



Electric PILATUS TURBO PORTER

By STEVE GRAY. . . From the creator of the wildly popular 'Electric Beaver' comes this R/C electric STOL aircraft designed for Astro 05 geared electric power on 7 1200 mah cells. Simple to build and fly.

• When you consider the hundreds of Peanut Scale and Rubber Scale designs which have shown up over the years from those prolific Free Flighters such as Hannan and Mooney and when you also consider that these designs can be enlarged to a suitable size for electric sport scale, you just have to be excited about the possibilities. I was, and this article presents my second design for electric R/C sport scale, the Pilatus Turbo Porter. The model is an enlargement of Bill Hannan's peanut scale plan for the same plane. The 13-inch span peanut scale plan was enlarged five times to make a 65-inch span R/C model. Some may say that the 65-inch span is quite large for an electric power model using an 05 motor. I assure you however, that its Free Flight-type construction allows for a good-performing R/C electric model.

The Pilatus Turbo Porter is a rather unique-looking aircraft. A Swiss design, it was built as a STOL, cargo-carrying aircraft for use in the confines of the Alps. The squarish lines and high aspect ratio wing make for simple building and good flying characteristics. These good flying characteristics are actually due to the larger size

of the model. It has ample wing area to easily support the weight of the flight system. An Astro cobalt 05 gear system powers the model from seven 1200mah Sanyo cells. Other ferrite motors can of course be used with minor changes to the motor mount and would fly the model well. Larger motors could be used of course, as there would be ample wing area to support the additional batteries and lots of room for them, but it was decided to keep to a maximum of seven cells to keep the project affordable and simplify charging.

Use lightweight radio gear and through-out construction build light. Carefully select the balsa used and use Cyanoacrylate glue. Avoid modifications to the design which would add weight. Remember the success of your model will be measured in grams.

Begin construction by carefully choosing the wood to be used. Select stiff straight-grained wood for longerons, spars, and leading edges and trailing edges. A balsa stripper is very useful for cutting consistent strips from selected sheets. Softer, lighter wood can be used for cross-

members and uprights in the fuselage and ribs in the wing and tail. Gather up your glue, pins and tools and get started.

FUSELAGE

The fuselage is constructed in a conventional stick framework fashion as anyone who has built rubber scale models is familiar with. Lay out the plan flat and cover it with waxed paper for protection. Pin down the 1/4-inch balsa longerons and the 1/4-inch sheet cabin side. When preparing this part be sure to accurately cut out the slots to accept the spar dihedral brace and the trailing edge. These two holes will determine the alignment and incidence of the wings, so take care to be accurate. Using softer wood, cut to size and glue in the uprights and gussets. Allow this side to dry, remove from the plan and then build the other side. As you will notice, these fuselage sides, and indeed the whole fuselage, is easy to build as there are no curves in it.

Having completed both sides, it will be necessary to accurately and squarely join them. First sand them flat and true with respect to each other. Next glue them together at the tail post at the correct angle. When dry, crack the fuselage sides inward

just behind the wing as shown on the top plan view and install two crossmembers, top and bottom, to hold the sides the proper distance apart. Use a square to maintain a true box framework as the glue dries. Install F-5 and the remaining fuselage cross members forward, up until where the fuselage again breaks to taper to the nose. Remember to install the spruce crossmembers in the floor where shown. Crack the sides here and fill in the crossmembers from the nose back. Let the assembly dry thoroughly. Install F-1 through F-4 and sheet the forward fuselage with light 1/16-inch sheet balsa. Slip 1/2-inch wide pieces of 5/16-inch surgical tubing, or doubled-over rubber bands over the spruce crossmember securely. Fill in the fuselage floor with 1/16-inch balsa where shown and make and install the 1/16-wire strut mounting wire. This strut mount wire stretches across the fuselage in one continuous piece for strength. Secure it to the 1/4 x 1/2-inch spruce crossmember with landing gear straps or bind it to the crossmember with thread and glue it. Install F-5 and the spar box made from 1/8-inch plywood and 1/8-inch square spruce. Glue this assembly into the fuselage, lining up exactly with the holes in the fuselage sides for the wing dihedral braces.

Install the 1/8-inch balsa filler pieces on top of the rear of the fuselage for the fin mounting. Cut a hole in this for the rudder pushrod.

MOLDING THE WINDSHIELD

The windshield is formed of .045 butyrate sheet (available from Sig Manufacturing), by stretch-forming it over a balsa plug. Begin by cutting a block of balsa to fit into the windshield area. Then tack-glue it into place, sand it to fit and shape it just like the windshield you want to duplicate. Remove the block and fine-sand it as best you can. You can fill the grain with spackling compound or leave it alone as you prefer. Personally, I just fine-sanded the balsa plug. Do not use polyester resin to fill the grain as the hot plastic you are forming will soften and blister the resin. Drill a one-inch hole into the back of the plug and insert an 18-inch piece of 1-inch dowel and glue this in place. This will give you a handle to support the plug. Make a rectangular frame from 1/2-inch plywood about 2-inch larger, all around, than the plug. Staple the butyrate sheet to it and heat the plastic in your electric oven under the broiling element on high and leave the oven door open. Prop up the frame with wooden blocks so that the plastic is about 10 inches away from the element. Leave the plastic in until it sags uniformly from edge to edge. Just before it melts remove it from the oven. (Use oven mitts for obvious reasons). Have someone hold the plug on the end of the dowel against the floor or table vertically and while the plastic is still hot, stretch it over the plug. Push down until you have the plug completely covered. As the plastic is cooling, cut around the edge of the plug with a knife and remove the plug. It helps to spray the plug before forming with cooking no-stick spray such as "Pam" to act as a mold release. Make

a few windshields while you're at it as spares or for friends. Don't be afraid to try it, it's really very easy.

The cowling on my model was vacuum-formed. A balsa cowl could, however, be easily made by gluing together and forming some soft balsa blocks. Hold the cowl to the fuselage with small screws into the hardwood blocks glued to the fuselage.

LANDING GEAR

The landing gear is formed by bending, wrapping and soldering 1/8-inch and 3/32-inch piano wire. The two main struts fit into a brass tube which is as long as the width of the fuselage and is installed on top of the 1/4-square spruce landing gear crossmember under the surgical tubing. Use "J" bolts to attach the struts to the underside of the fuselage. The oleos are duplicated by slotting 5/16-inch dowel to fit over the 1/8-wire L.G. struts. Glue the dowel on and fill the gap left with balsa and sand to shape. The landing gear absorbs shock by moving up and down in the slot in the fuselage side. The surgical tubing provides the return. You could mount the landing gear solidly for simplicity but you may want to use Trexler wheels to absorb the shocks of harder landings. "JoZ" lightweight wheels were used on the original. The tail wheel is built from wire, bent and silver soldered to shape. Bind and epoxy this assembly to the tail post.

You will have to build a trap door in the floor of the fuselage to allow entry into the fuselage and to facilitate changing batteries. The door is made from 1/8-inch light plywood with cooling holes cut into it. The bottom of the fuselage is framed with 1/8-square spruce to hold the door in place. Build the servo mounts with 1/8-inch plywood and 1/4-inch triangular stock and install them before covering the fuselage.

STAB/RUDDER

The stabilizer is built with 1/4-inch balsa. Choose stiff straight pieces for the leading edge, spar and elevator leading edge. Use soft, light balsa for the rest. The fin and rudder are built from 1/4-inch strip stock. Keep the tail light to aid in balancing later. You can sand the elevators and rudder to a tapered cross section if you wish.

WING

The wing is easily built flat over the plan. Cut out all the wing ribs. Use light 3/32-inch 'C' grain balsa for this and make all the ribs exactly 1/8-inch stock. Choose hard stiff 1/4 x 1/2-inch balsa for the main spars and pin them to the plan. Pin the 1/2 x 3/8-inch leading edge and the 1 x 1/4-inch balsa trailing edge down as well. Glue in the ribs and then add the top spars. Use 1/8-inch square hard balsa for these. When dry, remove the wing panels and glue on the 1/8-inch balsa sheet wing tips and the 1/4 x 1/8 spruce root rib stiffeners. Drill through the root rib and this stiffener and install the two wing hooks made up of 2/56 pushrod wires. Anchor these with epoxy and install a retainer nut and washer on the threaded portion. Turn the wing upside down and cut away the root rib at the spar to allow for the installation of the 1/8-inch plywood

wing dihedral braces. Glue these into place securely. Bend to shape from 1/16-inch wire and install the strut mounting wires. Glue these to the wing spars and add 1/4 x 1/2-inch balsa pieces behind them to hold them there. Shape the leading edges and sand the whole thing to remove any lumps and bumps.

Build the wing struts from 1/4 x 1/2-inch spruce sanded to an airfoil section. Bend 1/16-inch wire strut fittings to shape and epoxy them to the ends of the struts. You may want to reinforce the joint with fiberglass. Remember, while you are building them, that the struts are designed to be functional.

THE MOTOR

The power system used is an Astro Cobalt 05 gear drive using seven 1200 mah Sanyo cells. The motor is held to the mount and the batteries to the floor with rubber bands. Install the servos and pushrods before covering for simplicity but leave the tail surface installation and hinging for later. This will make covering simpler.

COVERING

The model is covered with Solarfilm, chosen for its ease of application and light weight. MonoKote, although a bit heavier, would be okay too. Just stay away from high-shrink or heavy coverings. The structure is easily warped and the weight factor must always be considered. After covering, make and install an elevator control horn and hinge the control surfaces with small Du-Bro or Klett hinges. Make sure that the control surfaces are free-moving. The windscreen was installed using R/C 56 glue and held in place with rubber bands until dry. Install the motor, on-off control and the rest of the radio system. Paint and install the cowling.

A World Engines mini-flight pack was used for the on-board equipment. The small S-22 servos are light and have been reliable. The 100mah battery pack which comes with the mini-flight pack was used but this necessitates field charging the model every few flights. You may wish to use a 250 mah pack for greater piece of mind.

The best-looking prop on the model is a Grish Tornado brand aluminum-colored 10 x 6 polyester prop. A Hillcrest 3-blade spinner fits perfectly. The model was tested with this prop and it works just fine. For better performance, a standard Top Flite 11 x 6 prop was used and permitted longer flights.

The model should have between 1-1/2 to 2 inches of dihedral under each wingtip. This should be established by the angle of the dihedral braces and strut length. Check for this amount and for any warps. The balance point is indicated on the plans. Shift things to get it right. Set up the rudder throw for about 1-1/2 inches of deflection in either direction and the elevator for about 3/4 inch in either direction. The model came out to weigh about 50 oz. ready to go and all fueled up. If yours is about the same, then charge up and get out to the field. The model flies like a trainer and has ample power to R.O.G. from grass. Enjoy your Pilatus Porter and the fun of electric flight. •