

ELECTRIC CHALLENGE "25"



By Charles D. Evans

Here it is! A mid-size sport flier that's clean, quiet, and still has plenty of performance!

Having flown "05" and "15" sized motored craft for a time, the need for more power and better handling ability was experienced. I set out to find a 25 sized aircraft to fulfill my immediate need. But alas, nothing seemed to fill the need at the time. Being on this earth for over 65 years and having built models since the age of six, one would think a new design would be a snap. Mistaken, again.

Having a fairly complete collection of model magazines, I began to research for vital information to aid in the design. A list of Do's and Don'ts were compiled. Referring to experts in the field like Bob Kopski, Dr. Keith Shaw, Premier Electric Flier, Chuck Cunningham of RCM, Bob Boucher of Astro Flight fame, Mitch Polin, and Dick Gibbs, we got started. After all, electrics are a new challenge.

One thing they all agreed with is KILS —

Keep It Light Stupid. My model's built to fly rather than crash. Longevity is excellent with the construction presented. Nothing revolutionary, just common sense and good choice of wood graded for use and weight.

Electric Challenge — How Come?

Our club, The Martin Marietta Radio Control Modelers of Orlando, Florida, is a great bunch of men. Each doing his own thing according to the club rules and regulations. We kid each other about the

ELECTRIC CHALLENGE 25

Designed By:

Charles Evans

TYPE AIRCRAFT

Sport/Electric

WINGSPAN

55 1/4 Inches

WING CHORD

9 1/2 Inches

TOTAL WING AREA

530 Sq. In.

WING LOCATION

Low Wing

AIRFOIL

Semi-Symmetrical

WING PLANFORM

Constant Chord

DIHEDRAL, EACH TIP

3/4 Inch

OVERALL FUSELAGE LENGTH

40 Inches

RADIO COMPARTMENT SIZE

(L) 15" x (W) 2 3/4" x (H) 2"

STABILIZER SPAN

22 Inches

STABILIZER CHORD (incl. elev.)

6 1/4 Inches (Avg.)

STABILIZER AREA

144 Sq. In.

STAB AIRFOIL SECTION

Flat

STABILIZER LOCATION

Mid-Fuselage

VERTICAL FIN HEIGHT

8 3/4 Inches

VERTICAL FIN WIDTH (incl. rud.)

6 1/2 Inches (Avg.)

REC. MOTOR SIZE

Astro Flight 25 Cobalt

BATTERY SIZE

14 Cell 1250 mA SR Magnum

LANDING GEAR

Conventional

REC. NO. OF CHANNELS

4

CONTROL FUNCTIONS

Rud., Elev., Throt., Ail.

BASIC MATERIALS USED IN CONSTRUCTION

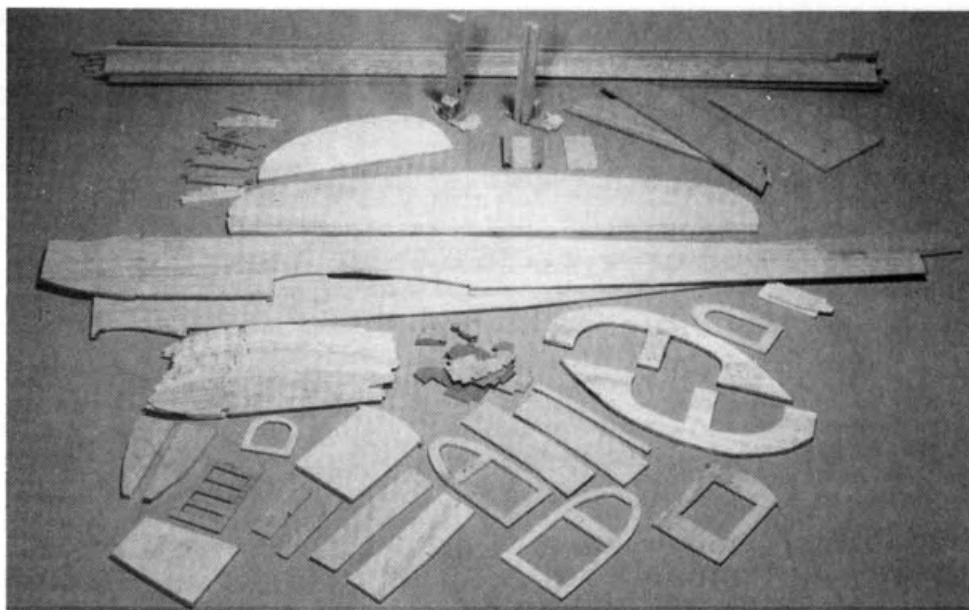
Fuselage	Balsa, Ply & Spruce
Wing	Balsa, Ply & Spruce
Empennage	Balsa
Wt. Ready To Fly	71 Ozs. (4 Lbs., 8 Ozs.)
Wing Loading	19.5 Oz./Sq. Ft.

new wave of the future (electrics), greasy kid stuff (engine powered), and that electrics are a new challenge to the modeler.

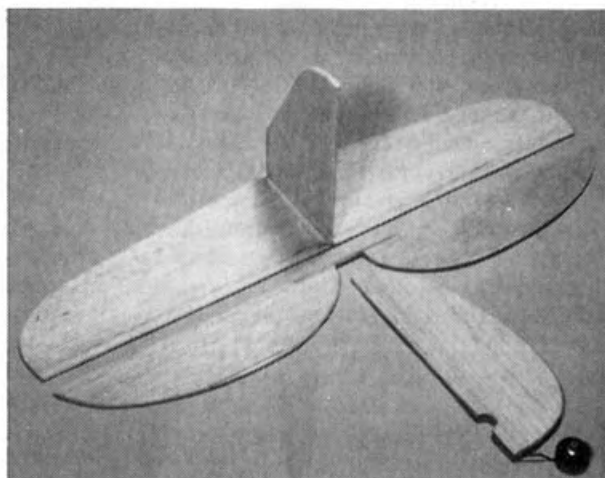
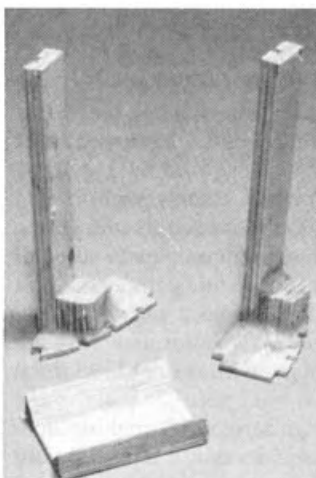
An old, dear friend, since passed on to the Flying Field up yonder, used to say, "All things figured right, one can fly a brick." His name was Harry Moyer. His original AMA issue was 193. I picked up the challenge when I decided to turn to electrics, hence the name Electric Challenge.

This model is the fifth in a series of this design and the best to date.

Excess sheeting has been eliminated to keep the weight down. The use of lightning holes where possible brings additional weight relief. You may find areas where you can reduce weight, but do not compromise the structural integrity. I have not experimented with carbon fiber or Kevlar, so cannot comment on their



When scratch-building, it's best to create a kit first.



LEFT: Assemble the plywood landing gear assemblies and "V" block motor hold-down assembly first so they will be ready when needed. RIGHT: 3/16" balsa sheet is used for the tail pieces. Tail wheel is 1" diameter.

contribution to weight loss. Let's get to the construction of Challenge.

CONSTRUCTION

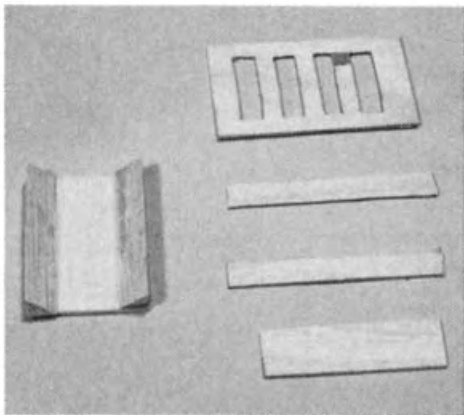
Wing:

For no other reason than to get it out of the way, let's start with the wing. Templates are most helpful in cutting out the wing ribs. Mine are made from plywood. Make a template for W1 and W2. They can be used to cut W1A and W2A plus the small riblets that mate the wing to the fuselage. It may be helpful to drive a pin just through the template enough to grab the balsa being cut. Use two, one at the leading edge and one at the trailing edge. To cut the radius for the leading edge dowel, use a piece of 1/4" o.d. brass tubing. Sharpen the inside diameter to allow its use as a cutter/punch. Use a small cone shaped stone for your Dremel tool to get the job done. While using the template to cut out the ribs, use the brass tubing to create the radius for the L.E. dowel.

Make a kit of all the components needed to build the wing. Build the landing gear block subassemblies at this time. Now start the wing assembly. Cover plans with your favorite plan protector. Pin the 1/16" x 1/4" lower trailing edge sheet to

the plan. Next, pin the 1/4" square spar to the plan. Locate and install all wing ribs except W1. Cut two riblets using the template for W1A. Install W1B and W2B's. Install 1/4" sq. top spar, then all the 1/8" sq. spruce stringers or turbulators. Install the 3/16" x 1/4" trailing edge. Using the W4's, W5, and W3, set up the dihedral. Use your favorite cement for this. Mine is epoxy. Glue the tips on next. Also be sure to include the 1/4" sq. back up at the hinge locations. 1/4" sq. should be used also where the aileron strip wire bearings enter the trailing edge. Please note the fence to be built on both sides of W1 to hold the epoxy filler to keep wing mounting bolts from crunching the wing.

The ailerons are made from 3/8" x 1/4" aileron stock. They can be larger, but these work great. Temporarily install ailerons to balance the wing. Removal of weight on the heavy side is much better than adding weight to the light side. Keep it light. Now add W1's and the top 1/16" x 1/4" trailing edge sheeting. Sheet the bottom center section to W1A. Sheet 1/3 of the top center section. Mix 5-minute epoxy and fill the crush zone. Let harden, then complete the sheeting.



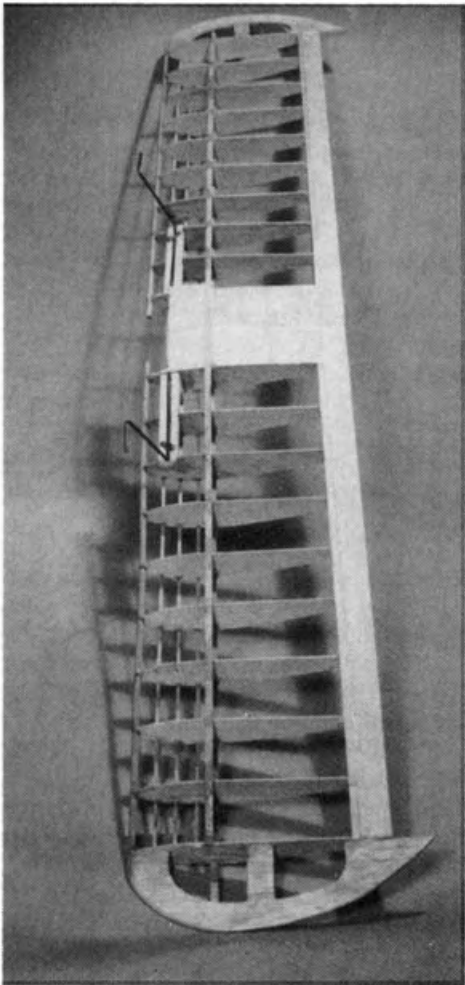
Air hatch pieces used to build the airway on the bottom of fuselage, just behind fire wall, and motor hold-down assembly.

Stab — Elevator — Fin — Rudder:

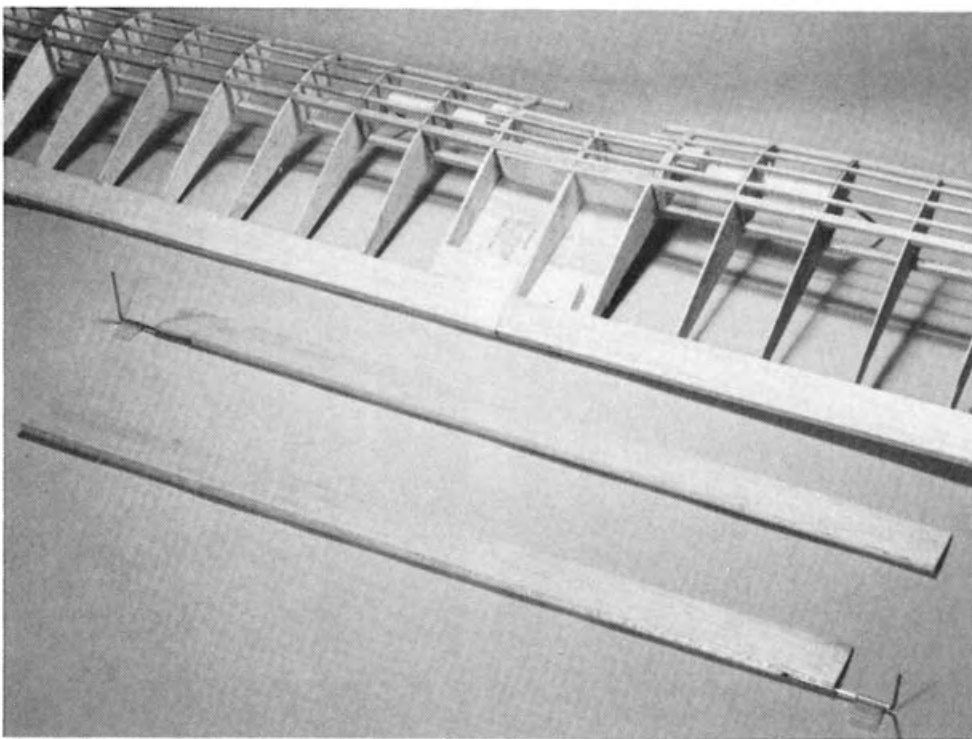
Cut from 3/16" light balsa. Lightning holes are now cut using round hole saws. These sizes are suggested but can be changed depending on the balance of your craft. Larger, or more holes for tail heavy, smaller or none for nose heavy. Join the elevators per plan using a 3/16" dowel. Round the leading and trailing edges. Set safely aside until needed.

Fuselage:

Make a kit of all components needed to build the fuselage. Start with the sides. The doublers are quite large and can easily be misaligned when gluing. Slow CA allows a little needed time to be sure the alignment is



Bottom view of wing. Landing gear, center section sheeting, and wingtips are all in place. 1/4" dowel is used for leading edge.



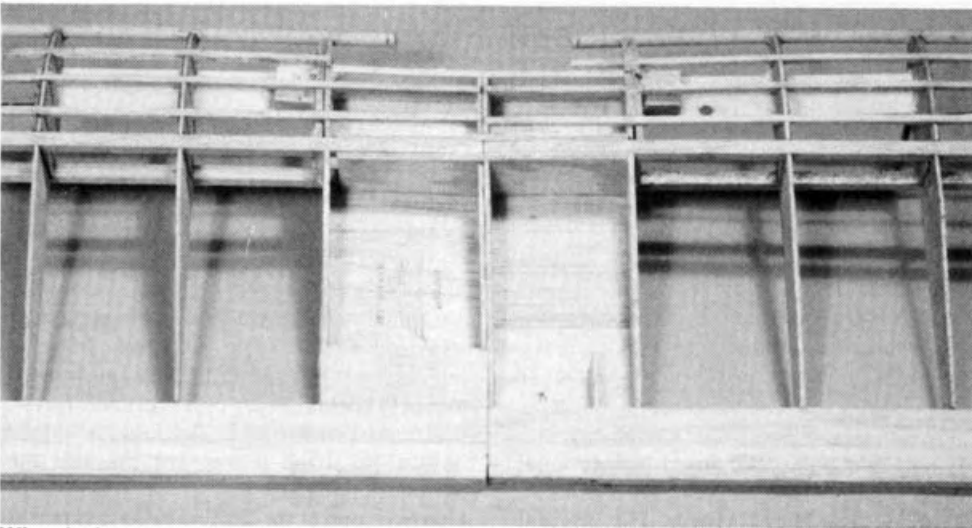
Strip ailerons and hardware ready for fitting to wing.

correct. Be sure to build a **left** and a **right** side.

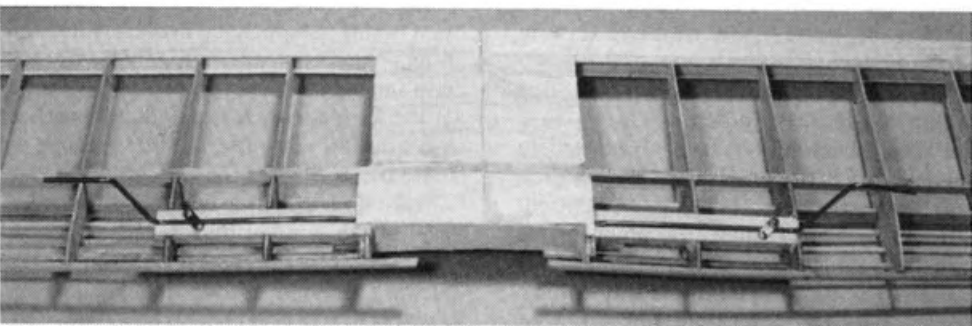
Install the formers starting with F4 and work toward the tail. Keep everything straight and eliminate any twists, sags, or other bad stuff. Be sure to include the 1/8" sq. between the formers on the sides, bottom, and top of the formers; a great increase in strength with very little addition of weight.

Next, glue in former F3 making sure everything is square and straight. Before

proceeding with construction, now is the right time to drill the holes for the two leading edge dowels. Locate the wing on the fuselage, seat it properly checking for square alignment. Using a 12" long 1/4" dia. drill bit, drill through F3 and into the wing through W3 and W4. Now complete the fuselage per plans. A note on the motor hold-down; credit for this innovation is given to Bob Kopski, electrics expert. This is the use of yellow inner tubing of the NyRod pushrod system for control surfaces.



Wing bolt areas are filled with scrap balsa or epoxy prior to adding top sheeting.



1/8" wire used for landing gear. Straps secure landing gear to plywood blocks.

Bill of Materials:

Wing:

- 2 — 1/4" x 36" wood dowels
- 6 — 1/8" x 1/8" x 36" spruce
- 4 — 1/4" x 1/4" x 36" balsa, medium to hard
- 4 — 1" x 1/16" x 36" balsa medium
- 2 — 3/16" x 1/4" x 36" balsa medium
- 2 — 1/4" x 1/4" x 36" balsa soft
- 4 — 1/16" x 4" x 48" balsa medium
- 1 — 3/16" x 8" x 12" lite ply
- 1 — 1/8" x 12" x 24" lite ply (enough for entire plane)
- 1 — 3/16" x 4" x 36" balsa light
- 2 — 3/32" x 3" x 36" balsa medium
- 1 — 1/32" ply 8" x 12"
- 2 — 3/8" x 1 1/4" x 36" aileron stock
- 8 — easy hinges Sig
- 1 pair — strip aileron horn wires — Du-Bro
- 1 set — strip aileron horn set — Du-Bro

Stab — Elevator — Fin — Rudder:

- 2 — 3/16" x 4" x 36" Balsa Light
- 9 — Easy Hinges — Sig
- 2 — Control horn assy. — Du-Bro
- 1 — 3/16" wood dowel

Fuselage:

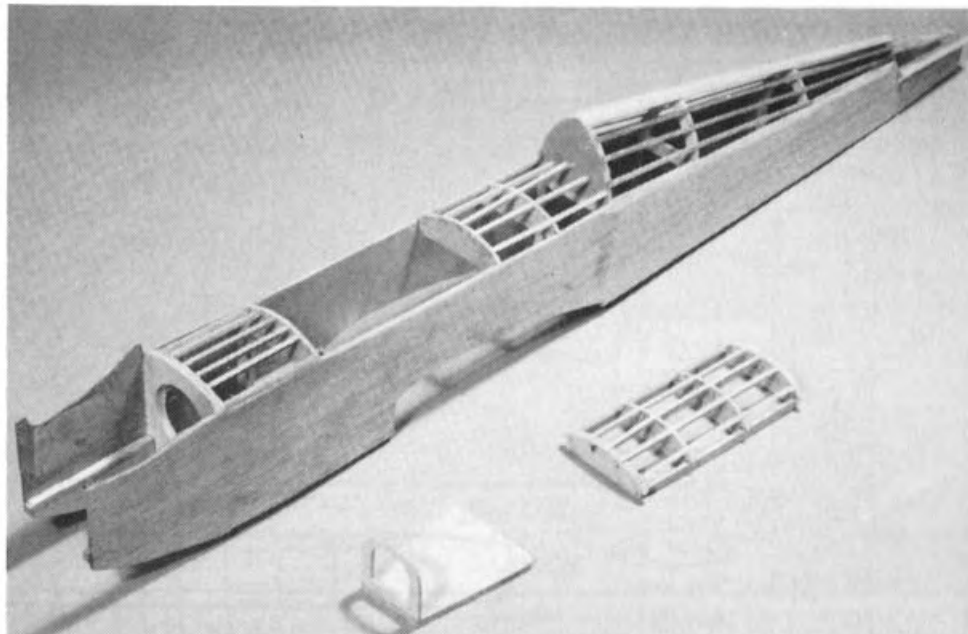
- 2 — 3/32" x 4" x 48" balsa, medium
- 1 — 1/32" x 12" x 24" ply
- 8 — 1/8" x 1/8" x 36" balsa
- 2 — 3/16" x 8" x 12" lite ply
- 1 — 1/8" x 3" x 36" balsa
- 1 — 3/8" x 3/8" x 36" spruce
- 1 — 1/16" x 8" x 12" ply
- 2 pkgs. — landing gear strap
- 1 — 1" dia. tail wheel
- 1 pair — 1/16" wheel collars
- 1 — 1/16" x 36" music wire
- 2 pair — 1/8" wheel collars
- 1 — 1/8" x 36" music wire
- 1 — 1/2" tri. balsa stock
- 1 — 3/16" x 1/2" x 36" spruce
- 1 — Astro Flight 25 Cobalt motor
- 14 — SR 1250 magnum cells
- 5 — 275 mAh Sanyo cells
- 1 — Throttle control — Flightec Sec II
- 1 — 2" — 2 1/4" Spinner Goldberg
- 1 — 9 x 5 APC or Graupner prop
- 1 pair — 2 3/4" Dave Brown Lite Wheels
- Misc. — 1/8" lite ply (see wing)
- Misc. — Clear acetate
- Misc. — 3/16" balsa sheet (see stab)

Miscellaneous:

- Balck Baron heat shrink film covering
- Colors used:
- Wing: Fire red — tips — stripes — red — white — blue — yellow
- Fuselage: Flag blue (sides) white top and bottom
- Stab: Fire red
- Fin: Cub yellow
- Rudder: Stripes of all colors — red, white, blue, yellow — in this order
- CA: Goldberg Jet fast and slow
- Epoxy: Sig 5-minute

It is held in place by running a 2-56 tap in both ends of the tube cut to length to fit the motor selected, and using a 2-56 bolt to tighten the tubing over the motor. The "V" block under the motor is made per plan. I find that using silicone sealant wiped on the top of the "V" block helps hold the motor in position.

The air scoop on the top of the cowl is nothing more than a modified rectangle measuring spoon. The handle is cut off at the highest point of the spoon and the



Fuselage assembly nearly completed. Note battery compartment hatch and motor mount assembly.

opening sanded to fit the cowl. An easy way to accomplish this is to wrap the cowl with sandpaper and slide the scoop over it until the cowl shape is achieved.

Battery Hatch:

The hatch is a nice thing to have on a long outing. Rotating battery packs allows them to cool before charging, thereby increasing their longevity. This is a bit more work but well worth the trouble. Use the formed up fuselage as an assembly tool to build the hatch. Line the hatch opening with plastic wrap. Hold the side rails in position with clothespins while building. Build as per plans. Mark front of hatch for future reference.

Chin Air Hatch:

This is necessary for proper cooling of the motor control and batteries. AH1 through 3 must be made at this time. Assemble as per plan. The hold-down is a landing gear

strap, same as used on the battery hatch.

Batteries:

The batteries used in the Challenger "25" are the SR 1250 magnums. By using these batteries, a weight savings of upwards of 3/4 pound is achieved. Although Electric Challenge will fly with SCR 1200's, everything is tuned to SR batteries. Rotating battery packs at the field is a snap. Charging is done with the Astro Flight DC-DC constant current charger and a digital voltmeter to detect peak voltage.

Landing Gear:

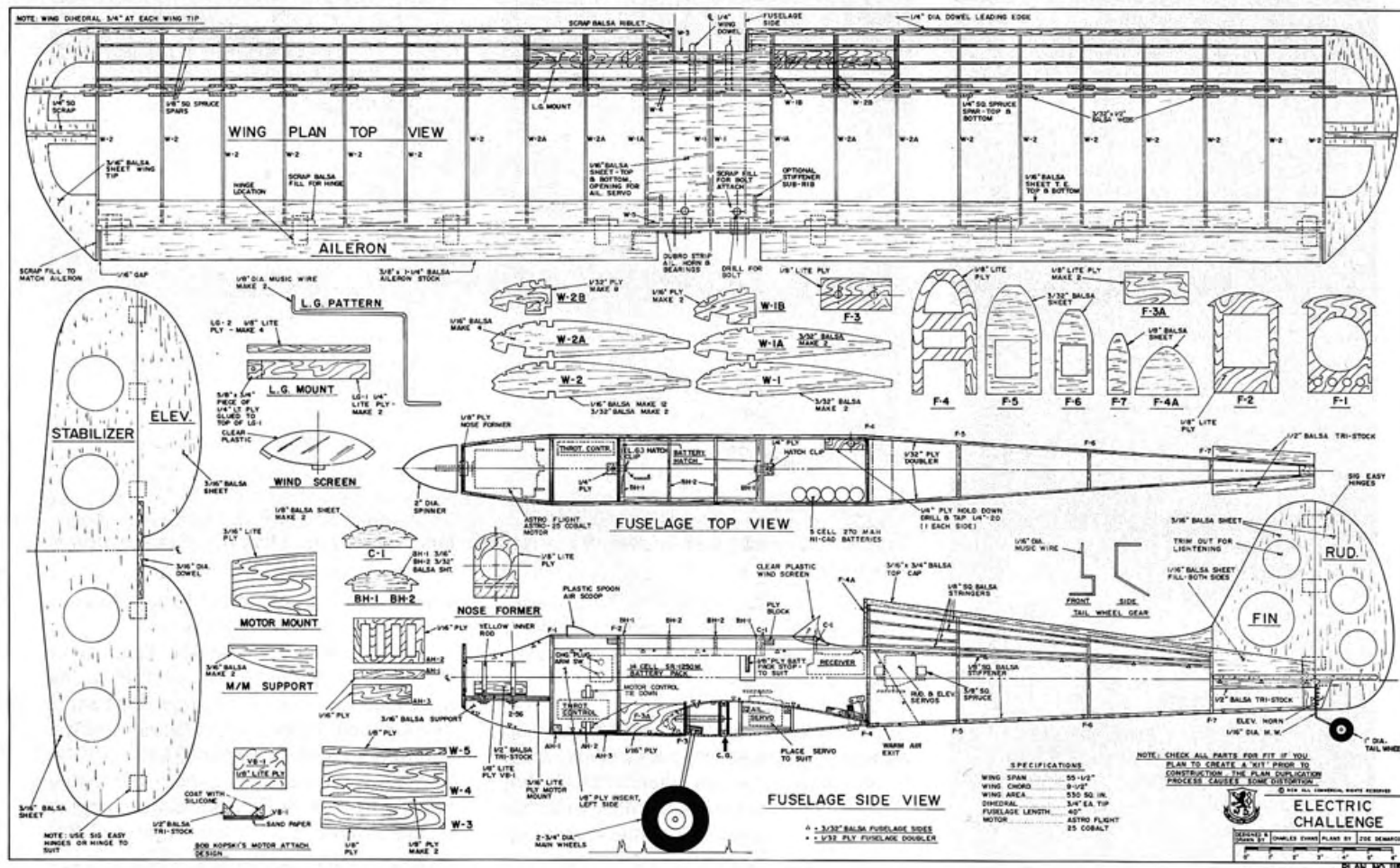
Bend from 1/8" music wire as shown. Be sure the wheel hub rests under the leading edge of the wing to aid in balance of the craft. The wheels should toe inward a few degrees to facilitate better ground handling.

Trim and Balance:

Each modeler has his preferred method of setting up his plane. Electric Challenge



Bare bones ready for covering and equipment installation. Lightening holes in tail help keep the aft section light. When balancing the wing, remove weight from the heavy side.



works well on a 0-0-0 set-up, that is motor, wing, and stab. First step: Zero the wing using a Robart incidence meter. Second step: Zero the stab using the meter. Sand, carve, or file until the relationship between the wing and stab is zero. Next, using the Robart meter, zero all axes of the motor in relation to the wing and stab.

The C.G., as marked on the plans, works just fine.

Covering:

Any heat shrink mylar type covering will do just fine. My personal preference is Coverite's Black Baron film because of the ease of handling and low temperature adhesion. The structure is strong enough for any available covering.

Air Outlet:

All that cooling air we are taking in at the front of this design has to escape somewhere. After covering of the fuselage is complete, remove one section of covering from the bottom near the rear of the wing hold-down section. I usually remove the third bay, no reason, just personal preference.

Motor:

The motor needs no introduction to Electric fliers. It is the Astro Flight Cobalt 25. It pulls the Electric Challenge through the air with the greatest of ease. No trouble with take off from mowed grass fields. The Challenge flew at the KRC Electric Fly in Quakertown, Pennsylvania,

for the past two years with no problems and also at the Lebanon Valley R/C Club Flying Field in Myerstown, Pennsylvania, also a mowed grass field.

My home field is a paved strip and needless to say, it jumps off the ground.

I use the Astro Flight recommended 9 x 5 prop, Graupner and APC. Both are very efficient. I have noticed a difference in noise between these two props. Yes, at 11,700 rpm electrics do make some noise. The APC seems to be quieter. Thrust is about the same, but cost differential is definitely a plus for APC.

Assembly:

Using the usual right angle triangle, glue the fin to stab on centerline. Be sure

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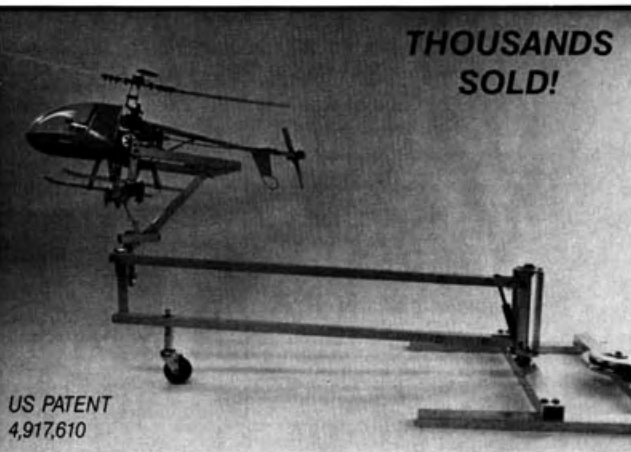
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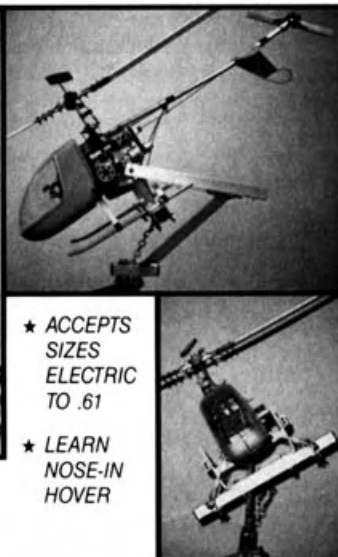
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everything is aligned properly and use thin CA. Next, square stab and fin up with fuselage. Make any adjustments to keep your stab and wing in the same parallel plane. Attach stab with slow CA to allow any last minute adjustments.

The next step is critical. Check again the alignment of the wing and stab. Make any adjustments necessary prior to drilling the holes for the 1/4-20 wing bolts. Measure wingtip to stab tip, both sides, to be sure of accurate alignment. Locate hole position on the wing and drill through wing and ply block with #7 drill. Remove wing and tap maple blocks with 1/4-20 tap. Drill wing holes to accept 1/4" nylon screws. Use thin CA in the tapped holes to harden threads and run the tap through again.

Install your favorite radio gear. Remember, keep it light. Micro servos and a 5-cell battery pack yield 32 ozs. of push which is plenty for this craft. The Aristo-Craft system has performed flawlessly for the past year, and the small servos are wonders. They have really been put through the mill.

Flying:

There is not too much to tell about the Challenge's ability. I do know it will

perform better than I have the ability to fly it. It will tack straight into the wind. Take off is with little or no correction, fly inverted, do loops from level flight, split S's, hammerhead stalls, Cuban 8's, rolling 8's, spins, and on and on. Remember "KILS." The lighter the electric, the better it will fly!

A special thanks to Andrew Lance for the great job done with the photography in this article. Not being a photographer myself, Andy jumped in and the results are self evident. Thanks, Andy!

I guess we have covered all of the instructions necessary to build the Electric Challenge "25". I hope you have as much enjoyment with yours as I have with mine. Fly quietly — Fly electric.

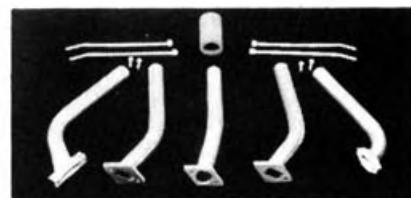
ABOUT THE AUTHOR:

Charles Evans is 67 years young and has been modeling for the past 61 years, off and on.

Charles belongs to Martin Marietta Radio Control Modelers of Orlando, Florida. He has been married to the same lovely lady, Mary Alyce, for 45 years, has two children, Sue Anne and Charles R. and has one grandchild, Elizabeth Anne who he is teaching to build and fly models. She is now working on an Electra. He always carries a model when traveling.



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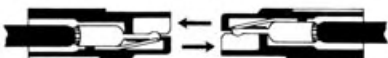
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