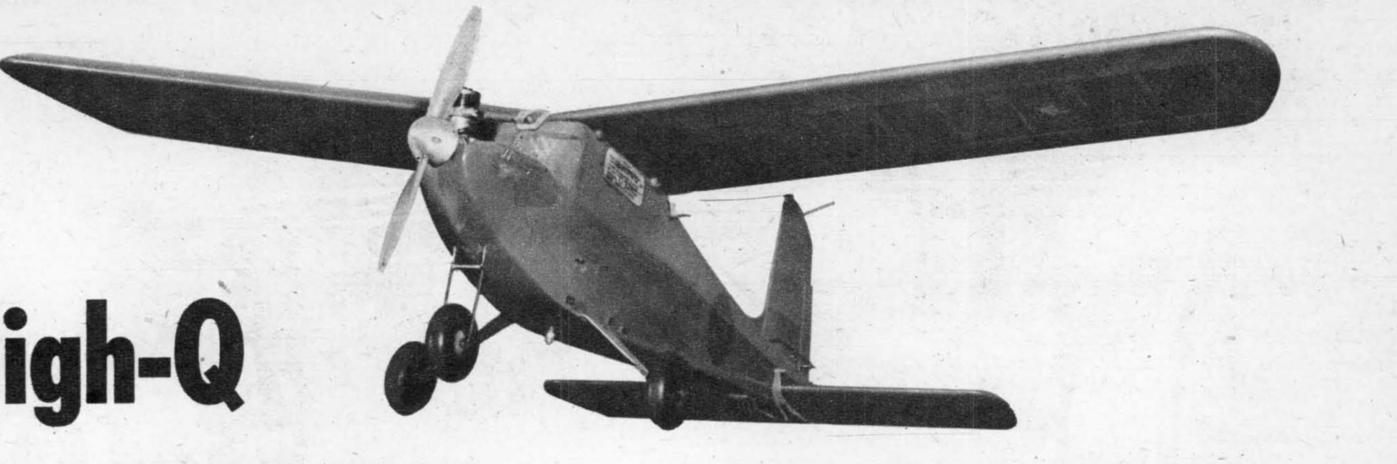


High-Q

The National Championship R/C Winner

What's needed in a model to win? One chap who knows: the Champ himself

By JACK C. PORT

■ *High Q* is not a completely new design, but rather my latest attempt to incorporate desirable features that would produce a better model for radio control contest work. Actually, the design is based on experience gained by flying other ships at contests and taking note of the scoring deficiencies present. Probably the most important factor in the design of a radio model is the type of basic control to be used. Because of past experience in flying and adjusting the basic escapement rudder control configuration, the design here was centered around the improvement in performance of this simple but effective method of control.

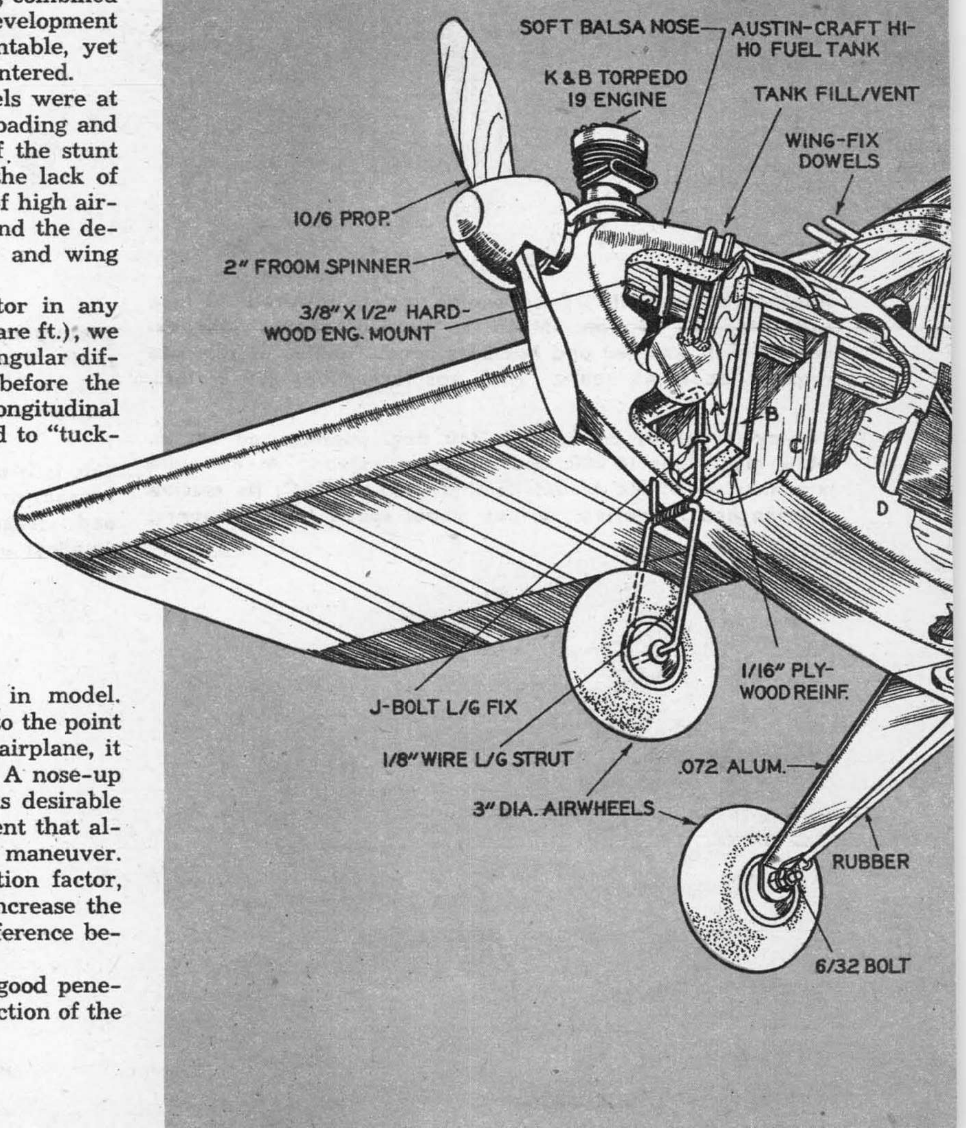
If we analyze the AMA radio control flight rules, combined with general contest conditions, certain ideas for development are evident. First, the model must be fully stuntable, yet adaptable to the type of weather conditions encountered.

As I have noted in the past, a lot of good models were at fault in the wind. Usually because of light wing loading and inadequate power, the model, although capable of the stunt pattern, was prone to be lost downwind due to the lack of penetration. Actually penetration is the property of high airspeed combined with good longitudinal stability and the degree of its use is primarily controlled by power and wing loading factors.

If we attempt to increase the penetration factor in any given model of light wing loading (12 to 14 oz./square ft.), we must increase power, move C.G. aft, and reduce angular difference between wing and stabilizer. Usually before the desired airspeed is reached, a condition of longitudinal instability appears. Sometimes the model will tend to "tuck-under," especially if airspeed is increased more by a spiral dive in an attempt to begin a maneuver. This is basically a result of flying the wing at too low an angle of attack, which causes the center of pressure to move aft, creating a nose-down tendency. Also, due sometimes to poor wing structure, the increased airspeed will cause a certain flexing that lessens even more the angular attack, thereby exaggerating the tuck-under condition in model.

Although the tuck-under condition may not be to the point of complete danger, with respect to crashing the airplane, it will minimize the property of stunting the model. A nose-up tendency proportional to the increased airspeed is desirable in any rudder-only model. This is the basic element that allows a rudder-only ship to enter and complete a maneuver. Therefore, in the desire to increase the penetration factor, and still maintain good stunt quality, we must increase the wing loading and power, so the angular flight difference between the wing and stabilizer is greater.

Another factor equally important in obtaining good penetration, combined with stunting quality, is the selection of the proper wing and stabilizer airfoils. The flat-bottomed, medium-lift section is desirable for the wing, because it must be flown at higher airspeeds to create sufficient lift for the wing loading. Also, it is less prone to aft center of pressure travel when used at low angles of attack, thus minimizing the tuck-under condition. The symmetrical stabilizer section was



chosen over the sometimes-used lifting section, because I did not want any change of lift, with respect to changing air-speeds, on the tail section.

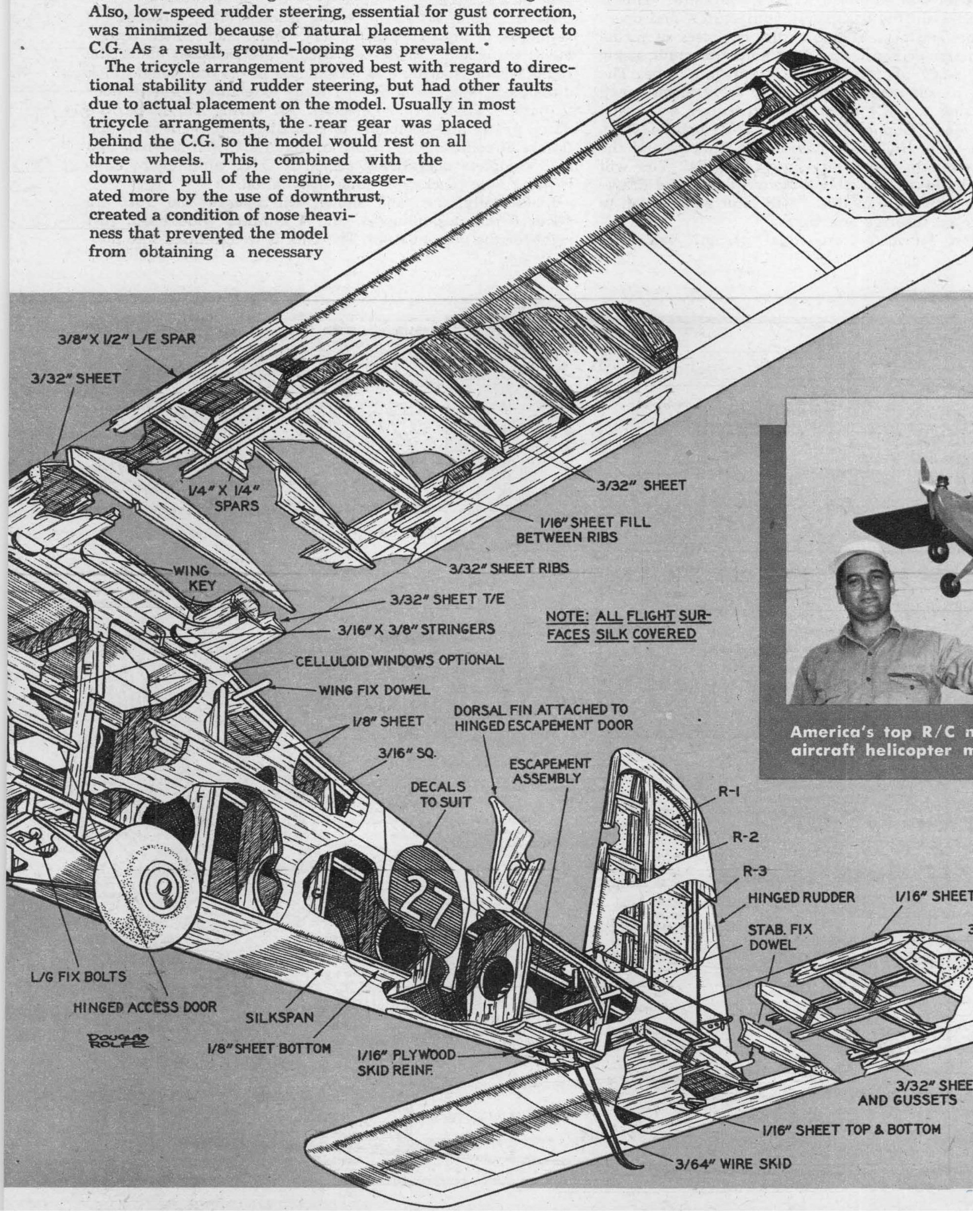
Last, but not least, was the application of a clean design layout to minimize drag. To summarize all the foregoing: The use of the higher wing loading, increased power and proper wing and stabilizer airfoils, combined with minimized drag, have increased the penetration factor in *High Q* for contest application.

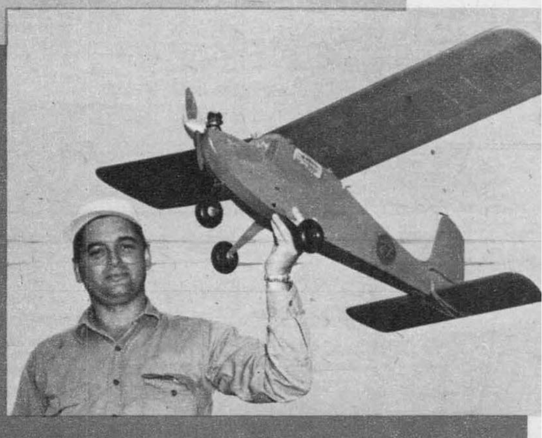
The next item to be given considerable thought was the design of strong, but functional landing gear. Again, it had been noted that a lot of models, although overpowered, did not obtain a proper take-off and/or landing, due to improper gear type or placement. The common two-wheeled variety was at fault primarily because of poor directional stability. This was noted throughout both take-off and landing roll. Also, low-speed rudder steering, essential for gust correction, was minimized because of natural placement with respect to C.G. As a result, ground-looping was prevalent.

The tricycle arrangement proved best with regard to directional stability and rudder steering, but had other faults due to actual placement on the model. Usually in most tricycle arrangements, the rear gear was placed behind the C.G. so the model would rest on all three wheels. This, combined with the downward pull of the engine, exaggerated more by the use of downthrust, created a condition of nose heaviness that prevented the model from obtaining a necessary angular attack at normal speed, for take-off. Some fellows corrected this by lowering the nosewheel, thereby positioning the model for a natural angle of attack, but as a result only good take-offs were obtained. Because of the low nosewheel the model would invariably bounce upon landing.

To minimize or completely eliminate the above conditions, the tricycle landing gear was selected—but so positioned that the fuselage glide descent angle governed nosewheel height with respect to main gear. It was so arranged that all three wheels were to touch the ground at once. This, combined with the placement of the rear gear forward of the C.G., lightened the nosewheel load to the point where necessary angular attack was gained at lower speed. The end point result was a shorter run and minimized zoom after R.O.G.

In actual practice, *High Q* statically rests upon the main





America's top R/C man is 33, a senior aircraft helicopter mechanic from Ohio gear and tailskid. When the engine is started and the model released, it will begin its take-off on all three wheels. After about 10 or 20 feet the nosewheel rises and the model continues on the main gear only. Because of its placement close to C.G., low-speed rudder steering is very effective. After about 60 feet, depending on wind condition, the angle of attack is regulated and the model will R.O.G. Upon landing, natural bounce is minimized, but not entirely eliminated. This can be corrected, however, after a little practice on the key switch. Before touchdown, give the model slight control to create a shallow dive, then opposite control to neutral. The result is an increased speed that will flare out landing, which, if executed properly, eliminates all bounce.

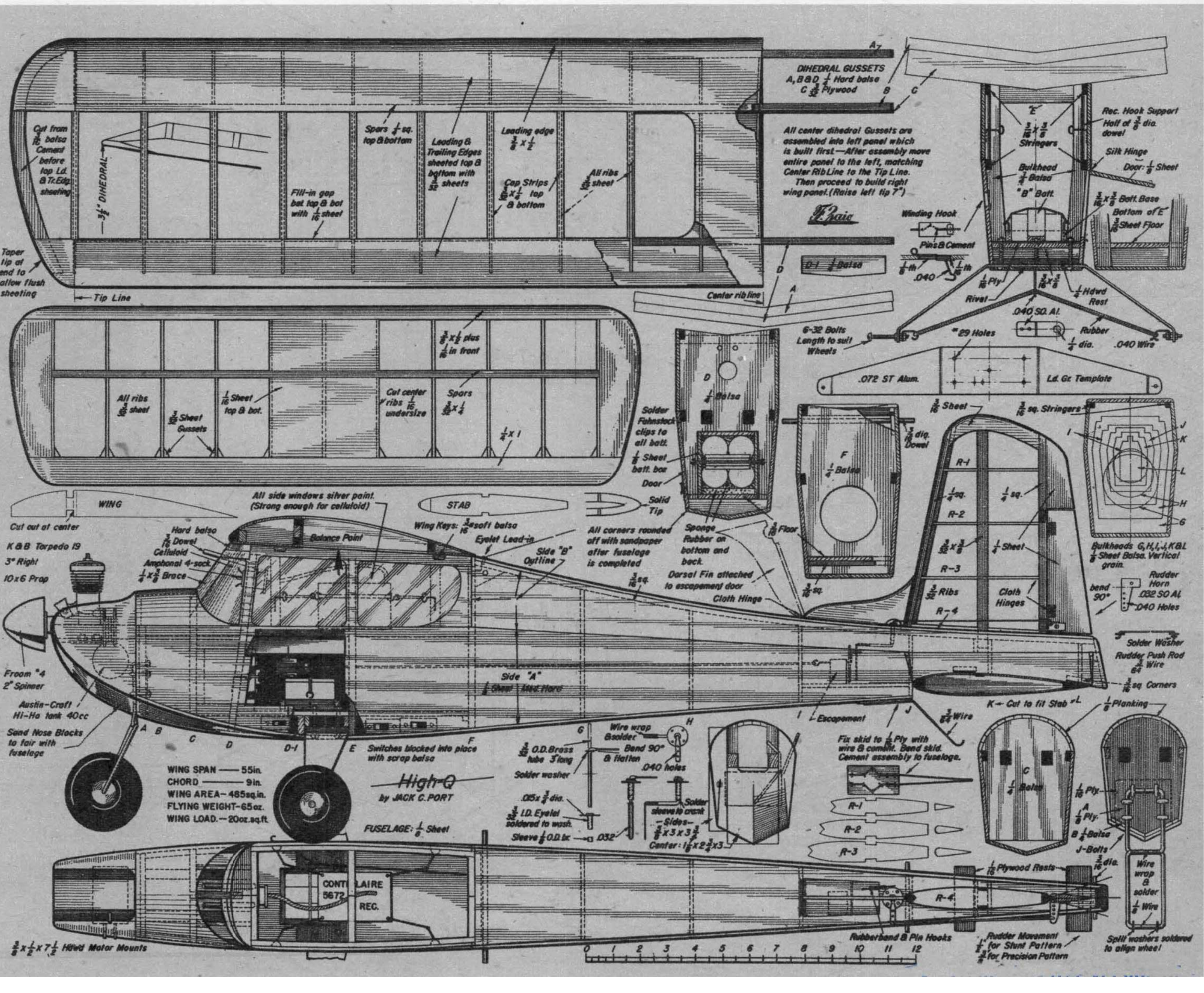
Although any radio equipment may be adapted to *High Q*, the original model was equipped with "Controlaire." This is natural, because I am the designer-manufacturer, and operate a spare-time business to defray the expenses of model building. The receiver is my new 5672 hard tube unit, using the Sigma 4F relay and the CK-5672 sub-min tube. The escapement is a self-neutral type, and the transmitter a crystal unit, using the 6C4 tube. Full particulars are available from Ace Model Supply—331 N. Elm St., Fairborn, Ohio.

Construction-wise, *High Q* is based on simplicity and the much-needed strength factor for contest survival. You will find it easy to build, as assembly is conventional and drawings are detailed. Because of this, I will limit information to basic procedure on fuselage and wing.

Fuselage. First, fabricate from equal strength balsa two primary side panels to outline lines A. Next, cement the 3/16" x 3/8" stringer to each side as shown. Now take the two side panels, with former positions marked, and cement formers into place, starting at cabin and working toward the tail, then finally the nose. Rubber bands will assist in holding the assembly together until dry. Next, cement the 3/16" square turtleback and 3/16" x 3/8" top wing-rest stringers into place. Now add separate cabin window section sheeting and side turtleback sheeting as shown by outline lines B. Next, add maple engine mounts, then drill holes and secure blind mounting nuts. Next, fabricate radio section flooring, which extends and cements to each cabin side and former position shown. Now add main and nose gears, securing main gear with 4-40 bolts. A local sheet metal shop will fabricate main gear at a small cost.

At this point all radio wiring is done. This includes installation of all switches, battery boxes and related equipment. On original model, all wiring was installed under the radio section flooring and terminated at the amphonal quick disconnect plug, with battery leads extending through floor to battery Fahnstock connectors. All wiring should be soldered neatly and cemented to structure to prevent vibration failure at connections. Before continuing, install receiver and give complete operational check. If O.K., continue by fabricating nose blocks and tank installation.

Incidentally, the tank shown will operate the Torp .19 about 6 minutes, plugged, and 4 minutes wide open, just right for the present rules. The tank is wedge-fitted into nose



blocks and cemented. Check for leaks before installation. Next, add top and bottom fuselage sheeting and planking. After all sheeting is applied, sand well and fair in nose blocks to fuselage contour. Then cover entire fuselage with Silkspan or similar paper to give added strength and minimize wood grain for proper finishing.

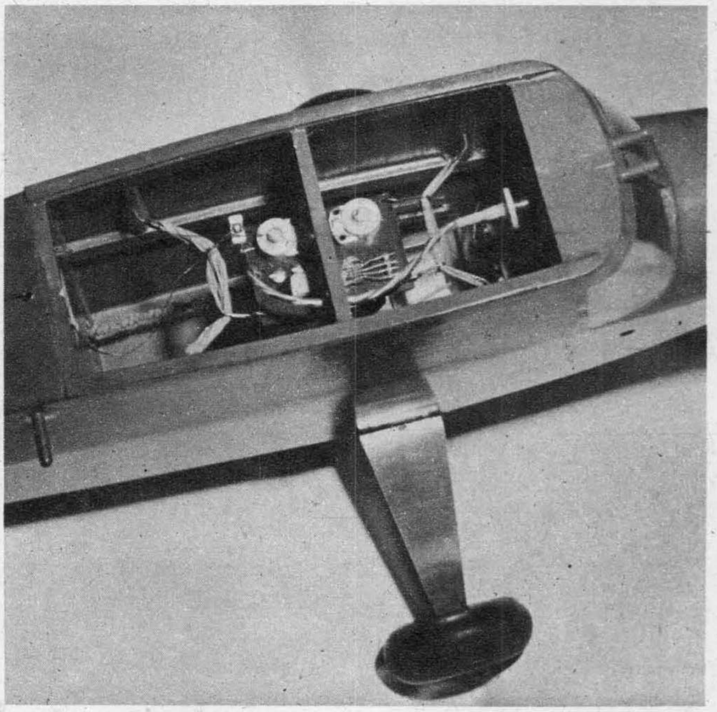
Wing. Effectively this is built from bottom up. Pin bottom leading and trailing edge sheeting to drawings. Note: make bottom leading edge sheeting wide enough to extend under the 3/8" x 1/2" leading edge. Cement 3/8" x 1/2" leading edge and 1/4" sq. bottom spar to bottom leading edge sheet, add 1/4" dihedral gussets, then cement all wing ribs into place. Next, fabricate and install wing tip, then cement top 1/4" sq. spar into place. The top leading edge sheeting is applied by butt joining first to leading edge, allowing to dry, then pulling down to top 1/4" spar. Next, apply top trailing edge and all top rib capstripping. Do not apply center sheeting until both wing panels are built. Allow this panel to dry 18 hrs., then shift panel to left, matching center rib line to tip line, then proceed to build right panel. All flight surfaces of model are covered with silk, and fuel-proof liquids used throughout.

To test and adjust *High Q* for flight is not difficult because standard procedure is used. Start by making a complete alignment check of the flight surfaces. If warpage or misalignment is present, correct before any flight attempt. For best characteristics, the model should balance 4" (plus or minus 1/4") from the leading edge of the wing. Set rudder travel for no more than 3/8" throw and plug the engine for limited power. The plug is made from 1/4" split dowelrod and fitted, so as to stop up half of the venturi opening. Before actual power flight, glide-test to insure initial trim. The model should go straight ahead from a running hand launch and have no noticeable stall tendency whatsoever. Although correct wing and stabilizer angular difference is shown on drawings, slight differences will exist; correct these by shimming stabilizer only.

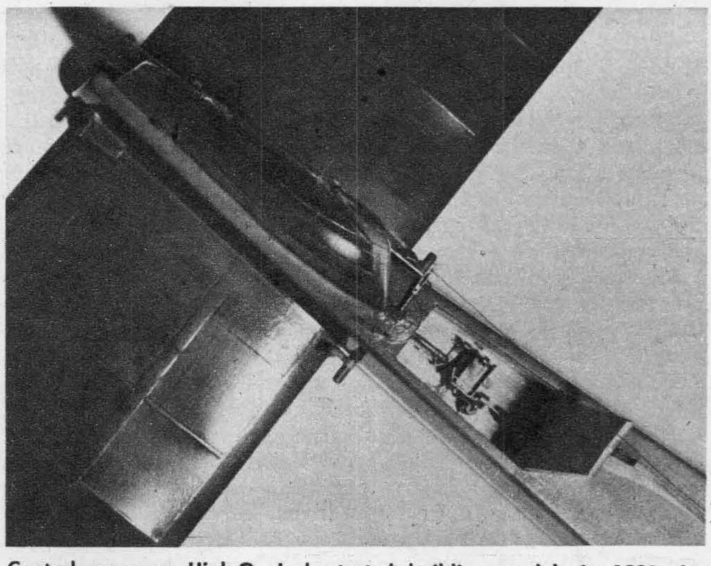
For first power flight, limit engine run to about 1 minute, by limiting fuel. Check radio equipment for proper operation, then hand-launch from a running start into the wind. Do not attempt to control the model, unless bad tendencies are present; if so, your radio is available for correction. Allow the ship to obtain reasonable altitude, then feel it out. Do not over-control, but rather observe flight characteristics for further correction. From here on, the actual trim and rudder throw will be dependent upon what type of flight you desire.

At the Nationals, for the stunt pattern, I used full power, with a 10/6 Tornado prop, rudder throw set for 1/2 inch and angular difference about 1 degree more than shown on drawings. For precision, I plugged the Torp, removed about 1 degree angular difference, and limited rudder throw to 3/8 inch. This is necessary, because no one adjustment is good for both precision and stunt patterns.

Now one last thought. *High Q* is a good model, with a proper balance of inherent stability, penetration and strength, so necessary for contest use. It is not tricky, but very easy to fly. Its performance on the contest field will be limited only by your experience on the key switch. For this reason, at every opportunity, fly and practice the AMA flight pattern. I did and finally came out on top.



Receiver used by Port on winning flights was the 27¼ mc Controlaire #5672 hard-tube unit which he designed, manufactures. It utilizes the CK-5672 sub-miniature tube; relay was Sigma 4F.



Control room on High-Q. Jack started building models in 1931; his first gas engine was a Brown—he put it in a Berkeley Buccaneer. Started RC'ing in 1949, studied electronics to perfect models.

Four-point landing gear on model is unique. Read Jack's reasons for developing this unusual set-up.