THE FLYING WING

Need Something Different And Exciting, But Don't Have A Lot Of Time Or Money? ... Why Not Try This Electric-Powered Flying Wing.

By Dennis Tapsfield

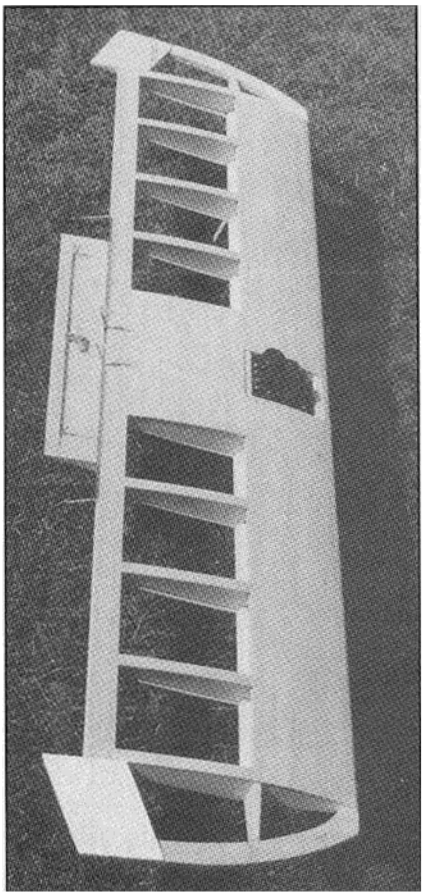
This is not intended to be a scale model; it is however, a look-alike based on some pictures I had of a full-sized aircraft called a Facet Opal. I wanted to build something different and decided on electric power since I can fly in a number of places locally where internal combustion engines are not permitted.

It is inexpensive to build, using a very basic 540 "buggy" motor selling for very low prices, which turns a 7" x 5" APC propeller at 11,000+ rpm on seven sub "C" 1400 or 1700 SCR cells. No sophisticated charging system is needed and the use of standard servos and rx avoids the need of miniature radio gear. The one thing you may need is a 250 or 300 mA rx battery.

The model is lightly loaded at around 13 oz. per square foot, and is quite fast, aerobatic, and real fun to fly. It has no fancy reflex wing section and is easy to build. If you intend hand-launching it, there is no real need for rudders or landing gear, since it flies very well on elevons and motor control only, but the plans do show both. Some experience with small fast models is advisable before flying this baby!

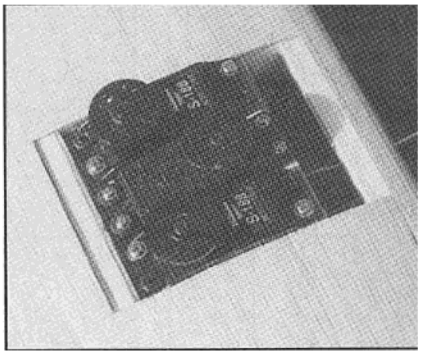
If you are keen to build one, here's the way to go:

First, cut a rib template from 1/16" ply to ensure accuracy; I usually push a couple of dressmaking pins through close to each end of the template so that the points protrude about 1/16"; the points will prevent the template from moving on the balsa while cutting the ribs out. Next, cover the wing plan with waxed paper and pin down the 1/4" x 1/4" lower spar and the 1/4" x 1/4" rib shim where shown on the plans to hold the ribs in line and level.



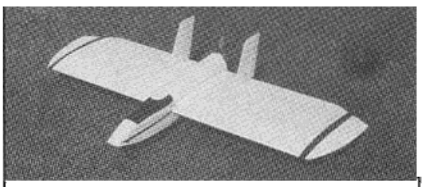
The basic wing all framed up. Structure is very simple and builds quickly.

Glue each rib in place on the lower spar, then glue in the top spar, the inner leading edge, and the trailing edge (if possible, it is better to shape these before gluing). Note: it is very important to have a warp-free wing, so do not have the joints too tight. The leading edge sheeting can now be added using two pieces, which leaves a gap of 2-1/2" in the center between the ribs to take the servos. The 7/8" wide trailing edge sheet can now be glued on, along with the center skin. When all is set, gently remove the wing from the plan and add all the 1/16" sheet vertical grain webbing between the ribs. Next, add the servo rails (positioned to suit the



The rudder and elevon servos being test-fit in place. (Rudder/nose gear servo is in the center.)

servos) — one is glued to the face of the spar, the other (front one) is cut into the ribs for support. When set, replace the wing on the plan, bottom up, and sheet the bottom of the wing where shown. Make sure that it is true with no twists or warps by measuring up from your building board. The measurements up to the trailing edge should be equal for the entire span, as should the leading edge. Allow the whole thing to set. If you intend fitting a landing gear, the blocks should now be fitted where shown. If you fly over grass and intend hand-launching the model (this is really quite easy), there is no real need for the landing gear as it will slide in very nicely on the underside of the fuselage, with the propeller protected by the lower fin and skid. Add the capstrips to the ribs and cut out and fit the wingtips and various parts as shown, including T2 and T1. The 1/2" x 2" soft balsa trailing edge stock can now be cut to length. Note: It is easier to cut the grooves for the elevon tubes and rudder pushrod tube before gluing the T.E. in place. Also, when gluing the T.E. in place, be sure it conforms with the wing airfoil and is not out of alignment. (See details AA on plans.) Bend the elevon torque rods from 3/32" dia. music wire as shown using brass tube for the bearings. Make up the rudder pushrods, if required; glue in the tubes, keeping them flush with the top

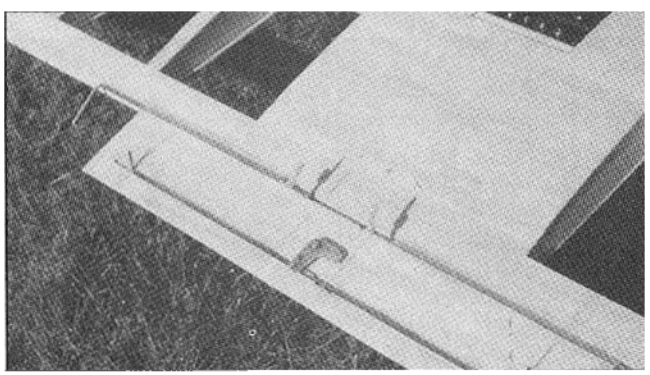


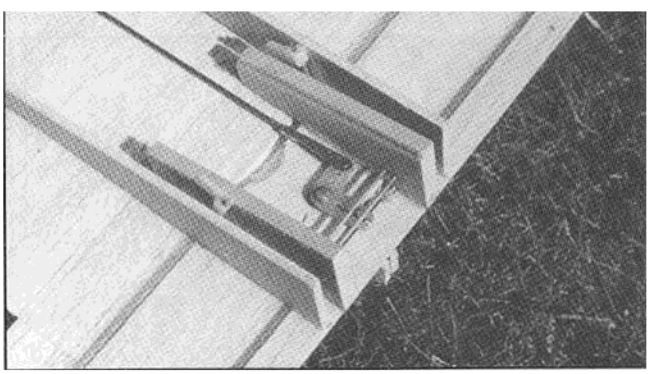
THE FLYING WING

Designed by:
Dennis Tapsfield
TYPE AIRCRAFT
Flying Wing
WINGSPAN
44 Inches
WING CHORD
11-1/4 Inches
TOTAL WING AREA
473 Sq. In.
WING LOCATION
Mid Wing
AIRFOIL
Symmetrical
WING PLANFORM
Constant Chord
DIHEDRAL, EACH TIP
0
OVERALL FUSELAGE LENGTH
20 Inches
RADIO COMPARTMENT SIZE
Adequate
VERTICAL FIN HEIGHT
5-1/2 Inches
VERTICAL FIN WIDTH
3-3/4 Inches
REC. MOTOR SIZE
540-600 Electric Motor
BATTERY SIZE
7 Cell/1400 or 1700 sub C
LANDING GEAR
Tricycle or None
REC. NO. OF CHANNELS
3 or 4
CONTROL FUNCTIONS
Rud., Throt., Elevons
C.G. (from L.E.)
2-1/4 Inches
ELEVON THROWS
1/2" Up — 3/8" Down
RUDDER THROWS
5/8" Left — 5/8" Right
SIDETHRUST
0°
DOWNTHRUST
7-1/2°

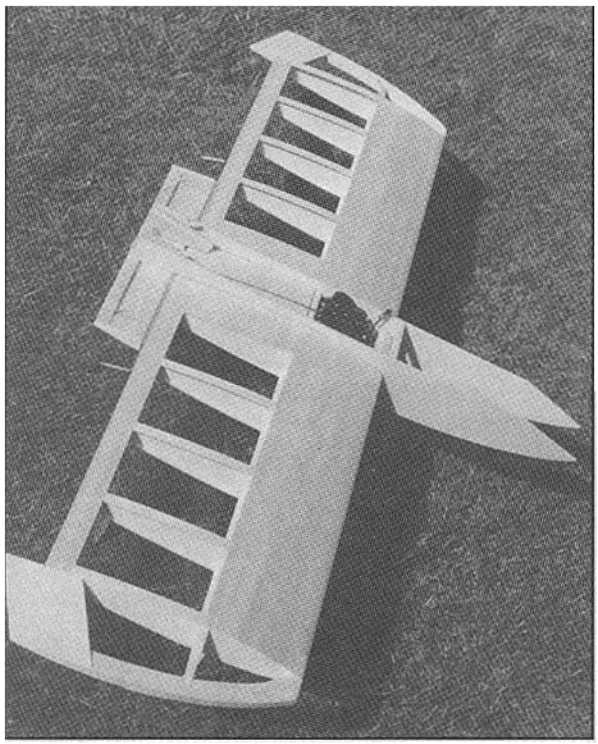
BASIC MATERIALS USED IN CONSTRUCTION

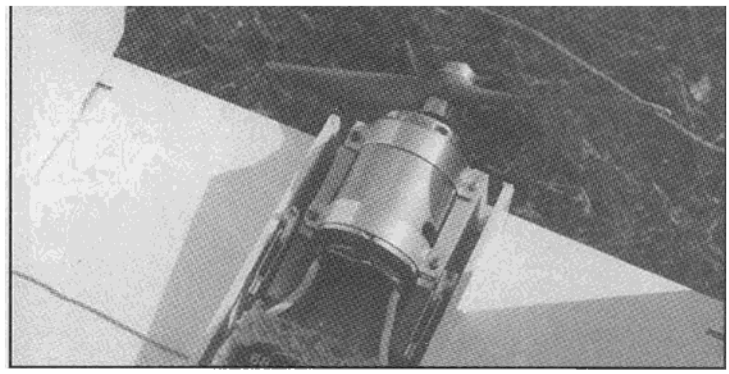
Fuselage	Balsa & Ply
Wing	Balsa
Empennage	Balsa
Wt. Ready To Fly	42 Oz. (2 Lbs. 10 Oz.)
Wing Loading	13-14 Oz./Sq. Ft.





LEFT: Elevon and rudder torque rods in place. Note special rudder bellcrank. RIGHT: Motor mount blocks in place and fuselage sides glued in position.





LEFT: Fuselage sides joined to wing, ready to add nose section. ABOVE: Motor installation is clean and simple. Be sure and remember to put the prop on in the proper direction!

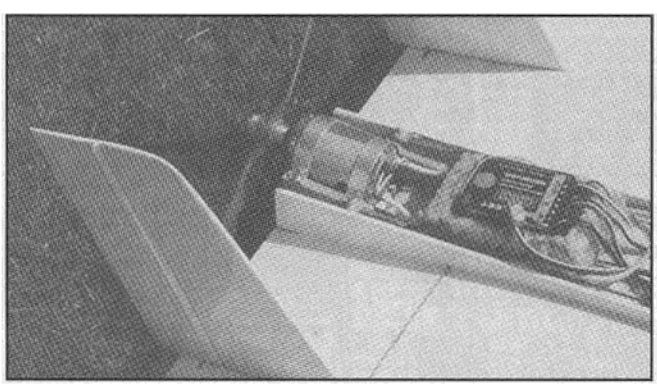
surface to maintain a smooth finish. Glue on the external leading edge after the leading edge sheeting has been surfaced with the inner leading edge, then plane and sand to shape.

Fuselage:

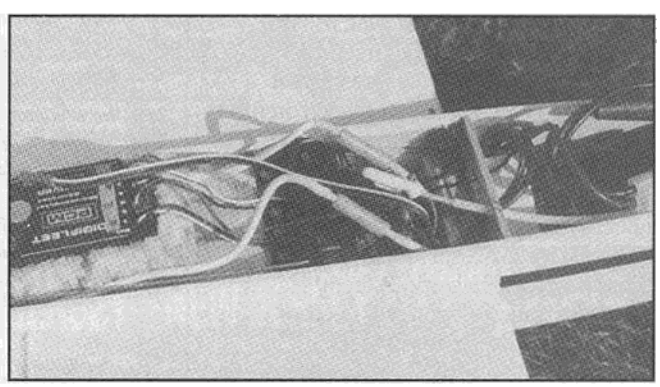
Cut F2 and the fuselage sides from 1/8" lite ply. Fit the servos and check that they all operate in the correct sense for the control surfaces. The elevons should now be fitted and hinged in place. Everything is very tight for space, so cut out the motor mounts and glue in place exactly where shown. Fit the elevon pushrods and check to ensure that it all works okay. The fuselage sides can now be fitted together with F2. Make sure there is enough clearance for the clevises between the motor mounts and the fuselage sides. When okay, glue the sides in place, drawing the parts under the wing together at the rear, leaving a 1/8" gap for the lower fin. When set, glue in the 3/16" x 9/16" balsa blocks for the lower fin support. Shape the balsa nose block. Then sandwich it between the sides and glue in place. Add the 1/8" x 1/8" balsa between F2 and the nose block, then sheet the fuselage bottom as shown. If you are using landing gear, install the nose gear bracket at this time.

The formers F2A, F3, and F3M should now be cut out and the deck assembled and finished as shown, blending the blocks at the nose to a smooth shape. Fit the 1/8" dowel at the front end to locate the deck and glue the small tongue to the front lower edge of F2A to prevent rearward movement. To hold the rear end down, fit four small self-tapping screws (two in the rear edge of the deck, and two in the ends of the motor mount) to enable a small elastic band to do the job. Make the fins and rudders from 3/16" sheet balsa to be hinged with film, if required (see drawing). **Do not** glue the fins in place prior to covering; I used Solarspan (Black Baron Film) on mine. When finished, mark out where the fins are to be, carefully remove the film from the area in question, and having covered the fins and rudders, epoxy in place, taking care that they are in line (e.g., parallel to the fuselage sides) and that they are vertical, checking with a small square. Make the lower fin from 1/8" lite ply. Carefully drill for the 1/16" dia. tail skid and epoxy the wire in place, then cover the fin with film, leaving the section which enters the slot clear of covering for gluing. Check the control movements and set the model up for flight.

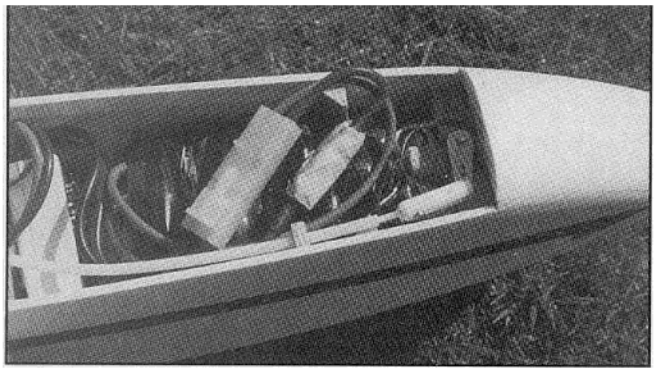
Note: The balance point of this model is critical and must not deviate from the 20% (2-1/4") from the leading edge. Do not trust your fingertips! Use some 1/4" triangular hardwood taped in the correct position on the underside of the wing and balance the model on hard blocks. Use the battery pack to achieve perfect balance, then glue in blocks to ensure that the battery never moves fore and aft. **Remember, the balance will change if you fly with or without landing gear.** My model is balanced with the landing gear; when I remove it, I have a piece of .104" wire about 2" long with a piece of lead on it which is dropped in from the top to compensate. Check the balance properly in both situations. Make sure the propeller is the right way round! Yes, it has been done before! It's a pusher. We could check lateral balance by holding the propeller and supporting the nose with a finger (okay in this case); add weight to the lighter wingtip, if required.



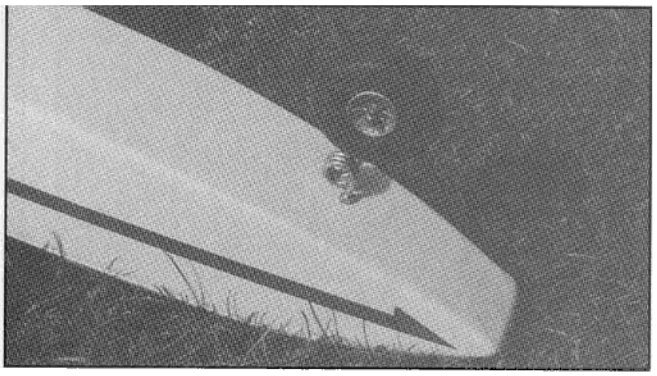
Receiver is located in front of motor.



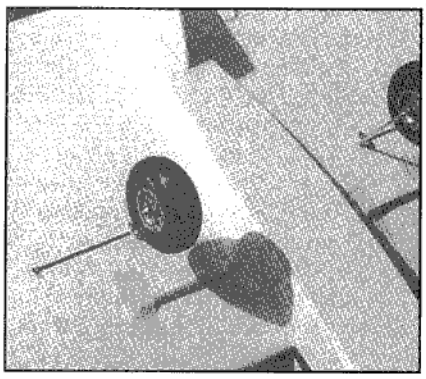
Things are a bit tight, but there is room for everything.



The motor controller, batteries, and nose gear steering mechanism are all located up front.



Nose gear installed on author's prototype.



Main gear installation.

A Note Of Warning:

One of my clubmates who built this wing had problems with radio interference from the motor, despite it being properly suppressed. I confess that I have had no problems, but it would be a good idea to carry out a range check with the motor running flat out, as this is when most sparking occurs. Perhaps some radios are more susceptible to this problem, or maybe the motor itself could be the culprit; in any case, it's better to be safe than sorry. Check it out! As a last resort, the radio receiver could be brought forward into the fuselage and the rx battery moved rearward to compensate.

Flying:

Here there are no surprises, launch it and it flies! You will find it will go just where you want: try some aerobatics, start with a shallow dive to pick up some extra energy (watch it, this model is quick), and pull it up and over, roll off the top, good isn't it? The first time I landed it, I came over the threshold at about three feet high and it floated on for 50 yards! Try to slow it down with elevator well out; you will find she responds well. It's an unusual model, one that will probably cause a stir and stop the flying at your local field while they all watch you surprise them! Have a lot of fun "quietly"; you will not lose your field by flying this model.

"Happy landings."

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