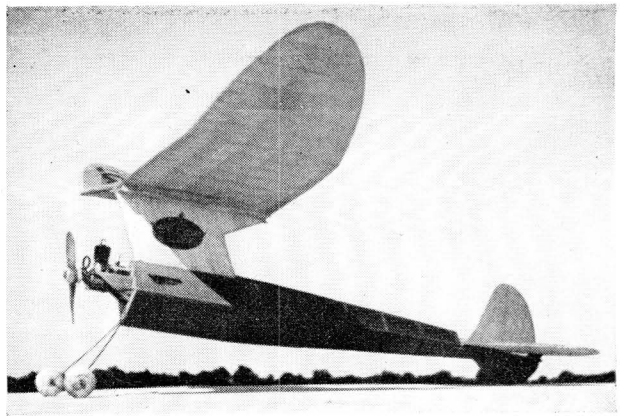


BILL REDEKER.

# A RECORD HOLDING NATIONALS WINNER

Build and Win Contests With This Plane That Made a National Three-Flight Average Class B Senior Record of 9 Min. 20.3 Sec. at the 1940 National Meet

By **BILL REDEKER**



The national record-holder ready to go places

WITH a defiant scream and a challenge to the clouds, a mighty little ship leaves the hands of its builder — up, up, up into the blue, climbing higher and higher with a tight vertical that commands the admiration and respect of every model builder on the field. Fainter and fainter grows the high-pitched roar of the motor as the little ship is rocketed skyward. Then, as the twenty-second mark is reached, it flips out on top, begins a long, flat glide, soars majestically while spectators gasp as another first-place is hung up with its line of victories.

It's the "Demon," fellas, the little ship that can't be beat! It's made a flight of 28 min. on a 10-sec. engine run.

The plans call for the installation of an "Ohlsson 23," but the "Demon" may easily be converted to a class C ship by using a "Baby Cyclone." In taking advantage of the adaptability of this fine performer as a dual class ship, the builder should take care in conforming to the weight rule. The wing area is 3.29 sq. ft. (474 sq. in.) and with an Ohlsson the ship must weigh at least 26.5 ounces to have an even 8 oz. wing loading. The use of a Baby Cyclone calls for 28.8 ozs. as its minimum weight. This yields an 8.75 oz. wing loading.

Due to the chance of losing a ship in a contest, this plane was primarily designed for simplified construction without sacrificing its performance. If you lose your ship one week you should have easily completed and thoroughly tested another potential winner by the time the next week rolls around.

## The Wing

The wing is of the elliptical type with polyhedral built-in to insure complete stability under extreme power. Its construction is light yet stressed to "take it" under the roughest treatment in flight or in contact with obstacles.

Enlarge the plans upon a suitable piece of paper and tack them to a board or work table. Cut the trailing edge from medium 1/8" sheet and put in place upon the plans. Then, using light pins and nails, bend the leading edge to its shape. Cut the ribs from 1/16" sheet and put the ribs in the tip section, slide the tip spars into place and use the same procedure for the center sections. When the four separate sections are dry, glue them together at the polyhedral joints. Covering is of "Silkspan" or bamboo paper. Two coats of thinned-out dope are suggested. Sanding

WING DESIGN BY COURTESY COMET MODEL AIRPLANE CO.

with fine finishing sandpaper will give a smooth surface.

## The Tail Assembly

The stabilizer is constructed by cutting out the leading and trailing edges and tacking them in place upon the board. Then cut the tapered spar and slide the ribs onto it and glue the entire structure as you place the ribs and spar inside the leading and trailing edges. Using 3/32" square balsa, glue in the diagonal braces which run from the spar to the trailing edge. Then plank the center section with 1/16" sheet on top and bottom as the plans show. Cover the stabilizer with "Silkspan" and cut the rud-



The proud winner with his high-flying "gas bird" after the record flight.

der from 1/8" sheet. Sand the rudder to a streamlined section, cover with "Silkspan" and glue firmly in place on the stabilizer. Two coats of thinned-out dope will be sufficient.

## The Fuselage

The fuselage is built of hard 3/16" square balsa strips. Two congruent sides are first constructed. Lay out the longerons upon

the plans and secure them to their bended position with light nails. Glue in the cross-pieces and let dry.

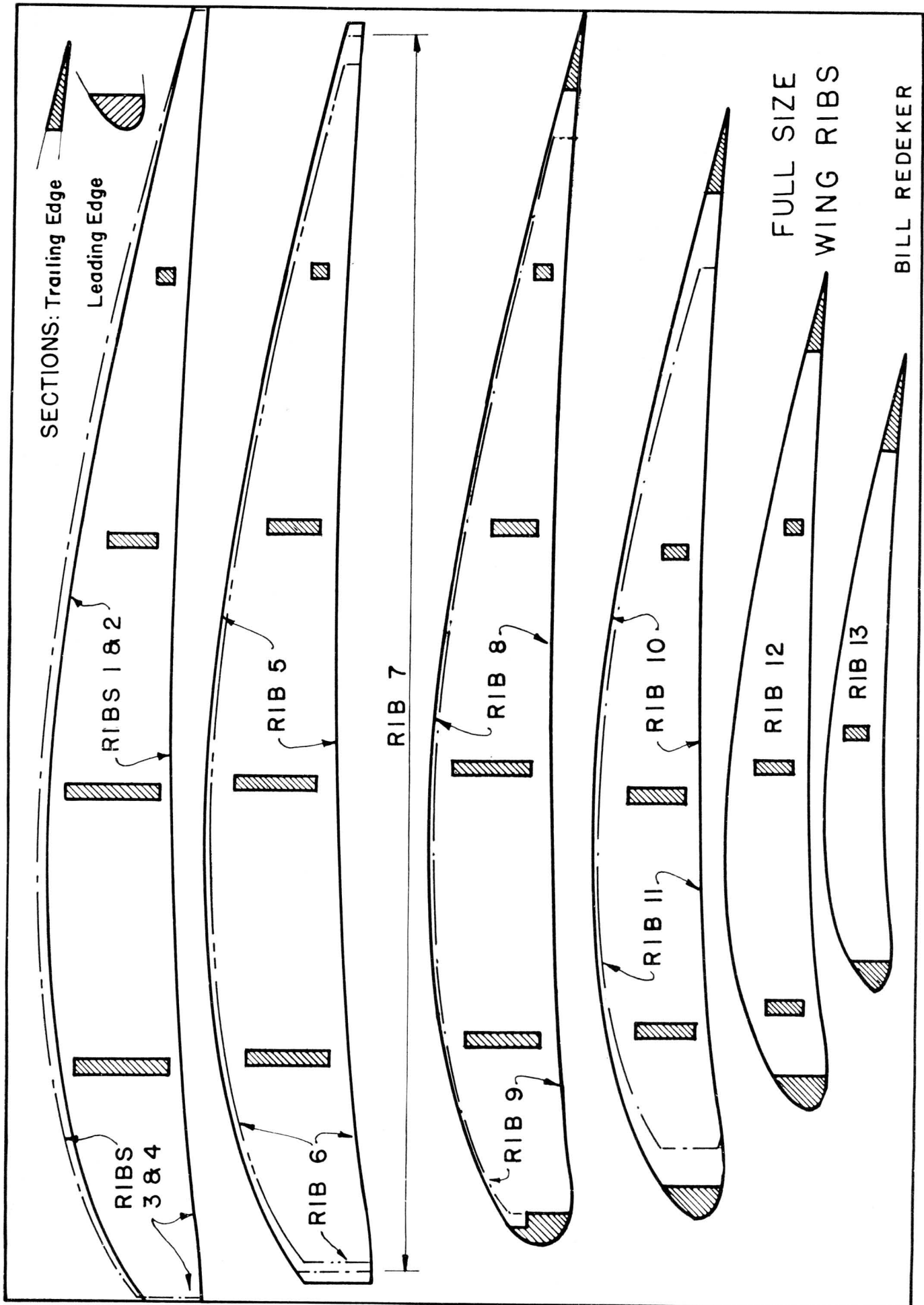
The same procedure is used in making the other side. After both sides are completely dry, carefully set up the two opposing sides and glue the cross-pieces in place as is shown on the plans. In doing this last be very careful to see that the four angles formed by the sides are all equal to 90 degrees. Using 3/16" sheet plywood, cut a square piece conforming to the cross section of your fuselage. Glue this in place with plenty of glue, as an extra amount of glue is many times worth its weight, in building the fuselage and wing mount.

Build the wing mount of 3/16" square hard balsa, as was used in the fuselage. This is built flat upon the plans. While the wing mount is drying, plank the top half of the fuselage with 1/16" sheet. As the builder will notice, the pieces that form the leading and trailing edges of the wing mount are long enough to reach through to the bottom of the fuselage. These square pieces are notched where they meet the top stringer. The uppermost longeron is notched in the corresponding place to give a tight joint. With these notches cut, glue the wing mount frame firmly to the top and bottom longerons. After this step is finished, plank the wing mount frame with 1/8" sheet and round off the edges with sandpaper. The platform is built of 1/8" medium sheet balsa. The pieces are 3" wide and the grain runs spanwise. These pieces are glued at right angles to the upright mount. Then, glue the two pieces of 1/8" sheet, cut to the curvature of the bottom of the wing, into place. Lugs for the rubber bands are made of rounded hardwood, inserted into the wing mount.

With the wing mount out of the way, proceed to bore the holes for the metal motor mounts. In doing this the builder should take special care in getting the right thrust line. It is best to secure the nuts firmly to the bolts by coating them thoroughly with cement behind the firewall.

The wiring is the next important step. Refer to the plans for the location of the coil and the timer. The coil is firmly cemented to the bottom of the fuselage; the timer is glued to the sheeting on the front of the fuselage. The battery box is mounted as shown on the plans. In wiring up the Demon be sure that all connections are well soldered.

Bend the 3/32" steel wire to the shape on the plans. Make the small duraluminum



fittings and bolt the landing gear to the bulkhead. Use 2" balsa wheels. Now that the interior is complete, plank the two bottom sides and sand the entire structure. Then cut the top longeron off at the last cross-piece to allow for the tail mount. The stabilizer should then rest on the tail mount parallel to the thrust line. The last diagonal braces in the rear of the fuselage are now put in place and the structure is ready for covering. Two heavy coats of dope are recommended to prevent the fuselage from becoming oil soaked. The sub-rudder is cut from soft 1/8" sheet and is glued in place. Bend a soft iron wire to conform to the outline of the sub-rudder to prevent mashing the soft balsa while the ship is on the ground.

### Flying

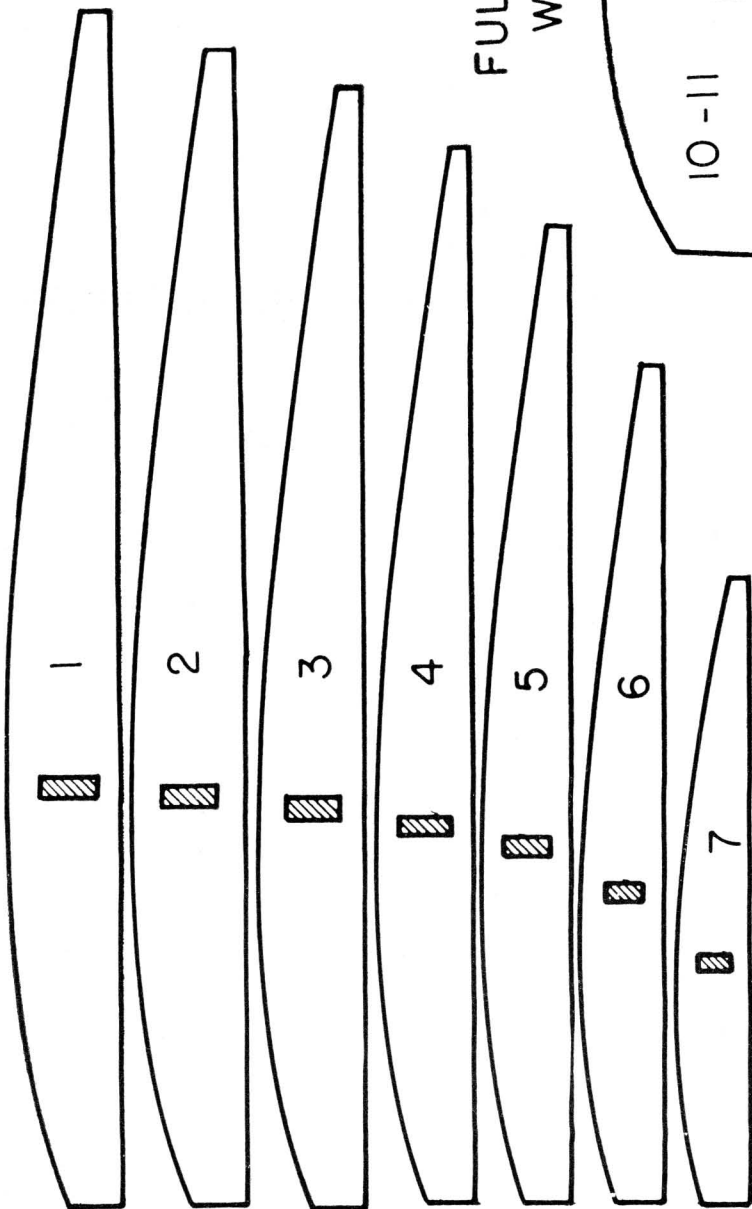
The one and only secret to successful flying, the one point often overlooked by many builders, is that of trimming your ship down to its maximum possible performance. To do this, the builder should experiment with his model incessantly. To begin with, the model should balance about

half-way back on the wing mount. All settings must be neutral. A low power test is advised after the plane has been hand-glided to determine its proper balance.

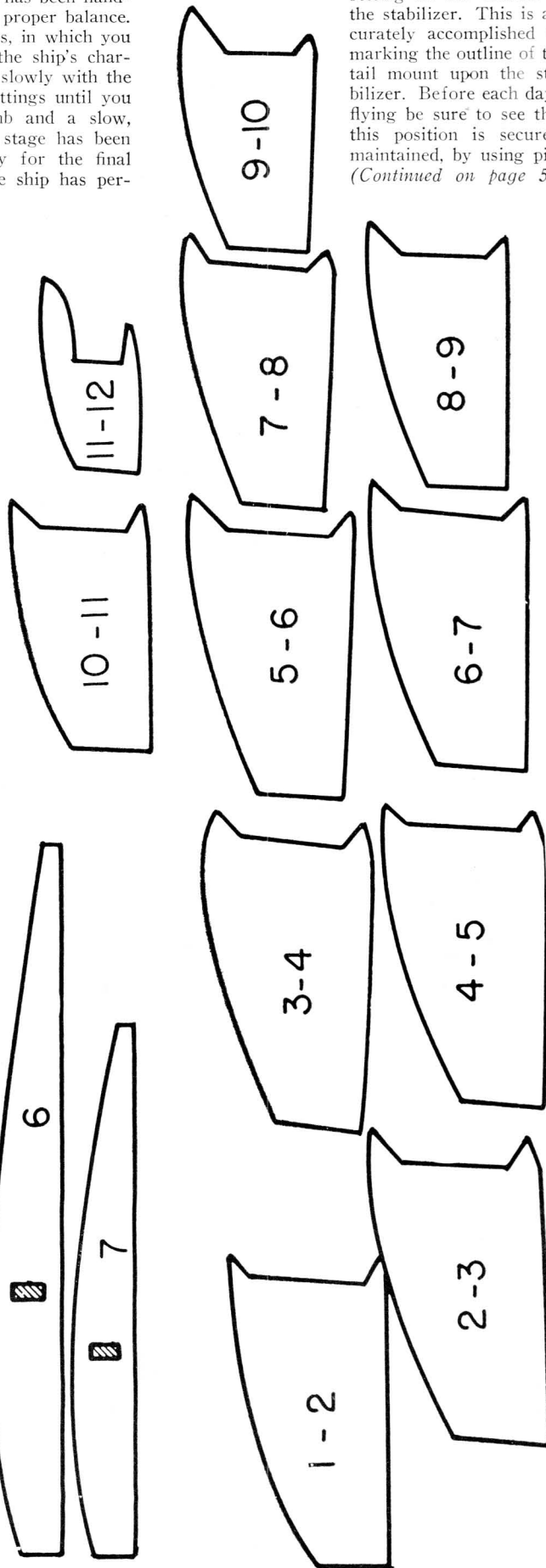
After a few test hops, in which you have noticed some of the ship's characteristics, experiment slowly with the rudder and elevator settings until you have a spiralling climb and a slow, flat glide. When this stage has been reached you are ready for the final power tests. After the ship has per-

formed to your highest approval it would be well to take a pencil and mark the rudder setting on the bottom of the stabilizer. This is accurately accomplished by marking the outline of the tail mount upon the stabilizer. Before each day's flying be sure to see that this position is securely maintained, by using pins  
(Continued on page 54)

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model to the greatest altitude while the engine is still running, then have it lose the least amount of altitude when the engine cuts. In this position it will be more liable to pick up favorable thermals and have longer total flight time. For this reason most gas models are designed and adjusted to climb at a very steep angle; when the model reaches the top of the climb it will be almost in a stalling attitude and, as we have just seen, lifting stabilizer tends to pull it out of a stall. In this way, as soon as the motor stops, the weight of the engine in the nose coupled with the lifting force of the cambered tail, will bring it into a level glide, with hardly any loss in altitude.

Obviously, an under-cambered stabilizer would not have this effect. The under-cambered stabilizer is quite an old principle, known for a good many years among all model builders. Ernest McCoy was the first to use it on an indoor tractor, back in 1928. He developed the so-called "Mystery Ship" which broke all existing records at that time and was characterized by its stable flight and long flat glide. The diagram explaining the reaction of this type of tail is shown in Figure 2.

In this case the center of lift is located behind the center of gravity and produces a forward moment as shown. To counteract this moment the stabilizer is cambered on the underside. This produces lift, or force  $F'$ , in a downward direction and sets up a moment about the center of gravity which is equal and opposite to that moment produced by the center of lift. Thus, the net result is once again zero, as shown by the equation:

$$F' \times d = C.L. \times D$$

Therefore,  $(F' \times d) - (C.L. \times D) = 0$

The big disadvantage to an under-cambered stabilizer is the same thing which gives the lifting stabilizer its great advantage, except that it reacts in the opposite direction. When the tail is lifting down it becomes necessary to move the wing back in order to balance the model, and thus it does not fly at its highest L/D value; hence, not at its best efficiency. McCoy's tractor was very notable by the fact the wing was located very much towards the rear of the motor stick; in fact more than half-way along the length. Of course, had the model been equipped with a tail boom such as is done today, some of this effect would have been offset; but tail booms were not used at that time. However, this is still an outstanding disadvantage of the under-cambered stabilizer and for that reason it has been replaced almost exclusively by the lifting tail.

There remains one last type of stabilizer: the neutral or non-lifting tail. This force diagram is shown in Figure 3. A neutral stabilizer is one which is equally cambered on both top and bottom, or in other words, a symmetrical airfoil. Thus the force produced by the tail is zero and the net moment about the center of gravity is zero. This is also the case when the stabilizer is a flat surface, but this type of tail is rarely ever seen in model use. A neutral tail, however, is sometimes used on large plane designs, particularly the light, private-owner type of airplane.

Thus, we have seen that the lifting

## A Flying Twin Motor Douglas DB-7

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props, then attach the S hooks to the winder and give the motors about 75 turns for a test flight. Your ship should climb a bit then settle in a long glide and come in for a perfect landing. If any adjustment is needed at this point do so by changing the angle in the stabilizer. The model should balance right on the rear landing gear strut mark.

When fully wound, the DB-7 takes off like no bomber ever did and climbs at an amazing angle. Some of you old timers who can still remember the climb on the old twin-pushers know what we mean. After the power is spent, your model will go into a very flat and fast glide. The landings are a treat to see; the ship just seems to slide in on its three wheels. Well, we won't say any more except, you build the ship and just wait and see!

## A Record Holding Nationals Winner

(Continued from page 19)

to supplement the rubber bands which hold it in place. Another good habit to get into is to thoroughly test your flight timer and motor before each contest until you are perfectly satisfied with them.

The rules allow the contestant a 20-seconds motor run and the modeler is foolishly wasting his time if he allows his plane to fly with five or six seconds under the allotted motor run. Therefore spend plenty of time in getting an exact timer setting

and see that your motor is at its tip-top performance. Don't go to the limit and risk an over-run; but utilize every second of the twenty that is permitted, because every fraction of a second on the motor run means more precious altitude—and that is what wins the contests!

Well, we leave you with an excellent little ship and a very good chance to turn in some winning flights with it. Loads of luck and many a "riser" with your "Demon"!

## Lifting or Non-Lifting Tail

(Continued from page 24)

never be possible to get an indoor tractor to fly with the wing far forward on the motor stick, without the action of a lifting tail; and all of the recent record-breaking indoor ships surely have been flying with the wing far forward. Of course, on gas models, getting the wing far forward is primarily the result of the weight of the motor.

It is also true, that a lifting stabilizer has better "anti-stalling" properties than a flat tail of the same area. As the angle of attack of the tail is increased, which is exactly what happens when the model starts into stall, the lift of the cambered section is increased. Hence there is a tendency to dampen out the stall before it even has a good opportunity to get started.

For outdoor gas models the lifting tail has a decided effect in pulling the model out of a very steep climb with minimum loss in altitude. In order to get the longest possible flight with a limited engine run allowed, it is absolutely necessary to get the