure that it is properly aligned when set in place in the wing saddle.

You can see the O.S. Engine brushless motor through the nose scoop, which provides plenty of cooling airflow.



With the hatch cover removed, you have plenty of access to the model's radio gear and battery pack.



Covered in a solid-gold finish, the model was in need of some color trim. There's nothing more Egyptian than the scarab beetle.

O.S. 3825/750, my Castle Creations Edge75 speed control had to be placed right behind the firewall. I lengthened the nose 1/2 inch on the plans to make more room and make it easier to balance. For me, the prop of choice for this ship is an APC 11x10 E. The battery is a Turnigy nano-tech 4S 4000mAh LiPo pack. The balance point was right on the forward center-of-gravity location without using any lead in the nose. For control, I use a 2.4GHz converted Hitec Eclipse 7 with no problems at all.

IN THE AIR

Test-fly with the center of gravity in the forward location, and set up the control throws using the high and low rates noted on the plans.

Takeoff: The model takes off from grass with very little rudder compensation, and I'm sure the wide gear and long tail is a big help. Line up into the wind, and slowly advance the power. She takes off at about 1/3 power and climbs out fairly straight.

High-speed flight: The Pharaoh really grooves, and the tracking is solid. With light wing loading and about 166 watts per pound for a power loading, the high-speed flight can best be described as "sprightly."

Low-speed flight: The thick, fully symmetrical wing section and long tail, along with the long dorsal fin, all give the Pharaoh a really nice low-speed flight characteristic. It is a real and true floater with great control right up to the stall.

Aerobatics: With such a light wing loading and plenty of power, aerobatics are not a problem. There's plenty of surface area on the control to perform a lot of great maneuvers. Loops are big; rolls are axial; and, on high rates, snapping maneuvers are easy.

Landing: Here is where it's really nice to have light wing loading. The Pharaoh is a nicely behaved ship on final. Even in a crosswind, the rudder and control moments shine. Be prepared: Once in ground effect, you almost have to force it to touch down! My second flight resulted in a nice, long, main-wheel landing.

BOTTOM LINE

So there you have it, folks: a simple-to-build, stylish yet fun, sweet-flying model that will stand out at the field. As with any of my plans, if you need help, feel free to send an email to me at mrittinger70@hotmail.com. Best wishes, and blue skies!