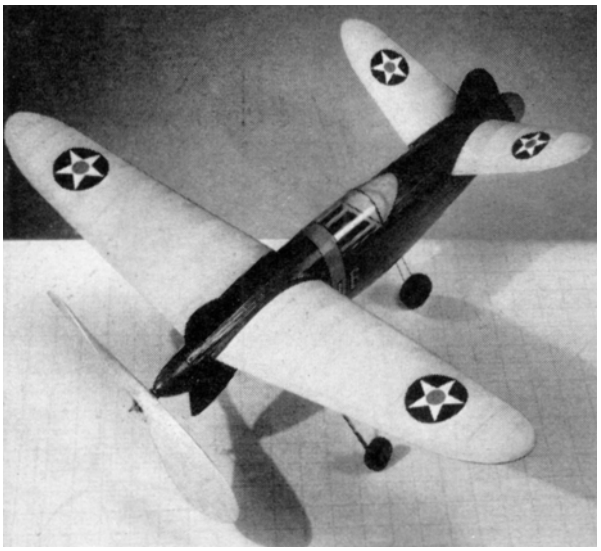
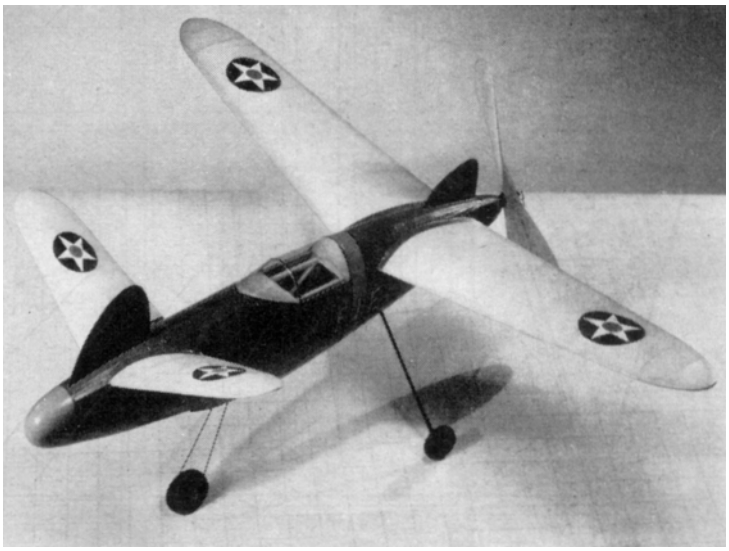




The canard model with features changed from original Army design to make stable flight possible. Planes of this type must be steered by a rudder at the nose as shown. (Below) The proposed design for full scale Army canard pursuit plane, now discarded

FLY A FIGHTER OF THE FUTURE

Vital features required in all canard airplanes - and how you can build a flying model of a possible future Army canard pursuit

by **CHARLES H. GRANT** *and* **FRANK EHLING**

RECENTLY the United States Army, in search for more efficient, high performance aircraft, investigated the possibilities of some unique designs. A number of them were discarded as impractical or offering no advantage over present types; one of these was a canard pusher pursuit plane pictured on this page (right lower picture).

Whether or not this plane was considered representative of canard type designs is not known: however, experienced model builders will unquestionably note a number of basic errors in the conception shown here. This doesn't mean that an efficient canard type pursuit plane cannot be made, but rather that certain vital requirements of this type of ship have been overlooked in the Army design.

Most full scale canards incorporate one vital error, namely, that the center of gravity is not far enough forward. Naturally this is not obvious to the casual observer but it makes such a ship extremely dangerous to fly. When the c.g. is far back the plane stalls quickly and suddenly tail-slides. Early fliers of this type of ship were content with correcting this condition by means of the controls rather than correcting design.

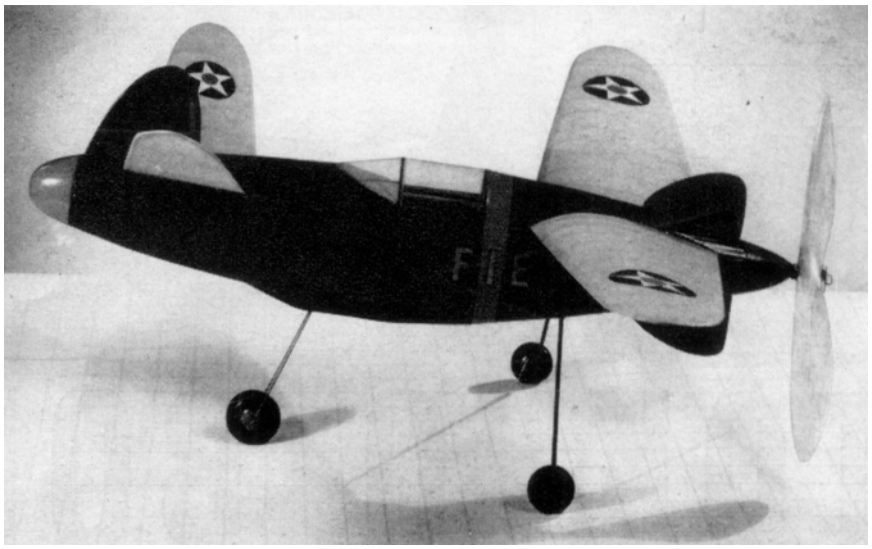
In all pushers, the area of the wing times the distance from its center to the c.g. should be much greater than the area of the front elevator times the distance from its center to the c.g. This is a basic rule for pusher types, and unless it is carried out serious stability troubles result.

The Army design here flaunts the bugaboo of the stall also in respect to another feature. namely, the elevator. It is essential in such a ship that the front wing stall before the rear wing. To provide this condition the front wing, or elevator, should have much more dihedral than the rear, or main wing. Thus at slow speeds, or when in a stall, the air spills out from the front wing allowing the nose to drop and the ship to regain its equilibrium. The front wing of the design shown would snake this plane impractical.

Another glaring error, from the pages of model building experience, are the vertical fins placed at the rear of the ship - without a fin at the nose. With these two large fins at the rear the ship cannot be controlled or steered directionally; or at least, such control would he very unsatisfactory. To make a turn with this type of ship it is necessary to move one end in one direction or the other, to create directional displacement and thus enable the ship to turn. To move the end at which the propeller is located is practically impossible; it would not only destroy propeller efficiency, but this end would be too close to the c.g. to move it effectively.

Therefore with canard type aircraft the rudder must be placed at the nose so as to push the nose one way or the other as desired. For steadiness it is essential to have a small amount of fin area at the rear. Best results probably would be obtained by having rudders at both front and rear. To make a right turn the front rudder would be *pointed* to the right, the rear to the left, thereby obtaining a double and effective action around the c.g.

Though these modifications in design may seem trivial, around them hinge the success of this type of airplane. When properly designed such craft can be made excellent fliers; you will have a chance to prove this by building the model described in this article.



This model has been designed with the basic characteristics of the- Army plane but in it have been incorporated essential changes for stable flight. You will note that; 1. the front wing has been given considerable dihedral; 2, its angle 2-1/2 degrees greater than the wing angle, which is also essential; 3, the c.g. is well forward of the leading edge of the main wing: 4, a vertical fin or rudder is at the nose with small stabilizing fins at the rear, replacing the huge rear fins in the Army design.

The wheels on the model have not been made retractable, though such a feature would contribute to the flight of the model; they were made rigid for simplicity's sake. If the builder desires he can incorporate a retractable landing gear or fly the model without landing gear.

As this design is most uncommon you will find it extremely interesting to build and to watch its unique performance. Many new points in design may be learned from a study of this craft. A few flights will prove its efficiency, for it is an excellent flier.

It is designed for hand winding; however, if the builder prefers, the nose plug holding the front end of the motor may be made detachable and equipped with a wire hook for stretching and winding the motor. Flights, hand wound, of about one minute have been made; wound with a winder, this little plane will fly like a contest ship.

Building instructions follow:

Study the plans till you get a clear idea of the ship. To start the fuselage lay down the fuselage sides. This is best done by making one atop the other; a better job will result. When dry remove from the plan and cement in the crosspieces. Cut the formers out of sheet and cement in place where they are shown on the plan. The formers are not notched, but the stringers are pinned in place by eye as shown on the plan and then cemented to the formers.

When dry remove the pins and sand the fuselage smooth. The landing gear is of bent wire and cemented in place; the rear one is then cut to size from bamboo and streamlined. Add the wire axles and cement the struts in place. The wheels are now added; a drop of cement on the axle will hold then in place.

Now add the front and rear plugs which are cut to shape from balsa blocks and sanded. A couple of coats of cement over the plugs will toughen the wood and serve as a good base for the colored dope. Bend the rear hook and cement in place: in this case it is cemented to the nose plug. Cut the radiator to shape and add to the fuselage. Cover the cabin with a good clear grade of celluloid.

The propeller is now carved from the block shown on the plans. Be sure to carve a left-hand propeller, as this is a pusher and a left-hand propeller is required. Sand it smooth and dope several times because the propeller is the heart of the ship and its performance is as good as the propeller. The shaft is then added to the finished job. Give the prop several coats of dope and resand with wet and dry sandpaper. The propeller is waterproof from the dope and by using wet sandpaper a glass-like job will result.

The wing is not as difficult as it appears; this type of construction saves balsa as well as time, and a better wing will result. To start, lay down the leading and trailing edge on the plan; in this way the size of the ribs are determined. Cut all that are required to the size shown on the plan and trim the rib trailing edge to get the size of the rib.

The lower part of the ribs are added, and then the spar is tapered to fit and slipped in place. Cement to all the joints and do not trim the end of the spar till you fit it in the body as this is how the wing is attached to the fuselage. Now add the tips which are cut of sheet. Sand the whole wing to get all the rough spots off.

The elevator is made in the same manner as the wing, therefore it will need no explanation.

To get a good covering on any model there should be no rough spots, so go over the whole job and sand all the parts smooth. On the fuselage at least eight strips are added in order to get a good job. After it is covered paint with clear dope and set aside to dry.

At this time the rudder and fin are cut out of balsa and sanded smooth; give all parts a clear coat of dope, sand smooth again.

Now the wings are added to the fuselage; the paper where the wing is will have to be cut away as it is hard to get a good cement job when trying to cement the wood to tissue. Slip the wing spar in the place shown on the plan and at the same time cement the leading edge to the fuselage. The elevator is attached in the same manner, except that there is 2-1/2 degrees incidence.

After the wings are attached to the fuselage they are ready to cover. When doping the wings be sure to see that there aren't any warps because this will spoil the flight. At this time the fins and rudder can be added to the fuselage.

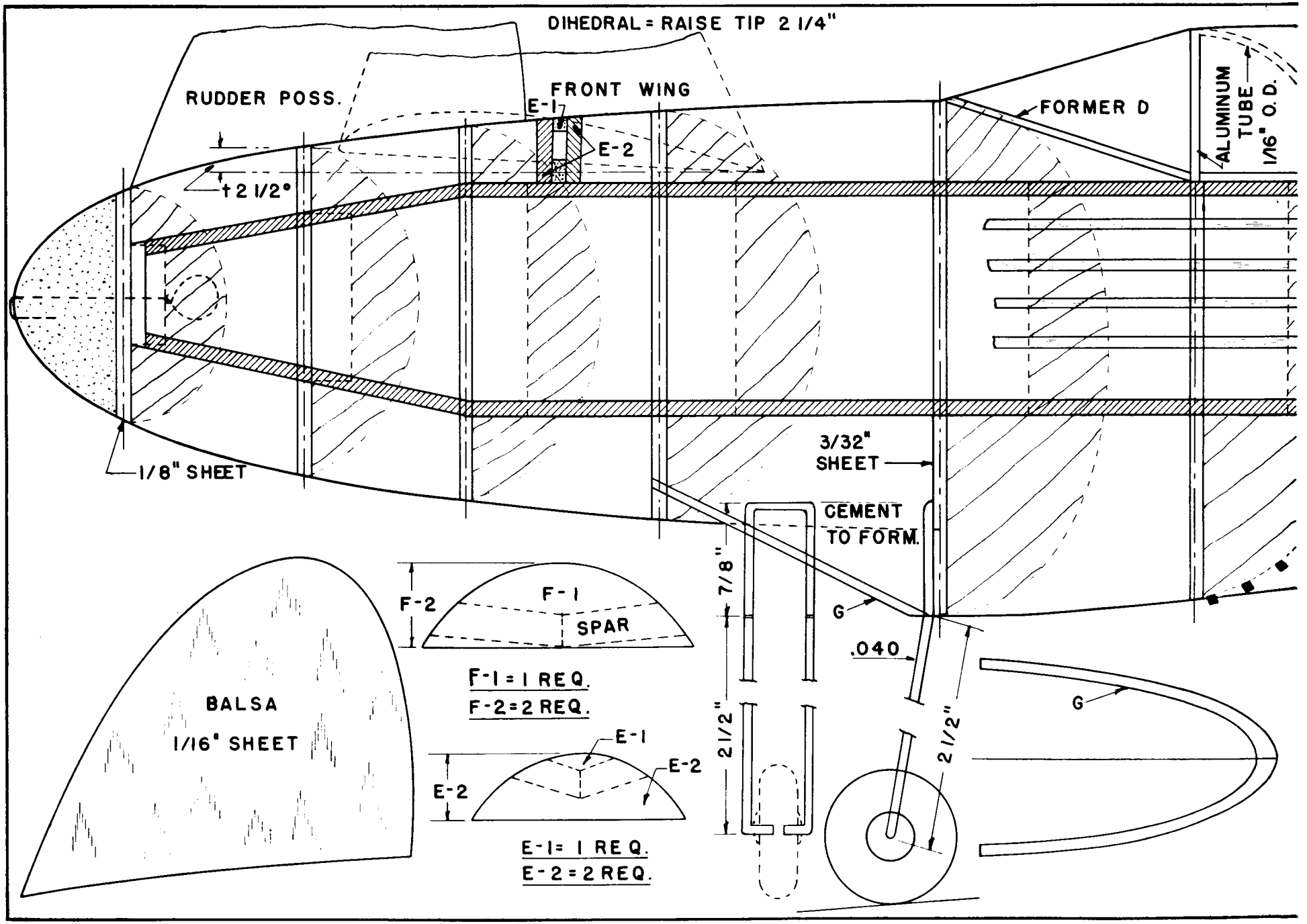
Now the model is ready to color; the body is olive drab and a red band is put around the fuselage; also add the decals. The wings are colored yellow, and when dry add the stars.

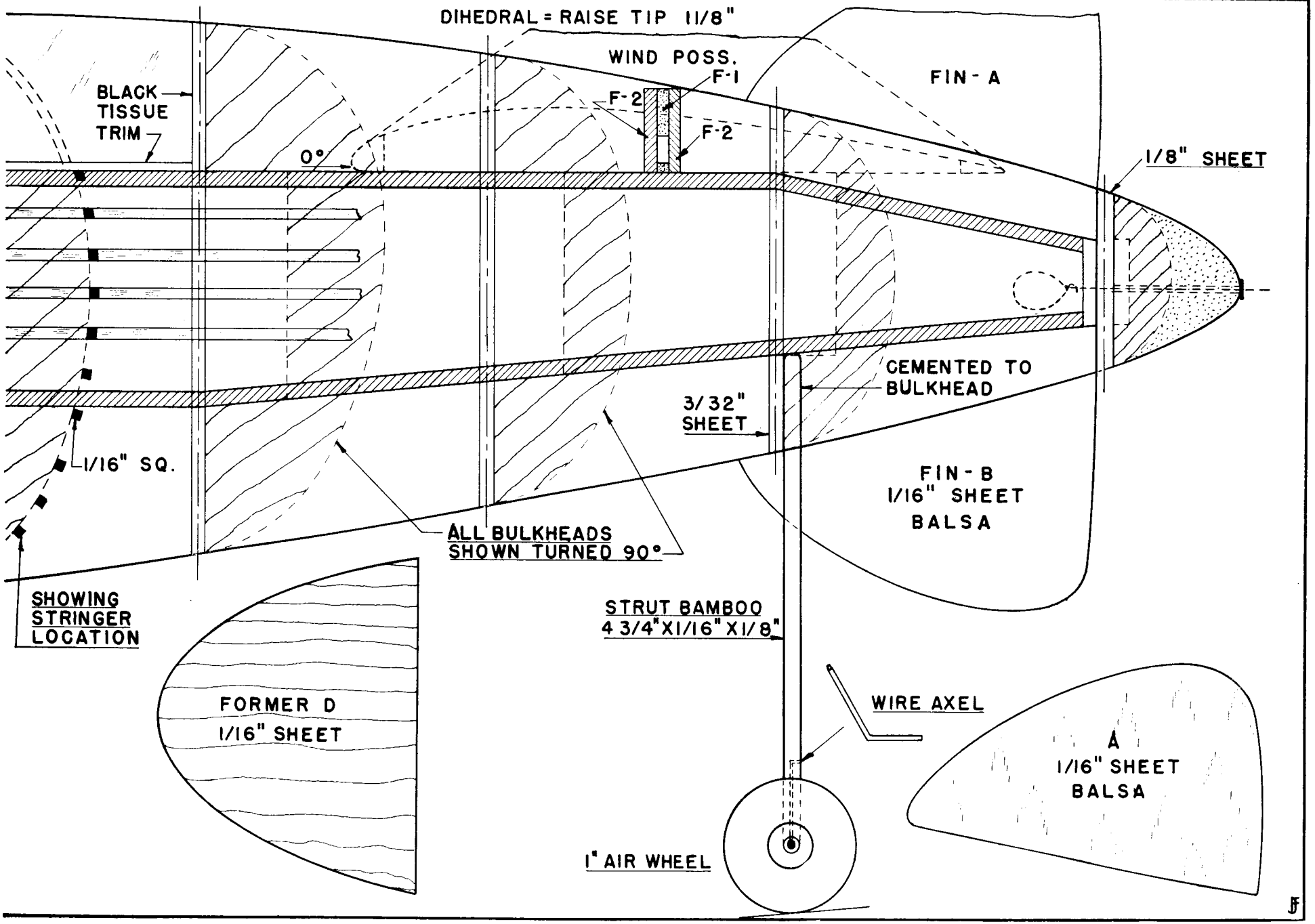
This ship flew well with six strands of 1/4" flat rubber and brought the ship to weight. Glide the ship; if it is nose heavy add a little weight to the tail. Wind the motor about a hundred times and launch the ship into the wind and watch its flight. To get the ship to turn, the front rudder is turned. The best time obtained with the motor hand-wound was fifty-six seconds, and the stable flights turned in amazed expert modelers. (Less power can be used if desired. Fine flights can be made with 10 strands of 1/8" flat rubber.)

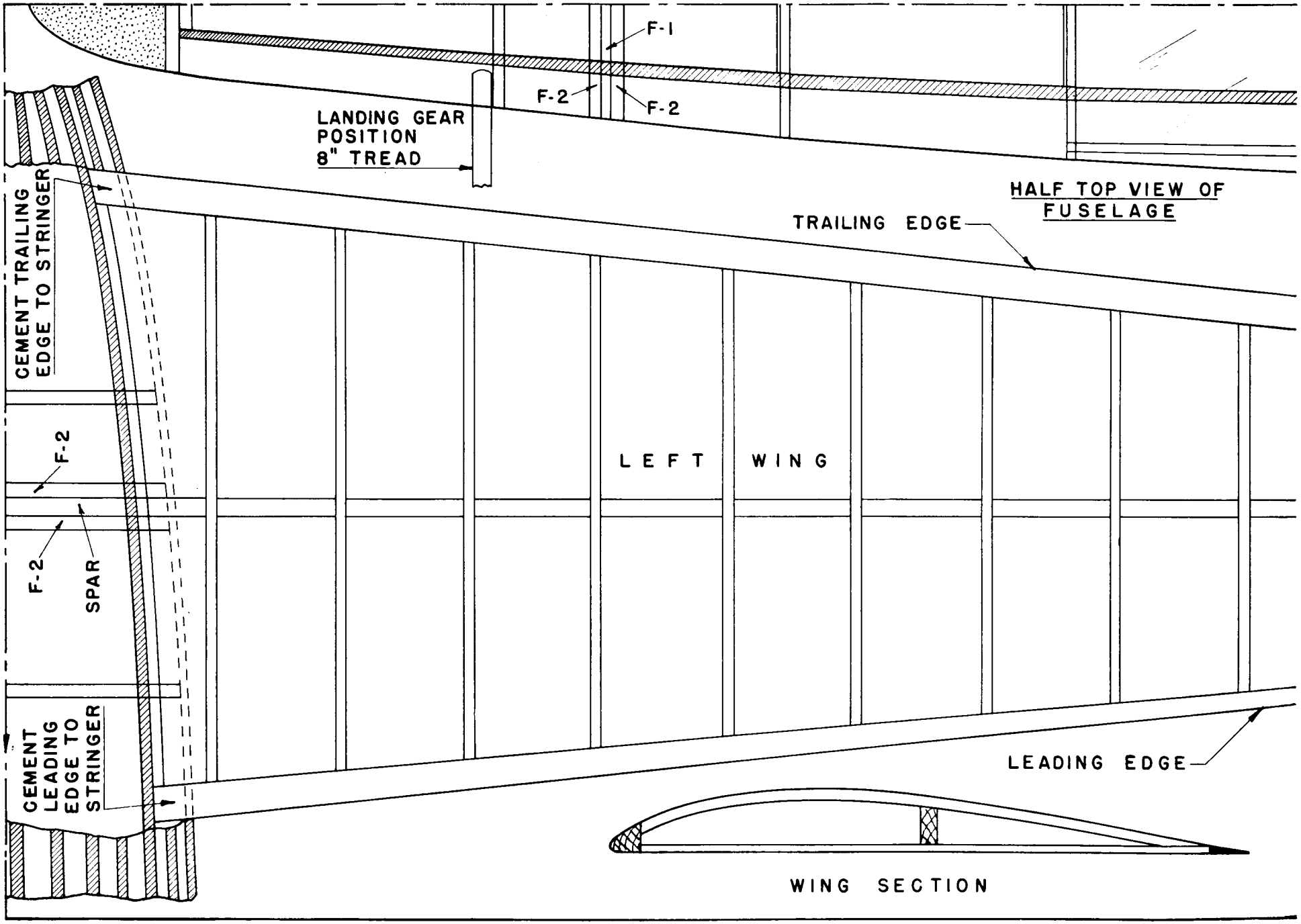
Tell us how your plane performs. Good clear pictures will be published in "Air Ways" if you send them to us.

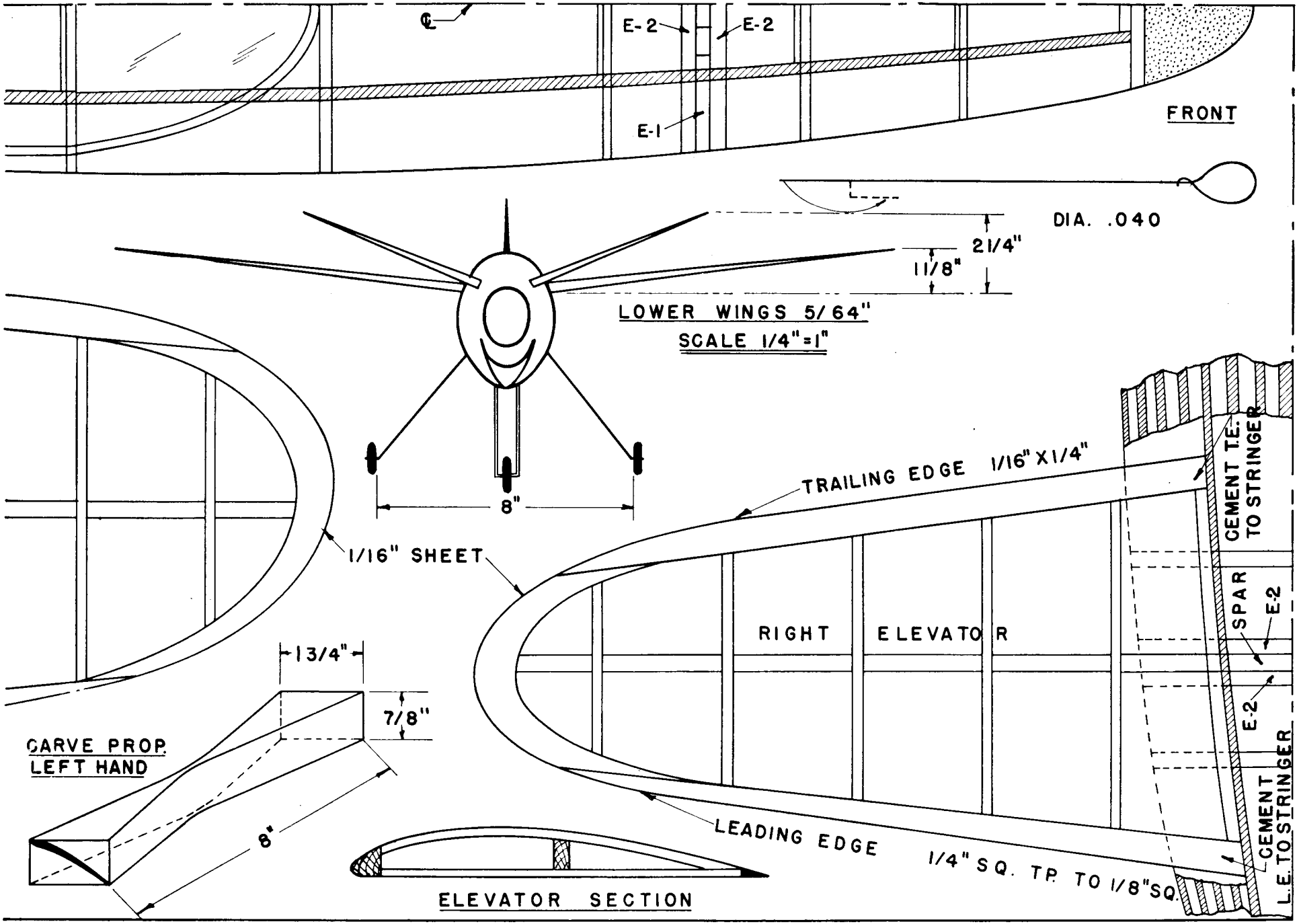
VICTORY

Scanned From July 1942
Model Airplane News


DIHEDRAL = RAISE TIP 2 1/4"
RUDDER POSS.
FRONT WING
E-1
E-2
FORMER D
ALUMINUM TUBE 1/16" O.D.
+2 1/2°
1/8" SHEET
3/32" SHEET
CEMENT TO FORM.
7/8"
G
.040
2 1/2"
2 1/2"
G
F-2
F-1
SPAR
F-1 = 1 REQ.
F-2 = 2 REQ.
BALSA
1/16" SHEET
E-1
E-2
E-2
E-1 = 1 REQ.
E-2 = 2 REQ.


DIHEDRAL = RAISE TIP 11/8"
WIND POSS.
F-1
F-2
F-2
FIN - A
BLACK TISSUE TRIM
0°
1/8" SHEET
CEMENTED TO BULKHEAD
3/32" SHEET
1/16" SQ.
FIN - B
1/16" SHEET
BALSA
ALL BULKHEADS SHOWN TURNED 90°
SHOWING STRINGER LOCATION
STRUT BAMBOO
4 3/4" X 1/16" X 1/8"
WIRE AXEL
FORMER D
1/16" SHEET
A
1/16" SHEET
BALSA
1" AIR WHEEL


F-1
F-2
F-2
LANDING GEAR
POSITION
8" TREAD
HALF TOP VIEW OF
FUSELAGE
TRAILING EDGE
CEMENT TRAILING
EDGE TO STRINGER
F-2
LEFT WING
F-2
SPAR
CEMENT
LEADING
EDGE TO
STRINGER
LEADING EDGE
WING SECTION


E-2
E-2
E-1
FRONT
DIA. .040
2 1/4"
1 1/8"
LOWER WINGS 5/64"
SCALE 1/4"=1"
8"
1/16" SHEET
TRAILING EDGE 1/16" X 1/4"
CEMENT T.E. TO STRINGER
RIGHT ELEVATOR
SPAR
E-2
E-2
CEMENT L.E. TO STRINGER
LEADING EDGE 1/4" SQ. TP. TO 1/8" SQ.
1 3/4"
7/8"
CARVE PROP. LEFT HAND
8"
ELEVATOR SECTION