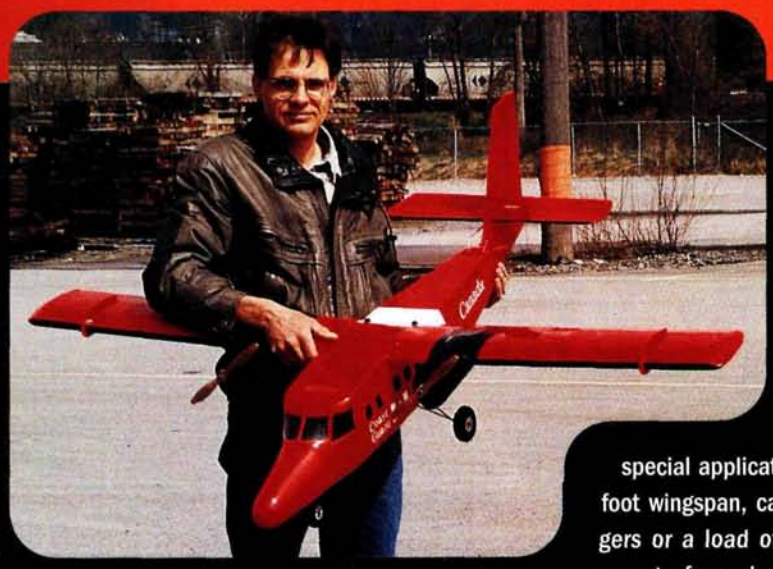
de Havilland TWIN OTTER



by Anton Eisele

A sport-scale model of DH's workhorse

The Canadian de Havilland Turboprop Twin Otter was designed for use as a regional commuter and for other special applications. The plane has a 65-foot wingspan, can carry up to 12 passengers or a load of 4,400 pounds and can operate from short runways. This 1/12-scale design of the Twin Otter makes a great 4-channel model that can be powered by a pair of geared Speed 480 electric motors or small .10-size glow engines. Because the model has a high-lift wing, I decided not to use flaps, but the ailerons are large enough to be used as flaperons if you're looking for STOL capability. If you go this route, you'll need to modify the wing for dual-aileron servos and use a radio with flaperon programming. If you're really into scale, there are lots of websites that can give you information on color schemes and scale detailing.

SPECIFICATIONS

MODEL: de Havilland Twin Otter

TYPE: sport-scale twin electric

SCALE: 1/12

WINGSPAN: 65 in.

LENGTH: 50 in.

WEIGHT: 3.5 to 4.5 lb.

WING AREA: 455 sq. in.

WING LOADING: 17.7 to 22.8 oz./sq. ft.

POWER REQ'D: 2 Speed 480 motors, or 2 .10 glow engines

POWER USED: 2 Kyosho 7.2V Speed 480s w/2 Maxx 2.5:1 gearboxes, a Schulze 35e ESC and an 8-cell, 2000mAh battery

PROP USED: Master Airscrew 10x6 electric

RADIO REQ'D: 4-channel (elevator, rudder, aileron, throttle)

FLIGHT DURATION: 4 to 6 min.

COMMENTS: designed by Anton Eisele, the de Havilland Twin Otter is an easy-to-build sport-scale twin for electric power or twin .10 glow engines. The model uses traditional balsa and ply construction, and the plan is highly detailed.

CONSTRUCTION

The wing with its constant chord is easy to build and has 3 degrees of dihedral on each panel. Start by cutting out the ribs from the material listed on the plan. Cut the top and bottom sheeting from a sheet of 1/16x3x36-inch balsa, and pin the bottom sheet to the plan. Glue the bottom 3/8x3/16-inch balsa spar onto the leading-edge sheet so that only half of the spar width is on the sheeting. Glue the ribs into place and then glue on the top spar. Use the dihedral gauge on the plan to set the dihedral angle of the root ribs.

Now add the top leading- and trailing-edge sheeting, the 1/4-inch balsa at the end of the aileron ribs, the capstrips and the shear webs. Be careful not to sheet the area where the nacelles will go. Flip the wing and glue on the remaining bottom sheeting and the capstrips. Sand the leading-edge sheeting so it's even with the ribs and then glue on the 1/4-inch leading edge. Before the wing halves are joined, shape the leading edge to the rib profile.

Cut out the nacelle sides from 1/8-inch plywood and glue them into place. Next, install the bellcranks and aileron pushrods, and route the motor wiring; you'll need to cut a small hole in the webbing at the nacelle for the motor wires.

This view of the top of the left wing shows the nacelle during construction. The formers are in place and are ready to be sheeted.

Here's the right wing panel minus the motor nacelle. Note the simple aileron bellcrank and pushrod system.

FSP0502 de Havilland Twin Otter

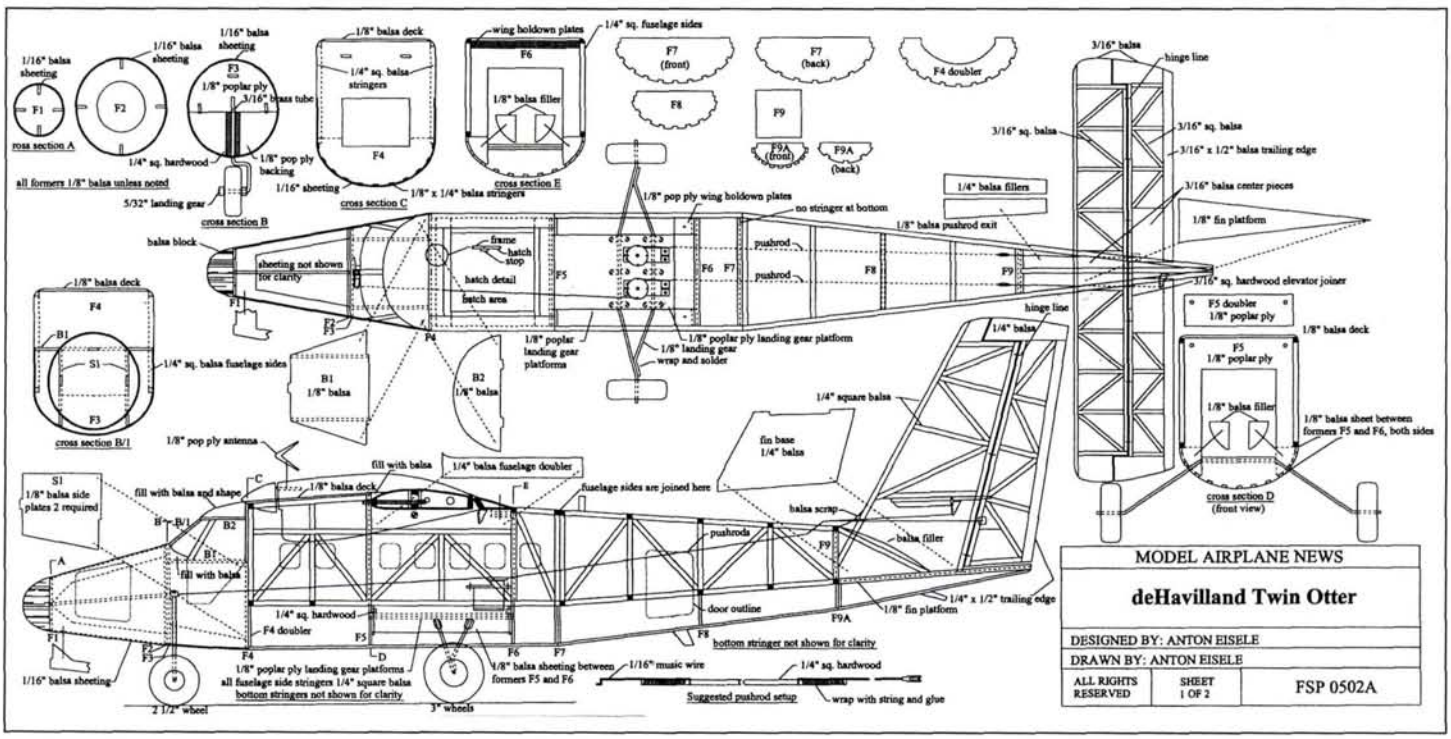
Designed by Anton Eisele, the de Havilland Twin Otter is an easy-to-build sport-scale twin for electric or twin .10 glow engines. The model uses traditional balsa and ply construction, and the plan is highly detailed. WS: 65 in.; L: 50 in.; engines: 2 Speed 480 electric motors or 2 .10 glow engines; radio: 4-channel; LD 2. **$19.95**

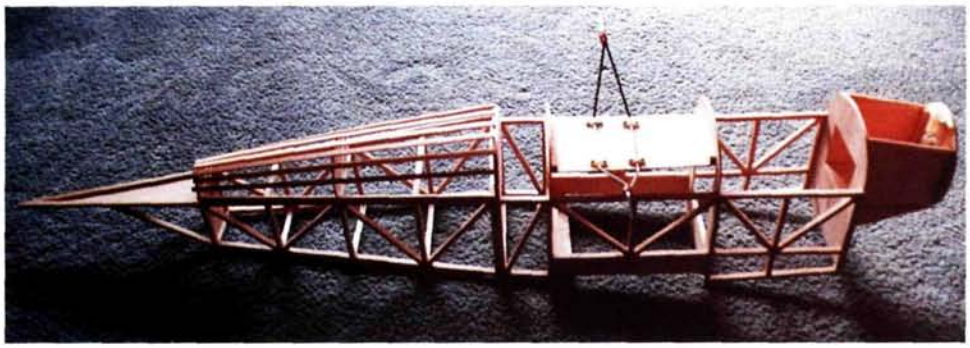
Join the wing halves with two plywood braces, sheet the center section of the wing and build the ailerons as shown on the plan. I mounted the aileron servo on a plate that slides into 1/4-inch hardwood rails, and I secured the plate with a single screw.

NACELLES

Glue formers N1, N2, N3 and N4A onto the nacelle sides, and sheet the top and bottom with 1/2-inch-wide strips of 1/16-inch balsa. Build the cowl by gluing formers N1A, N2A and N3A onto the 1/8-inch plywood cowl floor, and plank them with 1/16-inch balsa strips. Make the front section of the cowl out of 1/4-inch balsa and then sand it to shape. Screw the cowl to the front of the nacelle, and peg it to the rear of the nacelle.

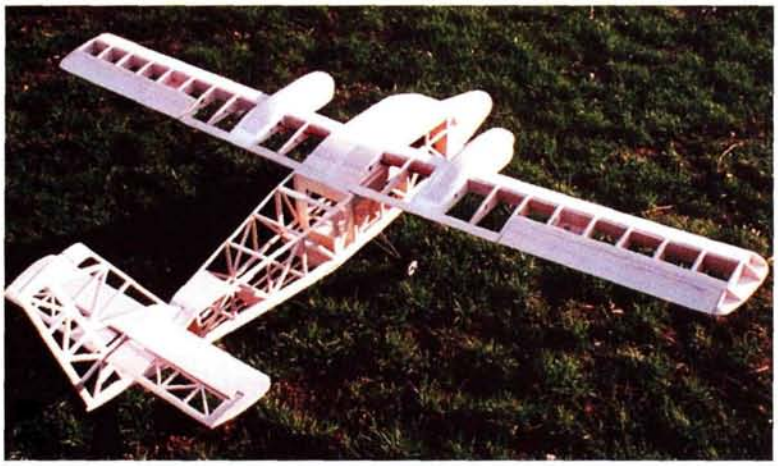
To order the full-size plan, turn to "RC Store.com" on page 130.





The fuselage has been framed except for the belly and nose bottom. Build the nose cone separately and add it later.

Glue the motor-mounting plate and the ¼-inch and ⅜-inch-square hardwood rails into the nacelle. The motors are held in place with a ½-inch-wide metal strip that's screwed into the ⅜-inch hardwood rail.



Here's the Twin Otter, built and ready to cover. Note that the stabilizer should be open frame and not sheeted as shown here. Just follow the plan.

FUSELAGE AND TAIL ASSEMBLY

The fuselage construction is unique; the sides are built of ¼-inch balsa sticks as front and rear sections (I find it easier to make the sections square and true that way). I then add the formers and longerons to give the fuselage its shape. Begin by building the two fuselage sides over the plan and gluing in the ¼-inch balsa wing saddle. When they're dry, remove the fuselage sides from the plan, clamp them together and sand them to make them identical.

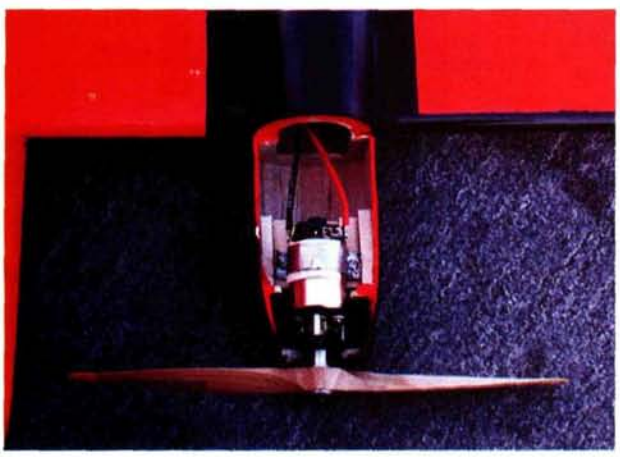
Join the aft halves with ¼-inch-square balsa sticks, former F9 and the ⅛-inch balsa fin platform, using the plan to get everything straight. Next, join the front halves by gluing formers F5 and F6 onto one of the fuselage sides and then gluing the other side onto the formers. Again, make sure everything is straight and true and then add the horizontal stringers.

Next, glue the front and back fuselage sections together and add F4 (note that it fits on the front of the fuselage box, not in between the fuselage sides). Build the box that goes between F3 and F4 from B1 and two S1s and fit them into F4.

Epoxy the 5/32-inch-i.d. brass sleeve onto F3, glue F3 onto the box and sheet the area between F3 and F4 with 1/16-inch balsa. Note that the sheeting goes only as high as B1.

Glue the two ⅛-inch plywood main landing-gear plates into place between formers F5 and F6. The main landing gear is made of ⅛-inch-diameter wire, and the front gear is made of 5/32-inch-diameter wire. Now add the rest of the formers and the ⅛x¼-inch balsa stringers. Note that the number of stringers decreases toward the rear of the fuselage.

Build the nose by gluing the balsa platform and the two ⅛-inch balsa stringers onto former F1. Now glue on former F2, sheet the nose with 1/16-inch balsa and then add the balsa nose block. Glue the assembly to F3. Place the wing on the fuselage and make the holes for the 3/16-inch-diameter wing hold-down dowels by drilling through F5 and into the leading edge. Remove the wing, and glue the dowels into it. Build the front deck and the battery access hatch out of ⅛-inch balsa. Glue B2 onto the front of F4, fill the top part with soft balsa and sand it to shape. Carefully sand the entire fuselage, and set it aside.



Here, the cowl has been removed to show the Speed 480 motor strapped into place. I placed a piece of balsa in front of the gearbox to prevent it from sliding too far forward.

Using the plan, build the fin, rudder, stabilizer and elevators and then shape the leading and trailing edges; do not assemble the elevator halves yet. Note the ¼-inch triangular reinforcement under the stabilizer where it meets the fin. It's best to cover the tail assembly first before permanently gluing it into the fuselage.

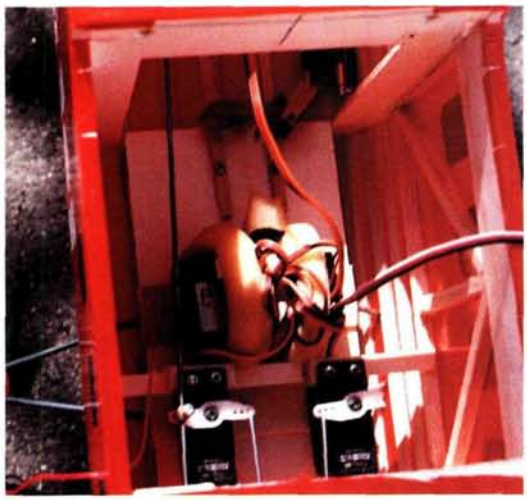
FINAL ASSEMBLY

Glue the tail assembly into the fuselage, and use slow-curing glue to give you time to align it. Put the wing on the fuselage, align it and drill the wing-bolt holes through the trailing edge and the wing-mounting plate. Tap the plate with a ¼-20 tap, bolt the wing on and recheck the alignment.

I covered the plane with UltraCote and painted the black trim with enamel spray paint; I cut the rest of the trim from white covering material. For servos, I used a Hitec HS-81 for the ailerons and standard servos for rudder and elevator. To power the model, I used a pair of Kyosho Speed 480 motors with Maxx Speed 400 metal gearboxes (I had to trim the gearboxes a bit to make them fit the Speed 480s) with 2.5:1 ratio turning Master Airscrew 10x6 electric wooden propellers. I found this combination to be the best compromise between thrust and speed. I also used an 8-cell, 2000mAh battery pack and a Schulze 35e speed controller wired in parallel.

GENERAL FLIGHT CHARACTERISTICS

Now to the fun part! Most modelers have the notion that twins are difficult to fly—



There's plenty of room to mount the radio equipment. Note the rails for mounting the battery pack.

not so with electric power! Glow twins can be tricky to set up for a good flight, but electric motors almost always run at the same speed, and the chances of one motor quitting are very slim. It has never happened to me.

Initial flight tests took place on a rather windy day—good for quick take-offs but not for flying a lightly loaded plane. After a final check, I let the plane run until it reached its maximum ground speed and then eased in some up-elevator; the climb was steady and not too steep.

The only trim needed was a bit of up-elevator. The Twin Otter flies rather slowly, so it appears quite scale in the air. The rudder is very effective, and I recommend using it more than the ailerons for turning. Stalls are flat, and recovery takes only a few feet. The plane has no bad tendencies. I did low and slow passes in a brisk wind without worrying about the motors missing a beat.

After one more fly-over, I made the final approach. I throttled back to ⅓ power and let the plane sink to about five feet above the tarmac; then I reduced power to idle and flared out. With the wind, the model landed at a slow pace on its main gear. This plane is easy to fly, and if you use glow engines to power your plane, you will get more speed. Just be careful with man-euvering; remember, the plane is lightly built.

CONCLUSION

This model is easy to build and even easier to fly; anyone who has basic building skills can complete it. Its gentle flight characteristics make for a great twin trainer, and it's relaxing to cruise around with. Wouldn't it look great on a set of floats? Have a go at this unique twin; you won't be disappointed!

Kyosho; *distributed by Great Planes Model Distributors, P.O. Box 9021, Champaign, IL 61826-9021; (800) 682-8948; (217) 398-6300; fax (217) 398-1104; www.kyosho.com.*

Master Airscrew; *distributed by Windsor Propeller Co., P.O. Box 250, Rancho Cordova, CA 95741-0250; (916) 631-8385; fax (916) 631-8386; www.masterairscrew.com.*

Maxx Products Intl., *815 Oakwood Rd., Unit D, Lake Zurich, IL 60047; (847) 438-2233; fax (847) 438-2898; www.maxxprod.com.*

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