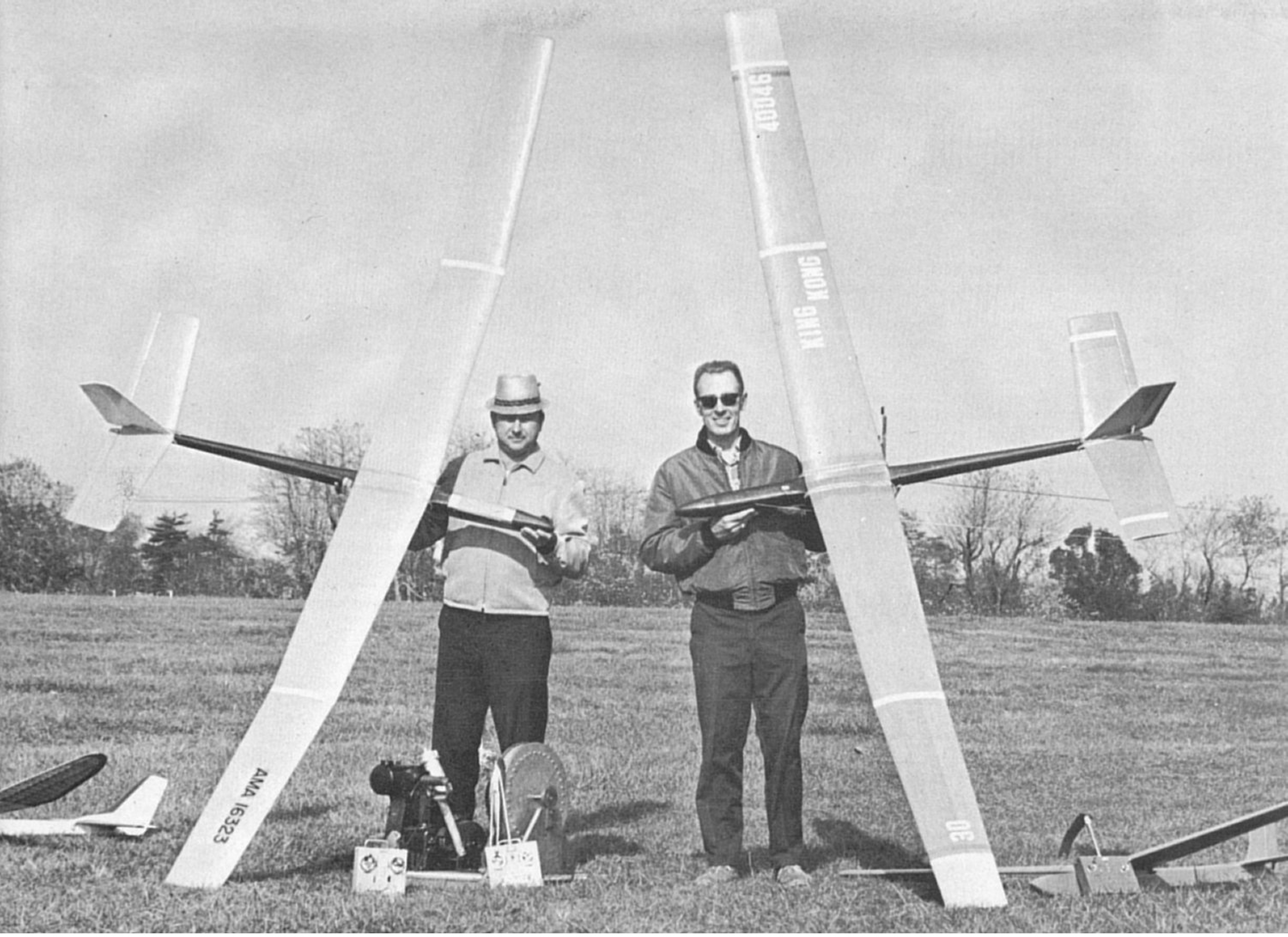


Joe Roslyn and author hold the first two Kongs, still flying after two years! Note use of plastic tape around wing chord at outer dihedral breaks to seal air gap and retain tips. Heavy-duty gas-powered launch winch in foreground.

KING KONG

Twelve-foot span, flat-land soarer is fast, functional, and durable machine for winning contests. Disassembles to practical size for transportation.

DICK SARPOLUS

THE KING KONG was designed for one purpose—to win in soaring competition. And that it has been doing. In three East Coast RC soaring contests in 1969, the Kongs placed first and second at Dover, third and fourth at Lakehurst after leading in all rounds except the last, and fourth at Columbia. They showed an amazing—and unexpected—ability to float in dead air. The two Kongs now flying weigh seven and a half and eight and a half lbs., but they still float as well as or better than the lightweights. They glide fast enough to cover a lot of territory and penetrate wind extremely well. Because of their large size and swift flying qualities, they can go far downwind—which is where it seems that the best thermals always are to be found.

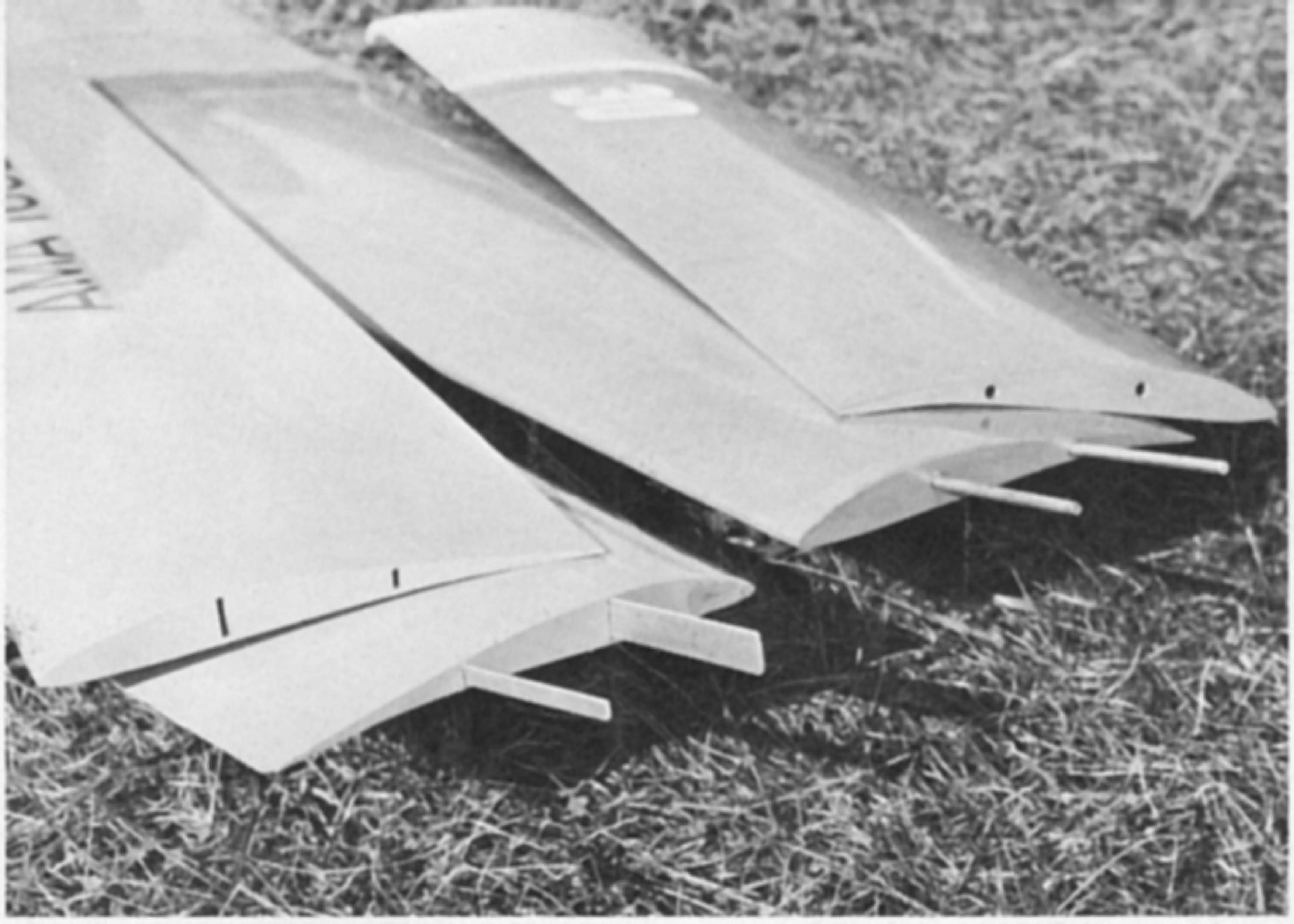
The design was somewhat of a group effort. Dr. Ed Morris started the trend to big gliders in our club with a 12-ft. model. Then we got together with Doc to make a fiberglass fuselage pattern for a new design. Fred Kingsbury, local fiberglass expert, made the mold and the fuselage pieces. Joe Roslyn did some airfoil research and picked the Eppler E-387 section. Then we got together to settle on the overall layout. The prototype was made up with Joe's choice of wing and the fuselage and tail I selected. It flew so well a second model was quickly finished, and we headed for the contests.

Some further comments on the design are in order. The fuselage was made as small in cross section as was felt practical. It has proved to be quite strong, surviving several almost straight down landings. The horizontal stabilizer has dihedral to protect it on landings, keeping the stab up off the ground. The tail assembly is held on with rubber bands for simplicity and for ease in fitting the plane in a car.

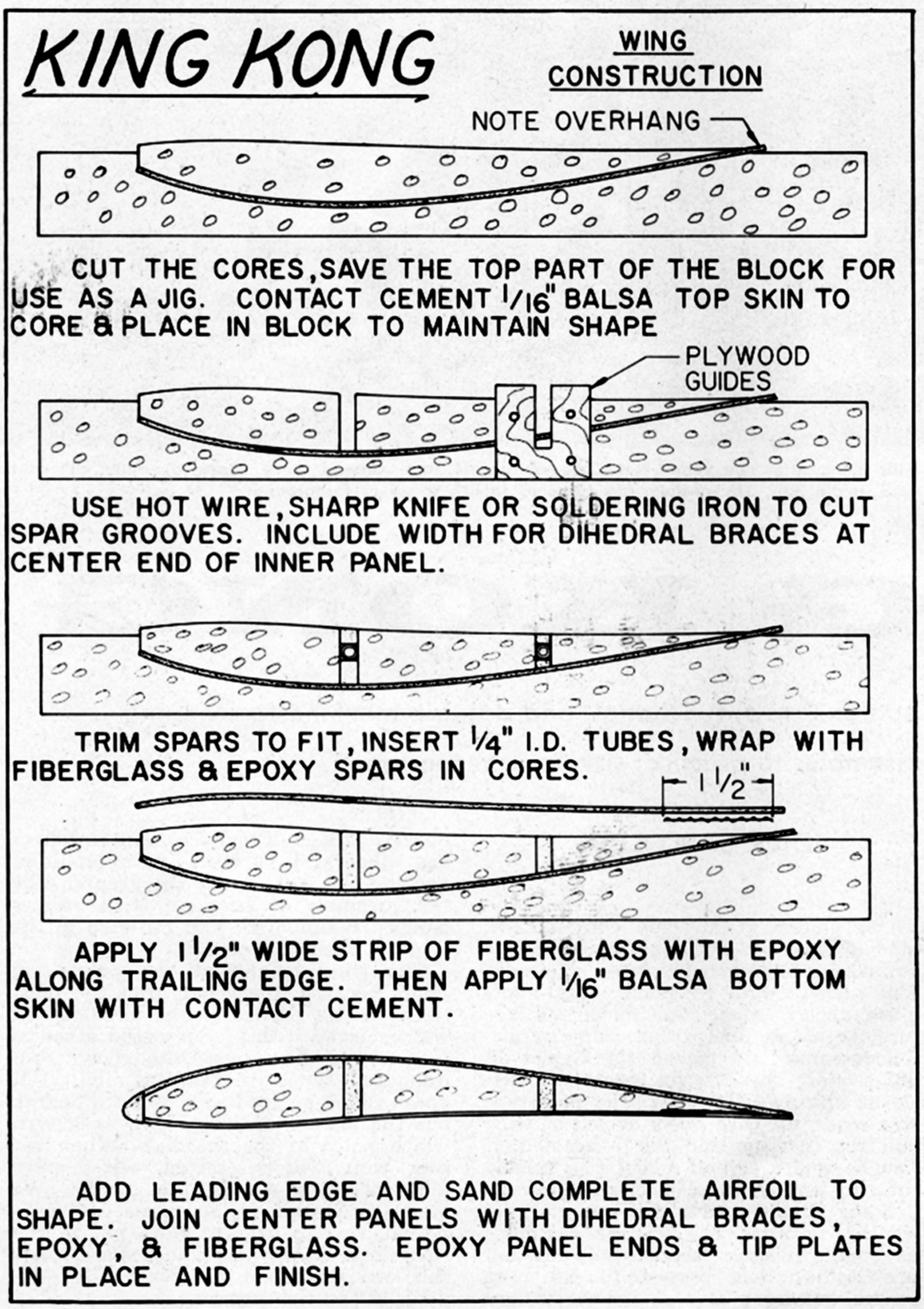
The wing breaks at the polyhedral joints because it was felt that the most strength was needed in the middle. This was achieved with four plywood dihedral joiners and fiberglass cloth. Polyhedral was used for better turning ability. It doesn't look as good as straight dihedral, but the plane will really hang in a turn which helps in the thermals. When the first wing was assembled, ten degrees dihedral were put in the middle. We looked at it and decided it needed polyhedral, so five degrees were put in the tip joints. A few test glides were made this way, but then we went to ten degrees at the tips too.

We didn't try for a high aspect ratio for two reasons: a feeling that it just wasn't needed, and the desire to make the wing easier to build. This seems to have been a good choice. Dr. Walt Good commented that the Reynolds Number effect on the fairly wide chord wing probably allows the airfoil section to operate quite efficiently at the speeds we fly. Whatever the reasons, the results are what counts and this wing really works.

Design was compromised in some areas for easier building. Plug-in wings would be a lot cleaner than a wing resting on top of the fuselage with many rubber bands holding it on, but plug-in construction seemed too complicated. The tail section is rubber-banded on for the same reason. The elevator size shown is most effective; the rudder is just about enough. With a 12-ft. wing, a bigger rudder may not help much, and the ship handles quite well as it is now. Watch those tight turns near the ground; that long wing reaches way down and takes a while to get back up.



Two practical types of dihedral tip joiners. With rods and tubes use one aluminum, one steel. Flat joiners are both aluminum fitting plywood/epoxy boxes.



When it comes to flying, any fairly competent pilot can handle the Kong, once he is accustomed to the somewhat slow turning response and the landings. It floats a lot farther than may seem possible. The plane is rugged enough so that a wing tip can be deliberately lowered to the ground while very low, and the plane spun around for a short landing. This may not be expert technique, but it works and could be better than an overshoot into a fence.

Most important in thermal soaring from a winch tow or high-start is finding lift within the first minute off the tow. Floating ability alone is not enough; move around to find the lift. If the ship doesn't get it in that first minute, it will probably be on the ground very quickly. Come off the start and circle to find the lift. Many times the Kong seems to just maintain altitude for a while before it starts to go up.

Skill must be developed to tell when the plane is in lift. Sometimes there is no doubt; the plane jumps up and it's easy to see. Light lift is hard to find. It takes watching for a wingtip to lift, or seeing the plane slow down. Many fliers go right through thermals, apparently never realizing what they have done. Important indications are birds circling, clouds forming, and noting where the other models are going.

These planes need a strong high-start or winch tow to get them up. The Kong goes up straight. Be easy on the rudder; not much correction is needed on the way up. Don't pull in too much up elevator. With poor technique, its easy to consistently break 125-lb. test nylon line on a winch tow. Wind helps the launch, but too much causes problems.

A power pod, as shown, is practical for test flying. It hinders the glide performance a little and adds about a pound of weight, but it's a lot less work than setting up a high-start. A 29 or 35 is sufficient. One Kong even was put up with a 19. The model was flown once with the power pod, and the outer wing panels left off. It flew fairly well. When test gliding the plane, be sure to really throw it hard—it needs the airspeed.

Construction

Start with the tail assembly, it's the easiest. Foam cores are used for the horizontal stab, which is built in one piece. For the covering, use a 36" piece of light 1/16" balsa. The flat bottom makes it easy to construct. Lay the 1/16" balsa bottom sheet on the work area. Spray the sheet and foam core with contact cement (we prefer Scotch Spra-Ment No. 6060). Let dry until tacky, then lay the foam on the balsa. Do the same with the top sheet, add the edges, and it's done.

We added and shaped the leading and trailing edges and tips before cutting the middle and putting in the dihedral angle. The fin is flat 1/16" balsa sheeting over the framing. Block up the stab for the dihedral angle and epoxy the fin in place.

Building a fiberglass fuselage is nothing to be afraid of, especially if it is a group effort to make several fuselages. The pattern was made from clear pine in two pieces, spot-glued together, joint down the middle. When completely shaped, the two halves were split apart. Each half was then fastened to a piece of heavy plywood slightly bigger than the pattern itself. Here we made our first mistake. The patterns were finished with polyester resin after they were attached to the plywood. More resin got on one half than the other. As a result, the two fuselage halves, when molded, didn't fit together as well as they should have.

Instead, the patterns should be finished with wax and an appropriate release agent. Then build up the mold with a layer of fiberglass cloth, several layers of fiberglass mat, and another layer of cloth, all well-saturated with resin. Since resins vary in the way they are mixed and used, follow the directions closely. Pop the mold loose from the pattern and it's ready to make fuselages.

Clean and wax the inside of the molds; use an appropriate release agent. Next, lay up the fuselage with cloth and resin. Two layers were used for the entire length, and three or four layers from the wing leading edge forward to the nose. When resin was brushed into the mold, it apparently disturbed the release agent. That fuselage never did come out of the mold. However, when the first coat was sprayed into the mold, no further trouble developed.

Joining the fuselage halves is a messy job. Trim and sand the edges, cut out the hatch opening and the opening under the wing. Remove the section for the tail assembly. Then hold the two halves together with tape and rubber bands. Use glass cloth and resin to join the halves together through the openings. Cut a long strip of cloth and feed it through the rear section of the fuselage; then lift up one end of the fuselage and pour in resin so it runs down along the seam. Use a piece of stiff wire to work the resin into the cloth, making sure all the cloth along the seam is well saturated. When hard, turn the fuselage over and do the other seam the same way. Use plenty of cloth and resin in the nose section. The stabilizer saddle is important because it must be strong to keep the tail assembly from rocking. Use plenty of fiberglass and resin here.

An alternate fuselage construction method using 3/32" plywood doublers and balsa sides is shown. It will do a good job but probably won't stand up to punishment as well as a fiberglass fuselage. Those interested in purchasing the fuselage halves may contact Carl Maroney, 3107 McComas Ave., Kensington, Md. 20795.

Much thought was given to building a strong wing. Various materials, such as fiberglass arrow shafts, stainless steel tubing, or dowels, were considered for spars. Full depth ¼" high quality spruce was finally chosen. Bought at a boat lumberyard, the spruce was quite expensive.

Large engine and small tank work as well as large tank and small engine, but author recommends the fast climb on powerful but light Fox 35 engine. Power pod could be streamlined considerably; it noticeably hinders the glide of King Kong.

Whether buying or cutting foam wing cores, make a point of saving the block of foam from which the core was cut. Make the templates for cutting the cores thicker than usual because of the extremely thin trailing edge. Edge glue the 1/16" sheet balsa skin together and trim to shape. Contact cement the balsa sheets to the top of the wing core, then lay the core back into the block from which it was cut. Now guides can be made for the hot wire, a soldering iron, or razor blade used to cut the grooves for the full-depth spars into the cores. By leaving the core in the foam block when the spar grooves are cut, the wing will not warp or twist out of shape. Put the ¼" spruce into the slots and mark it so it can be trimmed flush with the core.

Determine what arrangement is to be used for the plug-in outer wing sections. Since ¼" rod is probably easiest, cut slots in the spars to accept ¼" I.D. tubing, and epoxy the tubing into the spars. We wrapped the spars/tubing with thin glass cloth and epoxy for strength. As an alternate joining method, 3/32" aluminum joiners, cut to the dihedral angle, will slide into boxes built of plywood and epoxied to the spars.

Make the four plywood dihedral joiners and cut away the foam on both sides of the spars in the center section so the joiners may be installed later. Epoxy all the spars into the wing cores.

Because of the thin trailing edge required, the wood overlaps the foam and needs extra support there. Cut some fairly light fiberglass cloth into 1½"-wide strips to be put in all along the trailing edge, between the top and bottom balsa covering. Hobbypoxy Formula II was used for this. Prepare the balsa bottom covering. Leave the wing panels in the foam blocks so there is no chance of twisting a panel. Spread Hobbypoxy along the trailing edge, 1½" wide. Lay on the glass cloth and put more Hobbypoxy on top of it. Using a piece of cardboard to shield the Hobbypoxy, spray contact cement on the foam core and balsa skin. When the contact cement is tacky, put on the balsa skin. The Hobbypoxy is slow drying so this procedure presents no problems.

When the four panels are done, join the two center sections with the plywood joiners and plenty of epoxy. Wrap the center section with six-in. wide fiberglass cloth and epoxy. Trim the outer panels for the correct dihedral angle at the joint and cap the ends with 1/16" plywood. Drill the plywood for the ¼" joiner rods first and be sure the panels line up properly. Add the balsa leading edge and the plywood tip plates. Quarter-inch aluminum rod should be strong enough for dihedral joiners. To be safe, we have been using one piece of steel rod and one piece of aluminum rod on each side. Steel rod weight is .0139 lb/in. and aluminum rod is .005 lb/in.

This wing construction with all its spruce, epoxy, plywood, and fiberglass may sound too heavy and too strong. Not so! Many times 125-lb. test line has broken on a winch tow. The Kong weighs almost ten pounds, with the power pod, and that wing has to be strong! When it is flown in strong lift and a lot of down elevator used to keep it from going up too fast, the ship picks up speed and really moves. Therefore, we believe this type of construction is necessary. A Marvelite-covered wing could be tried.

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King Kong

(Continued from page 29)

The two spars were carried all the way out to the tips, but they probably are not needed much farther out than the plug-in tubing. Super MonoKote is best for covering the wing and tail—it's the fastest and lightest. Paint the fuselage a dark color. Our first one was light in color and could not be seen at all as the plane climbed high.

The power pod, if desired, is quickly built from plywood and fiberglass cloth. Put waxed paper over the wing and glue the pod parts together right on the wing to be sure it fits well.

Make the tow hook strong. We used a section of T-shaped aluminum extrusion and put some extra layers of glass cloth inside the fuselage at that spot. Use plenty of cloth and resin in the nose; it takes a lot of beating on the hard landings. Almost one pound was needed in the nose to achieve proper balance.

Nylon pushrods, used in the original model, were satisfactory except for the noticeable trim change as temperature variations affected the nylon. The new Sullivan GoldN-Rods should solve this problem. The elevator hook-up, with the split elevators, is a little more trouble to make. The two pushrods are soldered together inside the fuselage and then attached to the nylon tube.

The name "King Kong" certainly doesn't sound like a streamlined, graceful sailplane, but results count and the big Kong can hold its own in any soaring competition.

Please contact me in care of this magazine if you have any comments or questions.

FULL SIZE PLANS AVAILABLE—SEE PAGE 70