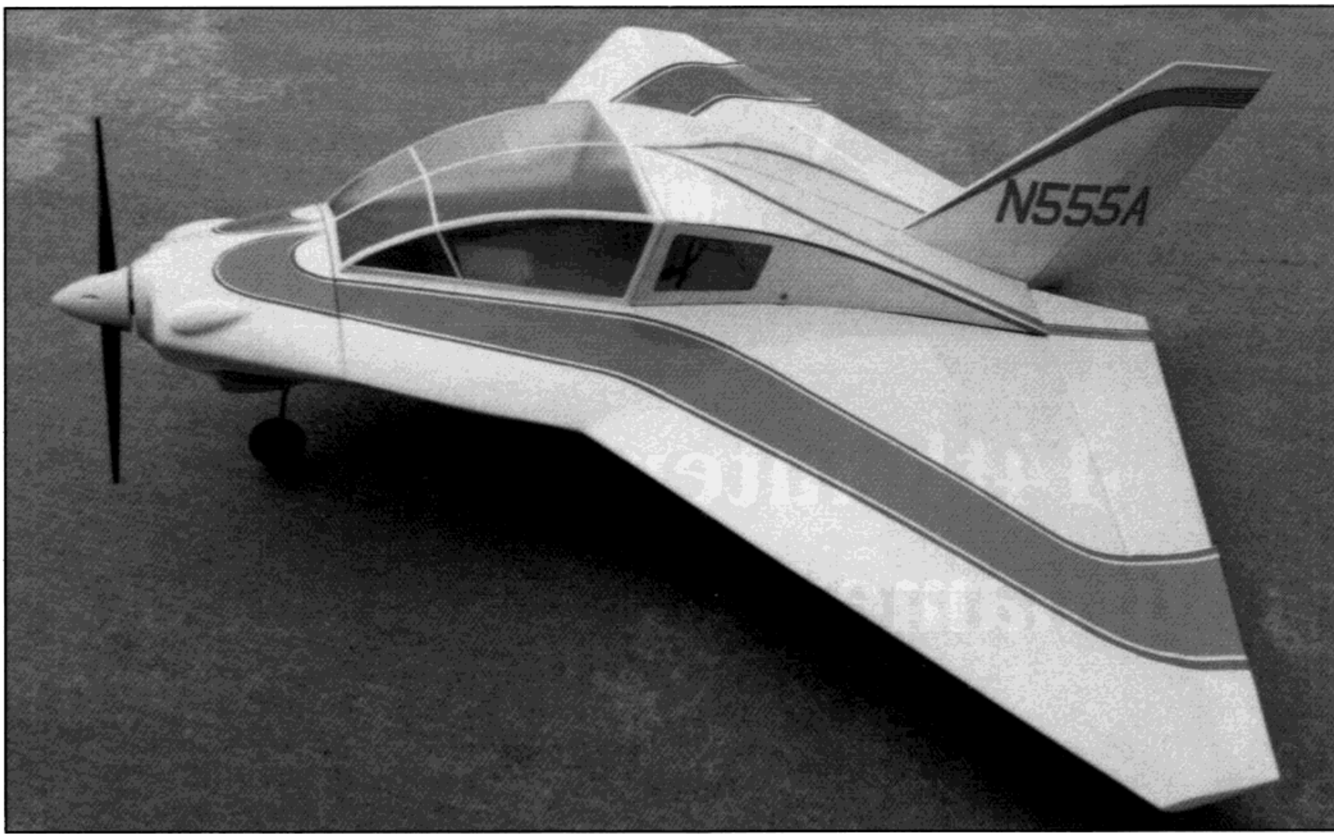
DYKE DELTA

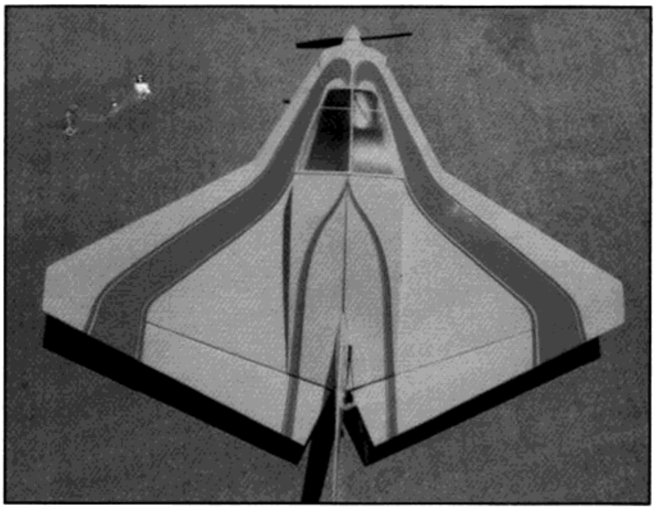
By Laddie Mikulasko

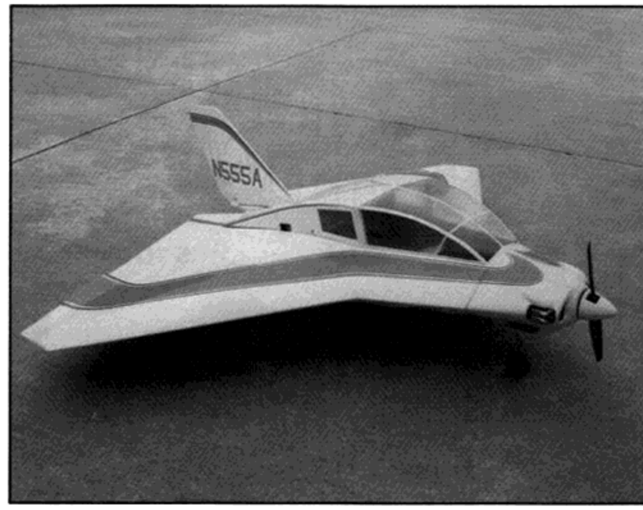


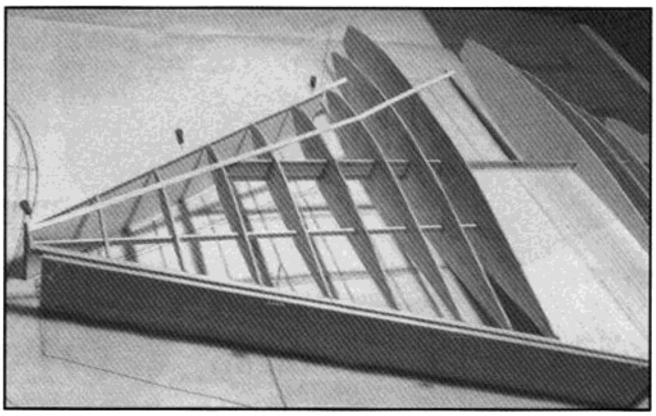
A Very Unusual Home-Built That Makes A Great Sport Scale Model For Either Electric Or Glow Power

Delta wing platforms are named for the Greek letter delta, which is triangular in shape. More than three decades have passed since John Dyke began to sketch a new and radically shaped home-built design. At that time, only the military was designing and flying deltas. John's idea for a delta design was certainly rare, if not unique in the home-built arena, thus engineering information was virtually nonexistent at the time. To overcome this problem, John elected to build several models to gather the necessary data. First a "U" control, then free flight, and ultimately a highly accurate solid scale model was built. This model was attached to a test rig that he mounted to the top of his car. He said that the most valuable information that he got from these tests was to find the craft's actual neutral center of pressure location. The data obtained from this model, proved to be within 5% of the actual performance figures turned in by the full-size plane. The prototype Dyke Delta designated JD-1 was test flown July 22, 1960. This unorthodox design fascinated most of the people who saw it. Steel tubing was used in the construction of the fuselage, wing spars, and tail assembly. The wing ribs were made of .019" steel channel and then welded to the front main and rear spars. The wing skin was laminated fiberglass .065" thick, and fastened to the capstrips with 100° countersunk explosive rivets. The turtleback assembly was also constructed out of fiberglass. Thanks to the low aspect ratio, the wingspan of the plane was only 18'. This allowed the outer wing panels to be folded so that the total width was 7' 4". The aircraft was towable at speeds up to 70 mph. On June 4, 1964 this aircraft was lost in a garage fire. John did not mourn this terrible loss for too long, because on December 16, 1964 he started on a new version of his Delta. He changed the designation to JD-2, since the new aircraft had the many minor and major changes incorporated into its design. For example, the wingspan was increased to 22', and the new aircraft was improved aesthetically as well. The JD-2 made its first test flight on July 18, 1966 and John has been flying this aircraft to this day. Since that time, more than a dozen copies of this aircraft have been built and flown. The plane is safe, stable, and certainly unique looking. I feel that visionaries such as John Dyke are part of the catalyst that ignited the imagination of others who followed, designers who dared to create unconventional designs, using new building materials, and different construction techniques.

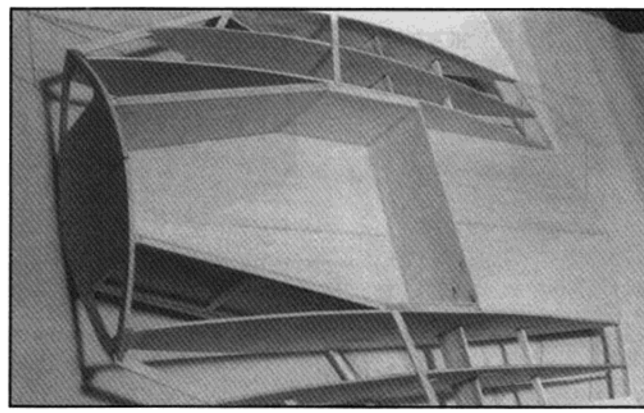
I have been a fan of delta wing aircraft for many, many years. Shortly after my wife and I emigrated to Canada in 1969, I came across a magazine called *Sport Aviation* published by the Experimental Aircraft Association of America. The EAA is an American organization established to promote designing, building, and then flying of full-size aircraft by ordinary individuals. In the May 1968 issue of *Sport Aviation*, I saw an article including 3-view drawings of John Dyke's "Delta." Using these 3-views, I



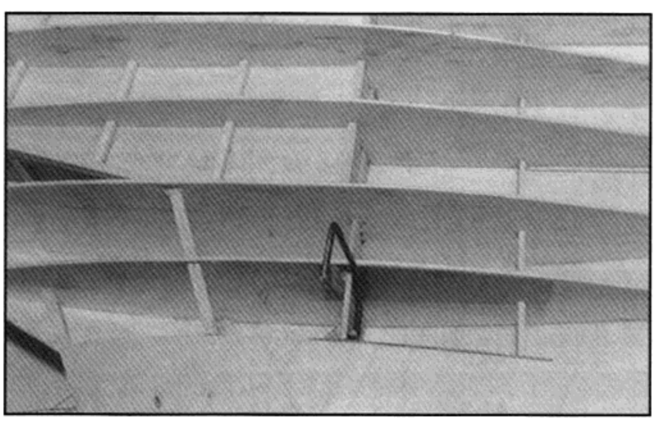




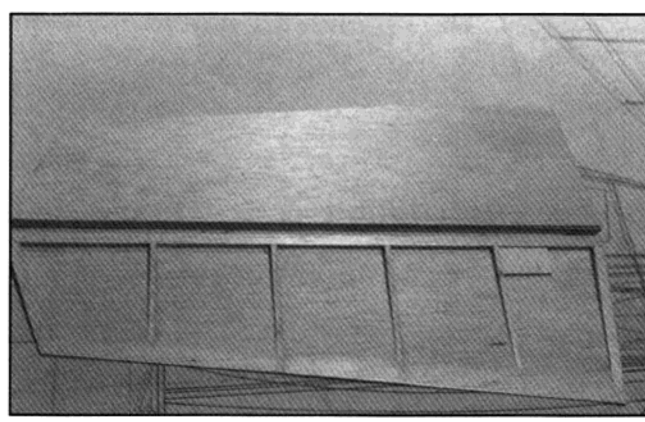
The alignment jig is used to build the wing.



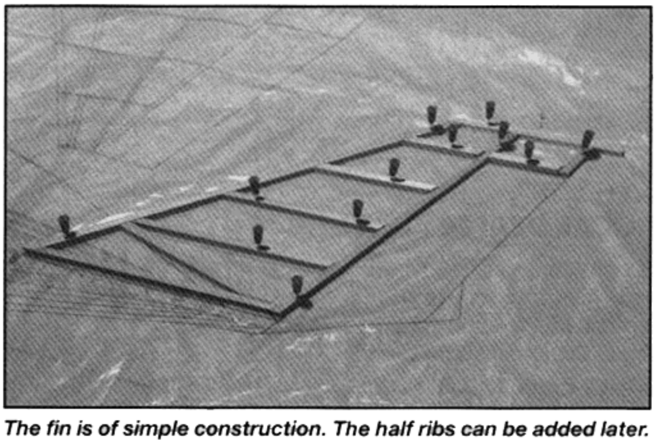
Looking at the top of the wing. Open bays on top will be sheeted.



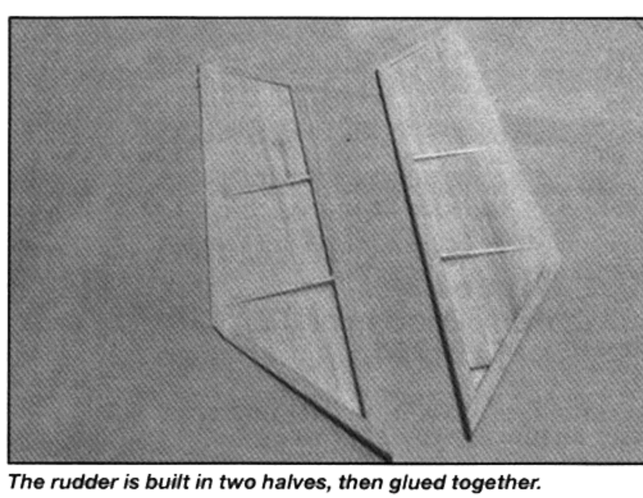
The bottom of the wing showing main gear attached to the main spar. Notice the ribs W1 and W2 in place. This whole area is not sheeted.



The Elevons. Note plywood plate to hold control horn.

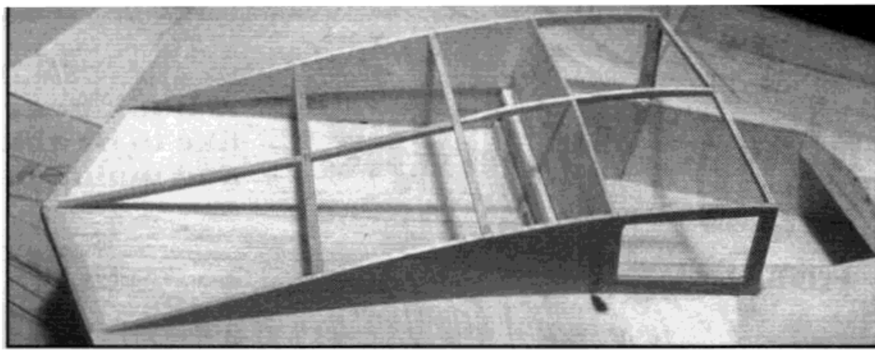


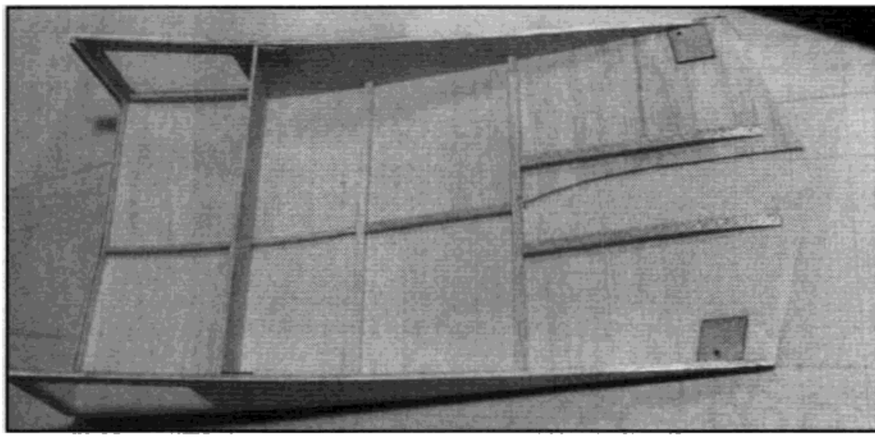
The fin is of simple construction. The half ribs can be added later.

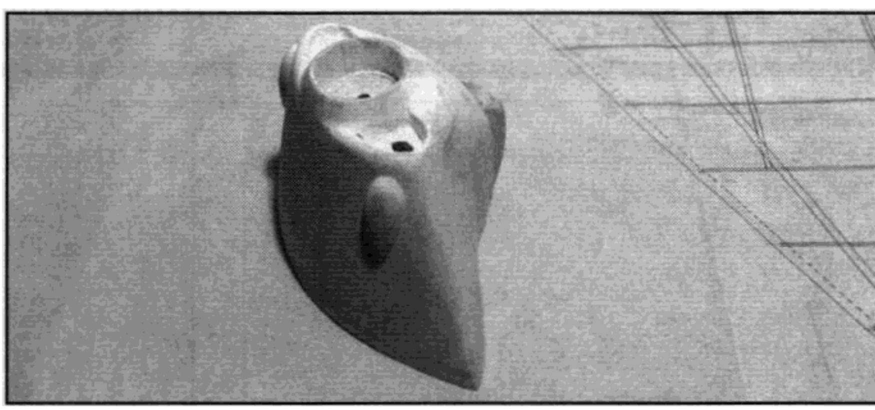


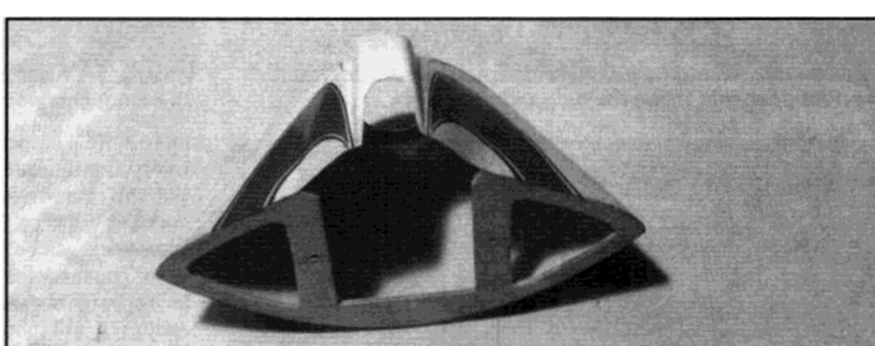
The rudder is built in two halves, then glued together.

DYKE DELTA
Designed by:
Laddie Mikulasko
TYPE AIRCRAFT
Sport Scale
WINGSPAN
40 Inches
WING CHORD
30 Inches
TOTAL WING AREA
670 Sq. In. (Approx.)
WING LOCATION
Low Wing
AIRFOIL
Symmetrical
WING PLANFORM
Double Delta
DIHEDRAL, EACH TIP
None
OVERALL FUSELAGE LENGTH
34-3/4 Inches
RADIO COMPARTMENT SIZE
(L) 10" x (W) 7" x (H) 3"
ELEVON SPAN
One-Half - 13 Inches
ELEVON CHORD (inc. elev.)
4 Inches
ELEVON AREA
175 Sq. In.
ELEVON AIRFOIL SECTION
Flat
VERTICAL FIN HEIGHT
8 Inches
VERTICAL FIN WIDTH (inc. rud.)
9 Inches
REC. ENGINE SIZE
O.S. 26 F.S./Astro 15 Geared
FUEL TANK SIZE
6 Oz.
LANDING GEAR
Tricycle
REC. NO. OF CHANNELS
4
CONTROL FUNCTIONS
Rudder, Throttle, Elevon
C.G. (from L.E.)
9-1/4 Inches
ELEVATOR THROWS
3/4" up — 3/4" down
AILERON THROWS
3/8" up — 3/8" down
RUDDER THROWS
1" left — 1" right
SIDETHRUST
None
DOWNTHRUST/UPTHRUST
None
BASIC MATERIALS USED
Fuselage .... Balsa & Ply
Wing .... Balsa, Ply, & Spruce
Empennage .... Balsa
Wt. Ready To Fly . . 72 Oz. (4 Lbs. 8 Oz.)
Wing Loading .... 15.5 Oz./Sq. Ft.

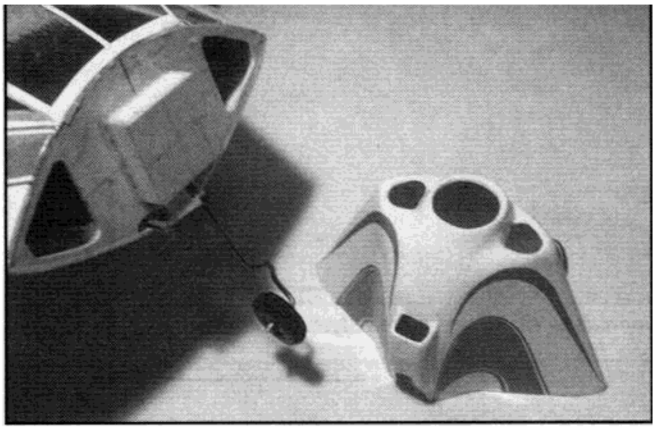

The removable rear half of the cockpit is built right on top of the wing.


Inside of rear portion of the cockpit.


This cowl plug is made up from balsa, however, blue Styrofoam can be used. Read text.

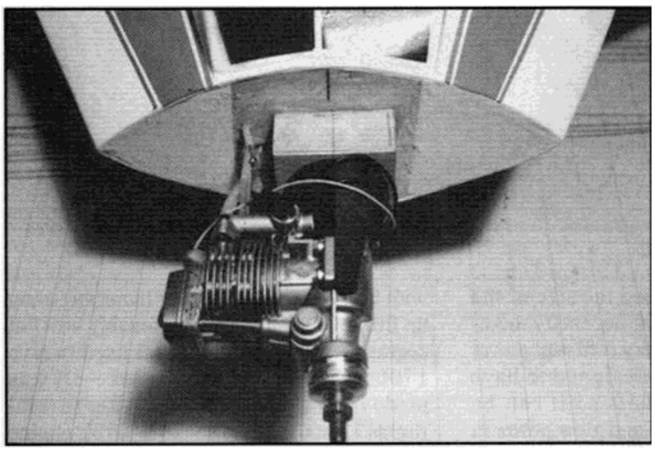

Finished fiberglass cowl.

soon constructed a .60 powered scale model of the Dyke Delta complete with the retractable undercarriage. During take-off on the very first flight, disaster struck. A combination of a crosswind gust and my inexperience as an R/C flier, reduced my dream to rubble. I was hoping to break new ground, but this was not what I had in mind. The damage was extensive, so I scrapped the model but not the dream. Now, some 20 years later, I decided to have another go at it. This one was to be powered with either an Astro geared 15 electric motor or an O.S. .26 4-stroke engine. I reduced the size of the original plans and made the necessary modifications to adapt these very different power plants. The model was designed to have removable engine mounts so it can be switched between electric and glow power in a few minutes. The first flight was made with the Astro electric motor humming away up front. The model flew reasonably well but certainly not spectacularly. I used twelve 1700 mA batteries and the take-off was made from a paved runway. After several flights I installed the O.S. 26 4-stroke engine and immediately the model became much



The nose gear held inside the tube with the clevis.

The rudder connected to the pushrod.



O.S. 26 4-stroke mounted on fire wall.

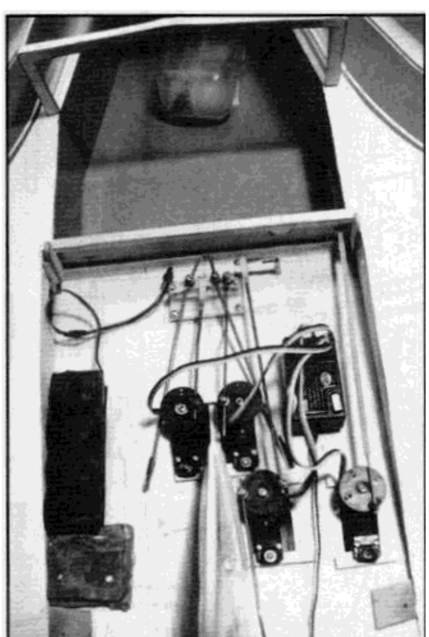
more agile. I suspect that losing 3/4 lb. of battery weight on a relatively small model with a low aspect ratio was the key to this. Lowering the wing loading while increasing the power loading, had a dramatic effect on the model's performance. I am sure that the electric version can be made to fly much better by using a different gear ratio. The model is a good stable flier with take-offs and landings being straightforward. Although the plane wasn't designed to do aerobatics, it will loop and roll but, as with any delta plane, it will not spin. When stalled it drops the nose, picks up flying speed, and recovers almost immediately. The take-off is only practical using a hard surfaced runway since the scale nose wheel is very small.

If you decide to build the Dyke Delta, be certain to select light wood. Before you start building the model, you should be aware that the model uses elevons for control. You may use either a mechanical or electronic mixer. On my model I used a mechanical type manufactured by the Logictrol Company years ago; however, the Du-Bro Company manufactures a different but acceptable style. The easiest installation is the electronic type that is a feature of most newer radios. Before any construction is attempted, please study the drawings. To make building of the model easier, I numbered all of the pieces and will refer to individual parts by numbers.

CONSTRUCTION

The model is built in one piece directly over the plan. The only detachable parts are the cowl and rear of the cabin. Start by cutting out all the ribs and formers. The main spar is constructed by gluing 1/8" x 1/4" spruce (2) to the top and bottom of the balsa sheet (3). Mark the locations of all of the ribs on this spar. Mark the location of all of the ribs on the rear spar (1) as well. On the back of cockpit former (22) draw two horizontal lines outlining the location of the main spar. Glue the main spar to this former accurately. Next, glue 1/8" square balsa (27) to the back of the cockpit sides (26) and to the cockpit floor (21). Glue cockpit former (22) to the cockpit floor, then glue the cockpit sides (26) to it. On the back of the fire wall (42), draw lines outlining the location of the cockpit floor, cockpit sides, and the position of the ribs (W3). Glue the fire wall accurately to the front of the cockpit. Slide the ribs (W3) onto the main spar and rear spar (1). Glue the ribs (W3) to the sides of cockpit and to the fire wall.

Slide the ribs (W4-W11) onto the front and rear spars. For accuracy, construct a simple alignment jig by cutting out balsa strips. The strip supporting the leading edge should be 2-1/2" wide and the strip supporting trailing edge should be 2-3/8" wide. The strips must be long enough to go under the



The radio installation. The mixer is a Logictrol no longer produced. For the glow engine version, the lead has to be added to balance the model. The fuel tank is held to the floor with silicone glue.

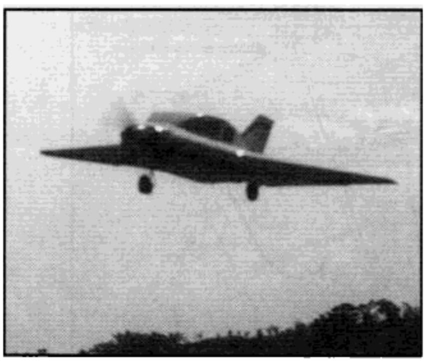
leading edge and trailing edge spars while assembling both halves of the wing. These strips should be cut out from 3/16" or 1/4" thick balsa sheet.

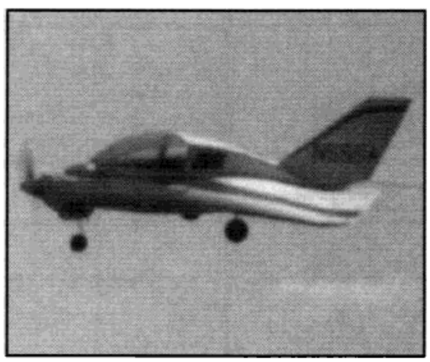
Mark the locations of ribs on the leading edge spar (5) and the trailing edge spar (6). Next pin the balsa strips you cut out for the alignment jig to the building board directly over the plan. To these, pin the leading and the trailing edge spars. Glue the ribs to the spars. Insert and glue the top spar (4) to all the ribs.

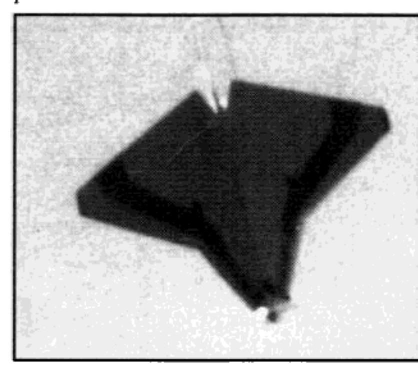
The top of the wing is sheeted with 1/16" light balsa. First, sheet the outboard section and then the inboard, all the way to the cockpit. Sheet the top of the instrument panel at this stage. Flip the wing onto its back and glue the bottom spar in place (4) and then sheet bottom of the wing. On the bottom, the center section between ribs (W5) and (W1) is **not** sheeted. To give the fire wall more support, glue in the 1/2" triangular stock pieces (29) between (W3) ribs and the fire wall as well as the cockpit sides and fire wall. Behind the cockpit former (22), glue on all 1/8" square balsa (20) to support the radio compartment floor (19). Glue in this floor between ribs (W3). To the bottom of this floor, glue in half ribs (W1) and (W2).

To transfer the rudder control from the servo to the steerable nose gear, make the simple assembly shown on the drawing. I cut the piece of NyRod tubing and inserted 1/16" piano wire into it and bent both ends to 90°. At both ends I soldered a clevis that I modified by removing the half that holds the pin. Glue this assembly to the side of rib (W2) at the location shown.

Next, construct the "cranked up" or reflexed trailing edge needed for both wing panels. Out of 1/16" balsa sheet cut out four pieces (18). To the sheet (18) at the tip, glue rib (10) and at the root glue the rib (8). Now, pin this sheeting at the front to the building board. Under the sheet at the trailing edge insert a shim so that bottom sheeting (18) stays curled up while the top sheeting (18) is glued to the trailing edge. Glue on top sheeting (18). Make one for both the right and left wing panels. Glue these trailing edges to both halves of the wing. Make certain that both sides are curled up by the same amount. Sand the whole wing to your satisfaction.







The elevons are made by gluing the balsa hinge spar (7) and ribs (9-15) to the sheet (19). Sand the top so that it tapers from the spar back to the trailing edge. On the inside, glue in the plywood block (17) that gives support to the elevon horn. Glue on top sheeting (19).

Next, make the removable rear portion of the cockpit. Build it directly on top of the wing. Place a piece of clear plastic sheet over the wing. Pin the sides (49) to the wing. Glue the front former (46) and the middle former (47) to the sides (49). Glue in 3/16" square balsa cross braces behind former (47) to give support to the top sheeting. Glue on the top sheeting. Notice that the direction of grain on the sheet (37) between the two formers is perpendicular to the direction of the flight. The grain on rear sheeting (38) is in the direction of the flight. To make the windshield, leave the rear half of the cockpit pinned to the wing. Pin former (45) to former (46). Pin the sides of the windshield frame (48) to the wing and glue to former (45) and to the wing. Glue in the center frame (50) of the cockpit to the wing and to former (45). At the top, glue in the two 1/8" square balsa pieces between the center frame and outside frames. The windshield is covered with .0010" clear plastic. Remove the rear cockpit and on the inside glue two 1/16" plywood plates at rear corners. Just behind the former (47), glue two more 1/16" plywood plates. They are needed to support the screws holding the removable turtledeck to the wing. Glue plywood block (53) to rib (W3) inside the radio compartment and the two plywood plates (16) to the radio compartment floor at the rear.

Construct the fin and rudder by making the frame out of 3/16" x 1/4" and 3/16" square balsa as shown on the plan. You may leave it flat or add half ribs to the outside as on the plans. Sand the fin and the rudder. Glue the fin to the wing. Cut an opening in the top sheeting (38) of the turtledeck so that the fin can go through.

To build the main landing gear legs and nose gear, bend 1/8" dia. piano wire to the proper shape in a vice. Attach the main landing gear to the main spar using thread and glue. To install the nose gear, first cut a length of 3/32" i.d. aluminum tubing and attach it with the thread to the plywood wedge as shown on the plan to have the nose gear angled forward. Bend the 3/32" piano wire to shape. The nose gear steerable arm is attached to it below the aluminum tubing. Slide the nose gear inside the aluminum tube. Once the steerable arm is connected to the pushrod, it will stay in place by itself.

The cowl is the most difficult part to produce. There are several ways to make it. For a one time job the best way is to make a disposable mold. I made mine as follows: Cut out the side and bottom view shape of the cowl from 1/16" balsa sheet. Draw a centerline on the side view sheet 1/16" wide and then cut it out. Glue the two halves of the side view sheets onto the centerline of bottom view sheet, making certain that it is square. At the rear, glue on the former (43). Next, using blue Styrofoam, cut square pieces to fill the four corners of cowl mold. Cut out one template (A-A) and (B-B) out of stiff cardboard. In the front, glue on the balsa disk which is the diameter of the spinner. Slowly start sanding the foam blocks to the shape using coarse sandpaper. Use the template to check the shape. Once the shape is achieved, take fine sandpaper and smooth out the outside surface of the mold. Next, to make the actual cowl, protect the foam with a coat of white glue. Dilute the white glue 50/50 with the water, and brush it onto the foam. Let it dry and then sand lightly. Next, take several strips of newspaper and wet them. Brush another coat of glue onto the mold and then start putting these strips of wet paper onto the mold. Cover the mold completely with two layers of the paper and let it dry. Now there are two options. You can either put on two more layers of the paper, or put on two layers of 2 oz. to 2.5 oz. fiberglass Recently, I have been using the paper method with good success. Once the outside is dry, sand lightly to remove the high spots. To get a smooth surface I used lightweight water soluble filler, since I finished my model with iron-on plastic covering. Dig out most of the foam leaving approximately 1/2" of foam (for rigidity) attached to the skin. If you elected to use fiberglass, then dig out all of the foam. The cowl is held to the fire wall using two self-tapping screws. They are accessed through the front cockpit. Before you start covering, inspect the entire model and check for fit and smoothness of the finish.

Cover the model with your favorite material as long as it does not add too much weight. If you are going to use iron-on materials for the color trims, draw the shape of these trims onto drafting paper first. Then place the trim sheets under it and with sharp blade, cut out the design right through the paper and trim material. When you are finished covering, install the radio, and engine or electric motor. For the glow engine installation, place the fuel tank inside the cockpit. The tank can be held to the floor with one of the silicone adhesives. Check the C.G. against the plan with fuel tank empty. To get the C.G. in proper location, most likely you will have to add some lead to the back of the plane when flown with glow engine. I stuck it to the rear cockpit floor with the silicone glue. Check the elevon throws so that full elevator stick provides control movement 1" up and down. Full aileron stick, should provide control movement 3/8" up and down. All the measurements are taken at the trailing edge tip at the widest point of elevons.

The first flight must be made from a hard surface. From my experience flying the Dyke Delta, there should be no surprises. The model, if balanced properly, will lift off nicely and, once in the air, it should fly steady. If it is too pitch sensitive for your liking, decrease the elevator throws or move the C.G. slightly forward.

I hope you will enjoy building and flying the Dyke Delta.