BY **ALEX SAMOUR** PHOTOS BY **ALEX SAMOUR & ARTY MUNDELL**

These are static and flight shots of the glow version from different angles.

Pilatus Porter PC-6

A sport-scale STOL aircraft for glow or electric power

SPECIFICATIONS

Wingspan: 50 in.
Wing area: 300 sq. in.
Weight: 51 oz.
Wing loading: 24.7 oz./sq. ft.
Length: 35.5 in.
Power req'd: .15 glow or 10-size brushless electric motor
Radio req'd: 4-channel, standard servos

GEAR USED

Radio: Futaba 8J 2.4GHz, R2006GS 6-channel receiver (futaba-rc.com)
Engine: O.S. LA .15 w/ modified stock muffler (osengines.com) and 4-oz. Du-Bro tank (dubro.com)
Motor: O.S. 10-size, 54A Castle Creations speed control (castlecreations.com), 3200mAh 3S ElectriFly LiPo (electrifly.com)
Glow prop: 8 x 3 or 8 x 4 G/F Series Master Airscrew (masterairscrew.com)
Electric prop: 8 x 6 3-blade nylon

My original goal was to develop a light 50-inch-span airplane to fly with the small-block O.S. LA .15 glow engine. I chose the Pilatus Porter (PC-6) because of its beauty and full-scale performance and because it was in my "someday" list. After seeing the glow version fly, it became obvious that an electric conversion was possible.

The Pilatus Porter PC-6 is a Swiss-made Slow Takeoff and Landing (STOL) aircraft. The first prototype flew in May 1959 with a 340hp piston engine. Since then, it has gained power and been adapted for many roles, including that with the military. The current version, offered by Pilatus Aircraft, is the PC-6 (B2-H4), powered by a turboprop rated at 550hp. The manual specifies a takeoff-roll distance of 646 feet and a landing roll of 417 feet at sea level. Test pilots have been able to make landings within 164 feet.

THE DESIGN

If you research low-speed aerodynamics, books and reports will all point in the same direction: Full-size airfoils don't scale down well. I chose the high-lift, high-drag airfoil S4061-096-84, developed for low Reynolds numbers by Michael Selig. This airfoil allows slow flight and steep descents without the need for flaps. I used the NACA-0009 on all tail surfaces to keep them as close to scale as possible. The proportions of the full-scale outline proved satisfactory in my analysis, so I did not make any adjustments. This is a 1:12 semiscale model that can be easily enhanced for scale competition.

My design combines a composite wing with the traditional balsa box fuselage. The word "composite" simply means different

materials are used in its construction. The assembly process is simple, and the result is stronger and lighter than a sheeted built-up version. The resulting airfoil shape is also more accurate. If you have some traditional wood-building experience, you have the skills to complete this project.

BUILDING THE PILATUS

I recommend medium CA (cyanoacrylate glue) for most wood-to-wood joints, with a few dots of thin CA for tacking parts. It's better to use 30-minute epoxy for high-stress joints, such as those around the firewall and landing-gear plates. Epoxy is also used to glue components inside the foam wing. Foam-safe spray adhesive will work for sheeting the wing, but test it on a scrap piece of foam before spraying the actual cores. Z-Poxy Laminating Resin or West System Epoxy combined with microballoons can also be used. Some people use aliphatic (wood) glue, but to avoid warping, the parts have to remain pressed for weeks. I use blue masking tape and small plastic wood clamps to hold parts during the curing process.

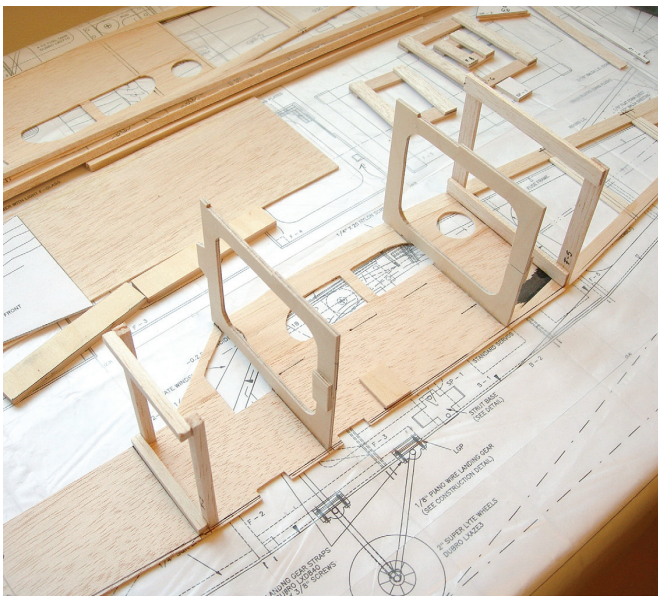
I made two assembly drawings and a separate sheet for the templates. The paper templates can be cut and pasted to the wood with 3M Spray Mount, producing more accurate parts. Cut a full kit first so that you are able to test-fit the parts ahead of the gluing process. Parts have tabs and notches for alignment. To create the notches, you can drill small holes and fill any gaps later with medium CA or wood filler. The plans include templates so that you can make your own cowl plug and cut your own wing-core molds. If you're interested in buying these components, contact me for additional resources at smallcomposite@yahoo.com.

The Porter is a fun airplane to fly, and its high-aspect-ratio wing provides a lot of lift while adding stability.

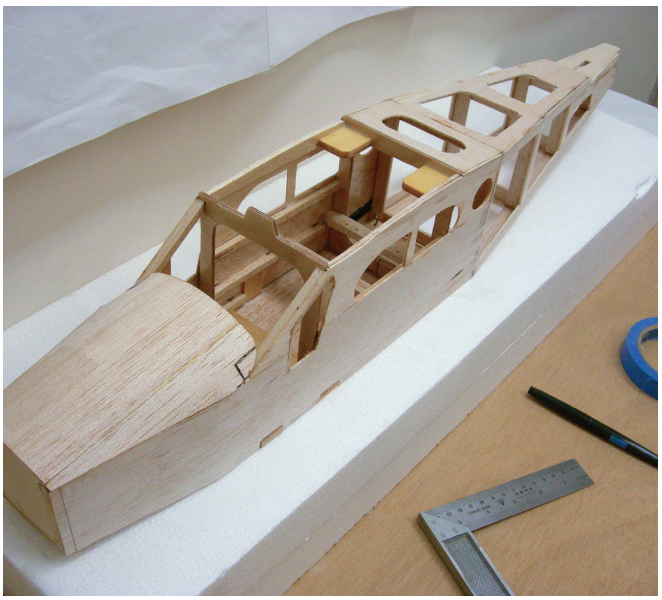
FUSELAGE

The square fuselage doesn't need to be pinned to the table, but you must keep the parts aligned and squared on each step. First, mark all the former and main component locations on the fuselage insides. With one fuselage side flat on the table, glue the main cabin formers to square. Glue the other fuselage half to form the cabin box. Keep the fuselage halves parallel and aligned to ensure that the stab will sit horizontally later on. Add the ¼-inch-square balsa stringers to reinforce the inner cabin. You can now add the landing-gear ply plates and the rest of the cabin bottom sections. Glue the wing hold-down plates and balsa wing saddle, as well.

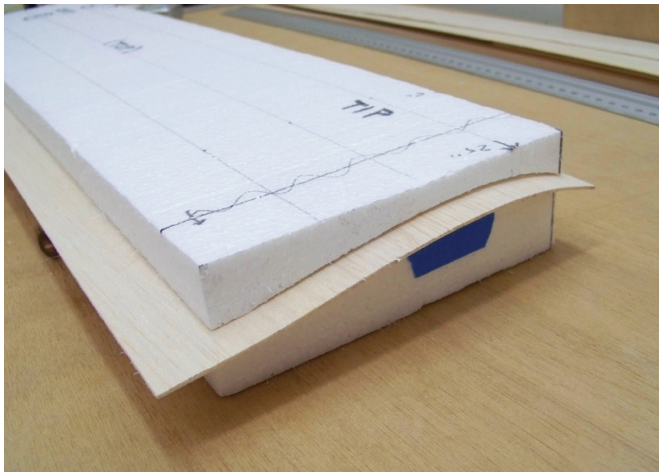
Clamp the front end, and glue the floor. In the same clamping operation, epoxy the firewall and add the ¼-inch-square



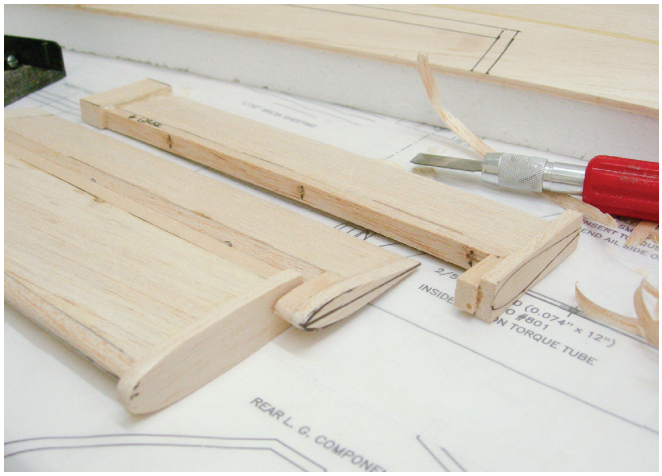
One fuselage side lays flat on the table, while cabin formers are added.



The complete fuselage is shown with the hood/hatch glued in place (glow version).



Top sheeting is pressed in place, using the core bed as support.



The tail sections are built the same way as the wings, then they are trimmed to size and the caps and other scale details are added.

reinforcement stringers. The hood is built separately and is attached to the fuselage, like a hatch with small magnets. The removable hood is necessary for battery access in the electric option.

To finish the rear section of the fuselage, clamp and glue the end post to the fuselage rear ends. Add the stabilizer–saddle assembly, then the rest of the formers. Finally, add the rear–fuselage floor and roof, sanding lightly as needed for proper fit. Once the fuselage is assembled, run all inside corners with a line of medium CA. You should end up with a light, rigid fuselage.

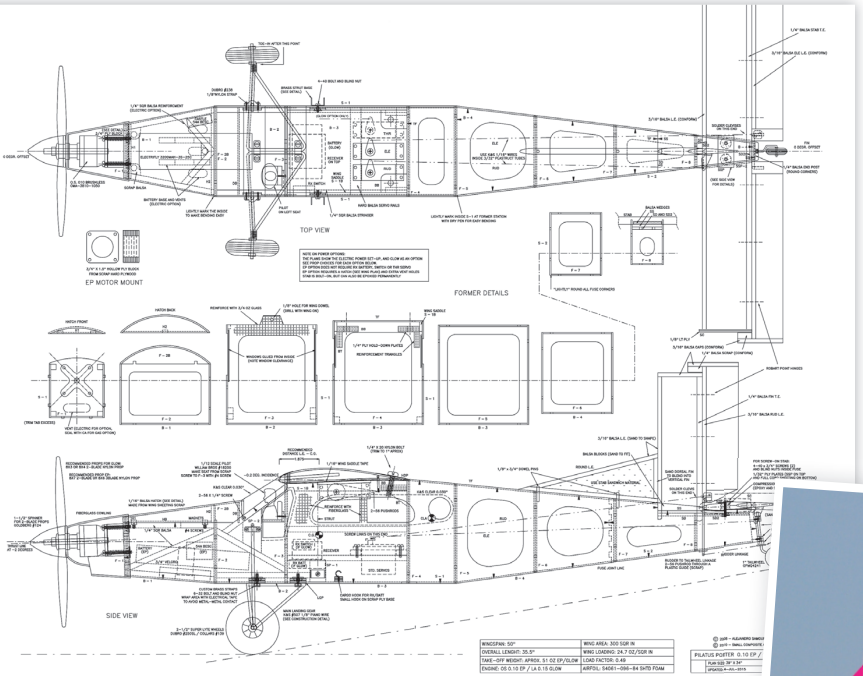
WINGS

Building a composite wing takes five simple steps:

- Sheet the core top.
- Glue all internal components to the underside.
- Sheet the core underside.
- Glue the leading edge.
- Sand, and trim to shape.

My design does not require wing spars. Tension and torsion loads are spread out through the balsa sheeting and MonoKote skin. Shear and compression loads are absorbed by the foam–core. Because it's so thin, the wing requires struts.

Assemble the wing halves separately. Cut the ailerons free from the finished wing halves, and cap all exposed foam

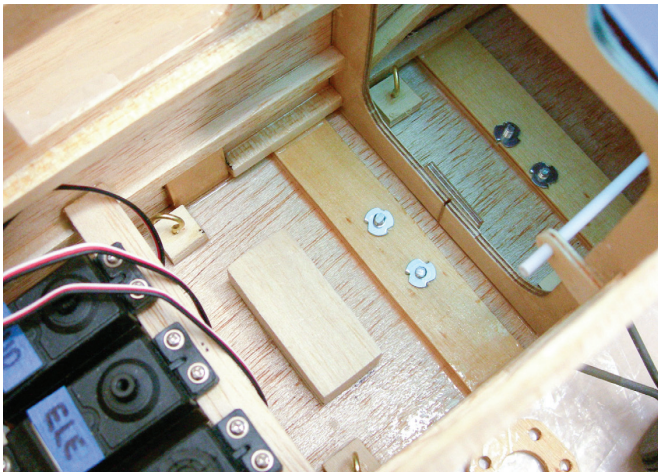


Pilatus Porter PC-6 | **X1115A**

Designed by Alex Samour, this sport-scale STOL aircraft has a composite wing with a traditional balsa box fuselage. The assembly process is simple, and the model can be covered with MonoKote. The Porter has good manners and is an excellent first taildragger.

WS: 50 in.; L: 35.5 in.; weight: 51 oz.; wing loading: 24.7 oz./sq. ft.; power: .15 glow or 10-size brushless electric; 4 channels; LD: 3; 3 sheets. $27.95

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



Cargo hooks are added to the cabin floor to hold the radio gear and tank.

The engine for the glow version is ready for the cowl fitting.

with balsa, as indicated. Trim and shape the leading edge and all caps to conform to the airfoil. Dry-hinge the ailerons, but do not glue them yet. Join the wing halves with epoxy, and reinforce with fiberglass tape at the center, as indicated. Once the bond has cured, square and level the wing onto the fuselage, and mark its location. Install the center dowel pin and the aileron servo base. Drill the wing rear bolt holes through the fuselage plates, and tap the threads to accept the nylon bolts.

TAIL SURFACES

The stabilizer, fin, and dorsal fin are built in a manner similar to the wing, then cut to size and capped, as per the plans. The Porter is designed with a screw-on stabilizer and landing gear so that they can be disassembled for travel. The screw-on stabilizer needs a special reinforcement at the center to avoid crunching the fragile balsa/foam structure. If you decide to glue the stabilizer in permanently, there's no need to reinforce it—just epoxy it in place. The dorsal fin will be installed after everything is covered.

FINISHING TOUCHES

Make and assemble the landing-gear parts on the fuselage with the nylon straps. Tie the assembly at the axle using wire, making sure that the wheels have the proper toe-in and camber. Silver-solder, as indicated. Assemble the tailwheel and torque rod, as per the plans. I used 2 ½-inch D-Bro Superlight foam main wheels and a 1-inch tailwheel.

The wing struts are functional, so don't fly without them. Build them with the fuselage lying upside-down and the wings bolted on. First, glue the strut assembly using CA, then remove and fiberglass, as shown in the plans. Paint it after it has fully cured. The struts will remain attached to the wings, and pins will be used to attach them to the fuselage before flight.

Temporarily mount the powerplant, radio gear, and all the hardware that will fly. Check the center of gravity in both directions, and add ballast if needed. The main servo rails can be positioned and glued at the end to help the balancing act. Uninstall everything, final-sand, vacuum, and cover with MonoKote in your favorite color trim. Final-assemble all of the gear, glue in the windows, and add all of the final details.

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POWER OPTIONS

The O.S. .15 LA has enough power to make the Porter climb with authority. Total fly time on 4 ounces of glow fuel is about 12 minutes, but allow at least 2 minutes for possible go-arounds. I found the 2-blade, 8 x 3 prop to be the best match, yielding 14,300 static rpm and 37 ounces of static thrust at sea level (about 72% thrust-to-weight ratio).

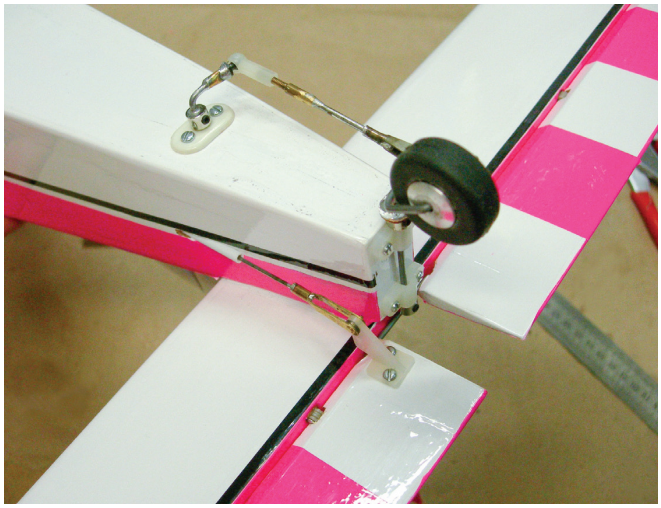
The electric O.S. 10-size motor, 54-amp Castle Creations speed control and a 3200mAh 3S LiPo will drive a 3-blade 8 x 6 prop the same as the .15 glow engine. Performance with a small 2-blade prop is not so good, probably because the motor does not load enough. Flight times will be well over 12 minutes with newer batteries. Both power options perform well, but if you fly from a high-altitude field, the electric version will perform better.

FLIGHT PERFORMANCE

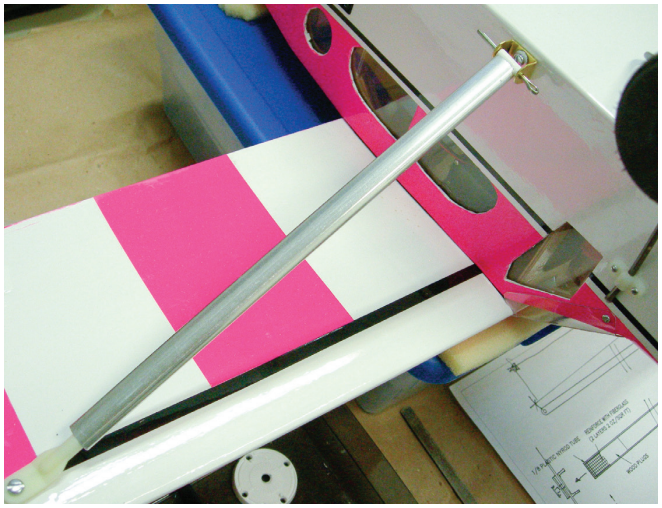
You can execute scale takeoffs by holding a small amount of elevator and slowly advancing the throttle to about 75% power. The use of rudder is necessary to keep the Porter tracking straight. At 100% power and with timely elevator input, it will take off in about 40 feet at sea level and climb at about 40 degrees until you decide to leave the pattern. The Porter is suitable for paved surfaces or short-grass operation; adding extralarge foam wheels will help operations from taller grass.

Once trimmed, the Porter will track straight. It can be flown with only ailerons and elevator, but graceful maneuvers require rudder. Scale turns are accomplished by using rudder to veer the airplane and the ailerons to keep wings at the desired bank. Slow flight and crosswind will also require rudder for proper tracking, but you will get used to it. It will soon become part of the fun.

The Porter has positive longitudinal and lateral stability at the indicated center of gravity. Trim it at about 60% power and then climb/descend with throttle management. It has aerodynamic rudder/



The tailwheel is connected to the rudder by a long torque rod that goes through the fuselage.



Wing struts are assembled on the airplane with the wing installed, then permanently fiberglassed into place.

aileron coupling, so you can also fly it with rudder and elevator only. Given the tall fin, it will tend to weathervane a bit.

The Porter will gracefully execute slow passes and turnaround maneuvers. The Porter is aerodynamically dirty, so expect a steep glide at idle. If you slow it down, it will hover against a moderate wind. It stalls at about 23mph with a mild drop of a wing but will not spin unless provoked. Centering all controls after a stall and then adding elevator should make it fly again.

By design, the Porter is not an aerobatic airplane, but it will do all positive aerobatics with pride. It will also flat-spin if you push it on high rates. Once in a developed spin, it will come out by itself, but it will take two to three turns to stop the rotation. Inverted flight is poor due to the type of airfoil but can be done at full power. The struts will keep the thin wings from clapping, so never fly without them.

If your landing technique is "chop the throttle and glide," you need to start from a higher altitude or closer to the landing site—especially when it's windy. The handbook landing approach is to fly it in a gradual descent at about 1/3 throttle. Once leveled a couple of feet above the runway, reduce the throttle to just over idle and slowly input elevator to flare into a three-point landing. Due to the wing aspect ratio, high-lift airfoil, and landing-gear geometry, two-point landings on hard surfaces are a bit tricky. Touch-and-go's are a lot of fun.

My daughter Maria helped me pick the right color for the Pilatus.

FINAL THOUGHTS

The full-scale Pilatus is a STOL aircraft designed for slow flight. This 1/12-scale version does that, plus a few more tricks. It is light and slow enough to fly in a midsize park or short field. It has enough wing loading to penetrate rough air like a bigger airplane. This is an interesting project for the intermediate-level builder. The Porter will accept more scale details and become a scale competition model. It will also allow you to add a small camera or even a parachute jumper. It has no bad manners or surprise areas for the pilot with a bit of taildragger experience. For a rookie, the Pilatus will be a good transition airplane into taildraggers.