By HENRY R. JEX

Aloha

Strictly a duration job, this Herkimer CO_2 powered contest winner can snare the trophies for you, too

ALOHA is a CO_2-powered contest model. It won the first contest it entered and nearly equalled the National record of 9 minutes for its category. Flights are always over 2 minutes, regardless of weather, over 3 minutes in warm weather!

This fine performance is due to several unusual design features. Primarily, its very small size (90 square inches) and light weight (3.5 ounces) permit the use of a long motor run of nearly 2 minutes. A Schmitz-Luck type airfoil is used in conjunction with sheet construction for efficiency and simplicity. Airfoil parameters are: camber—5% at 25% chord with a 3% thickness and a sharp leading edge. Thin 1/16" sheet is perfect for this shape, and it preserves a true, unbroken airfoil throughout the span and chord. Unique struts keep this thin section from twisting or bending, yet allow adjustment for C. G., warp, or removal. Minimum drag is caused by the pod-and-boom fuselage. Rugged T-construction simplifies building, while the screw in the cartridge holder enables fairing of this usually awkward area. Engine and cartridge are also readily accessible and are not "souped-up." A single-blade folding propeller makes effcient use of the gas energy, yet reduces glide drag immensely. Note that a reasonable diameter is used, along with higher-than-usual pitch and an efficient airfoil. The single folder is almost necessary for contest performance.

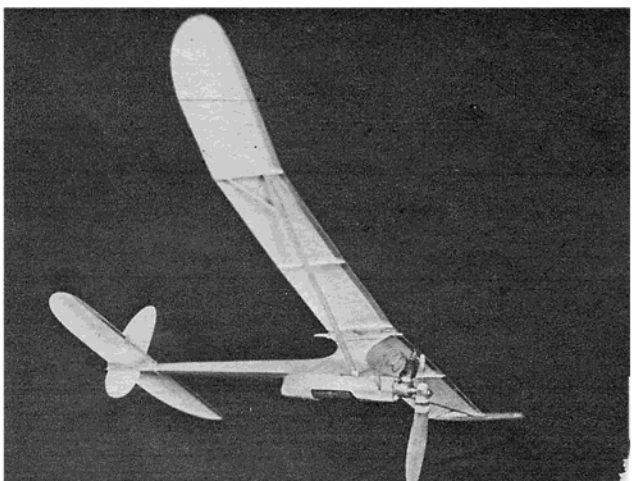
After all this harping on efficiency, some may lift their eyebrows at the extreme adjustments used. However, using the incidences and C. G. position shown, flights are always consistent, are not critical on adjustments, and, most important, variations in engine power don't affect adjustments. Aloha may be flown with the C. G. as far back as ½" from the trailing edge, but incidences must be carefully changed, so this is not recommended for the average flyer. Better still, follow settings exactly.

The fuselage is the more difficult, so knock it out first. Start with the 1/16" stiff balsa (quarter grain) boom. Cut the profile from 2" sheet, including the pylon. Add the 1/32" hard balsa pylon pieces (grain vertical) and the 1/32" formers as shown on the plan. Glue the 1/16" square fairing strip on last.

The pod and engine are next. Cut out and drill a 1/16" plywood firewall and attach it carefully to the nose of the boom, including the 3° to 4° down thrust and zero side thrust. Place a 1/16" sheet brace behind the lower part of the firewall, slightly offside to allow for the holder end. Cut out 1/16"-wide slots behind each bolt hole long enough for the 1/16" x 1" motor bolts to fit into. When the bolts are screwed in from the front, these should be a tight fit. Screw on the motor temporarily, put plenty of glue around the threads, and place ½"-wide linen sewing tape over and under the slots, effectively forming a "built-in" nut.

Place an empty cartridge in the holder; substitute a machine screw for the thumb screw (or cut off wings and slot head) and coil the tube as in the photographs. Put the holder

● If you like to work from full size plans you can secure working drawings of the Aloha on Plan #749 from AT's Full Size Plan Dept.



on the bottom of the boom in position shown; block up the small end, and attach it securely with ½" linen tape passed through slots cut in the tee. Glue well!

At this point, carefully bend the strut rails (one right and one left) from .020" music wire. Make sure the wire is a snug fit in the tubing used at the strut ends. Note that the open end is back, allowing it to unsnap in the event of a crash. Place this hook close to the fuselage, so that the rail snaps open and close. Glue this well, also. Fill in around the holder sides up to the firewall with 1/32" med. sheet, curved snugly over the parts involved. A hard block will be needed at the bottom front of the pod. Fair in the rear part with a soft balsa block, first scooped out to fit, then shaped outside. Add the wing and tail platforms and ⅛" square hardwood pylon top and sand the body smooth and clean. Cover the boon with light Silkspan, bottom first, then the sides, and fill in any crevices with Plastic Wood. Give the body one coat of clear dope and one coat of heavy bright red, orange, or yellow dope.

The wings and tail are the next to be constructed. They are relatively simple. Medium 1/16" x 3" sheet is used throughout, with the softer portion near the leading edge, if possible, because the curve is sharper at this part. Trace a paper pattern from the outer polyhedral break to the tip. This pattern is used not only for the wing tips but it is one half of the stabilizer planform. Cut out the wing, elevator, and fins from the sheet balsa, keeping the wing in one piece, Sand smooth with 7/0 sandpaper.

Ed Lidgard's method is used in forming the airfoil. First, cut out six hard ribs and make sure they fit the plan profile. Second, *wet* the top and *dope* the bottom of the wing back to 1½" from the leading edge. *Be careful* not to dope farther back, for in doing so you will spoil the airfoil. Now, while the wing is slowly curling up, place the ribs in their proper places, and pin them in place so that the airfoil is maintained. Don't worry if a slight twist develops at this stage; it is only necessary that the tips be carefully formed. Sand off the raised grain after the wing is dry but still flat on the bench.

The stabilizer is shaped in the same manner, but the airfoil is maintained by the tail platform. Cut apart the four wing panels and put the two left next to the two right panels. After sanding the ends of the outer dihedral breaks slightly to allow a clean joint, raise each tip 2¼" and glue well. After these have set, sand the center joint and with one side on the table, raise the other panel to 1½" at the outer break. Put a 2" long cross-grain brace between the center ribs so that the wing fits flat on the pylon mount.

The success of the sheet wing depends greatly on the struts used, so take great care in making this part. Use ¼" x 1/16" hard, tough balsa for the main strut, and 3/16" x 1/16" for the Y-piece. Glue up the Y over the plans, but leave the fuselage end a little long. Check the length by putting the wing and tail squarely on the body so that the C. G. falls as shown, and place the strut in its approximate position. Note that the Y must be cut so that the fuselage end of the strut falls in the center of the rail when wings are unwarped.

Put the L-shaped wires on the Y, cut short lengths of 1/16" O. D. aluminum or brass tube to fit over them, and attach tubes to the outer wing rib. The tubes should be a snug fit over the wire and should be raised slightly so the strut will fold flat on the wing. Replace the wing in its correct position on the pylon and trim the ends of the struts to just touch the rail. Groove this end, glue in a 1/16" O. D. aluminum tube, and reinforce with a piece of ¼" linen tape around the end. Note that wing may be slid forward or backward, the warp may be changed in either wing, or the whole may be removed by proper manipulation of the strut and rail. Hold the strut in correct position with short pins into fuselage on either side.

Apply ¾" colored or plain Scotch Tape to the wing leading edge to protect it, and run a thin line of dope along its edges. It is advisable to waterproof the wing so that it stays smooth. Dope or glider polish was too heavy for this model so a new idea was tried: spray or wipe on a heavy coat of the new water-repellent, "Aqua-Pruf," obtainable at any department store. Aqua Pruf adds practically no weight, doesn't raise the grain, and dries in five minutes. Surface must be satin smooth for best results. Try it on any thin sheet balsa!

Last but not least, comes the all-important propeller, for a good one will spell the difference between good and poor performance. Use a broken prop if you wish, but be certain the diameter is 8", the pitch is 6", and that the blade is of a wide type. A "Top-Flite" 8-6 was used on the original. Scoop out the undercamber until a thin, sharp airfoil results. Put a small box hinge on the flat part at the rear, positioning this as close to the hole as possible. These may be obtained from your hobby shop or from a cabinet maker's supply house. It's a good idea to strengthen each rolled part with a small drop of solder, but this is not absolutely necessary. Push ½" pin heads through the holes in the hinge and well into the prop. (Note: 2 Jasco heavy duty folding hinges may be used.) Glue securely.

The 1/16" music wire counterbalance support is now bent to shape, fitted to the short end, and glued on. Wrap ¼" linen tape around both sides of the hinge and the short end of the prop to strengthen these parts. Into a 3/16" x ½" deep hole in a block, stick the end of the balance support. Melt solder around it and file to balance after doping the prop. The support may be bent to get vertical balance. A 3/16" strip of paper wrapped around the CO_2 shaft will center the propeller. Cut apart the hinge now and check it for smooth action.

At this point it is essential that the completely assembled Aloha be checked thoroughly. Make sure the position of the C. G., the wing and tail incidences, and thrust adjustments are exactly as shown. Also check the model's weight. It should be around 3½ ounces including the empty cartridge. Correct carefully any warps or unbalance. Also, unscrew the cylinder until the motor runs nearly 1½ minutes. High power will not give the longest flights, but with this long motor run and the exposed cartridge the very utmost energy can be extracted from each charge. Also oil the motor frequently with 3-in-1 or similar oil.

After the Aloha has been checked and the motor slowed down, test-glide it over a grassy area with an empty cartridge. Try to get a 30-foot radius right glide. Use the rudder and wing warp to do this; i. e., right rudder, right wing washed in slightly. Keep the glide smooth and somewhat below a stall.

At last, a full cartridge may be inserted, the screw tightened up and backed off until the gas reaches the motor. Have the prop set so that the piston just touches the valve when the prop is on the left horizontally. Flip it over smartly, check to see if it is pulling forward, and release the model slightly to the left of the wind. Climb should be in shallow, wide right circles which gradually tighten as the power drops. At the end of the power run the model should be 100 feet up and just settling with a flat power glide. Increase power until this is the case, but keep in mind the fact that cool weather decreases the altitude.

After recovering the original Aloha from an out-of-sight flight of 12 minutes, it was decided to use a simple dethermalizer on hot days. A pop-up tail, Goldberg type is used and the release is a fuse. Merely hold down the trailing edge of the stabilizer with a ¼" loop on one end of a slow burning fuse, which trails behind. Tightly woven string should be soaked in a dilute solution of potassium or sodium nitrate, dried, and cut to a length previously determined to give a 5 to 8 minute flight. Try to get an even burning rate, like 1" per minute. Light the fuse just before flipping the propeller.