

CONSTRUCTION

BY NICK ZIROLI SR. ■ PHOTOS BY NICK ZIROLI SR. & TOM SMITH

TURBINATOR-E

This compact electric-powered ducted-fan model is easy to build and has plenty of performance to satisfy any jet pilot

OVER THE YEARS, I have designed and built a number of RC ducted-fan models. Due to my close association with the late Bob Kress, these models ranged in power size from .049 to .90 cubic inches. With current electric power technology being so efficient and practical, I decided to make a smaller electric-powered version of my 72-inch-span turbine-powered Turbinator jet. I designed the prototype Turbinator-E to be powered by the Astro brushless 020 motor/Wemotec 480 Mini Fan system offered by Astro Flight. It had a 44-inch wingspan and used a 3-cell LiPo battery. This combination flew OK but not as I would have preferred. I changed to a 45A ESC and a 4-cell 2100mAh FMA LiPo battery for a great increase in performance. I have also used the High End Technology RC 6904 ducted fan with the Astro Flight 020 803MS motor on 4 cells with very good results.

My first Turbinator-E was equipped with Robart 600-series air-up/spring-down retracts and weighed 52 ounces. The second has a 40-inch span and a shorter horizontal stabilizer. It has no landing gear and is launched with a 12-foot length of $\frac{3}{16}$ inch bungee cord from grass fields. This article is for the 40-inch span model. I used the new Airtronics RDS8000 2.4GHz radio system and the performance is as solid as a rock and is a winning combination for any electric ducted-fan model.

CONSTRUCTION

Cut out all the fuselage sides and formers. If a fixed landing gear is going to be used, make former F-2F from aircraft ply. Obtain the wing mount tube so you know what size to make the mount holes in the sides and ribs. Check your local hobby shop for the $\frac{3}{8}$ -inch tubes. K&S Products have many

SPECIFICATIONS

MODEL Turbinator-E

TYPE electric ducted fan

WINGSPAN 40 in.

WING AREA 360 sq. in.

WEIGHT 40 to 54 oz.

WING LOADING 16 to 21 1/2 oz./sq. ft.

LENGTH 43 1/2 in.

RADIO REQ'D 3- or 4-channel (elevator, throttle, ailerons, rudder optional)

POWER Wemotec Mini 480/Astro Flight brushless 020 803FM or High End Technology RC 6904 ducted fan with Astro Flight brushless 020 803 MS (must be long shaft)

ESC Castle Creations Phoenix 45

BATTERY 4-cell FMA 2100mAh or ThunderPower 4-cell 2000mAh

GEAR USED

RADIO Airtronics RDS8000 and RDS8000 2.4GHz with 94091 servos on ailerons, 94556 on elevators

RETRACTS Robart no. 601P 85-degree main gear, no. 602 nose gear

The Turbinator-E is off for another flight. This version has no landing gear and is easily made airborne with a bungee launch.



sizes. If you can't find aluminum tubes, brass may be also be used with a small weight penalty.

Join the $\frac{3}{32}$ -inch bottom section together from 3-inch-wide balsa sheets. There are three pieces between B-1 and B-5. I used Pacer Zap glue products for all construction. Mark the location of formers F-5 and F-7 on the bottom and draw a line down the center. Glue the formers in place centered and square to the bottom. Glue a $\frac{1}{8}$ -inch-square balsa strip along the bottom inside edge of the FS-6 $\frac{1}{8}$ -inch balsa inlet sides. Glue these to the bottom and formers. Assemble the $\frac{3}{32}$ -inch balsa fuselage sides, FS-1, FS-2 and FS-3. Only glue FS-1 to FS-2 from the front edge to the location of



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IT CAN BE BUILT WITH FIXED OR RETRACTABLE LANDING GEAR, OR LEAVE THE GEAR OFF TO SAVE WEIGHT

former F-4. Add the FS-5 and other edge strips to the sides being sure to make a right and left. Allow the FS-5 and $\frac{3}{32}$ x $\frac{1}{4}$ -inch strips to overhang the sides by about $\frac{1}{2}$ inch for beveling later. Taper the rear edge of FS-1 as seen in the top view.

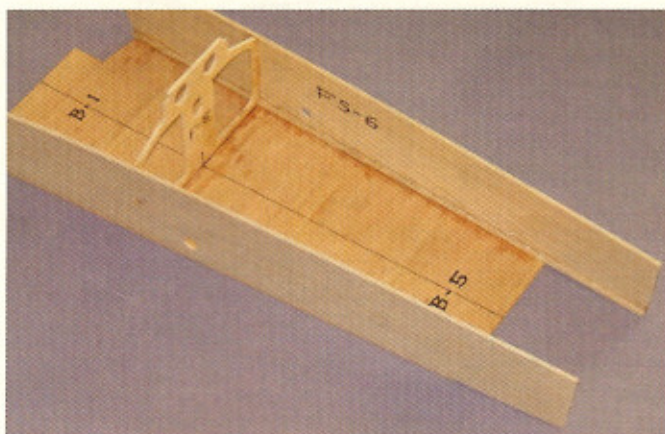
Install the sides and F-4 to the inlet assembly. Turn FS-1 at an angle to pass through the opening in F-5. Pull the rear ends of FS-1s together and glue together, and then glue them to F-5 and the bottom. Install formers F-1, 2 and 3. Angle the top of F-3 so F-3A will sit on top of it as shown in the side view. If fixed landing gear are going to be used, bolt the nose wheel mount to former F-2E. Hold the sides to the formers

with clamps and masking tape. Complete the rear fuselage with formers F-6, 8 and 9.

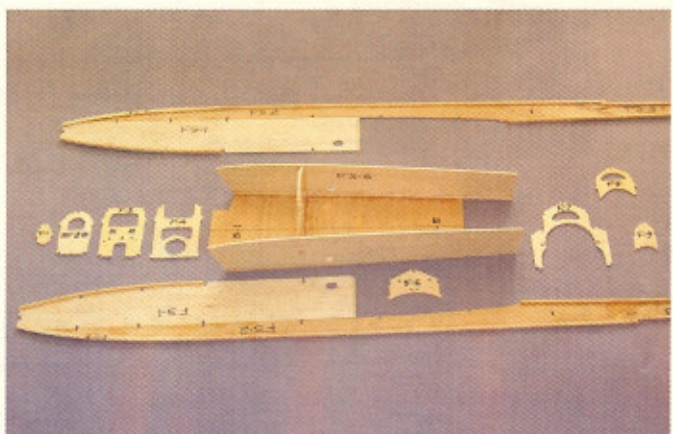
If retracts are to be used, install the air tank on the floor behind F-4 and gear mounts between F-2 and F-3. Add the battery floor BF-1, accessory floor FL-1 and elevator servo mount SM-1. Glue the motor mount MM-1 and MM-2 pieces in place. Cover the bottom aft fuselage with common bond paper glued in place with white glue. Install the small plastic tube pushrod guide. If rudder control is desired, mount a servo in front of F-5 and run a pushrod to the opposite side of the fuselage. Glue FS-4 and 4A in place. Use a sanding block to bevel the edges of FS-4 and the inlet sides of FS-6 to match the top

pieces. Also, bevel the fuselage sides and F-3 to match the angle of the formers. Put the wing tube through the holes in FS-6 with the $\frac{1}{32}$ -inch plywood FS-6A reinforcing plates on the inside. Check that the tube is square to the centerline of the fuselage. Adjust the holes in FS-6 if required. When correct, glue FS-6As in place. Cover the top of the inlets with $\frac{3}{32}$ -inch balsa.

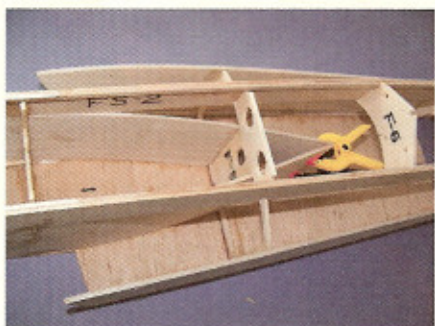
The hatch should be built in place on the fuselage. Cover the hatch opening with kitchen plastic wrap and assemble all the parts in place. The finished hatch is held in place with $\frac{1}{8}$ -inch alignment dowels in the back and a 4-40 screw and blind T-nut in the front. Glue in some tapered blocks



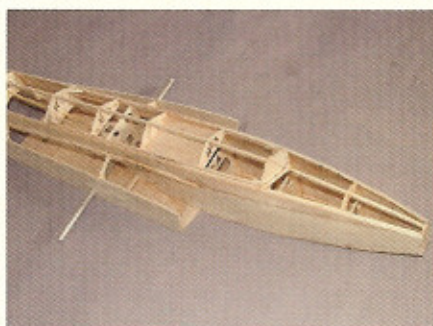
Here's the central fuselage structure that forms the air intake section of the fuselage.



Here are the basic parts for the fuselage structure.



The side assemblies slide into the central part of the fuselage and the ends are glued together as shown to guide the airflow back to the ducted-fan unit.



The wing panels are attached to the fuselage with this wing attachment tube shown here in place in the fuselage.



To make the removable hatch, cover the hatch opening with plastic wrap and build the cover in place on the fuselage. The wrap prevents the hatch cover from being glued to the fuselage.

under F-3 to support the blind T-nut. Cover one side of the nose and hatch with 1/16-inch sheet balsa and let it overlap F-6 a little. Trim and sand flush to the sides and top stringer (see section at F-5 on plans).

Before covering the other half, cut a separation between F-3A and H-2. Apply the second side and again cut and sand smooth. If the plastic wrap has done its job the hatch should not be very difficult to remove. Sand the 1/16-inch covering even with H-3. Fill the front of the hatch above H-2 with balsa and re-drill for the retainer screw. Cover the aft top of the fuselage from F-6 to F-9 with 1/16-inch balsa.

WING CONSTRUCTION

Rollled-paper wing tubes must be made to fit the joiner tube. Apply paste or spray-wax the metal tube and cover the tube with two layers of kitchen plastic wrap. Then, wrap

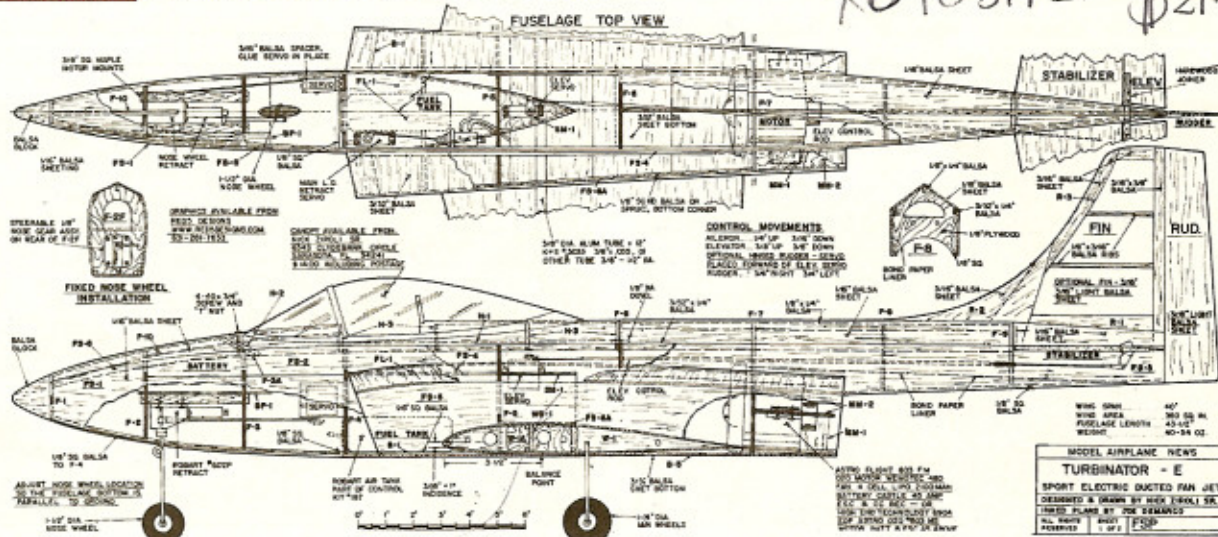
three layers of bond paper with yellow carpenter glue over the plastic wrap. Let this dry completely in a warm place. Make the holes in the wing ribs to fit the paper tubes.

Cut out the ribs and spars. Cut W-3 and W-4 ribs and braces for the landing gear if used. Glue a 1/8-inch-square hard balsa strip along the bottom edge of WS-1. Pin this to the plans. Tape the 3/16-inch-square rib shim where shown on the plans. Glue the appropriate 1/32-inch plywood wing tube and landing gear braces in place. Glue ribs W-1 to W-8 in place followed by the top 1/8-inch square spar at WS-1 and 3/16-inch square leading edge. Slide the paper wing tubes in place and slide the wings onto the wing tube. The W-1 ribs should fit flush against the fuselage sides. Adjust the holes in the ribs and spar so the wing panels fit properly. Glue the tubes in place on one rib with Pacer 5-minute epoxy. Make the aileron

servo lead tubes from rolled paper and glue in place at one rib. Place the wing over the plans and rib shims. Secure with weight and glue the tubes to the other ribs. This is done to set the correct wing twist and washout at the tip. Glue a 1/8-inch balsa and plywood block to the bottom of the wing tube at the outside edge of W-2 for the 1/2-inch-long sheet metal wing securing screw. Glue the 1/8-inch dowel wing locating pins into W-1.

Sand the leading edges to blend into the ribs. Cover the bottom of the wings with 1/16-inch sheet balsa. Trim the leading edge and taper the sheeting at the trailing edge. Cut the aileron servo opening and, if used, the retract servo opening. Cut through the covering at W-4 to indicate the end of the aileron assembly. I prefer to apply the wing sheeting in two pieces, from the spar to the trailing edge and from the spar to the leading edge. Apply Pacer Sheet Zap to the ribs

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and edges and tape the sheeting in place quickly. Place the panel over the plans and shims and hold the panel down with a stack of magazines. Once the glue has dried, remove the panel from the plans and cover the leading edge. You don't have to place the wing panel back on the plans for this. Add the 1/2-inch balsa wingtips and carve and sand to shape.

Install the wing panels and set the fuselage on a flat surface. Measure from the work surface to the leading and trailing edges. The center of the leading edge should be 3/16-inch higher than the trailing edge. Adjust the holes in the fuselage to obtain this alignment then apply Thin Zap to the holes to harden them. Cut the aileron from the wing panels and cap the openings with 1/8-inch balsa. Install the aileron end rib W-4A and 1/8-inch balsa horn mount. Angle the front of the ailerons

as shown on the plans. Make sure the ailerons fit properly then install the hinges after covering the model.

The tail surfaces can be cut from light 3/16-inch sheet balsa or built-up from stick and sheet stock for a lighter surface. A built-up tail does save time and is stronger. Join the elevators and cover the surfaces before hinging and gluing in place.

FINAL ASSEMBLY

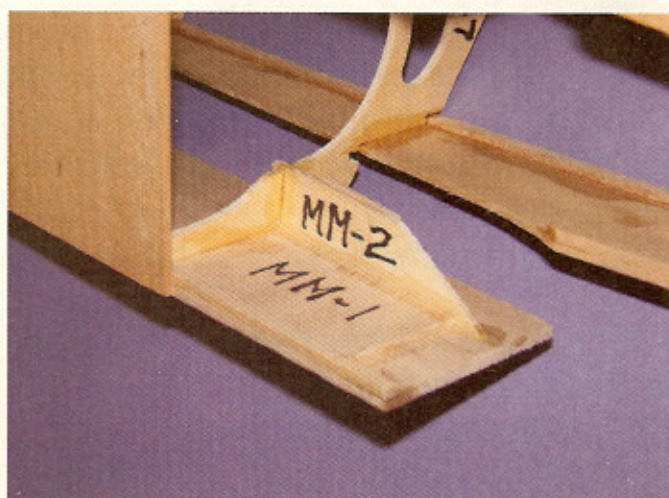
Cover all the parts with a lightweight iron-on covering then glue the tail surfaces in place. Be sure they are in good alignment with the fuselage. Cut and fit the fin fairing from F-9 to the tail and taper the edges to blend in place. Glue or hinge the rudder in place as desired. Trim the canopy and glue it in place on the hatch with Pacer Canopy Glue. I used Red5 Designs graphics for the aircraft markings.

Install the landing gear and wheels. Make certain that the bottom of the fuselage is parallel to slightly nose down with the ground. The nose wheel steering and aileron servos are held in place with Pacer Zap-a Dap-a Goo adhesive. Install the pushrods and set up the control surface throws as shown on the plans. Aileron servo covers are included with the formed canopy I sell. These should be glued in place over the servos and pushrods to protect them during belly landings.

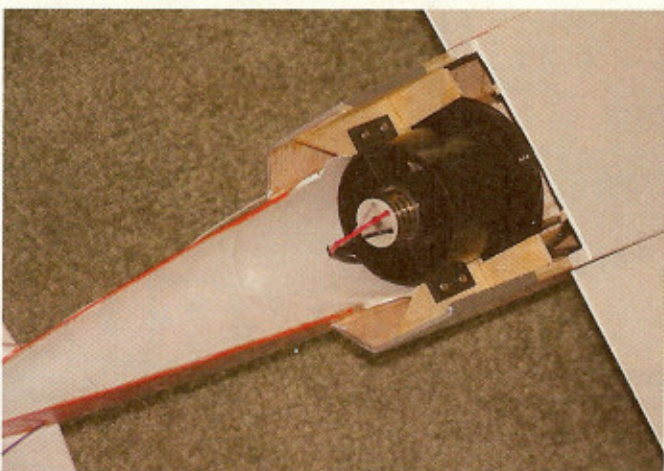
Install the ducted-fan unit and ESC. If your fan doesn't have an inlet ring, you must make one. Performance suffers considerably without one. Mine is made from a piece of 3/4-inch-thick blue foam and sanded to shape. Secure the ESC to the inside of the inlet with Velcro. Be sure the hatch formers do not interfere with anything inside the fuselage.



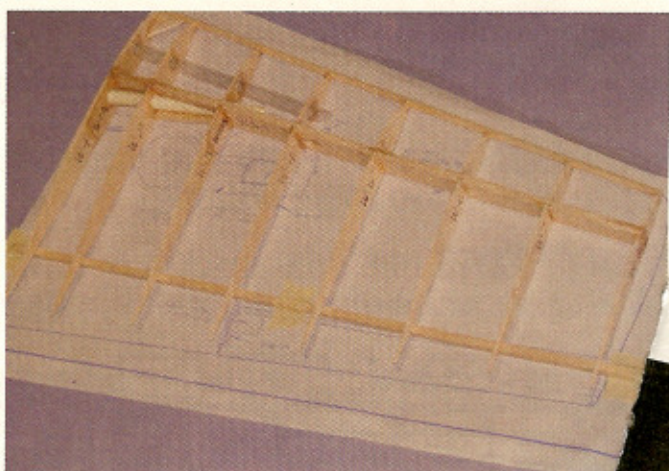
Here is the fuselage sheeting being glued into place.



Here's a closeup of the simple mount setup for the ducted fan unit. It is located at the aft section of the main fuselage forward of the tail section.

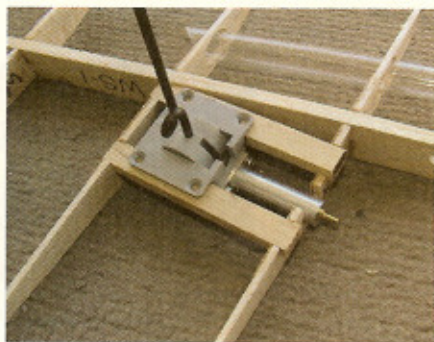


To fair out the bottom of the aft fuselage, common bond paper is glued in place with white glue.



The wing is basic and easy to build. Note the shims to keep it straight as being glued together.

CONSTRUCTION TURBINATOR-E



You have several options for landing gear. Here's the installation for the Robart main retract gear.



Here's the completed airframe ready for covering and the addition of the form canopy available from the author.



With the main hatch cover removed, you have plenty of access to the radio system and battery.

IN THE AIR

With the battery installed, the model should balance very close to the location shown on the plans. Check this critical requirement and make sure it is correct. Check control surfaces for correct directions and make sure the battery is fully charged before your first flight. With tricycle landing gear on a smooth surface, takeoff is easy. Acceleration is pretty good

and it should be in the air in about 60 to 75 feet. Without landing gear, a bungee launch off of grass takes only 6 to 8 feet to get in the air. Stretch the 12-foot-long bungee six paces, or to about 18 feet, to launch. It works every time and is worth the few minutes it takes to set up.

The Turbinator-E is very stable, good in windy conditions, and feels like a larger model. Loops, rolls and inverted flight are

easily performed. I am amazed at the large loops that can be made from level flight. A functional rudder will improve its aerobatic capabilities. The retracts add realism and people don't expect to see them on this size model. I have really enjoyed all my Turbinators, and I am sure you will too. †

See the Source Guide for manufacturers' contact information.

Nick shows off his collection of Turbinator jets. The big one is powered by a turbine engine while the two smaller E-versions use Wemotec and High End Technology electric fan units with Astro Flight brushless motors.

